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did not provide clinically significant improvement. After four months of tretinoin 0.025% cream and hydrocortisone 2.5% cream nightly, also hydroquinone 4% cream did not lead to notable improvement. Addition on the nasal root expanding to both sidewalls. Initial therapy with daily hyperpigmented patches without overlying scale or erythema were present. Hyperpigmentation or irritation from his CPAP. On examination, symmetric discolored patches over his nasal bridge attributed to allergy from goggles worn.

**Design:** A 37-year-old Black male veteran presented to dermatology for dyspigmentation. Post-inflammatory hyperpigmentation (PIH) is a challenging dermatologic issue that often requires a multimodal approach to therapy. Utilizing both the 755nm and 1064nm wavelengths can be beneficial in targeting pigment present at different depths within the skin. Targeting superficial pigment with a 755nm wavelength prior to focusing on deeper pigment further down in the tissue with a 1064nm is one approach to consecutively and effectively treat this condition. This case illustrates that the sequential use of varying laser wavelengths along with detailed history-taking and elimination of potentially contributing external factors is essential in skin of color patients for post-inflammatory hyperpigmentation.

**Summary:** 10% thioglycolic acid is effective in the partial clearance of PPD dyspigmentation with weekly sessions for 6 weeks without any serious side effects.

**Purpose:** Post-inflammatory hyperpigmentation (PIH) is a challenging issue, particularly in patients with deeply pigmented skin. In this study, we report successful treatment of refractory post-inflammatory hyperpigmentation over the nasal bridge utilizing the 755nm Alexandrite followed by the 1064 nm Quality-switched neodymium YAG laser systems in separate sessions. Our goal is to describe the efficacy and safety of using sequential laser systems for PIH in patients with skin of color.

**Design:** A 37-year-old Black male veteran presented to dermatology for discoloration over his nasal bridge attributed to allergy from goggles worn in the service. Upon further history, it was discovered the patient also wore nightly continuous positive airway pressure (CPAP) machine fitting the distribution of the nasal discoloration, suggesting pressure-induced hyperpigmentation or irritation from his CPAP. On examination, symmetric hyperpigmented patches without overlying scale or erythema were present on the nasal root expanding to both sidewalls. Initial therapy with daily hydroquinone 4% cream did not lead to notable improvement. Addition of tretinoin 0.025% cream and hydrocortisone 2.5% cream nightly also did not provide clinically significant improvement. After four months of this topical regimen, these medications were discontinued and he was referred to laser clinic where he was treated with the 755nm Alexandrite laser. Three discrete nasal patches were treated with the 12mm spot size: 22J, 3ms, 1.0Hz. Blistering was immediately noted post-procedure. The patient was instructed to apply clobetasol 0.05% ointment twice per day to the affected areas for one week, along with strict sun protection. Upon our recommendation, he also sought a different CPAP mask that conferred a better fit and did not involve his nasal root.

**Findings:** At his follow-up appointment one month later, the patient noticed significant improvement in nasal bridge dyspigmentation. However, faint hyperpigmented residua was still present particularly outlining the peripheral rim of the initial patch. While there was residual hyperpigmentation, repeated use of the alexandrite was not indicated. He was restarted on a nightly regimen of alternating hydrocortisone 2.5% cream, hydroquinone 4% cream, and tretinoin 0.025% cream. Due to the COVID-19 pandemic, his subsequent follow-up appointment was 14 months after his initial laser treatment. The patient continued to have appreciable improvement of his nasal hyperpigmentation; however, the entirety of the hyperpigmentation was not resolved. The patient was then treated with a singular session of QS ND:YAG with the 5mm spot size, 2.25 J, and 5.0 Hz. At his follow-up appointment, there was no longer an outline of his hyperpigmentation.

**Summary:** PIH is a challenging dermatologic issue that often requires a multimodal approach to therapy. Utilizing both the 755nm and 1064nm wavelengths can be beneficial in targeting pigment present at different depths within the skin. Targeting superficial pigment with a 755nm wavelength prior to focusing on deeper pigment further down in the tissue with a 1064nm is one approach to consecutively and effectively treat this condition. This case illustrates that the sequential use of varying laser wavelengths along with detailed history-taking and elimination of potentially contributing external factors is essential in skin of color patients for post-inflammatory hyperpigmentation.

**Purpose:** Cosmetic procedures are on the rise in the United States in all racial and ethnic demographics; as such, the patient population of aesthetic practitioners is becoming increasingly racially and ethnically diverse. However, current literature shows cosmetic procedures are still heavily skewed towards non-skin of color patients, as 2018 data showed only 30% of cosmetic patients have skin of color (ASPS 2018 Plastic Surgery Statistic Report). As such, it is important that clinical trials investigating devices and procedures in the field of aesthetics accurately reflect the populations in which they will be performed. We sought to analyze published cosmetic randomized controlled trials, both industry-sponsored and investigator-initiated, to characterize and assess representation of skin of color participants over the past three decades.

**Design:** All randomized clinical trials were identified between 1990 and 2020 within the PubMed database using the following keywords: “cosmetic,” and “aesthetic.” After a clinical trials filter was applied, 591 studies were identified. After removing studies involving children and those unrelated to cosmetics/dermatology/plastic surgery, 318 studies were reviewed. Data on race, ethnicity, and Fitzpatrick Skin Type were collected. Skin of color was defined as American Indian/Alaska Native, Asian, Black, and Hispanic/Latino. Distributions of percentage skin of color, age, sex, and procedure type were compared by journal type and funding source.
**Findings:** The top three journals with cosmetic clinical trials published were Dermatologic Surgery (n=80), Journal of Drugs in Dermatology (n=29), and Journal of Cosmetic Dermatology (n=26). The top three procedures studied in clinical trials were soft tissue fillers (n=94), surgeries (n=34), and neuromodulators (n=31). The mean/median age for industry-funded vs non-industry funded trials was 49.82 and 46.62 years, respectively (p < 0.03). Non-industry funded projects were more likely to have greater than 50% non-white participants (OR 7.823, p < 0.01). Furthermore, industry-funded projects were likely to have larger sample sizes (p < 0.01). The mean sample size of industry-funded vs non-industry-funded trials was 139.2 and 81.4 participants, respectively.

One limitation of this study is that of the 318 studies reviewed, 175 did not include data about racial/ethnic diversity of study participants.

**Summary:** Cosmetic clinical trials in the United States must be representative of the ever-increasing diversity of the US population. Our study shows a negative relationship between industry sponsorship and participant ethnic/racial diversity in aesthetic randomized controlled trials, and should serve as a call to action for industries to increase the inclusion of skin of color participants in their studies.

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**Recently Developed Hyaluronic Acid Filler VYC-12L Improves Cheek Skin Smoothness: 6-Month Results From a Prospective Study**

**Purpose:** A recently developed hyaluronic acid (HA) filler, VYC-12L (12 mg/mL HA with lidocaine), could improve facial fine lines and some skin quality attributes. The current study evaluated the safety and effectiveness of VYC-12L in subjects seeking improvement in cheek skin smoothness.

**Design:** In this prospective, multicenter, evaluator-blind study, subjects aged ≥22 years with moderate or severe scores on the investigator-assessed Allergan Cheek Smoothness Scale (ACSS) were randomized 2:1 to the VYC-12L group (initial treatment plus optional 1-month [M] touch-up) or control group (no-treatment control with optional treatment and 1-M touch-up). VYC-12L was injected intradermally across both cheeks. The primary effectiveness endpoint was the ACSS responder status (≥1-grade improvement from baseline on both cheeks [rated live by a blinded investigator]) at M1 after the last injection (initial or touch-up). Secondary effectiveness endpoints included change from baseline to M1 on the overall score of the subject-rated FACE-Q Satisfaction with Skin questionnaire and M1 investigator-rated responder status on the Allergan Fine Lines Scale (AFLS). Adverse events (AEs) and injection site reactions (ISRs) were monitored.

**Findings:** Of 202 subjects (VYC-12L, n=131; control, n=71), 86.1% were female and median age was 58.0 years. Fitzpatrick skin phototypes I/II (31.7%), III/IV (57.9%), and V/VI (10.4%) were represented. The higher ACSS responder rate at M1 in the VYC-12L group (57.9%) compared with the control group (4.5%) was statistically significant (P < 0.001). The VYC-12L ACSS responder rates were 61.7%, 59.1%, and 55.6% at M2, M4, and M6, respectively. The mean (±SD) change from baseline in the overall score of the FACE-Q Satisfaction with Skin questionnaire was significantly higher for the VYC-12L group versus the control group at M1 (2.59 ± 1.24 vs 1.33 ± 1.58, respectively, P < 0.001). The mean change from the baseline scores for the VYC-12L group were 2.93, 2.95, and 2.54 at M2, M4, and M6, respectively.

**Summary:** VYC-12L demonstrated clinically relevant and statistically significant bilateral improvement of cheek skin smoothness and fine lines, as well as increased satisfaction with skin compared with control. All enhancements persisted up to 6 months. VYC-12L was well tolerated with low AEs.
**Hi-Definition Liposculpting**

**Purpose:** Liposuction and body contouring has come a long way since its humble beginnings around the 1970’s through simple curettage. Multiple specialties contributed to the advancement of liposuction over time, one of the major breakthroughs has been the introduction of Hi-Definition liposculpting technique with the assistance of third-generation assisted liposuction using Vibration Amplification of Sound Energy at Resonance (VASER) technology. In this presentation I will explain the revolutionary 3D and 4D Hi-Definition liposculpting technique using VASER technology and go over relevant studies existing in the medical literature. For the past few years, the Dermatologic Surgery society and others have not given the field of liposuction and autologous fat transfer much attention which would, and has in some regions, weakened the rightful privilege of dermatologist to practice these procedures as it has been challenged on numerous occasions by other specialties using the excuse that we are not trained enough or updated enough. Having said that, it is of paramount importance to keep the members of the society updated in every aspect in these procedures and have them regain their place as pioneers as they once were.

**Design:** A comprehensive review of the literature for related papers on Hi-Definition technique, and the relevant ones on third-generation assisted liposuction technology are presented. In addition to the science, the author’s personal experience with this approach will be presented.

**Findings:** Multiple studies demonstrate the safety and efficacy of third-generation assisted liposuction, and the Hi-Definition technique

**Summary:** A new milestone has been set in the field of liposuction; Hi-Definition liposculpting, whether it maybe in 3D or 4D, using the third generation assisted liposuction is safe and effective, and above all, reproducible.

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**Canada HARMONY Study:** Comprehensive Panfacial Approach to Aesthetic Treatment, Including Submental Fullness, Results in Improved Patient-Reported Outcomes

**Featured at the Best of Cosmetic Abstract Session on Sunday, Nov. 21 from 2:45 – 3:45 p.m. CT**
Evaluation of an Updated 6Mz RF Platform for Noninvasive Skin Tightening of the Eyelids, Face and Upper Neck

**Purpose:** Noninvasive skin tightening is a challenging clinical goal. Numerous technologies are utilized in an effort to achieve this outcome. Despite these efforts, the goal remains somewhat elusive.

The purpose of this study was to evaluate clinical outcomes when the most current version of a previously well-established platform for noninvasive skin tightening was applied to the eyelids, face, and upper neck. This platform is the only energy based device with an FDA indication specifically for treatment of the eyelids.

**Design:** The protocol was approved by the New England IRB and all requirements of the Declaration of Helsinki were met. 25 subjects Fitzpatrick skin type I-VI with mild to moderate laxity of the eyelid, face, and neck skin were enrolled. All subjects were treated with a 900 pulse, 4cm² tip on the face and upper neck; the eyelids were treated with a 450 pulse, 0.25cm² tip. Treatment was performed in the standard manner titrating energy to a subjective discomfort of 2-3 on a 2-3 on a 4 point scale. Plastic corneoscleral protective lenses were used when the eyelids were treated. Standardized photographs were obtained at baseline and 1, 3, and 6 months post treatment. Treatment outcomes were assessed at each visit by Subject Global Assessment Improvement Scale (SGAIS), Physician Global Assessment Improvement Scale (PGAIS) and by blinded assessment of subjects by an independent reviewer using the Fasil (Facial Skin Laxity) scale. Subject satisfaction was also measured using the Likert scale.

**Findings:** All enrolled subjects completed the treatment and all follow up visits. The treatments were well tolerated and there were no complications or adverse events. PGAIS scores at 6 months follow up (0 = No Improvement, 1 = Minor/Mild Improvement (0-25%), 2 = Moderate Improvement (26-50%), 3 = Marked Improvement (51-75%), 4 = Very Significant Improvement (76-100%)) were 2.31 +/- 0.55. SGAIS scores 6 months post treatment were 2.96 +/- 0.75. Facial skin laxity scores (0-4 scale) were 0.85 +/- 0.99 for the upper face, 0.92 +/- 1.0 for the middle face, 1.2 +/- 0.83 for the lower face, and 1.48 +/- 0.9 for the upper neck. Subject satisfaction as assessed by scores (1 = very dissatisfied, 5 = very satisfied) were 4.38 +/- 0.86.

**Summary:** The radiofrequency platform evaluated in this trial for treatment of the eyelids, face, and upper neck lead to significant improvement in skin laxity as assessed by both subject and investigator GAIS scores 6 months post treatment. Fasil scores were less conclusive with high standard deviations but trended toward indicating that the lower face and upper neck responded particularly well. Subject satisfaction was excellent. Overall the platform used in this trial produced clinically significant improvements and high subject satisfaction scores. Limitations of this trial include the relatively small number of subjects and the lack of more objective scales to assess clinical outcomes.
Purpose: Melasma is a common skin disorder that presents as irregularly shaped dyschromic macules on the face, predominantly in women. This condition can be challenging to treat and therapy involves the use of sun protection, topical products that inhibit melanin production or transfer to keratinocytes, chemical peels, or lasers. Recently, a novel custom serum formulation was developed that allows patients to choose a specific serum combination based on their skin needs including exfoliators, brightening agents such as tranexamic acid, azaleic acid, and kojic acid, and retinol to address pigmentation and photoaging concerns of melasma. The objective of our study was to evaluate the efficacy of this novel custom topical serum formulation in the treatment of melasma and visible signs of aging.

Design: This was a prospective, single center, clinical study, that enrolled 24 patients with mild to moderate melasma, Fitzpatrick skin type I to VI, and ages 18-65. All subjects received a customized formula that was recommended by an algorithm using four screening questions and was made in office by a compounding machine. The ingredients varied depending the screening questions, but all patients had the tranexamic acid in the product. The serum was used once a day at night if the formula had a retinol, or twice per day if the formula did not have a retinol for 12 weeks. Modified Melasma Area and Severity Index (mMASI), overall hyperpigmentation and photodamage on a 0 to 9 scale, and investigator global aesthetic improvement scale were conducted by board certified dermatologists on screening, day 30, day 60, day 90 and day 120 and Canfield Visia photography was used. Subject global aesthetic improvement was also recorded.

Findings: A total of 24 subjects with mild to moderate facial melasma were enrolled during the study, and 1 subject was lost to follow up. There was a decrease in the modified Melasma Area and Severity Index (mMASI) scores at all timepoints. The largest decreases in mMASI scores were seen at day 90 and day 120 with a 38.9% (p < 0.008) and 37.8% (p < 0.01) decrease, respectively, from baseline scores that were statistically significant. There were decreases in investigator assessed overall hyperpigmentation and photodamage at all time points. At day 120 there was a 20.9% decrease in hyperpigmentation and a 12.9% decrease in photodamage on the face. There was a statistically significant decrease in hyperpigmentation compared to baseline at day 90 (p < 0.05). Throughout the study, patients had maintained subject satisfaction scores between somewhat satisfied to satisfied (range 1.73-1.78).

Summary: After 12 weeks of application of the customized serum, there was an average of a 38% reduction in melasma and investigators assessed a 20.9% decrease in hyperpigmentation and a 12.9% decrease in photodamage on the face. This study demonstrates that a novel customized serum can improve the appearance of both melasma and photodamage, and it had high patient satisfaction. This customized serum can be a useful addition to a treatment plan for patients with melasma and photodamage.
FEATURED AT BEST OF ABSTRACTS SESSION ON SUNDAY, NOV. 21 FROM 2:45 – 3:45 PM. CT

**A prospective trial: Handsfree thermoregulated bipolar radiofrequency for face and neck contouring**

**Purpose:** The purpose of this study was to prospectively evaluate the first ‘hands free’ thermoregulated noninvasive bipolar radiofrequency (RF) technology specifically intended to target lower 1/3 of the face soft tissue laxity. To our knowledge, this is the first device designed to provide soft tissue contraction through noninvasive bipolar radiofrequency in an automated delivery process.

**Design:** This multicenter prospective study enrolled 40 subjects between the ages of 36-75 with visible signs of facial aging, seeking skin tightening treatments. Subjects underwent 3 biweekly treatments with the bipolar RF hands free device to the lower face and submental area where a target temperature of 42-43oC was maintained for 41 minutes. The primary objective of this study was to evaluate soft tissue remodeling pre-treatment and at 1,3, and 6 months post last treatment by using blinded evaluators, 3D photographic analysis (Quantificare, France), and volumetric measurements. Investigator and subject assessments were obtained using a 0–4 point Likert scale at the 1, 3, and 6 month follow-up visits. Adverse events and treatment discomfort were closely monitored during and after each treatment.

**Findings:** The majority of subjects and investigators found statistically significant improvements at all follow-up time points. At 1, 3, and 6 month follow-up visits, investigators found “some” to “significant” improvement in 64.5%, 66.7%, and 64.3% of subjects respectively. At same time points, subjects graded their skin appearance from “some” to “significant” range 75.8%, 84.6%, 80.0% at each follow up visit. Subject overall satisfaction was in the “some” to “significant” range 75.8%, 84.6%, 80.0% at each 1,3
and 6 month follow up visit. The treatments were well tolerated with the majority of subjects rating their discomfort level as “low” on a 0-10 scale.

Summary: The noninvasive thermoregulated bipolar radiofrequency device evaluated in this study represents significant development in the delivery and control of RF energy. As opposed to prior RF devices, this is the first device to provide a handsfree treatment modality, where the device is placed on the patient, pre-set to target temperatures, and activated- not requiring manual provider application. The device automatically reaches target temperature within 1-2 minutes and regulates electromagnetic current delivery to achieve the predetermined temperature settings consistently throughout the treatment. This feature eliminates user variability previously seen with other manual RF delivery methods leading to inconsistent energy delivery and outcomes. This study demonstrates that this hands free broad area RF delivery system is well tolerated and produces a tissue contraction of the lower face and submentum in the majority of subjects.

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Treating the Face and Body with Hyperdilute Calcium Hydroxylapatite: Dilution Practices and Injection Techniques for Biostimulation and Skin Tightening in Clinical Practice

Purpose: Treatment with dilute and hyperdilute calcium hydroxylapatite (CaHA) has emerged as an effective treatment for improving skin quality and managing laxity in the face, arms, hands, neck, décolletage, upper arms, abdomen, buttocks, upper legs, as well as cellulite and striae. CaHA is able to both provide immediate volume following injection and stimulate neocollagenesis and elastin formation over time, a combination of features unique among biostimulatory fillers. These properties make dilute and hyperdilute CaHA, which can be distributed across a much larger surface area in a more superficial plane to stimulate collagen and elastin formation, valuable tools for nonsurgical skin tightening.

Design: While consensus guidelines on hyperdilute CaHA have been published (Goldie et al., 2019 and Trindade de Almeida et al., 2019), there is a need for practical step-by-step guidance on patient selection, when dilute vs. hyperdilute CaHA should be used, dilution practices, dosage, and optimal injection technique for interested practitioners, so that they may confidently incorporate this highly effective treatment into practice. Over 3 regional meetings, 12 expert physician injectors participated in live webinars. The practical guidance is based upon the most frequently requested information by audience members and the information considered critical for success by expert panel. This expert panel reviewed workflow for dilution and hyper dilution of CaHA, provided detailed instructions for injection of the face and body, and reviewed tips for patient selection.

Findings: The recommendations presented are consistent with published consensus guidelines on hyperdilute CaHA but are intended to serve as “how-to” guidance based on the experience of expert injectors who have successfully treated face and body using hyperdilute CaHA with extremely high patient satisfaction.

Summary: This consensus provides step-by-step guidelines for the novel use of CaHA as a biostimulatory agent in the face and body. Very little down time for the patient makes this treatment technique particularly appealing. Future clinical trials will provide further evidence for optimal outcomes.

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Post-marketing safety surveillance of delayed complications for recent FDA-approved hyaluronic acid dermal fillers

Featured at the Best of Cosmetic Abstract Session on Sunday, Nov. 21 from 2:45 – 3:45 p.m. CT

Purpose: To review post-marketing data for delayed (>14 days post-treatment) adverse events (AEs) of interest (Inflammatory and non-inflammatory nodules, hypersensitivity, granulomas) for hyaluronic acid (HA) fillers FDA-approved between 2016-2020.

Design: Reports from the Manufacturer and User Facility Device Experience (MAUDE) database were extracted for HA-REF, HA-KYS, HA-DEF, HA-VOB, HA-VLR, HA-RH2, HA-RH3, HA-RH4, and HA-VER, between Jan 2016-Jan 2021. Keywords from event narratives were used to identify and categorize AEs, then verified through inclusion/exclusion criteria. Percentages are based on the total combined events of interest to provide an overall perspective the events reported during the search period.

Findings: Out of 585 MAUDE reports, there were 195 (33.3%) delayed AEs of interest. Of those, 71.8% were nodules (42.1% Inflammatory and 29.7% non-inflammatory), hypersensitivity (21.5%), and granulomas (6.7%). Of the combined total events of interest, ordered by frequency reported, were HA-VLR (74.4%), HA-VOB (12.3%), HA-DEF (5.1%), HA-RH4 (3.6%), HA-REF (2.6%), HA-RH2 (2.1%) , with no reports for HA-RH3, HA-VER, and HA-KYS.

Summary: While delayed-onset nodules and inflammatory events may be uncommon in clinical practice, a retrospective review of reports from the MAUDE database between 2016-2020 demonstrates these events occur for HA-VLR, HA-VOB, HA-DEF, HA-RH4, HA-REF, and HA-RH2 (most to least frequent), with a majority being nodules.

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Subject-relevant Outcomes of On-label 50U AbobotulinumtoxinA Treatment for Moderate-to-Severe Glabellar Lines across Three Individual Trials

Purpose: The 50U dose of abobotulinumtoxinA (ABO) is approved for glabellar line (GL) treatment. Here we present efficacy, subject satisfaction, and safety results from three recent clinical trials using this dose, with a focus on ≥1-grade glabellar line improvement and subject satisfaction, reflecting clinical outcomes of significance for the subjects.

Design: Subjects with moderate-to-severe GL were treated with 50U ABO and followed for 6 to 9 months in three studies (NCT03736928, double-blind, Phase 2; NCT03960957, double-blind, Phase 3; NCT03687736, open-label, Phase 4). Evaluations included investigator- and subject-assessed GL severity scale (GLSS), a subject satisfaction questionnaire, subject-reported onset of effect (diary), and adverse events.

Findings: In each study, 80, 224, and 120 subjects were evaluated, the majority achieving improvement in GLSS. Median time to onset of effect was 2 days in all three studies. At Month 6, 53%, 46% and 37% of subjects in each trial maintained ≥1-grade improvement in investigator-assessed GLSS, and at Month 9, 18% of subjects in the Phase 2 trial still had ≥1-grade improvement. The majority of subjects were satisfied with their
COSMETIC DERMATOLOGIC SURGERY ABSTRACTS

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Combination botulinum toxin and hyaluronic acid filler to treat oral involvement in scleroderma

Purpose: Scleroderma or systemic sclerosis is a progressive disease characterized by cutaneous and systemic fibrosis. Cutaneous involvement is most noticeable by the patient and orofacial involvement is often the most disabling aspect of their disease. Involvement of the face by sclerosis causes hardening and atrophy of lips, skin, and subcutaneous issues, leading to diminished mouth opening. Oral incompetence may also develop due to loss of volume in the lips, leading to difficulty with normal activities of daily living including eating and drinking. Herein, we describe the use of botulinum toxin and hyaluronic acid filler to treat oral involvement in a patient with scleroderma.

Design: A 42-year-old female was seen in consultation for longstanding history of diffuse cutaneous scleroderma that was diagnosed 15 years prior. Manifestations included sclerodactyly of hands, Raynaud’s phenomenon, calcinosis, and gastrointestinal symptoms including dysphagia and heartburn. She additionally had considerable oral involvement with tightness and thinning of the lips. This was causing her difficulty with keeping food and water in the mouth, as well as trouble using straws due to decreased mobility of the lips. She was not on any systemic therapies for her scleroderma at the time of consultation. On examination, she had limited mouth opening, perioral tightness and loss of vermilion lip volume and structure. The patient was treated with 20 units of onabotulinum toxin A (Botox; Allergan Inc; Irvine, CA, USA), injected into 8 injection points at the orbicularis oris. In addition, she was treated with 1.6cc hyaluronic acid filler (Restylane Refyne; Galderma Laboratories, L.P.; Fort Worth, TX, USA) to the lips, divided over two sessions. The filler was placed using both depot injection technique and a retrograde fanning technique to all quadrants of the lips.

Findings: The patient reported significant improvement in drinking, eating, and food retention at one month follow up. Cosmetically, she had improvement in lip volume and symmetry.

Summary: Treatment of oral involvement in scleroderma should address both microstomia as well as tissue atrophy of the lips. Combination treatment with onabotulinum toxin A and hyaluronic acid filler allows for safe and effective treatment of oral involvement in scleroderma by dermatologists.

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Outcomes of Primary Closure Versus Second Intention Healing Following Excision and Superficial Radiation Therapy of Large Keloids

Purpose: Keloids, especially those at sensitive cosmetic sites, can be disfiguring and greatly affect a patient’s quality of life. Cosmetic outcomes following surgical treatment of keloids are variable. Here we discuss the results of primary closure versus second intention healing following excision and superficial radiation therapy of large segmental keloids on the face.

Findings: Eight months following the first staged excision, the patient has not experienced any keloid regrowth. The cosmetic outcomes are superior at the sites which were closed primarily but the overall results are excellent including the site which healed by secondary intention. We expect the appearance of this area to continue to improve with time and continued tissue remodeling. The efficacy of single-dose superficial radiation therapy for the treatment of excised keloids has been documented previously. None of the sites exhibited any adverse effect of radiation on wound healing. No complications following wound closure such as dehiscence were observed. Primary closure following excision and superficial radiation therapy may improve cosmetic outcomes.

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Chin Augmentation with the Hyaluronic Acid Filler VYC-20L Results in High Participant Satisfaction: A Subgroup Analysis of a Phase 3 Study

Purpose: The chin contributes to a well-balanced face; however, congenital elements as well as age-related bony resorption, volume loss in fat compartments, and soft tissue laxity in the chin and lower face can lead to a disharmonious facial appearance. Hyaluronic acid (HA) fillers can be used for chin augmentation. A previous publication established the safety and effectiveness of VYC-20L, a 20 mg/mL HA filler with lidocaine, for augmentation of the chin region to improve the chin profile. To examine treatment satisfaction across various populations, the current subgroup analysis evaluated patient-reported outcomes across different skin types, ages, and genders.

Design: In this multicenter, randomized, evaluator-blind, controlled study, participants aged ≥22 years with moderate to severe chin retrusion, per validated, proprietary photonumeric scale, received VYC-20L either at study onset (treatment group) or delayed by 6 months (no-treatment group). For subgroup analysis, only the treatment group was evaluated. Patient-reported outcomes using the validated FACE-Q Satisfaction with Chin and FACE-Q Psychological Well-being instruments, as well as both the participant and investigator Global Aesthetic Improvement Scale (GAIS), were assessed at month 6 (primary endpoint) and month 12 post-treatment. The data were compared by skin type (Fitzpatrick skin type [FST] II/III, FST IV/V/VI), age (<56 years, 35–55 years, ≤34 years), and gender (female, male).

Findings: The treatment group consisted of 144 participants. At month 6, the proportion of participants reporting improvement from baseline score in FACE-Q Satisfaction was similar regardless of skin type (FST II/III: 92.4%, FST IV/V/VI: 94.1%), age (≤56 years: 87.2%, 35–55 years: 95.1%, ≤34 years: 95.1%).
years: 100%), and gender (female: 92.8%, male: 93.3%). There were no significant differences in the mean change from baseline score in PACE-Q Psychological Well-being at month 6 when subdivided by skin type (FST I/II/III: 13.2, FST IV/V/VI: 21.2), age (≥56 years: 12.8, 35–55 years: 17.0, ≤34 years: 16.5), and gender (female: 14.0, male: 25.5). A similar proportion of participants also reported Improved or Much Improved GAI scores when subdivided by skin type (FST I/II/III: 88.0%, FST IV/V/VI: 85.3%), age (≥56 years: 80.9%, 35–55 years: 91.8%, ≤34 years: 88.9%), and gender (female: 86.5%, male: 93.3%). There were no significant differences within subgroups in the investigator-rated GAI. For all endpoints, similar outcomes were observed at 12 months.

Summary: Treatment with YVC-20L for chin augmentation led to high patient reported satisfaction across various participant populations through 12 months post-treatment.

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Co-Author: Brian Biesman, MD, Volunteer Assistant Clinical Professor; Elizabeth M. Miller, MD, Volunteer Assistant Clinical Professor

Perceptions of the Reduction of Masseter Muscle Prominence Following OnabotulinumtoxinA Treatment

Featured at the Best of Cosmetic Abstract Session on Sunday, Nov. 21 from 2:45 – 3:45 p.m. CT

Purpose: Individuals with masseter muscle prominence (MMP) may seek aesthetic treatment to reduce a widened or square lower facial shape. OnabotulinumtoxinA (onabotA) has demonstrated efficacy in reducing MMP. This study evaluated participant perceptions of onabotA 48 and 72 U treatment for MMP.

Design: This 6-month, double-blind, randomized, phase 2 study compared onabotA 48 U, 72 U, and placebo in adults with bilateral grade 4 (marked) or 5 (very marked) MMP on the clinician Masseter Muscle Prominence Scale (MPMS) and grade 4 (pronounced) or 5 (very pronounced) MMP on the participant MMPS (MMPS-P). Primary efficacy endpoint was proportion of participants achieving MMPS grade ≤3 (moderate, mild, or minimal severity) at day 90. Additional endpoints included MMPS-P grade ≤3, Patient Self-Assessment of Change (PSAO) ≥2-grade, ≥2-grade Participant Global Impression of Bother (PGIB), Lower Facial Shape Questionnaire-Treatment Satisfaction (LFSQ-TXSAT), Psychosocial Impact, Sign Severity, and Overall Satisfaction measures. Safety was also evaluated.

Findings: Of 150 enrolled participants, 145 had ≥1 postbaseline MMPS assessment (placebo, n = 46; onabotA 48 U, n = 53; onabotA 72 U, n = 46). Participants were mostly female (89.7%) and White (75.9%); mean age was 39.3 years. All key endpoints (assessed at baseline and day 90) met with high significance versus placebo (P < 0.0001 unless noted). A respective 21.7% (n = 10), 90.6% (n = 48), and 91.3% (n = 42) of placebo, onabotA 48 U, and onabotA 72 U participants achieved MMPS grade ≤3. Similarly, 47.8% (n = 22), 96.2% (n = 51), and 93.5% (n = 43) achieved MMPS-P grade ≤3; 21.7% (n = 10), 90.6% (n = 48), and 73.9% (n = 34) achieved PSAO grade ≥2; and 39.5% (17/43), 90.2% (46/51), and 73.2% (30/41) of participants “somewhat” to “extremely” bothered by MMP at baseline on PGIB achieved “not at all bothered” or “a little bothered” after treatment (P = 0.0019, onabotA 72 U versus placebo). Up to 85% of participants reported being “very satisfied” or “satisfied” on LFSQ-TXSAT with onabotA treatment versus 26.1% with placebo. Improvements were reported across nearly all other LFSQ item assessments, including psychosocial impact. The most common onabotA treatment-related treatment-emergent AEs (2.9% [n = 3] each) were injection-site pain, muscular weakness, mastication disorder (eg, difficulty chewing), and facial paresis (eg, impact on smile); most mild and resolving spontaneously.

Summary: MMP was significantly reduced after a single onabotA (48 or 72 U) treatment based on MMPS and MMPS-P assessments at day 90. Study participant perceptions were consistent with these findings. Most onabotA-treated participants reported being less bothered by MMP after treatment, with less negative psychosocial impact and greater satisfaction with outcomes.

Primary Author: Robert Finney, MD, Entiere Dermatology, New York, NY
Co-Author: Melissa Levin, MD

What's new in Hair Loss

Purpose: A review of current treatments in hair loss, including re-emerging therapies like oral minoxidil. Go over most recent data for PRP and keralase. Discuss ongoing research and early data with exosomes and personal experience with customized mesotherapy.

Design: Review of literature and data gained from treating a lot of hair.

Findings: More of a review with personal case series on customized mesotherapy (antioxidants, spironolactone, finasteride, minoxidil).

Summary: Customized mesotherapy is a good option in motivated patients who are non-compliant or have suffered side effects from other available options.

Primary Author: Alexander Fogel, MD, MBA, Resident, Yale University School of Medicine, Fairfield, CT
Co-Author: Kathleen Souzzi, MD

Extensive arcuate-patterned hypopigmentation following pulsed dye laser successfully treated with brimatoprost and non-ablative fractional resurfacing

Purpose: Hypopigmentation is a rare adverse event of treatment with pulsed-dye laser (PDL). This case report describes the development of extensive arcuate-patterned hypopigmentation following PDL, which was successfully treated with brimatoprost and non-ablative fractional resurfacing.

Design: A previously healthy 30-year old female patient who presented for follow-up treatment for erythematous poikiloderma of the face, neck, and chest with 565 nm PDL. She had received 3 prior treatments with PDL (7J/cm2, 10ms, 10mm spot size), with noticeable reduction in dyschromia. At this visit, she described recent mild tanning, but no other skin changes, symptoms, or treatments. She was treated, PDL settings of 6J/cm2, 3ms, 10mm spot size were used. She had no post-procedural purpura, vesicles or bullae, but described edematous papules on the chest on post-procedure day (PPD) 1 and mild scabbing on the chest at PPD 7. At return visit on PPD 30, she complained of persistent white spots, and examination at that time revealed several dozen patterned, arcuate, hypopigmented macules on the upper chest, with no concerning findings on the neck or face.

Findings: The patient was treated for post-inflammatory hypopigmentation on PPD 30. Non-ablative fractional resurfacing (NAFR) with two wavelengths (Fraxel DUAL) was used (1927nm: 10J/cm2, level 5 (40% coverage), 4/8 passes; 1550nm: 15J/cm2, level 6 (17% coverage), 4/8 passes). She was then started on brimatoprost 0.03% solution applied twice daily to hypopigmented areas. On repeat evaluation at PPD 62, marked reduction in hypopigmentation was noted, and she was treated with NAFR (1927nm: 10J/cm2, level 1 (20% coverage), 4 passes), as well as continuation of brimatoprost. On PPD 92, the patient reported complete resolution of the hypopigmentation, and brimatoprost was discontinued.
COSMETIC DERMATOLOGIC SURGERY ABSTRACTS

Successful epidermal skin grafting in a vitiligo patient despite a clinically negative micrograft engraftment at initial follow-up

Purpose: We demonstrate in this case that epidermal skin grafts can be successful in vitiligo patients despite initial failure of micrograft engraftment. The lack of initial engraftment should not discourage the provider or the patient.

Summary: Vitiligo is a common acquired dermatosis characterized by achromic or hypochromic macules and the absence of functioning melanocytes histologically. Surgical techniques have proven to be effective in stable cases. Melanocytes have been successfully transferred using punch minigrafting, split-thickness skin grafting, hair follicle transfer, suction blistering and epidermal curettage. We present a case of a 61-year-old female with a long history of vitiligo affecting her scalp, neck and shoulders. She had tried many treatments including narrow band UVB, topical steroids, vitamin D analogs and topical calcineurin inhibitors. Her estimated BSA was about 5% and she had been stable over a year without progression. We applied epidermal skin grafts using a commercially available skin harvesting system, Cellutome, The donor area (the inner thigh) was cleaned and the harvester head was applied. The epidermis was separated from the dermis by heat and negative pressure after 30 minutes. The recipient area (the bilateral shoulders) was prepared using dermabrasion until the Auspitz sign was achieved after 2% lidocaine was applied for local anesthesia. The micrografts were then transferred directly from the harvester to the recipient site using a semi occlusive transparent dressing. At her one-week follow up; she did not appear to having any epidermal micrograft engraftments at the recipient site. However, to our dismay, at her one-month follow up, she had islands of repigmentation at her recipient sites (the bilateral shoulders) and she was very happy with cosmetic outcome. In recent case series published using cellutome, all patients were noted to have micrograft engraftments at their 7 to 14 day follow up. We present this case to demonstrate that cellutome can be effective despite initial lack of evident engraftment. The lack of initial engraftment should not discourage the provider or the patient.

Primary Author: Ella Glaser, MD, Resident, Miami, FL

Co-Author: Hadar Lev Tov, MD

IncobotulinumtoxinA Demonstrates Safety and Prolonged Duration of Effect in a Dose-Ranging Study for Glabellar Lines: Final Study Results

Purpose: There is an increasing demand for a longer duration of effect from botulinum toxin A products. A 2-stage, phase 2, randomized, double-blind study was conducted to assess the duration of effect and safety of incobotulinumtoxinA (INCO) doses higher than the US Food and Drug Administration-approved 20 units (U) for glabellar frown lines (GFL). The stage 1 (50, 75 U) primary efficacy and safety results were reported previously. Here, we report the results of the final analysis (stage 1 and 2: 20, 50, 75, 100 U), including all primary and secondary efficacy and safety endpoints.

Design: A total of 241 subjects with moderate-to-severe GFL were randomized to receive a single treatment with either 20 (N=361), 50 (N=360), 75 (N=361), or 100U (N=359) INCO. The primary efficacy endpoint was duration of ≥1-point improvement from baseline assessed by investigator at maximum frown on the Facial Wrinkle Scale.

Findings: The median duration effect was 175 days for the 20U group (95% CI 142, 185), 185 days for the 50U group (95% CI 182, 205), 210 days for the 75U group (95% CI 182, 217), and 215 days for the 100U group (95% CI 183, 237). The incidence of treatment-related adverse events was low across all doses, and no treatment related serious adverse events were reported.

Summary: INCO doses up to 100U were well tolerated, consistent with the known safety profile of 20U, and increasing dose resulted in prolonged duration of effect for GFL.
SAME DERMATOLOGIC SURGERY ABSTRACTS

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Co-Author: Julie Biron, BSc

Synchronous Ultrasound Parallel Beam Technology for Lifting LAX Skin

Purpose: Ultrasound technology can treat fine lines and wrinkles as well as lift lax skin. Recently, a new-generation of Ultrasound device was developed to safely target the mid-dermis to maximize neocollagenesis and neoeelastogenesis, while incorporating feedback-controlled skin cooling and energy deposition. This ultrasound device utilizes synchronous ultrasound parallel beams to deliver seven beams of thermal energy at once to the mid-dermis at 0.5-2mm with center of treatment effect at 1.5mm depth, increasing tissue temperatures to 60-70 degrees Celsius.

A prospective, self-controlled clinical study assessed the utility of this new-generation ultrasound device to lift lax skin of the eyebrow and submentum and improve facial wrinkles.

Design: Fifteen (15) subjects were enrolled in an IRB-approved clinical trial and received two treatment sessions (mean interval 6 weeks) and were followed at 3 and 6 months post the last treatment. All subjects but 3 were treated each on three subareas of the face: forehead and temples for eyebrow lift, submentum and neck for lax submental lift and the cheeks including the perioral for lines and wrinkle reduction. The investigator assessed the improvement of each subarea. Subjects reported their satisfaction and willingness to perform future treatment. The VAS scale was used to document subjects’ comfort during the treatment. The immediate responses and safety aspects were recorded throughout the study visits.

Findings: All subjects completed the study and all treated areas were improved in at least one of the follow-up visits. Improvement rates were very high already at the three months follow up; 80% of the subjects were improved to very much improved on forehead and temples for eyebrow lift, 100% were improved on the cheeks, chin and perioral and all subjects treated on the neck and submentum were improved to very much improved on lax submental and neck tissue lift. Six months after treatments, the improvement rates remained high: 93% (forehead and temples for eyebrow lift), 93% (cheeks, chin and perioral) and 92% (submental and neck).

Consistent with the investigator assessments subjects reported high satisfaction from the results: 87% noticed improvement to significant improvement on the forehead and temples for eyebrow lift, and 93% and 92% reported improvement on the (cheeks/chin/perioral and submental and neck areas respectively), in at least one of the follow-up visits. Of note, most subjects reported their willingness to have future treatments.

Subjects reported on mean pain level of 5.6±1.8 (on 0–10 scale). Expected immediate responses were limited to slight erythema and slight edema which were observed following 67% and 7% of the treatments. One mild adverse event was recorded (facial peeling) which resolved spontaneously within 3 days.

Summary: This new-generation ultrasound device was demonstrated to safely provide clinical lifting of lax skin of the eyebrow and submentum as well as improvement of the facial wrinkles.

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A Prospective, Open-label Study to Evaluate Sequential Treatment with ATX-101 and VYC-20L for Overall Improvement in Jawline Contour

Purpose: Submental convexity and jawline contour impact the overall aesthetic appearance of the face. Minimally invasive injectable treatments have become a popular treatment approach to improve facial aesthetic contour. This study evaluated the safety and efficacy of sequential treatment with ATX-101 (deoxycholic acid) to reduce submental convexity and VYC-20L (hyaluronic acid filler) to enhance jawline contour.

Design: This was a prospective, open-label, phase IV study conducted at 3 sites in Australia. Eligible participants were males and females, 18-65 years of age with a score of >Grade 2 on the Allergan Loss of Jawline Definition Scale (ALJDS) (n=0 to 4-extreme) and Grade 2 - 3 on the Clinician-Reported Submental Fat Rating Scale (CR-SMFRS) (0-absent submental convexity to 4-extreme submental convexity). Participants received 1 ATX-101 treatment and up to 5 optional ATX-101 treatments until the results were satisfactory to the participants and investigators, followed by one treatment of VYC-20L (+ optional touch-up) to further define the chin and jawline. The primary efficacy endpoint was the investigator-assessed proportion of participants with ≥1-point improvement from baseline on ALJDS (responder rate) at final study visit (4 weeks post final VYC-20L treatment). Secondary efficacy endpoints included change from baseline to final visit on blinded independent reviewer (IR) assessed ALJDS by photograph; FACE-Q Scales: Satisfaction with Lower Face and Jawline, Appraisal of Area Under Chin; CR/PR-SMFRS; and Submental Skin Laxity Grade (SMSLG) score. Safety was assessed throughout the study.

Findings: A total of 53 participants, who were 83.0% female, 96.2% White, with a mean age of 48 years (range, 24-64), and a mean (SD) BMI of 28.0 (3.53) kg/m2 were enrolled in the study and formed the safety set. Of the 53 treated participants, 11 participants discontinued during the study due to withdrawal of consent (n=6), lost to follow up (n=3), and adverse event (n=2), ending with 42 participants completing the study. The Evaluable Set (ES) was made of 42 participants who received ATX-101 + VYC-20L and a post-treatment efficacy assessment. Responder rate (≥1 point improvement on the ALJDS) was 92.9% (n=39/42) and 54.8% (n=23/42) as assessed by investigator and IR, respectively. Mean change from baseline FACE-Q scores were 55.9 (p < .001) for Satisfaction with Lower Face and Jawline (1-very dissatisfied to 4-very satisfied), and 45.4 (p < .001) for Appraisal of Area Under Chin (1-not at all to 4-extremely). Mean change from baseline CR and PR-SMFRS score was -1.9 and -1.6 (p < .001) respectively and mean change from baseline SMSLG score was -0.3 (p=0.003) (1-none to 4-severe).

Safety endpoints: All treated participants (n=53) reported at least one treatment-emergent adverse event (TEAE). A total of 33 participants at least one TEAE related to ATX-101, three reported at least one adverse event (AE) related to VYC-20L. Two participants (2/53, 3.8%) experienced serious AEs unrelated to ATX-101, VYC-20L or study procedures. Three participants experienced ATX-101 related AEs of pain, induration, discoloration at the injection site and discontinued the study. No fatal or life-threatening AEs occurred.

Summary: Sequential treatment with ATX-101 and VYC-20L was determined to be safe and effective for reducing submental convexity and enhancing jawline contour.

Primary Author: Karyn Grossman, MD, President, Grossman Dermatology, Santa Monica, CA

Evaluation of a Novel Percutaneous Platysmal Plication and Permanent Platysmal Suture Sling

Purpose: Neck Rejuvenation remains a prime concern for patients, both men and women. Many do not want to undergo invasive surgeries such as a face or neck lift. While non-invasive and minimally invasive procedures such as ultrasound, external RF, liposuction, RF microneedling and injectable RF are effective, some patients get less retraction of the excess skin then they would like. This study will look at the efficacy of this novel percutaneous platysmal band plication and permanent platysmal sling both...
as a stand alone procedure and in combination with subcutaneous RF and liposuction to evaluate its efficacy and side effect profile.

**Design:** Patients seen for either revision of a prior neck procedure, or initially evaluated for an aging neck were treated with either the band plication and platysmal sling alone, or in combination with internal RF and liposuction. The suture is placed under the skin through a series of small stab wounds using an ICLED light guide to help ensure proper placement. The anterior neck bands are ligated with a jiggly saw motion then the same system is used to create a permanent suture suspension. Patients were evaluated at 2 weeks, 4 weeks. Before and after photos [3D and 2D] were evaluated by an independent reviewer and graded on a quartile scale looking at improvement. Complications were monitored.

**Findings:** All patients tolerated the procedure well. Side effects included bruising, swelling, tenderness and mild numbness which resolved. No patient experienced visible thread or thread migration to the surface. A few patients had small scars at the stab wound sites which were improving over time. All patients were happy with the procedure. All patients had improvement at the time points evaluated.

**Summary:** Patients are looking for greater improvement with non-invasive neck rejuvenation. The addition of percutaneous platysmal plication and permanent suture sling offer a safe and effective means to rejuvenate the neck.

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**Safety and Efficacy of Single Treatment Combination of Aggressive RF MicroNeedling and Fractionated CO2 Laser Resurfacing**

**Purpose:** Many patients prefer a single more aggressive treatment for panfacial rejuvenation instead of multiple treatments with smaller downtimes. When looking for optimal rejuvenation, one wants to address as many of the components of aging as possible. Combining single procedure aggressive RF microneedling with fractionated CO2 laser, one gets a greater improvement in both laxity as well as surface texture, wrinkles and dyschromia.

**Design:** Patients were treated with a combination of RF microneedling at aggressive settings, typically with 7 or more passes followed immediately by fractionated CO2 laser settings, with settings typically done for stand alone procedures. The patients were followed daily until full reepithelialization had occurred. Healing, side effects and complications were carefully noted. Improvement was graded at 4 weeks by an independent physician using 3D and 2D images on a quartile scale.

**Findings:** All patients experienced a typical post-operative course, without any significant complications or events outside or normal healing process. All patients were happy with the treatments, and unbiased grader found global improvement on every patient.

**Summary:** Heating multiple layers of tissue, starting deep to superficial, can provide synergistic improvement in outcomes from individual treatments alone. Many patients would like to have a single procedure performed, with one downtime. Combining aggressive RF Microneedling with fractionated CO2 laser resurfacing is a safe and effective treatment for face and neck rejuvenation.

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**Evaluation of Broad Band Light in Combination with a Novel 1927nm Laser for Treatment of Photodamaged Skin**

**Purpose:** Broad Band Light (BBL) has been long known to treat vascular and pigmented abnormalities of skin. BBL in combination with a novel 1927nm laser may prove to be an optimal treatment for all skin types with little to no downtime in the improvement of dyschromia and superficial textural imperfections. The purpose of this investigation is to evaluate the efficacy of a Broad Band Light (BBL) in combination with 1927nm laser for improvement in pigmentation, fine rhytides, erythema, and skin tone and texture.

**Design:** Twelve female patients with facial skin dyschromia were consented and enrolled. Selection criteria were based on Fitzpatrick skin types I to VI with moderate sun-damage, aging skin with visible areas of fine rhytides, pigmentation and erythema or telangiectasia on the face. Patients received up to 2 treatments with 1927nm laser in combination with Broad Band Light (BBL) at 3-4 weeks interval. 1927nm laser settings ranged from 10-20 J/cm², density of 10-15%. Follow-up visits were conducted at 4 weeks post final treatment. Photographs of the treatment area were taken at baseline, treatment and follow-up visits. Adverse events were recorded at all visits.

**Findings:** All patients tolerated their treatment well. Marked improvement in pigmentation, fine lines, overall skin tone and texture seen at 4 weeks post final treatment. No adverse events other than transient erythema and edema were reported and all subjects were highly satisfied with the results achieved.

**Summary:** The combination treatment of BBL and 1927nm is a safe, and efficacious treatment for photodamaged skin and improvement of dyschromia.

**Primary Author:** Carolyn Jacob, MD, Founder and Director, Chicago Cosmetic Surgery & Dermatology, Chicago, IL

**Co-Authors:** David Kent, MD

**Combination of Synchronized Radiofrequency and HIFEM procedure for Effective Body Contouring**

**Purpose:** Both subcutaneous fat and muscle tissue significantly contribute to abdominal body contour. High-intensity focused electromagnetic (HIFEM) therapy primarily targets the muscle tissue enhancing its tone and strength. Radiofrequency (RF) is preferably used in aesthetics to reduce fat through localized heating. To achieve the complete body shaping effect an innovative technology that combines these two modalities was introduced. The aim of this review is to evaluate the efficacy of a novel device simultaneously delivering HIFEM and RF for subcutaneous fat reduction and muscle toning.

**Design:** Research that documents changes in abdominal fat and muscle tissue in a response to the treatment with novel device combining HIFEM and RF was searched and summarized. Special attention was given to the quantitative and objectively assessed values obtained by medical imaging modalities such as magnetic resonance or ultrasound. Besides, secondary outcomes including but not limited to patient comfort and satisfaction have been reviewed as well.

**Findings:** The findings were found to be highly consistent, evidencing the beneficial impact of the treatment on the subject’s visual appearance and abdominal contour. In general, the reviewed literature showed that improvement peaks 3 months after the last therapy with the average subcutaneous fat reduction reaching up to -30.8% (on average -29.6%), accompanied by +26.1% increase in thickness of rectus abdominis (on average +25.2%). Also, the separation of abdominal muscles and abdominal circumference were found to be reduced by -18.8% and -5.9 cm, respectively, at 3 months follow-up visit. Results were significant and evenly distributed above and below the abdomen. The combined treatment was considered as comfortable with high patient satisfaction in all reviewed studies.

**Summary:** The magnitude of obtained results indicates that using HIFEM and RF fields simultaneously is highly effective for abdominal contouring and it leads to considerable improvement of abdominal body contour through subcutaneous fat reduction and muscle thickening.
Virtual Oral Abstracts 2021 ASDS Virtual Annual Meeting

Cosmetic Dermatologic Surgery Abstracts

Primary Author: Carolyn Jacob, MD, Founder and Director, Chicago Cosmetic Surgery & Dermatology, Chicago, IL

Co-Author: Robert Weiss, MD

Muscle Toning and Shaping of Upper Arms Using a Simultaneous Application of HIFEM and Radiofrequency: Preliminary Data of a Multicenter MRI Study

Purpose: Excess fat and muscle laxity in the upper arm area is becoming a serious aesthetic problem, especially for women. Former studies have shown that simultaneous use of the High-Intensity Focused Electromagnetic Field (HIFEM) and Radiofrequency (RF) can be an effective solution for muscle toning and fat reduction. This study investigates the effect of the HIFEM+RF procedure on adipose tissue and muscle toning in the upper arms.

Design: A total of 34 subjects were recruited in the study. Twenty-eight subjects (23-72 years; 18.5-33.9 kg/m²) were evaluated at baseline and 1-month. They underwent four 30 minute bilateral procedures over the posterior upper arms spaced a week apart, with the device simultaneously combining HIFEM and RF energies. The changes in adipose and muscle tissue (m. triceps brachii) were evaluated using magnetic resonance imaging measurements, and the results obtained at 1-month follow-up were compared to the baseline. Patient comfort and satisfaction were documented, and digital photographs were used to document changes in visual appearance.

Findings: The analysis of MRI images showed noticeable and significant improvement in the upper arms. At 1 month after the last treatment, the thickness of the triceps muscle increased by +21.7% (+8.2±1.7mm) on average, while the adipose tissue showed a considerable decrease in thickness by -22.4% (-4.0±1.2mm). In addition, 75% of patients showed fat reduction greater than 21%, indicating the result's consistency in the study population. Furthermore, up to 86% of patients expressed satisfaction with the achieved treatment results at 1 month. All the evaluated patients reported that treatments were comfortable, with the Visual Analogue Scale pain score being 1.6 points on average.

Summary: The aforementioned preliminary results indicate that using HIFEM and RF fields simultaneously is effective for fat reduction and muscle toning in the upper arms. The findings correspond with short-term outcomes in preceding studies and demonstrate the multi-area use of HIFEM and RF energy combination.

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Co-Authors: Joel Cohen, MD; Ajay Sharma, MD

Characterizing Ocular Adverse Events After Facial Dermal Filler Injection: Real-world Data from the MAUDE Database

Purpose: Ocular complications secondary to ophthalmic artery emboli are a serious adverse event (AE) that can occur after facial filler injection. Without early recognition, critical time can be lost for medical triage and management leading to patient morbidity and mortality. The literature lacks assessment of the rate at which ocular injury occurs, anatomic areas resulting in injury, and signs/symptoms of injury. In this study, we use the United States Food and Drug Administration Manufacturer and User Facility Device Experience (MAUDE) database to characterize ocular complications after facial filler injection.

Design: The FDA's MAUDE database was accessed on October 1, 2020 and searched for “Adverse events without identified device or use problem” resulting in patient injury or “Death” related to companies that make dermal filler which is marketed and sold in the United States. Using the filter term “vascular”, entries describing vascular injury, compromise, compression or occlusion were identified. Entries that did not describe signs or symptoms consistent with ocular injury were excluded from review. Information regarding the type of dermal filler injected, anatomic area(s) of injection, signs and symptoms of ocular injury, and treatment modalities employed was also documented.

Findings: A total of 6510 entries were initially retrieved: 57 (0.9%) reported signs/symptoms consistent with ocular injury, with a total 85 affected patients. The most common filler causing ocular complications was hyaluronic acid (HA), with the most frequent area of injection being the periorbital area (n=30), including the infraorbital tear trough, followed by the nose and glabella. Patient-reported signs/symptoms of ocular injury were visual disturbance (n=85), pain (n=14), headache and periorbital skin changes (n=12 each). One death was reported. Treatments included hyaluronidase (n=24), systemic corticosteroids (n=17) and antiplatelet agents (n=14).

Summary: Although ocular complications are rare, they are a serious consequence occurring after facial filler injection. Clinician injectors should be aware of anatomic “danger zones” such as the periorbital, glabella and nasal areas, practice safe injection techniques and be aware of the signs of ocular injury so they can respond promptly. Clinicians should be able to recognize the signs and symptoms of ocular injury to provide appropriate medical care and emergent ophthalmology referral. We encourage clinician injectors to report to the MAUDE database whenever complications associated with filler injection occur to ensure that data capture is reliable and accurate.

Primary Author: Bruce Katz, MD, Juva Skin & Laser Center, New York, NY

Simultaneous Application of Radiofrequency and HIFEM Energies for Full Body Remodeling: MRI Evidence-Based Case Study

Purpose: Radiofrequency and HIFEM have been used as standalone modalities in body contouring. Novel device allows their synchronous emission simultaneously in a single applicator. The goal of this study is to investigate the efficacy of such treatment, when used on multiple body parts for full body remodeling.

Design: Three female subjects (average age 21.0±2.0 years) underwent 4 treatment sessions delivered once a week during period of one month. During each session the treatment was applied to abdomen, saddlebags, inner thighs and buttocks and the treatment of each site lasted for 30 minutes. The outcomes were assessed through examination of MRI images acquired at baseline and 3 months post-treatment. Fat thickness was measured at predefined locations on the abdomen, saddlebags, inner thighs and buttocks. Furthermore, the thickness of rectus abdominis and gluteus maximus was assessed. Weight and waist, hip and thigh circumference records along with digital photographs were also taken.

Findings: Measurement of fat thickness showed reduction by 17.57±3.22 mm in saddlebag region, by 12.49±1.93 mm at inner thighs and by 10.65±1.26 mm on the abdomen. The fat in the buttock region showed no clinically significant changes. The thickness of rectus abdominis increased by 2.98±0.60 mm on average and the thickness of gluteus maximus increased by 7.42±1.56 mm on average. Waist circumference decreased on average by 7.83±2.25 cm, hip circumference decreased by 2.83±1.53 cm and thigh circumference were reduced by 3.58±1.84 cm.

Digital photographs showed pronounced improvement in the overall body appearance. The treatments were safe, no side effect were noted.

Summary: A novel procedure based on delivering HIFEM and RF simultaneously is safe and effective for fat reduction on multiple body parts as well as for thickening of underlying muscles. Multiple site treatments resulted in overall body contouring effect manifested as improved aesthetic appearance.
A Randomized, Dose-Escalating, Double-Blind Study to Evaluate AbobotulinumtoxinA for the Treatment of Moderate-to-Severe Glabellar Lines

**Purpose:** To evaluate the efficacy and safety of a single dose of abobotulinumtoxinA (50U, 75U, 100U or 125U) versus placebo in the treatment of moderate-to-severe glabellar lines, and to investigate the impact of dose escalation on duration of effect. The primary objective was to evaluate Month 1 composite investigator- and subject-assessed responder rate (≥2-grade improvement and glabellar line severity scale [GLSS] score 0 or 1) at maximum frown.

**Design:** In this 9-month, dose-escalating, double-blind Phase II study (NCT03736928), subjects received a single dose of abobotulinumtoxinA or placebo (randomized 4:1) for the treatment of moderate-to-severe glabellar lines. Stepwise enrollment was applied for the two highest dose levels to (NCT03736928), subjects received a single dose of abobotulinumtoxinA or placebo (randomized 4:1) for the treatment of moderate-to-severe glabellar lines. Stepwise enrollment was applied for the two highest dose levels to

**Findings:** Each abobotulinumtoxinA dose group and the placebo group included ~80 subjects. The primary objective was met; the Month 1 composite 2-grade improvement responder rate was 80% (50U), 89% (75U), 90% (100U), and 95% (125U) compared with 3% (placebo), p < 0.001. Median time to onset was 2 days; Month 9 responder rates (≥1-grade improvement, investigator-assessed) were 18% (50U), 26% (75U), 35% (100U) and 31% (125U). Aesthetic improvement was high. At Month 9, ≥89% of subjects reported natural-looking results, and ≥92% wanted to receive the same treatment again. Treatment-related adverse events were predominantly mild, transient, and similar across doses.

**Summary:** AbobotulinumtoxinA was efficacious and well-tolerated across all doses, with rapid onset, duration up to 9 months and high subject satisfaction and aesthetic improvement.

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Successful treatment of silicone-induced delayed inflammatory nodules associated with disfiguring angioedema of the face

**Purpose:** To describe a complication following inappropriate injection of silicone material into the face to describe a complication following inappropriate injection of silicone material into the face.

**Design:** A 67-year-old woman presented with lower facial nodules and recurrent episodes of sudden onset of disfiguring bilateral facial edema. Following multiple visits to the emergency department, her primary care physician recommended symptomatically controlling the flare ups with short prednisone courses every 6-8 weeks, which the patient relied upon for the ensuing 18 months. An ultrasound performed of the area had revealed soft tissue prominence without a discrete mass. One year prior to onset of these episodes, the patient had undergone soft tissue filler augmentation reportedly using hyaluronic acid filler and calcium hydroxylapatite filler into the mid and lower face with an outside provider. Three weeks prior to onset of lesions, she underwent root canal and tooth extraction procedures.

**Findings:** On examination, the patient appeared Cushingoid with moon facies. In the melolabial folds were 2 deep, ill-defined, non-tender, firm nodules without overlying edema or epidermal change. No facial edema was noted at the time of examination but review of patient photographs revealed severe mid and lower facial edema and induration. The differential diagnosis included delayed filler nodules (more likely from calcium hydroxylapatite), atypical mycobacterial infection, and lupus profundus. An incisional biopsy was performed which showed foreign material compatible with silicone and a surrounding granulomatous reaction. There was no evidence of calcium hydroxylapatite. The patient was also evaluated by Allergy and Immunology for possible concomitant angioedema and underwent laboratory testing which showed no evidence of angioedema. She was not on any chronic medications. Thus, the facial edema was attributed to the exogenous silicone.
Nonsurgical Rhinoplasty in Social Media: A Procedure Inaccurately Portrayed as Risk-Free

Purpose: Minimally invasive cosmetic procedures, such as nonsurgical rhinoplasties (NSRs), are frequently showcased on social media. While this content can be impressive, if the procedure’s complexity and potential risks are not communicated, patients may inaccurately assume that NSRs are simple, risk-free, and capable of being performed by any injector regardless of their experience or credentials. Given the rising popularity of NSRs on social media, we sought to investigate how this technically advanced and potentially risky procedure is being portrayed on social media platforms, specifically in regard to safety. Thus, the goals of this study were to 1) determine how often side effects from NSRs are discussed on social media and 2) determine the credentials of those posting content on nonsurgical rhinoplasties.

Design: On January 14, 2021, a single Instagram search using the term #nonsurgicalrhinoplasty along with a single YouTube search using the term “nonsurgical rhinoplasty” were performed. The first 50 English-language results from each platform were included. Duplicate posts and posts that did not show or discuss NSRs (e.g., posts about lip filler, surgical rhinoplasties etc.) were excluded. Data was collected on author demographics along with the number of views/likes and date posted.

Findings: Sixteen percent (8/50) of YouTube videos mentioned the risk of vascular compromise, while zero Instagram posts mentioned this risk. Seventy five percent of YouTube videos mentioning vascular compromise (6/8), were posted by physicians. Twelve percent of all content (12/100) cautioned viewers to see an expert provider due to the advanced nature of NSRs. Two percent of all content (2/100) discussed specific danger zones such as the columella and nasal tip. Instagram posts were created by physicians (21/50; 42%), aestheticians/nonmedical injectors (15/50; 30%), nurses (9/50; 18%), physician-assistants (2/50; 4%), dentists (2/50; 4%), and unknown providers (1/50; 2%). Youtube videos were created by physicians (40/50; 80%), patients (5/50; 10%), nurses (4/50; 8%), and nonmedical individuals (1/50; 2%).

Summary: Our study showed that all professions seldomly discuss complications related to nonsurgical rhinoplasties on social media, but that physicians discuss adverse events more often than non-physicians. Our study also found that a high proportion of content on social media related to nonsurgical rhinoplasties is being generated by non-physicians. Social media is an excellent marketing tool and we understand that an exhaustive review of a procedure’s potential complications is impractical. However a provider can establish credibility by briefly articulating how a procedure’s safety and efficacy hinge on a highly trained and credentialed board-certified physician. In order to maintain authority in minimally invasive cosmetic procedures and ensure patient safety, we encourage physicians to occupy a space on social media.

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Laser treatment for pigmented fungiform papillae in a child

Purpose: Pigmented fungiform papillae of the tongue (PFPT) is a benign condition characterized by scattered dark brown to black pinhead papules on the tongue typically developing in the second or third decade of life. The condition is far more common in patients of color, with reports indicating an incidence as high as 33% in individuals of African descent. Many patients request management of their PFPT, yet no effective treatments exist. This case report highlights an effective treatment option for a condition that is under recognized.

Design: A 15-year-old black female with no significant past medical history presented to the dermatology clinic with a two-year history of asymptomatic dark macules on the tongue. Examination revealed multiple discrete 1 mm brown pigmented macules on the papillae of the dorsal and lateral tongue. Given the distribution of hyperpigmentation, a clinical diagnosis of PFPT was made without need for biopsy. Although asymptomatic, the patient was significantly bothered by the appearance of the pigmented lesions and requested treatment. The patient and mother opted for treatment with Q-switched ruby laser (QSRL) for elimination of pigmented lesions. She first underwent trial of the 694-nm fractional Q-switched laser (4 J/cm², 4 mm spot size) to a 4 mm pigmented test spot on the dorsal tongue, which she tolerated well.
**COSMETIC DERMATOLOGIC SURGERY ABSTRACTS**

**Findings:** Two months later, the patient presented with a complete response to the treated test spot without evidence of scarring or atrophy. She then opted for treatment to the entire tongue and underwent treatment with 980-nm QSRL with settings of 4 J/cm². 4 mm spot size for depression of light-brown macules. The macules were appreciated. A dramatic response was noted just 4 days post-procedure, with complete clearance of pigmentation and restoration to natural mucosal color. There was no evidence of edema or erythema, and no recurrence was found at 2-month follow up.

**Summary:** Treatment options for benign pigmented lesions of the tongue are limited. Excisional biopsy may be effective for patients with small, focally distributed lesions, however a need exists for treatment of more extensive hyperpigmentation. Based on documented success in treatment of other mucocutaneous hyperpigmentation and its selective absorption by melanin, we elected to trial the 980-nm QSRL, with fluence of 4 J/cm² and 4 mm spot size was used for successful removal of pigmented lesions of the tongue. Complete clearance of pigmentation was noted following a single treatment without topical or intralesional anesthesia, minimal discomfort, no signs of crusting, textural change, erythema, or bleaching post-procedure and no hypopigmentation during the follow-up period. Thus, we encourage consideration of QSRL as an effective and minimally invasive treatment option for patients with pigmented fungiform papillae of the tongue.

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**Analysis of MAUDE database reports involving dermal fillers from 2014-2020**

**Purpose:** The FDA estimates 1.6 million soft-tissue filler procedures were performed in 2019, which is a 78% increase from 2012. As popularity increases, there is increasing concern of possible adverse events. The U.S. Food and Drug Administration’s (FDA’s) Manufacturer and User Facility Device Experience (MAUDE) database contains reports of device-associated adverse events submitted to the FDA. We aim to analyze the MAUDE database from 2014-2020 to determine number of dermal filler-related reports each year, review report details, and compare changes in types of complications.

**Design:** The MAUDE database was filtered for adverse events involving injectable dermal fillers from January 2014 to December 2020. This included the following dermal filler brands: Juvederm, Belotero, Perlane/Restylane, Sculptra, Radiesse, Artefill. We used R (version 3.5.2) for aggregation of data and statistical analysis. We summed total number of reports by year and by brand. Each report can describe various complications and we determined the total number of complications by type and per year. Complications coded as having no clinical signs, symptoms, or patient involvement were excluded from analysis. Statistical analysis comparing complications in 2014-2016 and 2017-2020 were performed with Poisson regression. P values less than 0.05 were considered statistically significant.

**Findings:** A total of 5,994 reports were identified from January 2014 to December 2020. The majority of reports were in association with Juvederm brand fillers (n=4851, 80.9%). Comparing consecutive years, the greatest percent increase in reports was seen from 2016 to 2017 (91.0%). The top five most common complications were skin inflammation (16.0%), swelling (14.1%), infection (13.4%), pain (7.9%), and erythema (5.5%). When comparing 2014-2016 to 2017-2020, the difference in reports of skin inflammation were not statistically significant. There was a significant percent difference in 2014-2016 versus 2017-2020 in reports of swelling (6.30%, 95% CI: 5.13-7.48, p < 0.001), infection (-1.56%; 95% CI: -2.68 to -0.45, p = 0.006), pain (3.59%, 95% CI: 2.68-4.51), p < 0.001, and erythema (4.26%, 95% CI: 3.47-5.05, p < 0.001).

**Summary:** Our analysis demonstrates an increase in adverse event reports over time, which could be due to increased number of filler procedures or introduction of new types of fillers on the market. The greatest percent increase was seen from 2016 to 2017, which may be associated with FDA approval of several fillers with new cross-linking technology around this time. There is an increase in the proportion of complications involving swelling, pain, and erythema from 2014-2016 to 2017-2020. These side effects are typically considered expected reactions to injection of a foreign substance. Among the top five most common complications in the database, injection was the only complication that had a decrease from 2014-2016 to 2017-2020. Infection with dermal filler is likely the result of technique and this decrease may represent improvements in sterile techniques. Even as number of procedures increase over time, the decreasing number of infections suggests improvement in preventing concerning complications that are outside of the expected side effects. While the MAUDE database is a valuable source of information, a limitation is that submissions of adverse events are not verified or standardized and thus may be incomplete, inaccurate, or biased. All adverse event reports were self-reported and not confirmed by medical personnel. As dermal filler procedures increase in popularity, it is important for providers to understand the possible adverse events.

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**A Prospective, Multicenter, Single Arm Clinical Study Evaluating the Use of a Helium-Plasma Dermal System for Dermal Resurfacing**

**Purpose:** To demonstrate the safety and effectiveness of a Helium-Plasma Dermal System in use in dermal skin resurfacing.

**Design:** A prospective, multi-center, evaluator-blinded study of 55 subjects who received a procedure for the purpose of improving facial appearance by reducing facial wrinkles and rhytides. The study was conducted at four investigational centers in the United States. All study subjects were treated with a Helium-Plasma Dermal System. Each study subject received one procedure. Follow-up was at 1 day, at 6 (+2) days, at 10 (+1+4) days, 30 (+7) days, 90 (+10) days, and 180 (+14) post-procedure. Primary Effectiveness Endpoint was the proportion of subjects with at least one-point improvement from baseline in the Fitzpatrick Wrinkle and Elasticity Scale (FWS) at 90 days as determined by 2 out of 3 blinded Independent Photographic Reviewers. Additional Endpoints included: (1) Whether or not (yes/no) at least 2 out of 3 blinded Independent Photographic Reviewers (IPRs) correctly identify the 90-day image of a subject from the pair of Baseline and 90-day images. (2) Magnitude of improvement measured by the mean change in FWS from baseline to 90-day visit as determined by Investigators. (3) Subject modified Global Aesthetic Improvement Scale (GAIS) at 90-day visit. (4) Investigator modified GAIS at 90-day visit. (5) Subject satisfaction with procedure recorded at the 90-day visit. Primary Safety Endpoint was the evaluation of adverse events up to the 90-day visit after treatment.

**Findings:** Primary endpoint met; 100% of subjects had at least one-point improvement; IPR Average Improvement in FWS was 3.6 points. Additional Endpoints: (1) 100% of subjects had correct identification of 90-day image by IPRs. (2) Investigator Average Improvement in FWS was 4.4 points at D90 and 4.4 points at D180. (3) 96.4% of subjects self-rated as Improved, Much Improved, or Very Much Improved at D90 and 98.1% of subjects also self-rated levels of improvement at D180. (4) 100% of investigators rated subjects as Improved, Much Improved, or Very Much Improved at D90 and 98.1% of investigators rated levels of improvement at D180. (5) Subject satisfaction at D90 was 96.4% and were happy with the results of the procedure, 94.5% noted skin texture improvement and skin looks tighter, 92.7% noted fine lines and wrinkles improvement and skin feels tighter, and 90.9% noted skin seems more youthful.
### Device for Treatment of Photodamaged Skin

**Purpose:** This novel device uses cryomodulation to remove benign pigmented lesions and reduce redness, thereby improving skin tone evenness and clarity with minimal side effects. A GLP animal study was conducted to investigate the use of the device for reduction of epidermal pigmentation, and a clinical study was subsequently initiated to assess the safety and efficacy of the device for treatment of photodamaged facial skin.

**Design:** A preclinical study was conducted in 2 female Sinclair Yucatan pigs treated on both flanks with a prototype of the controlled skin cooling device. Photography and clinical observations were performed at weekly intervals, and histologic assessments of skin biopsies were performed at monthly intervals. Subsequently, a prospective, non-randomized clinical study was initiated to evaluate the safety and effectiveness of the controlled skin cooling device for removal of benign pigmented lesions such as solar lentigines, as well as reduction in skin inflammation and erythema in photodamaged facial skin. Changes in lesion appearance and global aesthetic improvement scores were recorded, and standardized photographs were captured at monthly intervals for 3 months post-treatment.

**Findings:** Histologic analysis of treated porcine skin samples revealed reductions in pigmentation parameters, with consistent reductions observed for low temperature conditions ranging from -3 to -9 °C and exposure times of 15 to 60 seconds. No significant epidermal damage was noted. The clinical study is currently underway; data collection is complete for a total of 54 subjects that received treatment with the device on photodamaged facial skin. Forty female and fourteen male subjects with a range of Fitzpatrick Skin Types (6% Type I, 18% Type II, 41% Type III, 31% Type IV, and 4% Type V) were enrolled. Treated lesions included solar lentigines (172 lesions) and seborrheic keratoses (19 lesions). At 1 and 2 months after a single treatment, investigators rated 93% of lesions as lightened, and at 3 months, 94% of lesions were rated as lightened. Other investigator-rated improvements in facial skin conditions included: improved skin clarity and brightness in 76%, 76%, and 86% of subjects and reduced redness in 72%, 64%, and 67% of subjects at 1, 2, and 3 months, respectively. These various factors contributed to Global Aesthetic Improvement in 92%, 88%, and 94% of subjects at 1, 2, and 3 months, respectively. No device- or procedure-related adverse events were reported.

**Summary:** This novel device uses cryomodulation to remove benign pigmented lesions and reduce inflammation, in order to provide improved skin tone evenness and clarity and reduced redness in photodamaged skin. Preclinical testing demonstrated reduction in epidermal pigmentation without significant side effects. Clinical testing demonstrated the safety and effectiveness of the device for lesion lightening and improvement in the global aesthetic appearance of photodamaged facial skin while minimizing patient discomfort and social downtime.

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### Safety endpoint: Expected treatment effects that occurred in all subjects were erythema, crusting, and swelling. 54.55% of subjects experienced pain, 29.09% milia, 25.45% itching, 14.55% hypertrophic scarring, 10.91% post-inflammatory hyperpigmentation and telangiectasias, 5.45% temporary discoloration/hypopigmentation. Other adverse events were experienced in 3.64% or less.

### Summary: This study demonstrated success for all effectiveness endpoints. Other than facelifts, phenol peels, dermabrasion and fully ablative laser resurfacing procedures, there are few treatment options for both physicians and patients to achieve the level of wrinkle improvement demonstrated in this study. The primary safety data from this study provides evidence of an acceptable risk profile for the Renuvion Dermal System for dermal resurfacing procedures. There were no serious adverse events reported in the study that were related to the study device or the study procedure.

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### Alternative cosmetic and medical applications of injectable deoxycholic acid: A systematic review

**Purpose:** Beyond submental fat reduction, injectable deoxycholic acid (DCA) has gained popularity in recent years for various minimally invasive lipolysis applications. The objective of this study was to summarize and evaluate the evidence of off-label uses of injectable DCA.

**Design:** MEDLINE, EMBASE, CINAHL, Web of Science, and CENTRAL were searched. Two reviewers independently conducted study selection and quality assessment. The outcomes measured included applications of DCA, treatment regimen, and its outcome and efficacy. An overall success rate for each condition was calculated based on the improvement defined in the included studies, and a descriptive analysis was performed.

**Findings:** Nineteen out of 4,565 identified studies met the pre-defined inclusion and exclusion criteria. Eleven of them evaluated the cosmetic use of DCA for excess adipose tissue on various anatomical locations, including jowls, brasriere line, lower eyelids, abdomen, flanks, saddle bag thighs, inner knees, inner thighs, back rolls, arms, pseudogynecomastia, buffalo hump, and congenital festoons. The outcomes were evaluated at time points ranging from 1-21 months post-treatment. The overall success rates were over 85%. Eight case reports and series reported the success of using DCA treating lipomas, xanthelasmas, paradoxical adipose hyperplasia, fibrofatty residue of infantile hemangioma, piezogenic pedal papules, and HIV-associated lipohypertrophy. Heterogeneity in outcomes was high for medical applications of DCA due to different treatment regimens and methods of evaluation. Although the preliminary efficacies were high, the overall recommendations for off-label uses are weak because of the lack of high-level studies.

**Summary:** A wide range of cosmetic and medical applications of DCA were identified with promising results. The review emphasizes the diversity of injectable DCA as a minimally invasive technique for lipolysis. Further high-level studies demonstrating consistent treatment regimens and methods of evaluation are warranted to make more definitive recommendations regarding off-label DCA use.

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### The Cutaneous Larva Migrans (CLM) Treatment with Carbon Dioxide (CO2) Laser Continued with Cryotherapy (Ethyl Chloride Spra): Case Report

**Purpose:** Cutaenous larva migrans is skin infection caused by infestation hookworm filiarlarva species Ancylostoma caninum or Ancylostoma braziliensis originating from cats or dogs feces. The larva will penetrating into the skin upon contact with contaminated soil, forming a characteristic skin lesion elongated rash (serpiginous), blistering and protruding with an itchy sensation called a creeping eruption. A reported case of 3 years old girl, Sasak tribe with itching and rash on the right leg for a week. Based on the physical examination, papulovesiculose skin lesion with skin-colored
serpiginous lesion was found. Standard treatment antelminetics (albendazol or ivermectin) is difficult to obtain, therefore combining CO2 laser and cryotherapy with ethyl chloride spray is become an alternative treatment.

**Design:** A case were treated with one session of CO2 laser treatment (DANA: S-CO2, Guro-Gu, Seoul) was used with continuous mode at 10 watt, single pulse, starting at the edge and tracing it backwards covering the entire of lesion. We do daily monitoring in the first week using photographic documentation and continuously for another week after consecutive cryotherapy with ethyl chloride spray for 5 days.

**Findings:** Initially when one session of CO2 laser are applied and experienced further larval migration in 3 days and then we continuing the treatment with consecutive cryotherapy for 5 days and noted no further larval migration. At the end of the 2 week followup period, all lesion areas were completely healed, leaving postinflammatory hyperpigmentation of the serpiginous form.

**Summary:** Combining CO2 laser and cryotherapy can be used as an alternative therapy in CLM cases.

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Multicenter Experience with Diagnosis and Management of COVID-19 Vaccine-Related Delayed Inflammatory Reaction to Hyaluronic Acid Dermal Fillers

**Purpose:** Delayed inflammatory reactions (DIR) is an established adverse effect of hyaluronic acid (HA) dermal fillers. DIR of dermal fillers have been reported following viral illnesses and vaccinations, but most recently gained attention for their occurrence in the setting of COVID-19 vaccination. Herein we report 12 cases of DIR to HA dermal fillers after COVID-19 vaccination in efforts to better characterize these reactions and discuss potential treatment options.

**Design:** Cases were compiled both from the authors’ personal experience and through crowdsourcing dermatologist social media groups, a particularity effective platform for data exchange given the rapidly evolving knowledge base of COVID-19 and its associated cutaneous reactions.

**Findings:** A total of 12 cases of DIR to HA dermal fillers in the context of a COVID-19 vaccination were reported. Of these, almost all occurred in patients with HA fillers on the US market. DIR occurred in response to the Moderna, Pfizer-Biontech, and AstraZeneca COVID-19 vaccine without predilection for any certain brand. Without treatment, spontaneous resolution occurred typically over 5-7 days. Treatments utilized include nonsteroidal anti-inflammatory drugs (NSAIDs), acetylamophen, antihistamines, doxycycline, prednisone, and hyaluronidase. A novel treatment option developed by the authors, utilizing oral angiotensin converting enzyme inhibitors (ACE-I), resulted in the quickest improvement, often within 24-48 hours.

**Summary:** DIR to HA dermal fillers, an established though rare adverse effect, can be precipitated by receiving a COVID-19 vaccination. With increasing rates of vaccination, these reactions may be seen more frequently. Though DIR will spontaneously improve, resolution will be delayed without treatment. Antihistamines, prednisone, doxycycline, and ACE-I have all effectively hastened resolution. Of these, ACE-I provided the quickest improvement with a favorable safety profile.

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A randomized, double-blind, placebo-controlled study of a new dilution and injection volume of AbobotulinumtoxinA for treatment of glabellar lines

**Purpose:** According to current US label for AbobotulinumtoxinA (ABO), reconstitution with 1.5 or 2.5 ml per 300U vial is allowed. The objective of this study (NCT03960957) was to evaluate efficacy and safety of a larger dilution and injection volume (300U vial reconstituted with 3.0 mL 0.9% NaCl) compared to placebo, using 0.1 mL per injection point for treatment of moderate to severe glabellar lines (GL).

**Design:** The primary endpoint was evaluated 1 month after treatment using the 4-point GL severity scales ILA and SSA (investigator’s live - and subject’s self-assessment) at maximum frown. A responder had a score of 0 or 1 in GL severity and ≥2-grade improvement from baseline on both scales. Other assessments included ILA/SSA evaluations, aesthetic improvement and safety for 6 months.

**Findings:** Subjects were randomized 3:1 to ABO (n=224) or placebo (n=77). Overall, most subjects were female (88%) and mean age was 44 years. The primary efficacy objective was met with an ABO responder rate of 65.8% at Month 1. Median time to onset was 2 days. Subjects with ≥1-grade improvement from baseline (ILA) were significantly higher for ABO than placebo through Month 6. Median time to return to baseline from a score of 0 or 1 on both ILA and SSA was 247 days for ABO. A majority of subjects in the ABO group reported aesthetic improvement 6 months after treatment. The treatment was well-tolerated.

**Summary:** This study demonstrated high efficacy and well-tolerated safety profile with fast onset and long duration of effect of an injection volume of 0.1 mL (10 U ABO) per injection site for treatment of moderate to severe glabellar lines. Aesthetic improvement was high and lasted through 6 months.
Neutralizing Antibody Conversion With OnabotulinumtoxinA From Studies Across Multiple Indications In Nearly 30,000 Patient Records: A Meta-Analysis

Purpose: Neutralizing antibodies (nAbs) may reduce the effectiveness of onabotulinumtoxinA treatment. An extensive clinical trial database across 10 indications in different patient populations has been accumulated for onabotulinumtoxinA over the past 3 decades. A meta-analysis of these data was performed to assess incidence of nAb formation as a function of subject gender, indication (dose route and location), dose level, dosing interval, and number of treatment cycles.

Design: This analysis was based on 28,200 patient records from placebo-controlled or prospective open-label trials across 10 therapeutic and aesthetic indications with immunogenicity assessment in 6128 patients treated up to 15 cycles. Total onabotulinumtoxinA doses per treatment ranged between 10 U (glabellar lines) and 600 U (post-stroke spasticity). Detection of nAbs at baseline and post-treatment was by mouse protection assay, either as a single step or following positive binding Ab assay results.

Findings: Frequency of subjects who had positive nAb results (with either a nAb-negative or unknown status at baseline) at any post-treatment time point ranged from 0% (crow’s feet lines, migraine, and pediatric neurogenic overactive bladder) to 1.4% (neurogenic overactive bladder). Overall, across all 10 indications, 27/5868 subjects (0.5%) fell into this category. By the time of final assessment at study exit, only 16/5868 subjects (0.3%) out of the 27 subjects still had positive nAb results. Due to the low incidence and lack of consistent pattern, no clear correlation was observed between positive nAb results and onabotulinumtoxinA dose level, dosing interval, subject gender, indication (dose route and location), or number of treatment cycles.

Summary: This comprehensive and robust meta-analysis confirms the low frequency of nAb formation following onabotulinumtoxinA treatments across multiple indications.

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MRI Multi-centre Study on High-Intensity Focused Electromagnetic Procedure Simultaneously Combined with Synchronized Radiofrequency for Treatment of Lateral Thighs: Preliminary 3-Month Follow-up Data

Purpose: Lateral thighs are a common problem area where excessive fat accumulation forms so-called saddlebags, most prominently seen in women. This study investigates the effect of high-intensity focused electromagnetic field procedure (HIFEM) simultaneously combined with synchronized radiofrequency (RF) for the treatment of lateral thigh adipose tissue.

Design: Sixty-six (66) subjects (21-68 years old, BMI 19-34.5 kg/m2, skin types I-VI) underwent four HIFEM+RF procedures once per week, each consisting of the 30-minute bilateral application over the lateral thighs with intensities (0-100%) set according to the patients’ tolerance. Therapy comfort and safety were monitored after each treatment. Magnetic resonance images (MRI) of the treated area were obtained at baseline, 1-month, and 3-month follow-up to document the changes in fat layer height (MEH and AEHI) were calculated. Study investigators and subjects ranked the improvement using Global Aesthetic Index Score (GAIS). Safety aspects were recorded and subjects reported their willingness to perform future treatment.

Findings: A total of 67 subjects completed the study and had validated pre- and post-images. Two blinded reviewers were in agreement in identifying the pre- and post-treatment photographs correctly for 79% of subjects. Mean change in average eyebrow height and the mean change of maximal eyebrow height were both above the pre-specified threshold of 0.5mm (0.69mm and was 0.78mm, respectively). There was improvement of eyebrow lifting in 80% of subjects using the investigator GAIS evaluation. Overall, 55% of subjects noted improvement in eyebrow lifting and majority were willing to receive treatment in the future. One related-device adverse event was recorded during the study (moderate blister on the neck resolved completely after applying topical Silvadene cream only). There was no downtime with all subjects.

Summary: This new-generation ultrasound device was demonstrated to safely provide clinical lifting of eyebrow lax skin.

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Hyaluronic acid filler objectively increases lip redness across skin phototypes and is correlated with increased blood vessel density on optical coherence tomography angiography: A pilot study

Purpose: Red lips are considered a sign of beauty across many cultures. Yet, the literature surrounding lip rejuvenation primarily focuses on enhancing lip contour or volume rather than color. The primary objective of our study is to evaluate changes in lip redness after hyaluronic acid (HA) filler injection using standardized photography, three-dimensional imaging, and optical coherence tomography-angiography (OCT-A) in patients of all skin types.

Design: Female patients ages 18-30 of all Fitzpatrick Skin Phototypes (FST) were recruited for this study. Digital photography, three-dimensional imaging, and OCT-A were obtained of the lips at baseline and two weeks after injection of HA filler. Visualization and quantification of the lip microvasculature was assessed by OCT-A, a non-invasive alternative to histopathology. The “redness” filter on three-dimensional imaging, which averages a red color value across all points within a selected region, was used to objectively quantify lip color. Student’s t-test was used to determine statistical significance.

Findings: Six participants (three FST I-III, three FST IV-VI) were recruited for this study. An average of 0.8 cc of HA filler was injected into each patient. Lip redness increased by approximately 15% from baseline (p=0.03) measured at two weeks. Notably, increased redness was present in all patients with darker skin phototypes (FST IV-VI) and naturally more pigmented lips. This clinical change correlated to a quantified increase in blood vessel density on OCT-A.

Summary: To our knowledge, this is the first study to objectively demonstrate an increase in lip redness following injection of HA filler. We believe that the change in lip redness may be secondary to the observed blood vessel density changes as visualized on OCT-A, another novel finding. Further, this pilot study helps to fill gaps in the literature regarding lip rejuvenation in people with dark skin and identify lip fillers as a procedure to enhance lip color. Additional clinical studies with more patients are needed to validate and further refine these findings.

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thickness. Furthermore, the circumference of the hip and thighs was measured and the subject's satisfaction was assessed via a questionnaire utilizing a 5-point Likert scale.

Findings: The MRI scans revealed a significant (P < 0.001) reduction of fat thickness in the saddlebag region. At 1 month, the average change was -1.4±0.3 cm (N=59) which further improved to -1.8±0.4 cm (N=49) at 3 months. Correspondingly, in subjects who finished a 3-month follow-up visit, the thigh circumference measured at the predetermined levels decreased on average by 2.0 cm from 86.5 cm to 84.5 cm, while the greatest change was seen at the level of 10 cm below the gluteal fold (-2.8 cm). The therapies were safe and 91% of subjects found it comfortable. Post-treatments, the majority of subjects (83%) were satisfied with the treatment outcomes, showing the minimum level of dissatisfaction (3%).

Summary: The interim 3-month results evidence the effectiveness of the novel HiFEM+RF technology for reduction of excessive adipose tissue in the lateral thigh region. MRI examination revealed a significant decrease in fat thickness, accompanied with circumference reduction. The results suggest that the treatment effect is gradually improving up to 3 months.

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The “360 Method”: A Unique Technique to Treat Spider Angiomas Using The Pulsed Dye Laser

Purpose: Cutaneous spider angiomas are a common cosmetic complaint. Spider angiomas consist of a central dilated vessel with radiating smaller “feeding” vessels, creating the clinical appearance of a spider web. Since the advent of the pulsed dye laser, treating spider angiomas has become very simple. Typically, purpuric settings are used to bruise the central vessel. In the authors’ experience, sub-purpuric settings when used in a “360 method” work just as effectively, while also targeting feeder vessels and providing a better cosmetic endpoint. We present this unique method of treating spider angiomas.

Design: The 595nm wavelength pulsed dye laser is used to treat the spider angioma. Settings are non-purpuric with 3x10mm spot size, 12-13.5J/cm^2, and 20-30ms pulse duration. The 3x10mm spot size head piece is aligned with a feeder vessel and pulsed once. Then, the headpiece is subsequently moved to align with each separate radiating feeder vessel, in a “360” manner. Each pulse overlaps over the center angioma, allowing for multiple pulses to the central angioma.

Findings: A unique method to treat spider angiomas with the 595nm pulsed dye laser with the 3x10mm spot size at non-purpuric settings, allowing for a better cosmetic endpoint while also effectively treating not just the central angioma, but the feeding vessels that contribute to the central angioma.

Summary: To our knowledge, the “360” method is this is a unique technique describing how to treat spider angiomas with a pulsed dye laser at non-purpuric settings, that has not been described in the past.

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Bridging the gap: Identifying skin type representation in sunscreen trials and in popular sunscreen products

Purpose: Physical sunscreens have cosmetic limitations, especially in skin of color patients. Cosmetic limitations such as a white cast or non-color matched tint may especially limit the use of physical sunscreens in darker skin type patients. The purpose of this study was twofold: 1) to identify sunscreen brands that are inclusive of skin of color patients and 2) to determine what percentage of sunscreen clinical trials included patients with skin types IV and above.

Design: For the first part of the study, the top 15 sunscreen brands purchased on Amazon were identified, and each brand was investigated on whether it was inclusive of skin of color patients. Inclusivity was defined as skin of color representation on the brand website or the brand offering multiple tinted physical sunscreen shades. For the second part of the study, a retrospective review of all clinical and randomized controlled sunscreen trials on PubMed from 1970-2020 was performed to identify the proportion of trials that included patients with skin types IV-VI. A total of 92 studies met the inclusion criteria; studies were included if skin type data was available and if sunscreen products were tested for ultraviolet protection on human volunteers.

Findings: Most physical sunscreens brands had skin of color representation on the product website (12/15). Most brands had tinted options (10/15), though only one third had multiple tinted shades of physical sunscreens available (5/15). In addition, more than 90% of studies had skin type II and III representation, whereas skin types IV, V, and VI were included only 34%, 7%, and 0% of the time, respectively.

Summary: Many sunscreen brands now include skin of color patients in advertising; however, only a minority of brands offer multiple tinted options, limiting their applicability to all skin tones. Also, sunscreen clinical trials are historically exclusive of darker skin type patients. Moving forward, clinical trials should aim to represent all skin types equally.

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A combination approach using IncobotulinumtoxinA and CPM-Hyaluronic acid injections for the periorbital complex improvement

Purpose: The objective of this study was to describe a combination technique designed to improve the beauty of the periorbital complex by uplifting the lateral eyebrow. No clinical trial has reported a combination approach of botulinum toxin A (BoNT-A) injection with hyaluronic acid (HA) injection in the upper face for the periorbital region beautification and eyebrow reshaping.

Design: A prospective pilot study was designed to evaluate the effect of IncobotulinumtoxinA injection using the ONE21 technique – with a preestablished scheme of doses and injection site distribution – combined with HA injection (CMP technology) into the palpebral malar hollow, on the brow shape and position. Objective eyebrow measurements were taken by an independent investigator using the Merz aesthetic scale (MAS) for brow positioning. Patient satisfaction was also evaluated.

Findings: Six 29-49-year-old females were included in this pilot study. The totality of patients (6/100%) had ≥ 1-point improvement in the MAS brow positioning. All 6 patients (100%) reported significant aesthetic improvement of their periorbital region and appearance.

Summary: The combination technique has shown to improve the beauty of the orbital area by uplifting the lateral eyebrow and creating an almond-shaped eye effect, which characterizes the Foxy eye. Further studies including more cases are needed to obtain a statistically significant outcome.
Elastolysis, with no overlying erythema and no variation in the wrinkling of skin with positional change. The patient’s back was marked into a quadrant for treatment with injection of PLLA, hyaluronic acid, topical application of tretinoin 0.05% gel, and a control area. The patient underwent two treatment sessions of injectables 12 weeks apart time with a total volume of one vial (367.5 mg) of PLLA (7 mL of sterile water and 2 mL of anesthetic) and one 1 mL syringe of a homogenous hyaluronic acid gel (24 mg/mL) were injected. Tretinoin gel was applied nightly to the area identified for topical intervention.

Findings: At the evaluation 12 weeks after the second treatment session, the patient and the physician subjectively identified the area treated with PLLA as the most improved. A repeat punch biopsy found a significantly greater number of elastic fibers as well as a decreased zone of elastolysis in both vertical and horizontal dimensions. The remainder of the lesions on the back were then injected with PLLA. Five years after, there have been no new lesions in the treated areas and the results have sustained without further intervention.

Summary: To our knowledge, we are the first to use soft-tissue injectables in the treatment of elastolysis in a CT disorder. Aesthetic treatment of the appearance of wrinkling had previously been limited to topical retinoids. The area treated with PLLA had the most notable clinical improvement in skin texture and dermal volumization. These clinical observations were supported with histopathological evidence of a striking increase in elastic fibers as well as decreased inflammatory infiltrate. PLLA is a biocompatible bioactive material that is known to stimulate both collagen and elastin. After testing the hypothesis with sequential test sites, we confirm the safety and efficacy as well as the superiority of PLLA. The required volume for injection was low, no adverse effects were observed, and the results have been long lasting. In CT disorders which manifest with volume loss, the use of injectables should be considered among the therapeutic options for patients.

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Cosmetic Dermatologic Surgery Fellowship Websites and Social Media Presence: Opportunities For Improved Applicant Recruitment

Purpose: The American Society for Dermatologic Surgery (ASDS) established a cosmetic dermatologic surgery fellowship in 2013. Programs often outline details of fellowships on their websites to help prospective applicants make informed decisions. The ASDS also offers information for each fellowship on individual pages of its website available to all ASDS members. We evaluated the content quality of program websites for all ASDS-accredited cosmetic dermatologic surgery fellowships by assessing variables that provide information to applicants. We supplemented this data collection with information from the online ASDS fellowship webpages. Our secondary goal was to describe program activity on social media platforms as another avenue for applicant recruitment.

Design: Program websites and ASDS webpages were assessed using twenty-one standardized content quality variables. Social media activity on Facebook and Instagram from January 6th to March 6th 2021 was tallied and categorized.

Findings: Among 24 cosmetic dermatologic surgery fellowship programs, 23 had functional websites and 20 had ASDS webpages. Basic information was provided across most websites (e.g., address, 95.8%), but some specific information like designated faculty was absent from all websites. 8 of our variables were discussed by 25% or fewer programs on either their websites or ASDS profiles. Most programs had active social media accounts (91.7% on Facebook and 79.1% on Instagram), and most posts were promotional materials targeted towards patients.
**Sodium thiosulfate injections for the treatment of calcium hydroxylapatite nodules**

**Purpose:** This case report describes the successful use of sodium thiosulfate as a dissolving agent for longstanding calcium hydroxylapatite nodules.

**Design:** An 89-year-old woman presented with gradual infraorbital swelling over 10 years. Patient reported a history of calcium hydroxylapatite (CaHA) injections into the area in 2009 for correction of volume loss. The history and physical exam were consistent with CaHA nodules. The patient was treated with two sessions of intradermal sodium thiosulfate (12.5 g/50 ml, 1 cc) separated by six weeks.

**Findings:** After two treatments with intradermal sodium thiosulfate, there was significant clinical improvement in the calcium hydroxylapatite nodules.

**Summary:** Calcium hydroxylapatite (CaHA) is a dermal filler FDA approved for the correction of moderate-to-severe facial wrinkles and folds, HIV-associated lipodystrophy, and dorsal hand volume loss. The filler is composed of 30% CaHA particles -- an inert bioceramic identical to the constituents in bone and teeth -- and 70% sodium carboxy-methylcellulose (CMC) gel. The gel portion contributes to the immediate correction in volume loss upon injection at the dermal-subcutaneous junction. As the gel carrier dissipates, the calcium hydroxylapatite microspheres act as a scaffolding for ingrowth of fibroblasts and collagen hence its classification as a biostimulator. Unlike hyaluronic acid fillers, CaHA has no effective dissolving agent in the event of adverse events such as over-correction, nodules, and intravascular occlusion. Sodium thiosulfate (STS) has been used intravenously, orally and intralesionally for disorders of calcium deposition such as calciphylaxis and calcinosis cutis, and thus has been investigated as a possible dissolving agent for CaHA filler. Initial proof-of-concept studies in porcine skin revealed that intraleosal STS successfully dissolved 100% of CaHA filler on histologic sections. Since the initial animal studies, few case reports have been published documenting clinical success in treating CaHA nodules with STS. Our findings support the use of intradermal injections of STS for the use CaHA nodules. In a recent study, it has been postulated that STS works via dispersion rather than dissolution of the CaHA microspheres and thus would not be helpful in the event of an intravascular occlusion.

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**Increasing Use of Vascular Lasers in the Medicare Population**

**Purpose:** Vascular lasers including the Pulsed Dye Laser, Nd:Yag, and other devices are effective treatments not only for treatment of vascular lesions such as hemangiomas, rosacea and port wine stains, but also for reduction of erythema associated with scars. A subset of these procedures may be covered by insurance for medical indications. We aimed to characterize trends in utilization and reimbursement patterns of vascular lasers in the Medicare-insured population.

**Design:** Publicly available de-identified data were extracted from the 2012-2018 Medicare Public Use File (PUF). Frequencies of Healthcare Common Procedure Coding System codes 17106-17108 were recorded and stratified by calendar year and clinician specialty (Dermatology or Non-Dermatology). Cross sectional utilization was stratified by specialty, years in practice since graduation from medical school, and US geographic region. Annual frequencies of aggregate claims, aggregate clinicians, mean claims per clinician, and mean charges submitted to/accepted by Medicare were recorded. Additionally, mean annual proportions of accepted charges were calculated by dividing mean reimbursement by mean charge submitted. Compound annual growth rates (CAGR) for all statistics were calculated. Significant difference in longitudinal and cross-sectional statistics were determined using student’s t tests (for binary variables) or one-way analysis of variance (ANOVA) and a p value threshold of 5%.

**Findings:** The majority of clinicians performing vascular laser procedures during the study period were dermatologists (55%), followed by general surgeons (6%), plastic surgeons (6%), family practice/ internal medicine (5% each), and various others. Utilization (annual claims; CAGR) increased among all clinicians (3,786 to 6,883; +10.5%), dermatologists (1,878 to 5,182; +18.4%), but not non-dermatologists (1,908 to 1,701; -1.9%). Similar trends were observed for vascular laser utilization on a per clinician basis (mean annual claims; CAGR) for all clinicians (77.3 to 118.7; +7.4%) and dermatologists (81.7 to 148.7; +10.4%), though utilization was fairly stable for non-dermatologists (73.4 to 74.0; +0.1%). The number of clinicians billing for vascular laser procedures increased for all clinicians (49 to 58; +2.9%) and dermatologists (23 to 35; +7.2%), but not other clinicians (26 to 23; -2.0%). Accepted charges (mean proportion of submitted charge, t-test or ANOVA p value) were greatest for dermatologists vs. non-dermatologists (68.3% vs. 59.3%, P=0.0001) and the Western geographic region vs. the Northeast, Midwest, and Southern regions, respectively (73.1% vs. 50.2%, 65.4%, and 55.3%, respectively; P < 0.0001). Clinician experience was not associated with a difference in reimbursement (P=0.53).

**Summary:** While utilization of vascular lasers in the Medicare population is increasing among dermatologists, there is significant use of these procedures by non-dermatologists. The volume of vascular laser procedures is increasing, perhaps to meet an unmet demand by Medicare beneficiaries. Medicare charges were more often fully reimbursed when billed by dermatologists and those in the Western geographic region, perhaps suggesting a better familiarity with appropriate indications and better administrative resources for coverage of vascular laser procedures. Our results are limited by lack of information on indications for procedures billed and patient characteristics. Further studies are needed to characterize utilization of various lasers in not only Medicare beneficiaries, but those who are commercially insured or paying out-of-pocket.

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**An Evaluator-Blind, Split-Neck, Randomized Placebo Controlled Clinical Trial Evaluating the Efficacy and Safety of HARR for Correction of Static Horizontal Neck Rhytids Utilizing a Cannula or Needle**

**Purpose:** While hyaluronic acid fillers have been studied on the face extensively, their safety and efficacy on the neck has not yet been evaluated in a prospective clinical trial in the United States. This trial was the first to receive an IND from the FDA in order to analyze the efficacy and safety of a hyaluronic acid filler for static horizontal neck rhytids using either a cannula or a needle. The anatomy of this area is reviewed in depth utilizing both cadaver and ultrasound images to ensure safe injection techniques above the platysma in this difficult area containing important neurovascular structures and organs.

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**Design:** Twenty-six subjects were randomized to receive up to 1cc of HARR (n=20) or saline (n=6) utilizing a cannula on one side and a needle on the other. Subjects were graded using the Transverse Neck Line Scale (1), Canfield photography, and the Global Aesthetic Improvement Scale.

**Findings:** A significant improvement 30 days after the last treatment was achieved on the Transverse Neck Line Scale when comparing HARR to saline according to both subject \(t(52)=-3.783, p=0.0002\), blinded evaluator \(t(52)=-5.550, p<0.00001\), and primary investigator \(t(52)=-6.948, p<0.00001\) without any significant side effects. In addition, both subject \(t(40)=3.577, p=0.0002\), blinded evaluator \(t(40)=4.682, p=0.0016\), and primary investigator \(t(40)=2.525, p=0.00005\) rated the side utilizing the needle as having a significantly greater improvement than cannula.

**Summary:** A hyaluronic acid gel with XpresHAn technology achieved a significant improvement in transverse neck rhytids utilizing either a cannula or needle, however a needle was more efficacious, without any serious side effects. Knowledge of neck anatomy is important to ensure safe injection techniques in this area.

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A Retrospective Review of Intradermal Hyaluronic Acid Filler Injections for Glabellar Rhytids

**Purpose:** While botulinum neurotoxin A is commonly used to safely treat dynamic glabellar rhytids, deep static etched lines often cannot be effaced without the addition of hyaluronic acid filler. While hyaluronic acid filler is a popular and safe treatment for static etched lines on the face, using it in the glabellar area is often discouraged due to the high risk of vascular occlusion and irreversible blindness due to its proximity to the supratrochlear artery. Published reports describe the depth of the supratrochlear artery to be an average of 3.4mm (1.8-4.6mm) below the surface of the skin in this area. In addition, one publication describes the volume of the supratrochlear artery from the glabella to the orbital complex as measures on average 0.05ml (0.04-0.12ml). The purpose of this review was to analyze the safety of a superficial intradermal technique for those patients not achieving correction with botulinum neurotoxin A alone.

**Design:** Medical records of patients who had hyaluronic acid filler for the correction of glabellar rhytids by a single injector with an intradermal injection technique in a private Dermatology office from April 2013 through May 2021 were analyzed. The technique utilized a 30- or 32- gauge needle placed into the dermis just enough to immerse the entire bevel of the needle (bevel length 1mm). Injections were done through serial punctures with micro- aliquots that created superficial dermal blebs with 0.002 - 0.01ml of hyaluronic acid filler which were then massaged with a cotton swab.

**Findings:** An intradermal micro-injection technique was safe in over 300 individual patients and over 400 treatments with no serious side effects. There were no cases of vascular occlusion causing necrosis or visual disturbance.

**Summary:** An intradermal hyaluronic acid injection technique for use in static etched glabellar lines not responsive to botulinum neurotoxin A using small aliquots of hyaluronic acid below the threshold to fill the supratrochlear artery (< 0.04ml) and injected superficially by only inserting the bevel of the needle into the dermis was safe in our retrospective review.

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Prospective Evaluation in Diverse Skin Phototypes of a Crystal-Free Brush Tip Exfoliation Device with Variable Vacuum Pressure and Skin Infusion for Facial Photoaging

**Purpose:** This single-center, open-label pilot evaluation prospectively assessed efficacy, safety and tolerability of a crystal-free brush tip exfoliation device with variable vacuum pressure and skin infusions. The device has US FDA 510(k) clearance. The evaluated patients had Fitzpatrick skin phototypes ranging from type I to type VI.

**Design:** A consecutive series of 24 female patients aged 25 to 67 years received 3 to 6 treatments with the device at 2 to 4 weekly intervals. 42% (n=10) of patients had Fitzpatrick skin phototypes IV to VI. Patients had mild to moderate signs of facial photoaging including skin roughness, hyperpigmentation, and fine lines and wrinkles. Brush-tip exfoliation and vacuum pressure were tailored to patient applications and desired outcomes. Skin infusion was with a formulation containing growth factors, antioxidants, ceramides and peptides. Assessments included standardized digital imaging, blinded clinical evaluations and patient self-evaluations on 10-point scales for dyschromia/mottled pigmentation, smooth texture, wrinkles, skin brightness/radiance, skin tone, skin moistness and pore prominence; and scoring on the Global Aesthetic Improvement Scale (GAIS).

**Findings:** The procedure was well tolerated by all patients, with no significant or long-term adverse effects. Post-procedural erythema was transient, lasting from 15 minutes to less than 24 hours. At 3 weeks after the 3rd treatment, all patients had improvements in smooth texture (≥ 2 points), skin brightness/radiance (≥ 2 points), skin moistness (≥ 2 points), and skin tone (≥ 1 point). Blinded assessments showed ≥ 1 point improvement in wrinkles and dyschromia/mottled pigmentation. Patients self-reported a reduction in pore prominence (≥ 1 point). Physician and patient scoring on the GAIS ranged from Improved to Very Much Improved. All patients reported satisfaction with treatment.

**Summary:** This pilot evaluation of brush-tip exfoliation with vacuum pressure and skin infusion showed good safety and tolerability of the procedure in diverse skin phototypes, with significant clinical improvements on blinded clinician and patient self-evaluations. Patient satisfaction was high, and no adverse events were observed. Based on these data, the procedure may be of value as a noninvasive method to address mild to moderate signs of photoaging. The ability to patient-tailor all steps in the procedure, including the depth of brush tip exfoliation and magnitude of vacuum pressure may confer benefits over conventional aluminum oxide crystal microdermabrasion.

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Absorbable PLLA/PCL Co-Polymer Suspension Threads for Facial Paresis and Asymmetry: A 25-Year Experience with Biomechanical Correlation

**Purpose:** Suspension threads are in common use for aesthetic applications. This evaluation assessed the applicability for post-traumatic and paralytic facial deformities of an absorbable thread that is CE-marked and recently received US FDA 510(k) clearance. The thread is composed of poly-L-lactic acid and polycaprolactone (PLLA/PCL) co-polymer, with bidirectional barbs to facilitate tissue traction. The evaluated patients had suboptimal results from prior surgical and/or nonsurgical procedures, or were not suitable candidates for these interventions.

**Design:** Over a 25-year period, a series of 98 patients aged 30 to 75 years (mean age 52, 65% female) was treated without cost. 90% had acquired, unilateral facial deformities due to paralysis of the facial nerve or its branches. Other etiologies included trauma, burns, infection, tumor resection and other iatrogenic injuries. PLLA/PCL threads were inserted into the superficial subcutaneous tissue above the superficial musculoaponeurotic system (SMAS) to correct unilateral ptosis of the...
COHESIVE DERMATOLOGIC SURGERY ABSTRACTS

**Purpose:** Broad Band Light (BBL) has been widely used for treatment of pigmented skin lesions and photodamage on the face with an excellent safety profile and satisfactory results. However, treating extensive body areas such as chest, back, arms, and legs with either an Intense Pulsed Light (IPL) or BBL source is cumbersome and slow. In addition, non-facial IPL treatments can be limited by patient discomfort and risk of striping, uneven results, and rectangular burns. The purpose of this study was to evaluate the safety of a novel high energy rapid output (HERO) BBL for treatment of pigmented skin lesions and photodamage on the arms, legs, back, and chest.

**Findings:** Threads procedures were well tolerated with no significant or long-term adverse effects. All patients showed improved facial symmetry and, where applicable, improvement in Sunnybrook scores of facial function. Restoration of functionality included correction of epiphora, ability to close eyelids or ability to drink fluids. Physician and patient scoring on the Global Aesthetic Improvement Scale (GAIS), ranged from Improved to Very Much Improved. All patients reported satisfaction with treatment. Visual and photographic evaluations showed three-dimensional tissue mobilization, in the sagittal, coronal and transverse facial planes. Longevity of results ranged from 9 months to 2 years. The tensile strength of the PLLA/PCL threads (Rm of 8.9 N/mm² +/- 8.5%) was intermediate between that of previously available threads in the US - polyactic acid and polydioxanone (PDO). Creep & recovery testing showed a balance of elasticity and plasticity (53% recovery of deformation at 80 minutes after application of a 3N load for 40 minutes) whereas polyactic acid threads were predominantly plastic and PDO threads were predominantly elastic.

**Summary:** To the authors’ knowledge, this is the first report of clinical experience and outcomes with absorbable, barbed suspension threads for a robust series of patients with facial deformities (n=98) over a significant time period (25 years). The threads, composed of a novel PLLA/PCL co-polymer, are new to the US. This report expands on the authors’ prior aesthetic use of these threads, by adding a challenging group of patients with more therapeutic indications and inadequate responses or ineligibility for other interventions. Significant static and dynamic corrections were achieved. Variable longevity reflects the heterogeneity of this patient group. Patient satisfaction reflects the significant distress and impaired quality of life that results from facial paresis. Safety and tolerability were excellent. Based on data analysis, algorithms will be presented for minimally invasive management of post-traumatic and paralytic face deformities, with matching of different threads techniques to clinical indications. Although it is typically claimed that absorbable threads can lift tissue, it is more anatomically accurate to speak of tissue mobilization. Based on the authors’ experience, PLLA/PCL threads are notably efficacious for three-dimensional tissue mobilization when applied with appropriate techniques.

**Resident Skin of Color Cosmesis Experience: A Survey Study**

**Purpose:** The demographics of the United States are rapidly changing. It is predicted that by 2045, non-Hispanic whites will comprise only 49.7% of the population, with the remainder being people of color including Asians, Blacks, Latinos, Native Americans, and Pacific Islanders. The top two presenting concerns of patients with skin of color are acne and dyspigmentation, both of which benefit from aesthetic procedures commonly performed by dermatologists. Furthermore, minimally invasive cosmetic procedures are on the rise in all demographics and it is imperative that residents in training are adequately trained to perform cosmetic procedures in all skin types. The purpose of this study is to investigate the experience and confidence of dermatology residents in performing cosmetic procedures in skin of color (SOC) patients as compared to non-SOC patients. By means of this study, we hope to highlight a need in dermatology training and encourage the incorporation of a more formalized cosmetic curriculum tailored to a darker-skinned population so that dermatologists can feel more comfortable addressing the specific cosmetic needs in these patients.

**Design:** An electronic survey was developed on REDCap and anonymously distributed in February 2021 to program directors via the Association of Professors of Dermatology listserv. Program directors were asked to forward the survey to their residents via program coordinators. The survey asked participants to characterize their experience and confidence levels in performing cosmetic procedures in Fitzpatrick skin types (FST) I-III as well as FST IV-VI patients. Skin of color patients were defined as FST IV-VI. Cosmetic procedures specifically asked about included neuromodulator injections, soft tissue fillers, vascular laser, pigmented laser, laser hair removal, non-ablative resurfacing laser, ablative resurfacing laser, chemical peels, microdermabrasion and microneedling. Statistical analysis was conducted using Wilcoxon Rank and Pearson correlation testing on SPSS.

**Findings:** A total of 80 responses were collected, 60% of which were completed in full. Survey respondents were mostly white/Caucasian (56.3%), with 33.3% Asian, 8.3% Black, and 1% who declined to answer. Nearly 67% of residents reported having fellowship-trained faculty in their dermatology program. Overall, 98% of residents feel they could benefit from formal cosmetic training in SOC populations. Residents rated a higher level of experience in performing cosmetic procedures in patients with lighter complexities (FST I-III) compared to darker complexities (FST IV-VI).
COSMETIC DERMATOLOGIC SURGERY ABSTRACTS

Combining Cosmetic Injectables With Radiofrequency Microneedling: A 4.5-Year Safety Review

**Primary Author:** Jordan Wang, MD, MBE, MBA, Medical Research Director, Laser & Skin Surgery Center of New York, NY

**Co-Authors:** Christian Albornoz, MD; Roy Geronemus, MD; Alexander Valiga, MD

**Purpose:** Combining radiofrequency microneedling with injectables is an effective therapy for facial rejuvenation. However, there remains safety concerns that inflammation may influence the spread of neurotoxin to undesired areas and treatment may limit filler efficacy.

**Design:** A retrospective chart review was performed over a 4.5-year period. Patients had single-session facial treatments with radiofrequency microneedling (Infini/Genius, Lutronic, South Korea) and either botulinum neurotoxin type-A (BoNT-A) or soft-tissue fillers. Safety was assessed by adverse events within the first 4 weeks.

**Findings:** For BoNT-A, 525 patients had 1,562 single-session treatments. 93.0% were female, and mean age was 51.2 years. The majority were treated with 1927nm wavelength (99.8%) at medium (87.0%). Top 3 injection sites were glabella (81.9%), forehead (68.8%), and periorbital area (63.6%). Mean units of BoNT-A per treatment was 46.4.

Of the 1,562 single-session treatments with BoNT-A, there was 1 case (0.06%) where apraclonidine eye drops were prescribed. She had undergone 8 other single-session treatments without issue. There were no other documented adverse events directly related to spread of BoNT-A, including neck weakness or spasms and impairments in chewing, swallowing, speech, and respiration.

For fillers, 398 patients had 1,237 single-session treatments. 93.7% were female, and mean age was 53.7 years. The majority were treated with 1927nm wavelength (99.8%) at medium (88.8%). Top 3 injection sites were cheeks and/or tear troughs (88.8%), perioral area and/or marionette lines (77.4%), and lips (33.5%). Mean number of filler syringes per treatment was 1.6.

Of the 1,237 single-session treatments with fillers, there were no documented adverse events related to spread of fillers or laser treatment of filled areas, including product migration, unexpected loss of filler volume, vascular occlusion, acute pain, cutaneous necrosis, blindness, and cutaneous burn.

**Summary:** Pairing low-power, low-density fractional diode laser with BoNT-A or fillers in a single session can be a safe combination.

**Pathologic foreign body reaction to poly-L-lactic acid and poly lactide/glycolide suture micro-suspension in minimally invasive facial lifting procedure**

**Primary Author:** Jake Wang, MD, Fellow, Yale New Haven Hospital, New Haven, CT

**Co-Authors:** Amy Lewis, MD; Kathleen Suozzi, MD

**Purpose:** To report the development of inflammatory nodules after suture micro-suspension using poly-L-lactic acid (PLLA) and polylactide/glycolide (PLGA) sutures, knots and cones.

**Design:** This is a single case report of a rare complication of biostimulatory suture micro-suspension.

**Findings:** A 61-year-old woman with history of pre-diabetes and hypothyroidism presented for facelift and jawline contour improvement. Suture micro-suspension was performed using Silhouette InstaLiftTM (Sinclair Pharma, Irvine, California) composed of 82% PLLA and 18% PLGA sutures, knots and cones during two different sessions 1 month apart on the bilateral cheeks, jawlines and neck. Two months after the two procedures, the patient developed tender pink nodules along the bilateral jawlines as well as streaky inflammatory plaques along the placement of the sutures. Cultures of nodules following incision and drainage revealed no growth. The patient was treated with intralesional triamcinolone, oral prednisone, doxycycline in addition to subcision, microneedling, and oral prednisone, doxycycline in addition to subcision, microneedling, intense pulsed light and pulsed dye laser with gradual resolution. Marked improvement was observed as shown by photos at 26 months.

**Summary:** To our knowledge, this is the first report of a pathologic foreign body response leading to inflammatory nodules due to PLLA/PLGA suture micro-suspension. Prior studies have reported subcutaneous nodule formation in 0-40% of patients receiving PLLA filler injections. This case report raises awareness that similar complications may rarely occur in biostimulatory suture micro-suspensions.

**Pairing various cosmetic treatments in a single session can increase versatility, convenience, and overall effectiveness. However, concerns remain that combining laser treatments with cosmetic injectables may increase patient risk.**

**Primary Author:** Jordan Wang, MD, Fellow, Yale New Haven Hospital, New Haven, CT

**Co-Authors:** Amy Lewis, MD; Kathleen Suozzi, MD

**Purpose:** Pairing various cosmetic treatments in a single session can increase versatility, convenience, and overall effectiveness. However, concerns remain that combining laser treatments with cosmetic injectables may increase patient risk.

**Summary:** Residents report insufficient experience and confidence in performing various cosmetic procedures in skin of color patients. This study highlights a gap in dermatology training programs and serves as an impetus for increased didactic and hands-on cosmetics training in melanin-rich patients.

**Carruthers Award Winner**

**Primary Author:** Jordan Wang, MD, Fellow, Yale New Haven Hospital, New Haven, CT

**Co-Authors:** Roy Geronemus, MD; Carolyn Kushner, MD

**Single Session Treatment With Low-Power Fractional Diode Laser and Cosmetic Injectables: A 5-Year Safety Review**

**Featured at the Best of Cosmetic Abstract Session on Sunday, Nov. 21 from 2:45 – 3:45 p.m. CT**

**Purpose:** Pairing various cosmetic treatments in a single session can increase versatility, convenience, and overall effectiveness. However, concerns remain that combining laser treatments with cosmetic injectables may increase patient risk.
Injectable Soft Tissue Filler Locations in Men and Women: An Age-Matched Case Analysis

**Purpose:** The popularity of fillers continues to rise. Traditionally, women have undergone the vast majority of treatments, but men have steadily shown increasing interest. Recent research has looked into understanding anatomic differences between male and female facial structures and their aesthetic implications.

**Design:** A retrospective chart review was performed over a 5.5-year period. 100 men and 100 women were each randomly selected, and cases were matched for age to help control for age-related facial changes. Only one case was used from each patient to avoid having similar and repeat injection patterns in the analysis.

**Findings:** Overall, 100 male and 100 female age-controlled cases were randomly selected. The mean age for each group was 50.4 years (R: 21-92 years). For men, Fitzpatrick skin type was I (29.0%), II (48.0%), III (18.0%), IV (3.0%), and V (2.0%). For women, Fitzpatrick skin type was I (63.0%), II (26.0%), III (10.0%), and IV (1.0%). The top 5 filler injection sites in men included the cheeks and/or tear troughs (86.0%), the perioral area and/or marionette lines (40.0%), the nasolabial folds (26.0%), the jawline (18.0%), and the chin (14.0%). The top 5 filler injection sites in women included the cheeks and/or tear troughs (78.0%), the perioral area and/or marionette lines (54.0%), the lips (44.0%), the nasolabial folds (14.0%), and the temples (7.0%). Facial heat maps were constructed to demonstrate differences in filler location. Cheek injections in men were more inferomedial compared to the superolateral injections in women. Male patients outnumbered their female counterparts 6:1 for filler injections along the jawline. Lip augmentation demonstrated the largest difference between genders of any location, with 44% of female patients compared to only 9% of men.

**Summary:** Injection patterns for soft tissue fillers vary between men and women, which account for anatomic differences in facial structure and anatomy.

**Primary Author:** Jordan Wang, MD, MBE, MBA, Medical Research Director, Laser & Skin Surgery Center of New York, NY

**Co-Authors:** Christian Albornoz, MD; Roy Geronemus, MD; Alexander Valiga, MD

Real-World Experiences With A Novel Nitrous-Oxide Delivery System in Cosmetic Surgery: A National Survey

**Purpose:** Many cosmetic procedures are associated with periprocedural discomfort. Inhaled nitrous oxide has received attention to alleviate this due to its rapid onset, short half-life, low side-effect profile, and ease of clinical integration.

**Design:** An online survey was distributed to physician practices who specialized in dermatology, plastic surgery, and aesthetics and who had a novel nitrous oxide delivery system (Pro-Nox, CAREstream America, Lake Mary, FL).

**Findings:** 204 respondents completed the survey. There was a mean of 2.6 years using this nitrous oxide delivery system. There was an average of 1-3 (42.7%), 4-6 (27.9%), 7-9 (12.3%), 10-12 (8.8%), 0 (3.9%), 13-15 (3.4%), and >15 (1.0%) cosmetic treatments with it per week. The top 5 procedures included radiofrequency microneedling (61.3%), ablative resurfacing laser (51.5%), non-ablative resurfacing laser (45.1%), ultrasound device (32.8%), and cosmetic injectable (29.4%).

Respondents believed this nitrous oxide delivery system to be safe. 7.8% experienced any adverse event, which included headache, dizziness, and nausea and vomiting. 3 respondents (1.5%) reported that they may have experienced a patient who lost consciousness, and a single respondent (0.5%) referred a patient to the hospital for headache and sense of doom caused by excessive inhalation. More information is required to determine if these events were true loss of consciousness or simply over-sedation. Based on this data, a conservative estimate for total number of cosmetic treatments performed with this nitrous oxide delivery system is 140,556, which would make the incident rate 0.002% for these 3 cases.

Overall, 99.0% believed this nitrous oxide delivery system to be effective at making cosmetic procedures more comfortable. The vast majority were satisfied with their use and believed their patients were also satisfied.

**Summary:** This novel nitrous oxide delivery system is an FDA-cleared device that can safely, reliably, and predictably provide analgesia.

**Primary Author:** Jordan Wang, MD, MBE, MBA, Medical Research Director, Laser & Skin Surgery Center of New York, NY

**Co-Authors:** Roy Geronemus, MD; Elizabeth Kream, MD; Girish Munavalli, MD, MHS

Perspectives of Patients With Striae: A National Survey With Treatment Implications

**Purpose:** Striae distensae are common skin lesions. Although they pose no great health risk, they have been associated with significant emotional and psychosocial stress. Despite high prevalence, there remains no single definitive therapy that can offer significantly improved outcomes for every patient.

**Design:** An online survey was distributed to individual consumers in the United States who had striae and were older than 18 years of age.

**Findings:** 125 respondents completed the survey. The mean age was 35.7 years, and 59.2% were female. The mean number of stretch marks for each respondent was 17.6. The top 5 locations were the abdomen (56.0%), upper legs (43.2%), buttocks (35.2%), chest (24.8%), and upper arms (21.6%). The top 5 held beliefs for their cause included rapid weight gain (40.8%), pregnancy (37.6%), puberty (28.8%), rapid growth (23.2%), and hormones (20.0%). The most bothersome qualities were their location (37.6%), color (34.4%), depth (32.8%), texture (32.8%), and itch (20.0%). Stretch marks impacted clothing options, outdoor activities, and social events for many. Overall, 23.2% considered themselves to be knowledgeable about treatments, but nearly two-thirds of respondents wanted to learn more. Of all respondents, 21.6% had treatments for their stretch marks, and 36.8% knew of others who had them. The mean age of those who had treatment was 36.4 years. The top 5 most common procedures that respondents had tried included chemical peels (16.8%), microneedling (8.8%), pulsed dye laser (7.2%), PRP (6.4%), and resurfacing lasers (5.6%). Of all treatments, the majority found them to be ineffective. There was the greatest interest in pursuing the following procedures in the near future: chemical peels (27.2%), intense pulsed light (19.2%), resurfacing lasers (15.2%), PRP (14.4%), and pulsed dye laser (13.6%).

**Summary:** Patients have various experiences and perspectives with their striae, which can impact clinical treatment approaches.

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Striae distensae are common skin lesions. Although they pose no great health risk, they have been associated with significant emotional and psychosocial stress. Despite high prevalence, there remains no single definitive therapy that can offer significantly improved outcomes for every patient. Striae distensae are common skin lesions. Although they pose no great health risk, they have been associated with significant emotional and psychosocial stress. Despite high prevalence, there remains no single definitive therapy that can offer significantly improved outcomes for every patient. Striae distensae are common skin lesions. Although they pose no great health risk, they have been associated with significant emotional and psychosocial stress. Despite high prevalence, there remains no single definitive therapy that can offer significantly improved outcomes for every patient.
COSMETIC DERMATOLOGIC SURGERY ABSTRACTS

Primary Author: Yu-Hsin Wang, MD, Chief Resident, Chang Gung Memorial Hospital, Taoyuan, Taiwan

Co-Author: Yau-Li Huang, MD

An Innovative, Mini-invasive, Transconjunctival and Transcutaneous Dual Approach for Double Eyelid Blepharoplasty with Simultaneous Blepharoptosis Correction

Purpose: Mini-invasive double eyelid blepharoplasty (DEB) together with blepharoptosis correction (BPC) has become a popular aesthetic procedure with a quick recovery period for the characteristic Oriental small eyes. We aim to demonstrate a novel mini-invasive transconjunctival and transcutaneous dual approach for simultaneous double eyelid blepharoplasty and blepharoptosis correction.

Design: This is a retrospective study reviewing 159 eyelids that underwent mini-invasive DEB with BPC from November 2018 to May 2019, including the technical description and the surgical outcomes. To investigate the efficacy of different surgical procedures, the preoperative and postoperative margin reflex distance 1 (MRD1) and levator function (LF) from groups of transconjunctival sutured technique, transcutaneous levator advancement technique, and the dual approach method were analyzed.

Findings: Statistically, the dual approach group has significant improvement in MRD1 and LF (47 eyelids, p < 0.05) corresponding to patients with ptosis of any severity.

Summary: The dual approach technique is a method with a wide range of applications, effective, and low revision rate that simultaneously correct blepharoptosis and create a double eyelid.

Primary Author: Susan Weinkle, MD, Bradenton, FL

Co-Authors: Younghoon Cho, MD; Brenda LaTowsky, MD; Heidi Prather, MD

An open-label extension study to evaluate safety and effectiveness of a biostimulatory poly-L-lactic acid injectable implant after changes in reconstitution and injection procedure

Purpose: To Evaluate the long-term safety and effectiveness of injectable PLLA as a single treatment regimen for correction of nasolabial fold contour deficiencies after changes in reconstitution and injection procedures compared to current approved US label.

Design: This was open-label extension study to follow-up the pivotal study NCT03780244 from Week 48 to Week 96. Subjects from the pivotal study that were randomized to treatment with PLLA reconstituted with 8 mL sterile water for injection (also including an additional 1 mL of 2%-lidocaine, no standing time before injection, and using subdermal injections), were eligible for the extension study. Endpoints for safety included adverse events collected throughout the study. Endpoints for effectiveness were assessed at Week 72 and 96 and included blinded evaluation of nasolabial fold wrinkle severity using a validated wrinkle assessment scale (WAS), aesthetic improvement and subject satisfaction.

Findings: A total of 38 subjects were included in the extension study, most were females (97%) and mean age was 54 years. No new adverse events related to study product and/or injection procedure appeared during the extension study. The treatment from the pivotal study provided long-lasting effect; at Week 96, a majority of subjects (69%) were assessed as having at least 1-step improvement on the WAS, and all subjects (100%) were rated as aesthetically improved by the investigators. Subject satisfaction remained high throughout the extension study.

Summary: In this extension study, PLLA reconstituted in 8 mL including an additional 1 mL lidocaine, administered immediately after reconstitution using subdermal injections continued to be well tolerated and with long-lasting duration of effect and subject satisfaction until Week 96.
**Findings:** In this study, patients ranged in age from 23 to 50 years. All patients were female. Diagnoses included deep morphea, en coup de sabre, lupus profundus and Parry-Romberg syndrome. Median disease duration prior to treatment was 6 years. Skin types ranged from FST IV to VI. Treatment sites include the lips, forehead and mid-face. Global treatment of the face was performed in one case. Various types of soft tissue filler were used including cross-linked hyaluronic acid gel, poly-L-lactic acid and calcium hydroxyapatite. In 2 cases there was deep dermal change in addition to fat atrophy and NAFL was used as adjunctive therapy. All patients showed immediate cosmetic improvement following correction with soft tissue filler. Treatment duration ranged from 2 months to 9 years. Exacerbation following soft tissue filler was not observed.

**Summary:** This case series is the first to focus on the use of dermal filler for CTD-associated deep facial atrophy among patients with skin of color. Observed outcomes are promising and add to the growing body of evidence that soft tissue filler is a safe and effective option for this population.

**Primary Author:** Sean Wu, MD, Fellow, Maryland Laser, Vein, and Skin Institute, Baltimore, MD

**Co-Authors:** Margaret Weiss, MD; Robert Weiss, MD

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**Systematic Review of Clinical Studies Comparing Non-ablative Fractional Lasers and Fractional Picosecond Lasers for the Treatment of Dermatologic Conditions**

**Purpose:** Traditional non-ablative fractional lasers (NAFL) and newer fractional picosecond lasers (FPL) both create microscopic fractionated injuries within the skin, which in turn stimulates skin remodeling and neocollagenesis. Both treatments are associated with shorter downtimes in comparison to full-field resurfacing and ablative fractional resurfacing. However, key differences in mechanisms results in different patterns of focal skin injury. By targeting water using a millisecond pulse duration, NAFL induces vertical columns of microthermal coagulative damage. FPL uses picosecond-range light-tissue interactions with melanin to create focal areas of plasma formation in the epidermis and papillary dermis, termed laser-induced optical breakdown. New studies showing over-lapping indications have prompted comparison trials between NAFL and FPL. Here, we summarize the available head-to-head comparisons in the medical literature.

**Design:** The PubMed database was queried in August 2021 for trials directly comparing NAFL and FPL. Title and abstracts were reviewed for 64 search results, yielding 6 articles which were selected for full-article review. Information on study design, demographics, treatment indication, laser selection, laser settings, efficacy and safety results were extracted for analysis.

**Findings:** All six comparative studies were small, with sample sizes of 20-30. Three randomized split face studies compared a fractional 1064nm +/- 532nm picosecond laser to a fractional 1540nm or 1550nm erbium laser for the treatment of facial atrophic acne scars. All three studies were performed in East and Southeast Asia in skin types III-IV. These studies consistently showed the efficacy of both modalities in treating acne scarring, but yielded mixed results on whether FPL provided a superior efficacy or improved safety profile. In addition, two studies, both in the United States and including a broader range of skin types, compared FPL to a 1927nm fractional thulium fiber laser for the treatment of photoaging. Though the two studies disagreed whether FPL is more effective or equivalent to the thulium laser for photoaging, both studies demonstrated a shorter downtime with FPL. Finally, one split-body study for abdominal striae alba showed that 1064nm/532nm FPL is equivalent to a 1565nm fractional erbium-glass laser in efficacy, with a shorter downtime.

**Summary:** Based on the limited information from small comparative studies, fractional picosecond lasers appear to offer at least non-inferior results to traditional non-ablative fractional lasers and, depending on the indication and settings, may be associated with shorter downtimes. Gaps in knowledge are significant and will require further examination.

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**Topical Regenerative Exosome Therapy: A New Paradigm in Skin Rejuvenation**

**Purpose:** Exosomes are extracellular nanoparticles that mediate cell-to-cell communication, which alter cellular growth, proliferation, and differentiation – an integral part of maintaining healthy skin structure and function. Intrinsic and extrinsic skin aging disrupts the balance between free radical damage and cellular antioxidant self-repair. In addition, it furthers fibroblast-extracellular matrix (ECM) interactions due to collagen fibril fragmentation. Supplementing the skin barrier with topical exosome therapy may enhance natural repair processes and accelerate the reversal of intrinsic and extrinsic skin aging.

**Design:** Human platelet extract is an extracellular vesicle (EV), leukocyte-depleted allogeneic product engineered from human U.S. sourced pooled apheresed platelets (derived from screened healthy donors). This purified topical product is comprised of platelet conditioned medium-derived extracellular vesicles rich in anti-inflammatory and angiogenic growth factors. Sourced platelets are received by a compliant manufacturing facility from FDA registered/licensed blood banks. It then undergoes a staged sterile filtration process to further eliminate cell-cell fragments and non-EV subcomponents. The end-product consists of platelet EVs rich in anti-inflammatory cues and antioxidant enzymes.

**Findings:** Human platelet extract contains high concentrations of proteins that function as free radical scavengers by catalytically neutralizing reactive oxygen species (ROS). Specifically, catalase, superferric dismutase (SOD), and heme oxygenase 1 (HO-1) remain catalytically active after lyophilization as noted on fluorometric-based assay. This purified acellular topical product further supports cell proliferation following in vitro scratch assay. In addition, proteomic analysis of human platelet extract revealed high levels of activated (pre-phosphorylated) vascular endothelial growth factor receptor 2 (VEGFR2), which supports angiogenesis. This EV-based product also prevents inflammatory polarization of immature macrophages exposed to lipopolysaccharide characterized by increased production of IL-10, implicating an anti-inflammatory role.

**Summary:** Herein we discuss the development of a paradigm-shift in skin rejuvenation – topical acellular extracellular vesicle product (human platelet extract), an off-the-shelf regenerative cosmetic agent, primed for anti-aging studies.

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**Co-Authors:** Katie Beleznyz, MD, FRCP; Jean Carruthers, MD, FRCS

**Efficacy and Safety of VYC-12 as a Combination Treatment for Skin Rejuvenation: A Retrospective Analysis of 1577 Treatments**

**Purpose:** VYC-12 is a non-FDA-approved hyaluronic acid-based implant intended for intradermal injection of the face and neck to enhance hydration and treat superficial cutaneous rhytides and depressions. Prospective studies have demonstrated that the improvements in skin quality, hydration, and texture seen post-VYC-12 treatment can persist for up to 9 months. However, published data on the use of VYC-12 in combination with other modalities is lacking. We present our data and experiences regarding the safety and efficacy of VYC-12, both as a stand-alone and combination treatment.

**Design:** A systematic chart review was undertaken at a single aesthetic dermatology clinic in Vancouver, Canada to identify all patients treated with VYC-12 up until May 3, 2021. For each VYC-12 treatment session, treatment modalities used on the same day (same-day combination) or in the subsequent 9 months (asynchronous combination) were recorded. Treatments
Intra-Cavitary Foam Sclerotherapy in Dissecting Cellulitis of the Scalp

**Purpose:** Dissecting Cellulitis of the Scalp (DCS) is a primary neutrophilic dermatosis commonly seen in young adult African American males. DCS clinically presents as multiple subcutaneous nodules that may have persistent purulent drainage and intermittent inflammatory flares, causing significant pain and morbidity. Treatment of DCS is difficult and therapies include antibiotics, anti-tumor necrosis factor agents, and isotretinoin although response is variable and many times suboptimal. We theorized intra-cavitary foam sclerotherapy (ICFS) would be effective in the treatment of DCS, and present several cases that were successfully treated with ICFS using sodium tetradecyl sulfate (STS) or polidocanol (POL).

**Design:** Foam sclerosing solution was made by mixing 1-3% STS or 1-3% POL with air in a 1:4 ratio using Tessari’s method. DCS cavities were identified with the patient and examined with ultrasound for any nearby vessels, sinuses, tracts, and fluid. If an exudate was present, then it was aspirated whenever possible before ICFS. Under ultrasound guidance, 1-3 cc of sclerosing foam was injected per cavity using a 27-gauge 1.25-inch needle on a 3-cc syringe. The ultrasound confirmed intracavitary injection and the absence of intravascular injection. Compression wraps were applied to the treated area for a minimum of 24 hours. The injection volume per session was limited to a maximum of 10 cc foam sclerosing solution.

**Findings:** A cohort of thirteen patients presented to our clinic with poorly controlled DCS after failing a variety of treatments. Patients were treated with a range of 2 to 19 ICFS treatment sessions. After 1-2 sessions, patients experienced reduction of pain, drainage, inflammation, and flattening of boggy abscesses. Some patients had hair regrowth within the condition was stable and then every eight weeks for maintenance therapy. 718 patients (97.6%) received same-day and/or asynchronous combination treatments. 1444 of the VYC-12 treatment sessions (91.6%) were performed in combination with other treatments on the same day. Adverse events included 1 case of transient, self-resolving late-onset papules, and 2 cases of suspected vascular compromise that resolved completely. 1 of the latter cases was treated with hyaluronidase while the other self-resolved. No specific adverse events were observed as a result of combination treatments.

**Summary:** In this large, single center, retrospective case review, VYC-12 is observed to be safe and efficacious for improving skin quality as part of a combination treatment plan. Controlled prospective studies exploring ideal treatment parameters and safety profiles for combination treatments would be beneficial to further analyze the safety and efficacy of VYC-12 as a combination treatment. Limitations of this study include its retrospective nature and restriction to a single aesthetic practice.

**GENERAL DERMATOLOGY ABSTRACTS**

**Primary Author:** Nader Aboul-Fettouh, MD, Resident, University of Texas Health Science Center at Houston, Houston, TX

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**Patient Satisfaction in Dermatologic Surgery: A Review of What We Have Learned So Far**

**Purpose:** Patient satisfaction (PS) is an important and commonly used index in determining the quality of health care services provided. A wide variety of factors play into PS which in turn may affect clinical outcomes, patient compliance, malpractice claims, as well as various other aspects of medical care. The objectives of this study were to compile a list of published, peer-reviewed articles relevant to patient satisfaction in dermatologic surgery in order to provide dermatologic surgeons a concise but effective review of methods that may assist in optimizing patient satisfaction in their practice.

**Design:** A comprehensive literature search of the Embase (Ovid), PubMed, Cochrane Library, and Web of Science databases was performed from the origin of each electronic database to February 28th, 2021 using the search terms: “satisfaction AND (“MOHS” OR “Dermatologic surgery” OR “Skin surgery” )” to include eligible articles that reported on PS as related to dermatologic surgery. Inclusion criteria included: manuscripts in English that directly reported on PS as related to dermatologic surgery. Exclusion trial included: review articles, non-peer-reviewed conference abstracts, studies investigating outcomes that required reconstruction solely in the operative room setting e.g., plastic surgery or head and neck surgery, and articles primarily aimed at testing and validation of survey tools designed rather than the patient data collected.

**Findings:** The initial search strategy yielded a total of 1653 articles. After exact duplicates were removed, 1372 articles had the titles and abstracts screened for eligibility by author NA, of which 43 relevant articles were identified. After full-text review of the 43 articles, 39 articles were deemed eligible for review and were included. These articles varied in study design and included cross-sectional cohort studies, retrospective cohort studies, comparative studies, and randomized controlled trials. The reviewed studies focused on overall surgical experience as well as pre-operative, intra-operative, and post-operative measures that affected PS. Two studies focused on the waiting periods patients underwent during Mohs micrographic surgery (MMS) and named methods to ease boredom during the wait, including the use of a novel virtual reality experience. Three studies focused on MMS reconstruction options, comparing satisfaction with secondary intention healing to other options such as primary closures, full-thickness skin grafts, and interpolation flaps. Three studies noted high patient satisfaction in surgical excision of a specific lesion type (melanoma-in-situ, basal cell carcinoma, benign facial melanocytic naevi). Two studies involved PS in the pediatric population, observing a high level of satisfaction in the majority of children undergoing dermatologic procedures, and identifying explanation of aftercare as a predictor of the parent’s satisfaction. Level of evidence for studies included in this review ranged from 1b to 3b on the Oxford level of evidence scale.
**Summary:** A wide variety of articles have been published on patient satisfaction in dermatologic surgery, although a minority of these articles are randomized controlled trials. Overall, the literature shows a consistently high level of patient satisfaction associated with dermatologic surgery. Future studies could add to the existing literature and expand on factors influencing PS in dermatologic surgery that have not yet been investigated.

**Primary Author:** Michael Abrouk, MD, Fellow, Harvard / MGH Laser, Boston, MA

**Co-Authors:** Giuseppe Ingrasci, BS; Robert Kirshner, MD, PhD; Gil Yosipovitch, MD

**Bibliometric Analysis**

**Purpose:** To analyze the number of highly cited articles and their impact on the field of dermatology.

**Method:** A review of highly cited articles in dermatology literature was conducted using the Web of Science database.

**Findings:** The study identified a significant number of highly cited articles in dermatology. Factors contributing to high citation rates include the relevance of the research, the quality of the methodology, and the potential for the research to impact clinical practice.

**Conclusion:** Bibliometric analysis can provide valuable insights into the impact of research in dermatology.

**Primary Author:** Michael Abrouk, MD, Fellow, Harvard / MGH Laser, Boston, MA

**Co-Authors:** Jacob Beer, MD; Merrick Brodsky, MD; Joanna Dong, MD; Ella Glaser, MD; Catherine Motosko, MD; Patricia Richey, MD

**Top Authors in Dermatology Residency and Fellowship by h-index: A Bibliometric Analysis**

**Purpose:** To identify the top dermatology residents and fellows based on their h-index.

**Method:** A bibliometric analysis was conducted using the Web of Science database.

**Findings:** The study identified the top 50 dermatology residents and fellows based on their h-index. The analysis revealed trends in productivity and impact over time.

**Conclusion:** The h-index is a useful tool for evaluating the research output of dermatology residents and fellows.

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**Co-Authors:** Jacob Beer, MD; Merrick Brodsky, MD; Joanna Dong, MD; Ella Glaser, MD; Catherine Motosko, MD; Patricia Richey, MD

**Design:** A 67-year-old female with end-stage chronic renal disease (ESCRD) currently on maintenance hemodialysis presented to the dermatology clinic in January of 2020 endorsing a two-year history of a progressively worsening ulcer on her left lateral neck associated with moderate pain and intense pruritus. The patient quantified the pruritus on the Peak Pruritus Numerical Rating Score (PP-NRS) as an average of 10 (0-10) that worsened at night and disrupted her sleep. In 2017, the patient experienced an episode of herpes zoster that affected her left lateral neck with resultant pruritus and pain which she described as a constant burning and shock-like sensation that led to regular picking, rubbing, and scratching of the affected area. A biopsy of the affected area was performed, and histopathological analysis revealed marked hyperkeratosis with foci of parakeratosis, epidermal acanthosis with irregular elongation of the rete ridges, hypergranulosis, a prominent stratum lucidum, and a patchy lymphohistiocyte infiltrate distributed in perivascular collections within the superficial dermis consistent with neurodermatitis. Treatments from that time to the time of presentation to our clinic included pregabalin 50mg once daily for one year, mirtazapine 15mg nightly for eight months, oxycodone 30mg daily for one month, cyclosporine 100mg twice daily for one month, botox injections, and a left stellate ganglion block. Of these, pregabalin, oxycodone, botox injections, and the stellate ganglion block produced moderate improvement in pain, but no effect on pruritus. Oxycodone worsened the pruritus. When the patient presented to our clinic in January 2020, dermatologic examination revealed a 7 x 3 cm eroded plaque on the left lateral neck with ulceration and sharply demarcated angular borders (Figure 1). Considering the patient’s history of herpes zoster with concomitant pain, paresthesia, and pruritus in the same dermal distribution, a diagnosis of PHN with PHI was made. Treatment with risperidone 0.5mg nightly and topical lidocaine twice daily was started. Over the course of six months, the dose of risperidone was increased to 4mg nightly with reported improvements in pruritus severity, nighttime awakenings, and scratching frequency. By October of 2020, the ulcer had reduced in size and measured 6 x 1 cm (Figure 2), and the patient reported an average PP-NRS of 6. At that time, intranasal butorphanol 1mg daily was added, and the patient reported further improvements in pruritus severity and scratching frequency. As of March 2021, the patient’s medication regimen included risperidone 4mg nightly, intranasal butorphanol 1mg daily, and topical lidocaine twice daily. At this time, the ulcer had resolved and epithelialized (Figure 3) with significant improvements in pain, scratching frequency, and an average PP-NRS of 0. Table I summarizes the changes in treatments, ulcer size, and PP-NRS over time.

**Findings:** Treatments for PHN include anticonvulsants such as pregabalin and gabapentin; tricyclic antidepressants; topical agents such as 8% capsaicin and anesthetics; and invasive therapies including botox injections and stellate ganglion blocks. While there are case studies of these effective PHN medications partially relieving PHI, there are no current specific treatments for PHI, and it may prove to be more difficult to manage than PHN-associated pain. For example, pregabalin is also effective for improving ESCRD-associated pruritus, and its ineffectiveness to alleviate our patient’s pruritus may point to the complexity of her PHI. Successful reduction of PHN-associated pain without concurrent reduction of pruritus may compel the patient to reflexively over-scratch the affected area and cause self-induced chronic ulceration in the absence of the deterrent of pain sensation.

**Summary:** Risperidone, a second-generation anti-psychotic medication that blocks dopamine in the mesolimbic neural circuit, has been reported to successfully reduce pruritus and scratching behavior in delusional parasitosis, a psychiatric cause of chronic pruritus, yet there are no reports of its successful use in NP. We decided to use risperidone to improve our patient’s longstanding scratching behavior and nocturnal pruritus. Risperidone may be started at a dose of 0.5mg before bedtime and increased weekly until reaching a maximum dose of 4mg/day. The most common adverse events (AEs) reported are sedation and hyperprolactinemia. Risperidone should be used with caution in patients with a history of an abnormal electrocardiogram as it may prolong the QTc interval. After six months of treatment with risperidone, our patient’s urge to scratch decreased as well as her ulcer size; therefore, we decided to add intranasal butorphanol, a kappa opioid receptor (KOR) agonist and mu opioid receptor (MOR) antagonist, to target the pruritus our patient was still experiencing. A recent case series of sixteen patients with refractory chronic pruritus treated with intranasal butorphanol found a significant improvement of pruritus in 81% of subjects. The most common AEs are sleep disturbances, sedation, psychomotor impairment, and nausea and vomiting. Our patient’s improvement in pruritus and scratching behavior with intranasal butorphanol and risperidone is unique in the current literature and may provide insight to the poorly understood pathogenesis of PHI. Simultaneous activation of KOR system and inhibition of MOR system within the mesolimbic circuit acts to decrease dopaminergic activity resulting in an “anti-reward” effect on addiction and itching behavior. Therefore, the successful use of these medications, along with the worsening of pruritus that occurred following treatment with oxycodone, an MOR agonist, may represent a central component of PHN pathogenesis that drives both pruritus and scratching behavior.

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**Co-Authors:** Jacob Beer, MD; Merrick Brodsky, MD; Joanna Dong, MD; Ella Glaser, MD; Catherine Motosko, MD; Patricia Richey, MD

**Top Authors in Dermatology Residency and Fellowship by h-index: A Bibliometric Analysis**

**Purpose:** To identify the top dermatology residents and fellows based on their h-index.

**Method:** A bibliometric analysis was conducted using the Web of Science database.

**Findings:** The study identified the top 50 dermatology residents and fellows based on their h-index. The analysis revealed trends in productivity and impact over time.

**Conclusion:** The h-index is a useful tool for evaluating the research output of dermatology residents and fellows.

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and gender was tabulated based on Google searches of full names and last-known institutional affiliation. Google Scholar (https://scholar.google.com/) and Scopus (https://www.scopus.com/) databases were also queried for h-indexes of top authors.

**Findings:** The top 20 dermatology authors by h-index are displayed in Table 1, along with rankings by total number of article citations.

**Summary:** Google Scholar and Scopus h-indexes, when obtainable, were queried for h-indexes of top authors. Since citations accumulate over time, any metric based on citations can be biased by author seniority and length of career. Determining author gender by cursory searches, and transferring between institutions, name changes, variations in initials, or duplications of common names may affect data quality. The h-index also does not account for author order. Future studies should ensure inclusion and synthesis of multiple sources and metrics when considering author influence.

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**Arfya: A Rare Disorder with an Enigmatic yet Instantaneous Response to Laser Therapy**

**Purpose:** Arfya is a disease characterized by deposition of silver into the skin, manifesting as blue-gray discoloration. While the discoloration is benign, it is usually permanent, so patients often seek treatment. Certain laser technologies may yield skin clearance without long-term ramifications. We discuss the case of arfya successfully treated with 1064 nm Q-switched neodymium-doped yttrium aluminum garnet (Nd:YAG) laser, which provided immediate, lasting clearance of pigment. Design: This is a case report of a condition with a unique response to laser. We discuss the case, operative course, and end result.

**Findings:** A 39-year-old female presented with blue-gray pigmentation involving the face and neck. Her discoloration developed gradually concomitant with ingestion of ionic silver for purported health benefits. Considering her classical findings of arfya, we pursued a trial of therapy with a 1064nm Nd:YAG laser. Despite using the lowest possible laser settings plus topical anesthetic for 60 minutes (benzocaine-lidocaine-tetracaine) and supratrochlear, supraorbital, infraorbital, and mental nerve blocks with lidocaine with epinephrine, she experienced severe pain with treatment, limiting the surface area that could be treated at a single session. However, laser therapy provided immediate and dramatic clearance of discoloration. The patient chose to be treated over several visits, with separate areas targeted during each laser session. At her final treatment session, the patient elected to have direct cutaneous infiltration with amide anesthetics, and treatment areas were injected with either 0.5% bupivacaine or 1% lidocaine with epinephrine. The patient noted significant reduction in pain during laser treatment of these regions as compared with her prior treatments where topical anesthetics and nerve blocks were used.

**Summary:** Nd:YAG represents a potentially effective treatment for cutaneous arfya. Although the pigmentation is considered akin to tattoo ink, unlike laser tattoo removal where results take weeks, arfya may exhibit immediate clearance with Nd:YAG through an unknown mechanism. Ultrastructural studies of laser treatment of arfya have demonstrated retained silver within clinically normal-appearing skin. It is postulated that laser treatment may alter the plasmon resonance of silver, thus emitting a different optical spectrum. Thus, while the silver is not cleared from the skin, it may be altered into a form that is not visible to the human eye, a mechanism distinct from macrophage-mediated removal of tattoo ink with laser therapy. Another unique issue for laser treatment of arfya is patient discomfort that may be refractory to topical anesthetic and nerve blocks, as seen in our patient and as previously described in several reported cases. Our patient exhibited marked improvement in treatment tolerance with direct infiltration of local anesthetic, although the risks of toxicity preclude use over large surface areas. Future research could help elucidate the mechanism for immediate clearance with laser as well as the physiologic basis for the disproportionate pain experienced during treatment, and potentially link these two phenomena.

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**Brow Shape and Height After Treatment with AbobotulinumtoxinA in the Glabellar Lines**

**Purpose:** As one of the first places the eye focuses, the brow is important to the overall aesthetic of the face and of vital importance to facial expressions. Patients are commonly treated with AbobotulinumtoxinA (ABO) in the glabella, but few objective measures are available of the effect on the overall brow height or shape.

**Design:** A post-hoc analysis was conducted using subject photos from a prospective study (NCT02718118) which evaluated the efficacy and safety of on-label injections of ABO in the glabellar lines. The analysis evaluated overall brow height and shape through a digital image analysis of the medial, mid-pupil, and lateral brow height and blinded-expert ratings of subject photos at baseline, day 30, and day 90.

**Findings:** 61 subjects were included in the analysis. Overall mean brow height did not change significantly from baseline for either timepoint, however, the lateral brow height increased at day 30 (mean change: 0.99 mm, P < 0.001), and the medial brow height decreased at day 30 (mean change: -0.81 mm, P < 0.001). At day 90, brow shape changes from day 30 were maintained but decreased in magnitude. Blinded experts rated the majority of subjects’ overall brow height at day 30 as either unchanged (74%, rater 1) or higher/much higher (69%, rater 2).

**Summary:** Treatment with 50 U ABO in the glabella reshapes your brow, lifting the lateral brow and changing shape to a lateral flare at day 30, with the effect persisting through day 90. This may lead to the appearance of a higher brow.

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**Subject Satisfaction with Two Treatments of AbobotulinumtoxinA a Year High Among Both Previously Treated and Subjects Naïve to Treatment**

**Purpose:** Patients who have previous experience with and those naïve to aesthetic botulinum toxin treatments may have different expectations when being treated, leading to differences in satisfaction. Furthermore, some have suggested onset and duration of effect may differ. Therefore, we completed a post-hoc analysis of a recent study with AbobotulinumtoxinA looking at subject satisfaction and efficacy by previous treatment experience.

**Design:** A post-hoc analysis was performed of a 12-month, open-label, multi-center, interventional study that evaluated subject satisfaction following two on-label injections of 50U of ABO in the glabellar lines at baseline and 6 months. Secondary endpoints were assessed at months 1, 3, 6, 7, 9, and 12 and included subject satisfaction, subject-reported FACE-Q scores, and glabellar line severity scores (GLSS).
Palmar and Plantar Hyperhidrosis: A comprehensive review

Sarah Nasser, BS; Arash Kimyai

Co-Authors: Farshchian

Purpose: Our aim was to review the numerous techniques utilized to minimize pain accompanying injections for palmar and plantar hyperhidrosis. Additionally, we discussed the advantages and limitations of each modality.

Findings: Current available techniques in reducing botulinum injection with merits and drawbacks are nerve blocks, Bier’s blocks, cryoanalggesia, needle-free anesthesia, topical anesthetics, and vibration anesthesia.

Summary: Topical anesthesia, ice, and vibration are the safest and most convenient non-invasive available methods to relieve pain associated with Botulinum Injection. Nerve blocks, Bier’s block, and needle-free anesthesia provide better anesthesia but are limited by the need for training and equipment.

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Methods to Relieve Pain Associated with Botulinum Injections for Palmar and Plantar Hyperhidrosis: A comprehensive review

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ensure an adequate level of support staff due to the complex nature of the field, as well as to ensure adequate supervision of mid-level providers given concern for adverse events. The most consistent theme across specialties is physician concern about autonomy, the ethical balance of patient care and financial performance, and long-term career prospects. These issues are magnified in dermatologic surgery, where procedural incentives and issues related to scope of practice may be more pronounced. Additional studies are needed to assess the experience of physicians with employment experience in PE, procedural case mix and supervision in PE clinics, the relative financial impact of PE in dermatology.

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Perinevoid Alopecia: A Rare Variant of Alopecia Areata That May Respond to Surgical Excision

Purpose: Perinevoid alopecia is a rare and poorly understood variant of alopecia areata. Case reports suggest surgical removal of the central nevus may aid in hair regrowth. Here we present a case of perinevoid alopecia in conjunction with an atypical nevus treated with surgical excision.

Design: Case Report.

Findings: A 35-year-old otherwise healthy male presented for hair loss surrounding a longstanding mole on his scalp. Due to the location, the patient admitted difficulty monitoring the lesion thus he was not aware of exact duration or any changes to the size or color of the mole. He notes gradual thinning of the hair surrounding the mole over the past year. While he had shaved his head, he denied shaving the area surrounding the mole. He denied hair loss elsewhere on his body, any pigmented changes to his skin, history of thyroid disease, personal or family history of atypical nevi or skin cancer. He was seen by his Primary Care Provider who performed a 4mm punch biopsy revealing a junctional melanocytic nevus with atypical features. He was referred to Dermatologic Surgery and underwent surgical excision of the atypical nevus with 5mm margins. Pathology revealed scar with focal residual junctional melanocytic nevus with atypical features, clear margins, and features consistent with alopecia areata; focal peribulbar lymphocytic inflammation with occasional eosinophils, catagen/telogen shift, and some follicular miniaturization. Taken together, these findings are consistent with perinevoid alopecia. A month following excision, the patient reported the surgical site had healed well without complications. Unfortunately, he had not noticed any hair regrowth although it is possible it was too early to see any change. Close follow up has been arranged.

Summary: Perinevoid alopecia, also termed neovcentric alopecia, represents a rare variant of alopecia areata that classically presents as a solitary patch of non-scarring alopecia with a central melanocytic nevus often located on the chin or scalp. It was first described by Quiroga and Pecoraro in 1958 and there have been less than 10 cases published in the literature since. Alopecia areata is thought to be an autoimmune response targeting the hair follicles resulting in inflammation and hair loss. The pathogenesis of perivoid alopecia is poorly understood. It is proposed that melanocyte-associated T-cell epitopes act as auto-antigens to induce an autoimmune reaction against the surrounding hair follicles. Clinical features similar to alopecia areata have been reported such as broken hairs, exclamation hairs, and yellow dots on dermatoscopy. The most reported histologic features are the presence of nests of melanocytes with surrounding perifollicular inflammation. In has been reported that some patients experience hair regrowth following surgical removal of the central nevus. In our case, our patient did not experience hair regrowth 1 month post-excision of his atypical nevus, however it may be too soon to see an effect. In conclusion, perinevoid alopecia is a rare variant of alopecia areata that presents as a solitary patch of non-scaring alopecia surrounding a central nevus without a depigmented halo present. Surgical removal of the central nevus may be associated with hair regrowth in some patients.

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Purpose: The coronavirus disease 2019 (COVID-19) pandemic has significantly impacted the healthcare system in all medical specialties, including dermatology. The rapid transmission of COVID-19 initially mandated the use of extensive and specific personal protective equipment (PPE) in the general dermatologic office and surgical setting. There is currently a lack of clear and updated guidelines for PPE during dermatologic procedures, specifically after successful vaccination efforts of the general public and healthcare workers alike. In this review, we investigate and document existing PPE and safety recommendations for COVID-19 as it pertains to dermatologic surgery. We aim to identify clear instructions for this setting, highlighting high-risk procedures and the need for further guidelines in the rapidly evolving setting of the COVID-19 pandemic after continued effective global vaccination.

Design: A retrospective review was conducted of the existing literature on PPE for COVID-19 in the dermatologic setting.

Findings: Although vaccination initiatives began in January of 2021, there have been no recent updates to the minimal PPE for prevention of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) transmission by the Center for Disease Control (CDC) in the healthcare setting. Additionally, there are few updated guidelines specifically pertaining to cutaneous surgery. Tee, Michael W., et al is the most recently published article delineating proper procedures and PPE during dermatologic surgery which includes, but is not limited to: eye protection, hair/shoe covers, masks, hand hygiene, pre-procedure SARS-CoV-2 testing, symptom screening, temperature checks, visitor limitations, as well as smoke evacuator use during electrocautery. Additionally, it is known that certain procedures are considered higher risk of SARS-CoV-2 transmission than others, and we speculate whether it is appropriate to broadly apply these stringent precautions to all surgical cases. SARS-CoV-2 transmission is highest for procedures performed on the head and neck due to an increased risk of viral particle aerosolization from the nares and oral mucosa. This knowledge prompted routine SARS-CoV-2 testing within 24-48 hours of surgery, even for asymptomatic patients. In most clinical settings, it is not commonplace to perform SARS-CoV-2 testing before surgeries performed at sites distant from these high-risk areas, as the likelihood of viral transmission is much lower. Now that physicians are largely vaccinated and there is an ever increasing number of patients vaccinated, will the need for SARS-CoV-2 testing prior to procedures on the head and neck be eliminated? Though some may argue that currently instated protocols must be followed until a vaccine-derived herd immunity is reached, the utility of pre-procedural SARS-CoV-2 testing and the guidelines for PPE in dermatologic surgery should be investigated and revised appropriately.

Summary: In consideration of widespread vaccination efforts amongst the general public and continued initiatives amongst healthcare practitioners, we recognize and emphasize the need to reassess SARS-CoV-2 testing practices and protective equipment guidelines as they pertain to dermatologic surgery. Vaccination efforts are likely to shape the previously pre-defined and mandated PPE, smoke evacuator for electrocautery and laser procedures, as well as pre-procedure SARS-CoV-2 antigen or IgM/IgG antibody testing. The success, or failure, of ongoing practice measures will influence future national consensus guidelines, with the refinement of current standard safety protocol to implement updated evidence-based policies.
Visualizing the Elimination of Glabellar Lines Following Treatment With DaxibotulinumtoxinA for Injection

Purpose: DaxibotulinumtoxinA for Injection (DAXI) is a novel botulinum toxin product in clinical development for the treatment of glabellar lines (GL). Phase 3 studies showed 98% of subjects were rated “None” or “Mild” by investigators at Week 4; “None/Mild” status was maintained for 24 weeks (median). Achieving “None/Mild” severity is a widely reported trial endpoint. However, in clinical practice, patients hope to achieve no GL (not just improvement). Here we present results indicating DAXI-treated patients most often achieve a “None” rating. We further present a novel graphical representation of the “None” or “Mild” assessment that illustrates the utility and sensitivity of the “None” rating.

Design: In two Phase 3 pivotal trials (N=303 and 306), subjects with moderate or severe GL were randomized (2:1) to receive DAXI (40U) or placebo. GL severity was assessed up to 36 weeks after treatment via the 4-point Investigator Global Assessment-Frown Wrinkle Severity scale (where “None” indicates absence of GL while frowning). A novel graphical representation of the entire distribution of GL severity ratings and change scores was used to evaluate patterns of efficacy over time.

Findings: Pooled data revealed 80% of subjects were rated as “None” at Week 4, and 35% at Week 12. Among subjects rated “Severe” at baseline (n=153), 68% and 24% were rated as “None” at Weeks 4 and 12, respectively, which represents a 3-point improvement from baseline (largest possible). Among all subjects, 90% achieved a ≥2-point improvement from baseline at Week 4.

Summary: Visualizing the entire distribution of GL severity ratings provides the most comprehensive depiction of efficacy.

Clinical Immunogenicity of DaxibotulinumtoxinA for Injection in Glabellar Lines Including Subjects With Multiple Exposures: Pooled Data from the SAKURA Phase 3 Trials

Purpose: DaxibotulinumtoxinA for Injection (DAXI) is a novel botulinum toxin type A (BoNTA) product containing purified 150-kD core neurotoxin (daxibotulinumtoxinA) in addition to a proprietary stabilizing peptide (RTP004) and other excipients. As with any new biologic product, DAXI has the potential to be immunogenic and elicit antibody formation. Therefore, investigation of DAXI’s immunogenic potential is an important component in the overall clinical safety assessment, including the responses after repeated drug administration.

Design: The presence of neutralizing antibodies to daxibotulinumtoxinA and binding antibodies to daxibotulinumtoxinA or RTP004 was assessed in adults enrolled in the phase 3 glabellar line clinical program, comprising two double-blind, placebo-controlled, single-dose studies (SAKURA 1 and 2) and an open-label safety study (SAKURA 3) of up to three repeat treatments of 40U DAXI. Binding antibodies were detected by a validated direct binding ELISA. The testing paradigm consisted of the industry standard multi-tiered approach and included screening, confirmatory assay, and titration assay. Samples from subjects testing positive for daxibotulinumtoxinA-binding antibodies were further evaluated for the presence of neutralizing antibodies in the mouse protection assay. The effect of anti-drug binding antibodies on treatment response and duration of clinical benefit was assessed. Safety was evaluated with respect to the occurrence of immune-related adverse events.

Findings: Overall, 2786 subjects received DAXI (n=882, ≥ 2 treatments; n=568, 3 treatments) and 2823 subjects were exposed to RTP004 as DAXI (n=2786) or placebo (n=203) (n=914, ≥ 2 exposures; n=702, 3 exposures). Of these, 2737 and 2772 had both evaluable pre- and post-treatment samples for binding antibodies to daxibotulinumtoxinA and RTP004, respectively. At baseline, 12 of 2737 (0.4%) subjects were found to have binding antibodies to BoNTA and 66 of 2772 subjects (2.4%) had detectable antibody titers to RTP004. Treatment-emergent anti-daxibotulinumtoxinA binding antibodies were detected in at least one study sample in 20 subjects (0.7%), and 1 subject (< 0.1%) with binding antibodies at baseline demonstrated an increased titer. No subject developed neutralizing antibodies to daxibotulinumtoxinA. Treatment-induced anti-RTP004 binding antibodies were detected in 35 (1.3%) subjects. No subjects had treatment-booster anti-RTP004 binding antibodies. In the majority of subjects, the binding antibodies were transient and not present in the final sample. No subject had binding antibodies to both daxibotulinumtoxinA and RTP004. All subjects with treatment-induced binding antibodies to daxibotulinumtoxinA or RTP004 achieved a response of none or mild glabellar line severity at Week 4 following each DAXI treatment cycle, and duration of clinical response was not different in treatment cycles when antibodies were detected compared with those in which no antibodies were recorded. No subjects with binding antibodies to daxibotulinumtoxinA or RTP004 reported any immune-related adverse events.

Summary: This is the first large-scale analysis of the risk of antibody formation to DAXI. No subjects developed neutralizing antibodies to daxibotulinumtoxinA. Results from this study suggest that DAXI administration results in a low incidence of antibody formation. For the small percentage of subjects who developed transient binding antibodies to daxibotulinumtoxinA or RTP004, these were found to not impact clinical efficacy, safety, or duration of action.

Melasma on Instagram: An Analysis of Hashtags

Purpose: To analyze the content, origin of content and content contributors of top melasma associated hashtags on Instagram.

Design: Authors generated a list of the top ten melasma associated hashtags on Instagram. This list was generated on March 14, 2021. Based on the engagement level, authors recorded the top 20 posts for each hashtag on the list. Authors then analyzed the top 20 posts belonging to each of the top ten hashtags. Duplicated posts were excluded. The occupation of users were assessed from their account and recorded. Posts were categorized into the following categories: body positivity, educational, treatment and camouflage.

Findings: Of the 200 Instagram posts, 4.5% (N=9) were “Body Positivity” posts, 6.5% (N=13) were “educational” posts, 83% (N=166) were “treatment” posts and 6% (N=12) were “camouflage” posts. 12.5% (N=25) were posted by dermatologists, 1.5% (N=3) by PAs, 1.5% (N=3) by nurses, 1% (N=2) by scientists, 0.5% (N=1) by a plastic surgeon, 22.5% (N=45) by laypeople, 52.5% (N=105) by aestheticians and 8% (N=16) by pharmaceutical companies.

76% (N=152) originated from Brazil, 14.5% (N=29) originated from the U.S, 10% (N=19) originated from the UK, Asia, Australia, Nigeria and France.
GENERAL DERMATOLOGY ABSTRACTS

Summary: Board certified dermatologists should use Instagram as a tool to educate the masses about melasma, as Instagram is used by millions of people everyday. The percentage of dermatologists generating melasma related posts is relatively low. Encouraging board certified dermatologists to post melasma related content on Instagram will increase the number of reputable content in this area.

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Characterization of Bloodborne Pathogen Exposures during Dermatologic Procedures: The Mayo Clinic Experience

Purpose: The purpose of this study was to identify the prevalence of bloodborne pathogen (BBP) exposures in dermatologic procedures. Secondary aims included identification of the type of exposure, type of procedure associated with each exposure, common anatomic locations of exposures, and common instruments involved in each exposure.

Design: Data was obtained from the occupational health department at each of three Mayo Clinic sites in Arizona, Florida, and Rochester from March 2010 to January 2021. A retrospective review of each exposure was conducted to identify the variables of interest. Each of these variables were further stratified by occupational title.

Findings: A total of 222 BBP exposures were identified through the tri-site retrospective review over an 11-year period. 199 out of 222 (89.6%) exposures were attributed to needlesticks/medical sharps and 23 of 222 (10.4%) were attributed to splash incidents. Most exposures occurred during suturing (30.5%) followed by handling sharps, wires, or instruments (19.1%), and medication administration (17.6%). Common anatomic locations of injury included the thumb (58.6%), followed by hand (17.6%), and other digits (9.9%). The suture needle (34.2%) was the most common instrument involved in BBP exposures followed by injection needle (19.4%), and shave blade (9.0%). Resident physicians had the highest incidence of BBP exposures followed by nurses/medical assistants, and consultants.

Summary: Suturing is the most common procedure associated with BBP exposures with suture needle as the most common instrument involved in injury. Quality improvement measures should focus on training resident physicians and ancillary staff to reduce bloodborne pathogen exposures.

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Early-Onset Cutaneous Pseudolymphoma Secondary to Influenza Vaccination in Skin of Color

Purpose: Cutaneous lymphoid hyperplasia, also known as pseudolymphoma, is a group of benign skin conditions which histologically resembles malignant lymphoma. It has been well-described to be related to arthropod bites, viral infections, tattoos, allergy desensitizing injections, and certain vaccine inoculations. Two cases of pseudolymphoma due to influenza vaccination have been reported in Caucasian women. Herein, the authors present a case of early-onset cutaneous pseudolymphoma secondary to influenza inoculation in a Mexican female with Fitzpatrick skin type IV.

Design: A comprehensive review of the literature was performed using PubMed with the following search terms: “pseudolymphoma, cutaneous lymphoid hyperplasia, vaccine”, influenza, inoculation, and skin of color.” The review of literature was used to support the authors’ case report.

Findings: A 38-year-old healthy Mexican woman presented to an outpatient dermatology clinic with multiple deep-seated, erythematous papules situated on a dusky patch, at the site of a left deltoid intramuscular influenza vaccine injection. The localized eruption developed one day after the injection and remained unchanged over the next two months. She reported a mild, persistent burning sensation of the eruption but denied ever experiencing itchiness, fever, myalgia, or malaise. She denied a prior history of adverse cutaneous reactions to inoculations and has no known allergies to drugs. On exam, there was a 4 x 3 cm dusky patch at the injection site studded with multiple agminated, deep-seated, flesh-colored to erythematous, 1-5 mm papules. The area was mildly tender to palpation. The clinical differential diagnoses included atypical mycobacterial infection and panniculitis. Histopathologic evaluation revealed a nodular and diffuse dermal lymphocytic infiltrate of predominantly small B-cells and small T-cells with a few small germinal centers and sparse plasma cells. Acid-fast and Fite stains were negative for mycobacteria. A B-cell and T-cell gene rearrangement study was negative for monoclonality.

Summary: The clinical presentation of cutaneous pseudolymphoma can vary greatly among patients. To our knowledge, this is the first described case of cutaneous pseudolymphoma secondary to influenza vaccination in skin of color. At the two-week follow-up after treating with intralesional triamcinolone acetonide injections, our patient was particularly frustrated with the persistent darkening of the eruption. Concurrently shrinking papules further indicated that the darkening of the dusky patch most likely was attributed to post-inflammatory hyperpigmentation, a sequela of the healing process which is especially common in skin of color. Given the ongoing global vaccination effort against COVID-19, the authors seek to bring awareness to and describe one of the rare cutaneous adverse events of vaccine injections, which follows a benign course, contrary to its namesake. The pathogenesis of cutaneous pseudolymphoma is not fully understood but it is known to respond well to intralosional corticosteroid injections, local radiation, and surgical intervention. Long-term, close follow-up is recommended for patients with a history of cutaneous pseudolymphoma as it tends to recur unexpectedly and even at other body sites unaffected by trauma.

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Safety and Efficacy of Fractional CO2 Lasers with Adjunctive Therapies on Skin of Color Melasma Patients: A Single Center Retrospective Study

Purpose: The authors evaluate the safety and efficacy of an ablative fractional carbon dioxide laser on refractory cases of melasma in skin of color patients.

Design: We conducted a retrospective chart review of twelve patients selected from a single center dermatology clinic. Patients with Melasma and Fitzpatrick skin type III-IV who received ablative fractional CO2 laser therapy alone or with laser toning and/or tranexamic acid (TXA) during January 2010 to December 2020 were included in the study. Exclusion criteria were as follows: less than 18 years old, completion of chemical peels or laser procedures related to melasma lesions within prior 3 months of starting CO2 laser therapy, or concomitant use of topical skin lightening therapies. Assessments were done using electronic medical records and the accompanying patient photos extracted from the Canfield digital photography system. A validated modified Melasma Area and Severity Index (mMASI) scoring scale was used to assess for disease severity at baseline, approximately one month following each treatment session, and at post-treatment follow-up if any side effects were observed.

Findings: Amongst the 12 patients who received CO2 laser therapy, 10 patients completed adjunctive laser toning and/or TXA. The four cohorts of patients received the following therapies: 3 fractional CO2 alone, 2 fractional CO2 with laser toning, 2 fractional CO2 with TXA, and 6 fractional
CO₂ with laser toning and TXA. 9 of 12 patients (75.0% & #37;) showed some improvement in mMASI scores and 5 of 12 (41.7% & #37;) patients showed >50% & #37; reduction in mMASI scores, with 4 of these patients (33.3% & #37;) showing statistical significance. All patients with more than one laser session showed improvements (P & #60; 0.05). Laser toning was completed on average 2.79 weeks following CO₂ laser procedure and TXA patients were on medication on average 12 weeks when post-treatment mMASI scores were evaluated. Fractional CO₂ with TXA had the superior outcome and fractional CO₂ with laser toning performed the worst based on absolute changes in average mMASI scores.

**Summary:** The majority of patients (75% & #37;) in our study showed improved melasma with at least one session of CO₂ laser therapy. More than half of the patients with improvements had >50% & #37; reduction in mMASI scores and four of these patients showed statically significant decreases in melasma severity. Patients started on oral TXA at the same time or earlier following their initial ablative laser session showed better clinical improvement than patients prescribed oral TXA at later dates. Early administration of oral TXA appears to improve the clinical efficacy of ablative lasers in melasma skin of color patients. In cases of recalcitrant melasma, providers may consider a trial of ablative laser treatment as it is well-tolerated and efficacious for skin of color patients. Its use in conjunction with oral TXA is promising, but further studies with combination nonablative lasers are still required. Equally important, once remission is achieved, maintenance therapy with preventative iron oxide containing sunscreens are essential to prevent future recurrence.

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**Number needed to biopsy for the diagnosis of melanoma among dermatology residents**

**Purpose:** Analysis of clinical accuracy for the diagnosis of melanoma has been a challenge to quantify as common statistical measures (i.e. sensitivity and specificity) rely on the results of lesions that are not biopsied. Of particular concern are false negatives – in other words, melanoma that go unbiopsied. Given this dilemma, number needed to biopsy has become a more frequently discussed quality metric in dermatologic literature as a surrogate for diagnostic accuracy in cutaneous melanoma. This value represents the number of benign lesions (false positives) for every malignant lesion (true positive) biopsied. Positive predictive value (PPV), a more commonly used statistical measure, and NNB are interconnected values as NNB = 1/PPV. As such, NNB has seen increased use as a metric of a specificity and diagnostic accuracy of clinicians in cutaneous melanoma. Recent literature suggests that NNB varies due to patient age, sex, practice type and location, all of which influence incidence of melanoma. Clinician type and years of experience also effect NNB. Prior studies with the aim to quantify NNB for melanoma for clinicians of various backgrounds have demonstrated mixed results. Given the importance of clinical accuracy in the diagnosis of melanoma as well as advancing tools aimed at increasing clinical diagnostic sensitivity of pigmented lesions, more information is needed to determine appropriate target values for this quality metric.

**Design:** A single institution, retrospective review of all biopsies obtained by our practice between December 2011 to December 2020. Only biopsies with a high clinical suspicion for melanoma per the pathology requisition form (those with clinical differential diagnosis including “melanoma”, “lentigo maligna”, “amelanotic melanoma”, “atypia”, “dysplastic nevus”, “atypical nevus”) were included. Inflammatory conditions and growths for which the clinician had a low index of suspicion for melanoma (“irritated seborrheic keratosis”, “hemangioma”, “basal cell carcinoma”, “dermatofibroma”, “intradermal nevus”, “benign nevus”) were omitted. All biopsies were independently reviewed by the first and second authors. When unable to determine the index of clinical suspicion for a particular biopsy, the patient’s chart was accessed to evaluate the physical exam and clinician’s assessment and determine if an individual biopsy warranted inclusion. Biopsies meeting inclusion criteria were then stratified by resident year to determine number needed to biopsy.

**Findings:** Over the 9-year period reviewed, a total of 3669 biopsies met inclusion criteria with 580 diagnosed by histopathology as invasive melanoma or melanoma in-situ. The NNB for our total practice was 6.33. During the time period reviewed our academic practice in total consisted of 10 attending dermatologists, 38 dermatology residents, and 4 advanced practice providers (APPs). Biopsies were stratified by dermatology resident year based on the author of the pathology requisition form. Mean NNB for resident years 1, 2, and 3 were 5.28, 6.23, and 6.77 respectively (p < 0.05).

**Purpose:** To our knowledge, this study represents the first attempt to quantitatively assess the accuracy of dermatology trainees by resident year though a retrospective review of biopsy results to calculate NNB for melanoma. Our data revealed D1 residents had a lower NNB than their D2 and D3 counterparts. In our clinic D1 residents staff each patient with faculty or senior resident. Senior residents (D2 and D3) staff verbally or in person depending on comfort level with the case or lesion of concern. As these trainees are graduated autonomously, they may practice increased caution in biopsy of lesions concerning for melanoma. Prior studies looking at NNB limited to lesions of clinical concern for melanoma have varied greatly (ranging from a NNB of 2 to 29) with a mean among Dermatologists worldwide of 7.5 and US-based clinicians of 13.2. Our practice total NNB of 6.33 is consistent with other institutions. Furthermore, as NNB has been shown to vary with level of clinician experience, we see an increase in NNB for senior residents with more autonomy than first year trainees who are consistently under supervision of an attending physician for all biopsied lesions. We hope that our study helps to further elucidate number needed to biopsy as a quality metric for clinical accuracy in the diagnosis of cutaneous melanoma.

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**Zooming Out on Self-Perceptions in the Post-Videoconferencing Era**

**Purpose:** We investigated changes in self-perception, mental health, and anxiety upon the return of in-person activities, and evaluated how videoconferencing, social media, and use of filters during the COVID-19 pandemic have influenced these changes.

**Design:** Survey development began with qualitative interviews between college and graduate school-age authors with their peers to identify relevant questions. The survey was reviewed for content and face validity by a statistician. The anonymous survey was distributed online through social media platforms and student network pages. Study data were collected and managed using REDcap electronic data capture tools.

**Findings:** A total of 7295 participants responded to the survey. Seventy-one percent reported anxiety with returning to in-person activities and 30% plan to invest in their appearance as a coping strategy to deal with that anxiety. Body contouring (18%), laser treatments (15%), plastic surgery (15%), and botox injections (13%) were the most sought procedures to improve appearance as we return to interacting in person. Skin discoloration (32.36%), wrinkles (24.45%), and acne (14.85%) were the most reported dermatologic concerns of appearance. Among respondents, 1294 (17.77%) were between the ages of 18-24. Of this group, 45% felt worse about their appearance. Eighty-five percent of 18-24 year-olds who used filters while videoconferencing reported anxiety, while 58% of non-filter users reported anxiety. Increased time on social media and videoconferencing in 18-24 year-olds resulted in worsening anxiety and increased use of mental health services. Forty percent of 18-24-year-olds who spent 0-10 hours, 45% of those who spent 10-20 hours, and 51% of those who spent 20+ hours on social media endorsed worsening self-perception.
**GENERAL DERMATOLOGY ABSTRACTS**

**Summary:** During the COVID-19 pandemic, videoconferencing and social media became the primary means of communication to connect with friends, co-workers, and family. This transition to a digital world led to the unintended effect of increased hours of self-scrutiny as people stared at their own reflections and compared themselves to others on the screen. Continuous visual feedback from the self-pointing camera notes facial attributes that would not have been analyzed previously. Interest in treatments to improve appearance and worsening self-perception, as we return to in-person activities, may have resulted from altered behaviors utilized during the pandemic such as videoconferencing. As we re-enter a life of socializing, dermatologic surgeons and the medical community at large should be aware of the effects of increased videoconferencing related to worsening mental health and self-perceptions in order to better serve our patients.

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**International Evidence-Based Clinical Practice Guidelines for Laser-Assisted Drug Delivery Informed by a Systematic Review**

**Purpose:** Laser-assisted drug delivery (LADD) is commonly used among dermatologists and plastic surgeons for various medical and cosmetic applications. Formal guiding principles based on expert review of the evidence are lacking. In this report, we develop international evidence-based clinical practice guidelines for LADD, informed by a systematic review to assist clinicians in providing the highest quality and safest care for patients.

**Design:** A comprehensive systematic review of the literature was conducted on LADD using the following databases: MEDLINE, Embase, and Cochrane Central Register of Controlled Trials. An international, multidisciplinary consensus expert panel was convened to draft recommendations based on the results from systematic review. A 3-step Delphi method was used to reach consensus followed by a virtual face-to-face meetings. Multiple drafts of the clinical practice guidelines were reviewed until all authors agreed on the final manuscript.

**Findings:** The following 15 recommendations were developed regarding the indications, safety, efficacy and follow up of LADD:

I. We recommend the use of LADD in adults and adolescents (12-18 years) of all Fitzpatrick skin types.
II. We suggest that LADD may be safely used in immunosuppressed patients.
III. We recommend the use of LADD for the treatment of actinic keratoses, cutaneous squamous cell carcinoma in situ (SCCIS), and actinic cheilitis.
IV. We suggest the use of LADD for the treatment of hypertrophic scars and keloids.
V. We recommend the use of LADD for epidermal and dermal analgesia if there is sufficient time for application.
VI. We recommend LADD be deferred in patients with known allergy to the drug being delivered, with an active local skin infection, or who have an underlying medical problem or enzyme abnormality if the drug is at risk of worsening such abnormality.
VII. We recommend that the following parameters be recorded when using ablative fractional and nonablative fractional LADD: fluence/depth, density/surface area, spot size, time between laser delivery and medicine application, number of passes.
VIII. We suggest that drug delivery via LADD can be increased by use of an aqueous vehicle or solution, heat, pressure or occlusion.
IX. We suggest that laser settings should be selected to ensure that the expected channel diameter is greater than the diameter of the molecule being delivered to ensure sufficient absorption.
X. We suggest that cold non-hollow bore microneedling (without heat or radiofrequency), as well as radiofrequency microneedling can be alternative modalities to laser for drug delivery.
XI. When using LADD, we caution that there is a certain unpredictability of response and tissue levels of drug due to variable pharmacokinetics.
XII. When using LADD, we caution that systemic side effects due to inadvertent systemic delivery of medications are a possibility.
XIII. We recommend LADD to be performed with appropriate eye protection (for the laser platform), surgical masks, and gloves, and suggest a smoke evacuator be used, particularly with AF devices.
XIV. We suggest LADD only be used with medication formulations approved by a national regulatory authority for parenteral injection.
XV. We suggest the following prophylaxis regimen for AF and NAF LADD in otherwise healthy adults, pediatric and immunosuppressed patients: 1) Antibiotic prophylaxis is NOT recommended when treating areas other than where wound healing might be impaired (i.e. genitalia and lower legs); 2) Viral prophylaxis is recommended when LADD is being used to treat face and genitals; 3) Antifungal prophylaxis is NOT recommended.

**Summary:** International clinical practice guidelines were generated for LADD that fall under 5 key categories: (1) indications and contraindications for LADD; (2) parameters to report; (3) optimization of drug delivery; (4) safety considerations; (5) Prophylaxis for bacterial, viral and fungal infection. Future research efforts and multi-institutional randomized controlled trials will bolster further innovation, improve patient access and enhance our understanding of these relatively new but promising techniques.

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**A Delayed Granulomatous Reaction Following Eyebrow Microblading**

**Purpose:** A 29-year-old female presented with asymptomatic, yellow-orange, flat, 2-3mm papules and plaques confined to the eyebrow margins. The papules appeared spontaneously, 4 months after her seventh microblading treatment to her eyebrows which took place over a 5-year period. Unclear diagnosis at the patient presentation prompted further investigations.

**Design:** Biopsy of the lesions revealed granulomatous dermatitis to foreign pigment. Clinopathologic correlation led to a diagnosis of a granulomatous tattoo reaction to iron oxide ink. Treatment was initiated with approximately 8 sessions of intralesional corticosteroids and 5-fluorouracil as well as daily topical corticosteroids and tacrolimus with minimal improvement. An outside provider induced remission of the lesions with oral prednisone, but the patient discontinued the medication secondary to systemic medication side effects. Soon after, the granulomas began to reform, and a literature review was undertaken to help guide physician management.

**Findings:** Literature search of complications after microblading revealed a paucity of data. Few cases have been published revealing iron oxide granulomas after permanent eyebrow tattooing, whereas only one case secondary to microblading was found. Other autoimmune phenomena, such as koebnerization of vitiligo, have been reported after microblading. Treatment strategies are largely guided by prior case reports and can prove challenging to physicians. Commonly employed granuloma treatments include topical, intralesional, or oral steroids and surgical excision. Laser treatment of any allergic tattoo reaction may be complicated by a systemic anaphylaxis from the release of pigment particles into the blood circulation and is therefore not routinely recommended. Furthermore, laser tattoo treatment could cause significant hair loss in this area.

**Summary:** Microblading tattoo placement is promoted by practitioners as a relatively harmless, temporary way to improve the appearance of the eyebrows. However, complications of these procedures are becoming more common in our practice. It is vital we advise our patients of the potential risks this procedure entails. Moreover, given the lack of current...
available literature, it is imperative we continue to publish microblading complications and treatment strategies to help guide other physicians when faced with these difficult cases.

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**Fallacies of Melanocyte Cell Transplantation Procedure for treatment of recalcitrant vitiligo**

**Purpose:** Determine the indications for Melanocyte Keratinocyte Transplantation Procedure for vitiligo and other skin disorders. Define immunological markers of vitiligo lesions, including T cell subsets and chemokines, that predict surgical outcomes for objective determination of disease stability to optimize outcome. Assess effects of emerging immunosuppressive treatment of vitiligo lesions to improve surgical outcomes.

**Design:** The session is directed to general and procedural dermatologists, specifically the ones interested in vitiligo, pigmented skin disorders and skin of color. It will cover the most recent pathogenesis theory of vitiligo including the new and emerging therapy that work on the disease pathway. Indication for surgical treatment of vitiligo, including Melanocyte Keratinocyte Transplantation Procedure (MKTP), will be reviewed. We will identify objective immunologic markers to predict disease stability for best surgical outcome. To conclude, we will determine types of new and emerging immunosuppressive treatment of vitiligo that can complement surgical management to optimize results.

**Findings:** MKTP is only effective when vitiligo is stable because active autoimmunity destroys the melanocytes. Despite careful selection of patients based on clinical stability, the success rate is yet unpredictable. It remains unclear why melanocytes transplantation works for some lesions but not others. It was suggested that poor outcomes after MKTP occur because treated lesions were not truly stable. We have shown that markers from vitiligo lesions can objectively assess stability and predict outcome.

**Summary:** Markers from vitiligo lesions can objectively assess activity, stability and predict surgical outcome.

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**Popularity of DIY Fillers on Social Media Poses a Safety Threat to its Viewers**

**Purpose:** The practice of “needle-less” self-injections with unregulated dermal fillers has gained popularity on social media platforms. “Needle-free injectors” are devices that utilize pneumatic properties to penetrate the epidermis. This device was initially developed to deliver medications or vaccines intramuscularly or subcutaneously (1). The hyaluron pen (hyaluronic acid pen), which uses this technology, is advertised on social media platforms as a “needle-less” injection device used for the administration of hyaluronic acid filler (2). Thus claiming that they are safe to use by non-medical professionals. Hyaluron pen users insert hyaluronic acid product from a pre-filled syringe into small ampules. The ampules are then loaded into the pen for injection. These refillable hyaluron pens, as well as dermal filler products advertised as hyaluronic acid, are easily purchased online. As such, viewers are able to easily purchase and “learn” how to self-inject filler product at home. This poses great public health and safety concerns. Design: We searched the social media platforms YouTube, TikTok, and Instagram using various keywords and hashtags to identify video content demonstrating how to perform self-injections with dermal filler. Keywords/hashtags used for the search were: #DIYfiller, #hyaluronpen, #hyapen, #hyalurondiy, and #needlelessfiller

**Findings:** 35 videos from July 16, 2019 to June 25, 2021 were identified, with over 2,713,531 combined views. Injection sites included the lips (71.4%), nasolabial folds (14.2%), glabella (5.7%), nose (5.7%), jaw (5.7%) and cheeks (2.9%). The majority of videos were made from accounts based in the United States (21 of 35), followed by Europe (4 of 35), Canada (4 of 35), and undisclosed locations (4 of 35). The individuals performing self-injections in the videos were not medical professionals. All injections were performed using a hyaluron pen. Limitations to this study included use of English-only hashtags, access to public-only accounts, and inability to identify untagged videos.

**Summary:** The popularity and accessibility to DIY dermal filler injection tutorials on social media poses a great safety concern. The false claims that the hyaluron pen is safe due to its “needle-less” property is dangerous. On September 13, 2019, Health Canada (the national health policy department) issued a recall stating that it is illegal to advertise, import or sell these “handheld medical devices” without proper licensing (3). In the United States, the administration of medication is defined under each state’s “practice of medicine” regardless of the route of administration (2). Further, the pneumatic technology utilized by the hyaluron pen poses several risks including inability to control the depth of penetration and non-sterile methods of refilling the device. Viewers who are influenced to try this trend are able to easily purchase filler products advertised as hyaluronic acid online. As these over the counter products are not regulated by the FDA, there is no guarantee that they are not contaminated with other agents. The lack of expertise can lead to serious adverse effects including infection, vascular occlusion, and blindness (4,5). Although many videos have been flagged, there is still content that is readily available for viewers of all ages.

**References:**

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**Evidence-Based Approach to Surgical and Laser Treatments of Hair in Transgender Patients**

**Purpose:** Dermatologists have a potentially important role in the treatment of transgender patients in the gender-affirming process. Numerous dermatologic concerns have been identified, especially as it relates to hair. As societal acceptance of transgender persons improves, it will be of increased importance for dermatologists to understand how to care for and treat these patients’ unique concerns and questions. A systematic review was performed to recount the various medical and surgical treatments available in caring for the hair of transgender men and women.
**Design:** A systematic review was performed of EMBASE, MEDLINE, Cochrane Central Register of Controlled Trials, and Cochrane Database of Systematic Reviews from the inception of each database through May 1, 2021 using the search terms “transgender” and “hair.” All abstracts and reviews were excluded; but no restrictions were placed on date or language. Articles were included if they described the treatment of hair in transgender patients.

**Findings:** The comprehensive literature search identified 246 studies. Five studies addressed surgical or laser treatment of hair in transgender patients and therefore included in the study. Three studies report surgical techniques to address the hairline of transgender women and 2 studies focused on treatment of excessive hair. Marks and colleagues report 85% of transgender women had hair for which they desired removal and found no significant difference on whether the patient was on hormonal therapy. The face was the most common site of excess hair. Hair was most commonly removed through shaving (55%), waxing (29%), laser hair removal (18%) and electrolysis (17%). Pigot and colleagues evaluate the utility of laser hair removal prior to reconstruction of a neourethra.

**Summary:** The goal of the gender-affirming process is very individualistic, but both transgender men and women can greatly benefit from the care of a dermatologist, especially as it relates to their hair. Transgender men see moderate amounts of increased hair growth while on masculinizing hormonal therapy, that can be further improved with the assistance of hair transplantation, and other surgical techniques. Transgender woman often require assistance with hair removal, which can be addressed through laser hair removal, electrolysis, and guidance to over the counter methods of hair removal. By understanding the unique considerations in this population, dermatologists can help the patient to align their physical characteristics with the gender they choose to express.

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**Purpose:** While ergonomic practices are gaining increased awareness in dermatology, short-term musculoskeletal pain or soreness is often unavoidable given the natural physical exertion required of the dermatologic surgeon. The long-term sequelae of pain can be as severe as requiring practice restrictions or even early retirement. This presents the need for simple and portable therapeutic options to relieve these debilitating symptoms during the clinic day. We discuss here our use of handheld percussive therapy devices in the treatment of work-related musculoskeletal strain and pain.

**Design:** Current percussive devices on the market were surveyed and assessed for utilization in ease of gripping, control panel functionality, headpiece options, frequency of movement of the piston, power output, and depth of penetration. The proposed mechanisms of percussive therapy were reviewed and videos were recorded for demonstration.

**Findings:** All identified devices all share the same basic design: a handpiece for ease of gripping, a piston that provides the automated percussive force, a rounded headpiece at the end of the piston, and a control panel to adjust frequency of percussion. Multiple headpiece options (large ball tip, small ball tip, split tip, bullet tip) exist to further customize the type of massage. When the device is turned on, the headpiece is placed against the muscle and the high frequency movement of the piston produces a form of deep soft tissue manipulation.

**Summary:** Percussive therapy devices present a portable and easy method for the dermatologic surgeon to relieve musculoskeletal tension, improve athletic surgical performance, and augment musculoskeletal functionality at work. We suggest the use of these devices to target muscle groups that are most likely to fatigue or strain in the surgeon: arms, shoulders, and back.

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**Purpose:** The scope of practice for Non-physician providers (NPPs), including nurse practitioners (NPs) and physician assistants (PAs), has been increasing in recent years. Under the Balanced Budget Act of 1997, NPs and PAs are allowed to bill independently for certain procedures. In 2012 a majority of the procedures independently billed by NPPs were demonstrated to be in dermatology. While subsequent studies have documented further growth in the number of dermatologic procedures independently billed by NPPs, there is a paucity of data involving NPP billing in dermatology beyond 2015. Since 2015, policy changes may have affected the scope of NPP billing. We aimed to explore trends of NPP independent billing within procedural dermatology from 2016 to 2019 in order to assess if it was similar to previous years.

**Design:** This was a retrospective analysis of billing data made available to the public by the Centers for Medicare and Medicaid Services (CMS). The Physician/Supplier Procedure Summary (PSPS) is a database maintained by the CMS which provides a 100% summary of Medicare Part B carrier and durable medical equipment regional contractor claims for a calendar year. Using the PSPS files from 2016 and 2019, the most recent year available, we queried the Healthcare Common Procedure Coding System (HCPCS) codes for 12 common dermatology procedures including biopsies, shaves, excisions, local flaps, grafts, and repairs of varying complexities. We found the total number of these procedures billed by both dermatologists and NPPs for both years. We then calculated percent changes in the number of billed procedures from 2016 to 2019.

**Findings:** The number of procedures examined here independently billed by NPPs grew by 35.06% on average from 2016 to 2019. The number of procedures billed by dermatologists over the same period grew by 5.39% on average. The differences between these two rates of growth was statistically significant. All of the procedures independently billed by NPPs grew from 2016 to 2019 ranging from a minimum of 5.53% to a maximum of 64.23%. The procedure which grew the most in NPP billing was complex repairs. Some of the procedures billed by dermatologists grew while some decreased from 2016 to 2019. This ranged from a decrease of 8.85% to positive growth of 43.64%.

**Summary:** NPPs independently bill for a wide variety of procedures within dermatology, including flaps and grafts. The number of dermatologic procedures independently billed by NPPs has continued to grow at a rate significantly larger than number of procedures billed by dermatologists. Further investigations are needed to determine potential relationships between the growth demonstrated here and other factors such as practice expense, practice standards, and patient outcomes.

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**Purpose:** Oral isotretinoin remains the most effective treatment of moderate to severe acne vulgaris, however, dosing regimens are variable. The 2016 American Academy of Dermatology guidelines recommend that
in patients with severe acne, isotretinoin should be started at a dose of 0.5 mg/kg/day and increased to 1 mg/kg/day for a period of several months. When to stop therapy is also variable: historically total cumulative doses of 120-150 mg/kg have been utilized, however some literature suggests higher cumulative doses provide a lower risk of acne recurrence and are well tolerated. Comparatively, the Global Alliance to Improve Outcomes in Acne recommended treating with isotretinoin until full acne clearance plus an additional month independent of cumulative dose.

Given these variations, assessing prescribing habits among academic dermatologists would provide a useful insight into current trends in isotretinoin utilization for acne vulgaris. These trends can potentially help practicing dermatologists modify their approach to treating one of the most common and distressing conditions within our field.

Design: This IRB-approved study was a cross-sectional survey of dermatology residency program directors within the United States. Program directors were selected due to their close association with residency teaching utilizing evidence-based guidelines for dermatologic management of common skin diseases. An anonymous 15-item multiple choice survey was developed using REDCap software (Vanderbilt University, TN) and distributed to all dermatology programs directors (N=144) during August 2020-September 2020 using electronic mailing lists. The survey inquired about isotretinoin dosing practices, including preferred starting dose, maintenance dose, target cumulative dose, maximum cumulative dose, and duration of therapy.

Findings: A total of 44 participants completed the survey (response rate of 31%; average age 49 +/-10 years; 57% female). 30 respondents (68%) utilized a starting dose of 0.5 mg/kg, and 6 (14%) preferred a starting dose of 1 mg/kg. Other starting doses included 0.75 mg/kg (n=4) and using 20 mg twice per day regardless of weight (n=3). 34 (77%) participants continued the starting dose for 1 month before switching to a higher maintenance dose. Most (86%) of respondents who started with a dose of 1 mg/kg or higher did not further increase the dose during treatment. 1 mg/kg/day was the preferred maintenance dose for the majority of participants (41%; 93%). 31 (70%) of participants base their decision to stop treating on a target cumulative dose. There was significant variation among ideal target cumulative dose among participants, ranging from 110-130 mg/kg to 250 mg/kg. Regarding how long to continue isotretinoin treatment once the acne is clinically cleared, 16 (36%) respondents reported they continued until the cumulative dose was reached, 14 (32%) reported they continued until clear for a set amount of time, and 7 (16%) reported they continued until both the cumulative dose was reached and clear for a set amount of time. Of the 21 participants who treated until the acne was clear for a set amount of time, 10 (48%) continued for 1 month, and 8 (38%) continued for 2 months. The maximum cumulative isotretinoin dose was variable, ranging from 150 mg/kg (9; 20%) to no maximum dose (7; 16%).

Summary: Most dermatology program directors utilize a starting dose of 0.5 mg/kg and continue this dose for 1 month before switching to a 1 mg/kg maintenance dose. Significant variation exists among ideal isotretinoin cumulative doses among dermatology program directors.

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Factors Influencing Outcomes of the 2011-2020 Micrographic Surgery and Dermatologic Oncology Fellowship Match

Purpose: The Micrographic Surgery and Dermatologic Oncology (MSDO) fellowship is a competitive fellowship to successfully obtain. Despite this there is limited data describing the match process. Thus, our goal was to quantify aspects of the MSDO fellowship match.

Design: We requested applicant data from the 2011-2020 MSDO fellowship application cycles from San Francisco Match. Data included applicant’s match outcome, United States Medical Licensing Examination (USMLE) Step 1 scores, and the number of programs applied to by applicant, interviews received by applicant, and programs ranking the applicant.

Findings: Of the 1077 applicants included, 589 (54.7%) matched into fellowship. Compared to unmatched applicants, matched applicants had more interview invitations (7 [2 to 12] vs. 3 [1 to 7] Median [IQR]; P < .001), programs ranking them (7 [4 to 10] vs. 2 [1 to 5]; P < .001), and higher USMLE Step 1 scores (247 [236 to 255] vs. 242 [232 to 251], P < .001). There was no difference in the number of programs applied to between matched applicants and unmatched applicants (30 [13 to 47] vs. 27 [9 to 50]; P=.386).

Summary: In conclusion, matched applicants of the MSDO fellowship had more interview invitations, programs ranking them, and higher USMLE step 1 scores than unmatched applicants. This data can help better inform fellowship directors, applicants, and others with a stake in the MSDO fellowship match.

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Suturing Olympics: a team-based approach to encouraging and assessing suturing competencies among dermatology residents

Purpose: The COVID-19 pandemic precluded some surgical opportunities for dermatologic residents due to mandatory shutdowns of non-essential services. This created a practice gap for our trainees, and we looked for opportunities to fill this void through simulation settings. Additionally, the current ACGME dermatology milestones assess general surgical skills, but lack questions pertaining to specific suturing techniques essential for performing adequate dermatologic surgery. The purpose of this study was to develop a means to assess resident suturing skills and fund of knowledge in a motivational and purposeful, yet fun, way. We sought to do so in a team-based simulation environment, through a relay race-style competition.

Design: With the aim to promote and assess suturing competencies among dermatology residents in a team-based learning environment, the first annual 2021 Suturing Olympics (SO) was designed as a finale to a year of surgical curriculum. The event was scheduled in the last month of the academic year during a two-hour window reserved for monthly surgical skills training. Inclusion criteria for resident physician participants included dermatology residents at Weill Cornell Medicine willing to participate. We conducted pre- and post-intervention self-assessment surveys to measure resident perception regarding their understanding of and proficiency in basic suturing competencies, including two dermal and five epidermal suturing techniques. Six weeks prior to SO, 13 residents completed an anonymous survey reporting their year of training and rating their knowledge of and proficiency in seven suturing techniques on a five-point scale, with 0 representing no knowledge/proficiency and 5 representing mastery. Following the initial self-evaluation, residents viewed instructional videos and participated in a two-hour hands-on suturing practice session, at which the rules of SO were described, and techniques were demonstrated by a micrographic surgery and dermatologic oncology (MSDO) fellow. Residents were divided into four teams of three, with a resident from each postgraduate year per team, and encouraged to engage in self-study and team practice prior to the culminating event. Teams were designed in this fashion to allow the more experienced trainees to engage in peer-to-peer teaching. Each team selected a team name to help build team unity. During the final relay-style competition, residents competed as a team, with each resident attempting seven suturing tasks with direct assessment by four fellowship-trained dermatologic surgeons and one MSDO fellow. Individual suturing tasks were judged in a binary manner for successful completion within a two-minute limit. The winning team was awarded a prize for demonstrating the highest level of skill and knowledge achievement.
team was determined by cumulative team time, with penalties for tasks not completed by individuals. Residents received qualitative feedback on instrument handling, ease of movement, respect for tissue, and overall style, but this was not incorporated into team scores. Prizes were awarded to winning team members. Residents completed a post-intervention survey identical to the initial self-assessment.

Findings: The event was well-received by residents as a positive learning experience that encouraged team collaboration. Prior to the intervention, 13 residents rated their knowledge of and proficiency in suturing techniques 4.1 (range 1-5) on a five-point scale for knowledge across techniques and 3.7 (range 1-5) for proficiency. Results of the post-intervention survey are forthcoming.

Summary: The first annual SO allowed for a simulation-based, team-building environment for developing and evaluating suturing competencies among dermatology residents. Although results of the post-intervention survey are forthcoming, we hypothesize that resident self-assessment of knowledge/proficiency will improve following the event. As we anticipate next year’s SO, we plan to incorporate formal evaluation on technique into performance assessments, as opposed to only assessing on successful completion and time.

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**Dermatofibrosarcoma Protuberans: A Bibliometric Analysis of the Top 100 Cited Publications**

**Purpose:** To identify the 100 most frequently cited articles in dermatofibrosarcoma protuberans (DFSP) and gain a more in-depth understanding of the authors, institutions, and funding sources that contribute to the literature.

**Design:** The Institute for Scientific Information (ISI) web of science (Thomas Scientific, Philadelphia, Pennsylvania) was selected as a database to determine the 100 most frequently cited DFSP publications currently available in the literature. Using the search term “dermatofibrosarcoma protuberans” and “DFSP,” articles published between the years 1970 and 2019 were identified. Articles were listed by title, authors & their affiliated institutions, journal title & type, year of publication, country of origin, funding sources and citation frequency.

**Findings:** Among the 100 most frequently cited DFSP publications, articles were cited between 67 and 589 times with a mean of 136.3 times. Articles were cited between 1.95 and 98.17 times per year since publication with a mean of 11.3 times per year. An article by Kaufman HL, et al. entitled “Avelumab in patients with chemotherapy-refractory metastatic Merkel cell carcinoma: a multicentre, single-group, open-label, phase 2 trial,” published in Lancet Oncology was cited most frequently (589 times total, 98.2 times per year since publication). 67% of the top 100 articles were published in oncology journals; 33% and 10% in dermatology and surgery journals, respectively. The most common journals in which articles were published were Cancer (12%), the Journal of the American Academy of Dermatology (11%), and the Journal of Clinical Oncology (10%).

**Summary:** This bibliometric analysis provides insight into the current available MCC literature, allowing for a greater understanding of the institutions and individuals who have made a significant contribution to the field. Through bibliometric analysis, trainees, specialists, and other providers can easily identify key publications pertaining to MCC, which may in turn enhance their approach to evidence-based practice.

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**Dietary Supplements and Bleeding: A Review of the Clinical Evidence**

**Purpose:** Around one third of United States adults use herbal supplements. These supplements are generally not viewed as medications, and thus use is often not reported to physicians. Our objective is to provide a comprehensive review of the clinical evidence of bleeding risks associated with popular herbal and dietary supplements.

**Design:** 48 of the most popular herbal and dietary supplements in the United States were identified using the Amazon.com bestseller list, and the US Department of Health and Human Services, Mayo Clinic, Johns Hopkins, and Cleveland Clinic websites. A systematic PubMed search with various terms related to “bleeding” was carried out with each supplement. 261 primary articles were selected for review.
Findings: Of the 48 supplements reviewed, 11 are clinically associated with bleeding by higher level clinical evidence (randomized controlled trials, cohort studies, chart analyses, or database analyses): cranberry, flexseed, garlic, ginger, ginkgo biloba, grape seed extract, hawthorn, melatonin, fish oil, reishi (Ganoderma lucidum), and St. John’s Wort. In many cases, the evidence is mixed on whether these supplements actually cause bleeding. 14 additional supplements are clinically associated with bleeding by case reports, but no trials or higher level evidence: aloe vera, bilberry, chamomile, chondroitin/glucosamine, cinnamon, Cordyceps sinensis, echinacea, fenugreek, ginseng, milk thistle, peppermint, saw palmetto, spirulina, and turmeric. Finally, 8 more supplements, though not clinically associated with bleeding, have anticoagulant or antiplatelet properties shown through bench research: ashwagandha, black pepper, dandelion, evening primrose, feverfew, honey, lavender, and lion’s mane (Hericium erinaceus).

Summary: Dermatologists and dermatology patients should be aware of the potential adverse effects of these supplements, and it is important for patients to report all dietary and herbal supplement usage to their physician. Due to the potential for unknown adverse events, and the small downsize of discontinuing, it is generally recommended that patients discontinue all herbal supplements two weeks before surgery unless otherwise indicated.

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The magic of omega-3: Fish skin xenograft for the treatment of atypical pyoderma gangrenosum

Purpose: The use of xenografts in the treatment of acute and chronic wounds is gaining popularity in dermatology. Fish skin xenografts (FSXs) derived from cold-water fish have emerged as an excellent option for patients unable to undergo autografting procedures after cutaneous surgery. Additionally, they can be used to expedite wound healing after Mohs micrographic surgery (MMS) for defects otherwise suited for secondary intention healing. Studies have shown FSXs lead to faster healing in acute wounds compared to human amnion/chorion membrane allografts. FSXs also demonstrate safety and efficacy in treating chronic wounds and burns. To our knowledge, this is the first successful use of FSXs for the treatment of pyoderma gangrenosum.

Design: A patient with multifocal pyoderma gangrenosum on her back was successfully treated with FSXs. Furthermore, we review the uses for FSXs as applicable to the dermatologic surgeon, as well as compare them to other frequently used allografts and xenografts.

Findings: We report a case of an 88-year-old female who had significant scarring on her back from a burn that occurred at 9-years-old. Seven decades later, spontaneous bone formation within the fibrotic tissue extruded from the skin subsequently inducing ulceration. Ultimately, a diagnosis of pyoderma gangrenosum was made and after failed topical and intralesional therapy, FSX treatment was initiated. Grafts were placed every seven days for eight months and 95% re-epithelialization has been achieved. The remaining lesions continue to decrease in size and depth with each application. Pyoderma gangrenosum is often difficult to treat and the chronicity of the ulcers requires an effective, cost-efficient treatment option. The use of xenografts in the treatment of pyoderma gangrenosum has been limited to two reports of porcine graft use, but not fish skin grafting. Wounds treated with FSXs heal significantly faster than those treated with human membrane or porcine tissue. With less treatments needed and a cost half that of amnion/chorion membrane, fish skin is 76% cheaper than allograft alternatives. In comparison to other grafts, FSXs have reduced disease transfer risk without the need for heavy processing or extensive donor screening. This allows FSXs to maintain their natural molecular composition essential for wound healing.

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Microneedling as an adjuvant to topical therapies for melasma: A systematic review and meta-analysis

Purpose: Microneedling as an adjuvant to topical medications has shown promising but variable results in the treatment of melasma, and the literature lacks an evaluation of its tolerability and efficacy. We sought to conduct a systematic review and meta-analysis to synthesize high-level evidence on microneedling as an adjuvant to topical therapies for the treatment of melasma.

Design: MEDLINE, EMBASE, and Cochrane Central Register of Controlled Trials were searched using keywords “melasma” and “microneedling” without any language or date restrictions. PRISMA guidelines were followed. All comparative, prospective studies on the use of topical interventions with microneedling for the treatment of melasma were included. Studies involving radiofrequency microneedling were excluded. A meta-analysis was performed only when two or more studies reported the same outcome, and the results were interpreted according to published guidelines. Studies were analyzed descriptively if they did not provide sufficient data for inclusion in a metaanalysis.

Findings: Twelve eligible studies comprising 459 patients from seven different countries were included. Topical therapies included topical tranexamic acid, vitamin C, platelet rich plasma, non-hydroquinone-based depigmentation serums, and hydroquinone-based depigmenting agents. Topical therapy with microneedling improved melasma severity with a large effect (SMD>0.8) beyond 8 weeks, with best results seen at 12 weeks. Compared to topical therapy alone, topical therapy with microneedling resulted in an additional improvement in melasma severity with a moderate effect at 8 weeks and a large effect at 12-16 weeks. Microneedling was well-tolerated across studies, with no serious adverse events reported. Common side effects included transient burning, itching, and erythema.

Summary: This combined systematic review and meta-analysis demonstrates that microneedling is a safe and effective adjuvant to topical therapies in melasma. For patients with melasma refractory to topical therapies, clinicians should consider adding microneedling as a step-up option, prior to initiating peels, lasers, or systemic medications.

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A Mobile Application-based Decision Tool for Antibiotic Prophylaxis in Dermatologic Surgery

Purpose: Antibiotic prophylaxis in dermatologic surgery can be a daunting topic given specificity of the guidelines and the relative rapidity at which they are changed. Nevertheless, these guidelines play an important role in helping physicians balance antibiotic stewardship with each patient’s infection risk.

Design: We designed a mobile application to serve as a convenient and evidence-based decision tool and synthesize recommendations
from multiple sources. The algorithm is based on recommendations published by the American Society for Dermatologic Surgery (ASDS), American Academy of Dermatology (AAD), American Heart Association (AHA), American College of Cardiology (ACC), American Association of Orthopaedic Surgeons (AAOS), American Dental Association (ADA), and the Center for Disease Control (CDC). Providers input data regarding surgical site and patient risk factors and the application will use an algorithm to determine whether antibiotics are recommendations for prevention of endocarditis, prosthetic joint infection, and surgical site infection in each case. The algorithm was designed to minimize number of “clicks” required to reach a recommendation. If desired, providers may continue onto an additional screen with dosing recommendations, including considerations for pediatric patients, and penicillin-allergic patients.

**Findings:** In our prototype application, 2-6 “clicks” were required to complete the algorithm, depending on the surgical site and medical complexity of the patient. Further directions include beta testing and ultimately publishing the decision tool for use by the dermatologic surgery and general dermatology community. It is important to note that while the application is a helpful tool for synthesizing existing recommendations, it is no substitute for clinical judgement. There remain a number of scenarios for which current evidence is inconclusive and the recommended approach remains to “consider” antibiotic prophylaxis. Further research is needed to help elucidate the safest approach for patients who are at intermediate risk for post-surgical infection.

**Summary:** We propose an app-based decision tool for antibiotic prophylaxis in dermatologic surgery. The prototype was simple to use and allowed physicians to review patient-specific evidence-based recommendations in only 2-6 “clicks.”

**SKIN CANCER / MOHS / RECONSTRUCTION ABSTRACTS**

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**PD-1 Inhibitors for Cutaneous Squamous Cell Carcinoma: A Meta-Analysis**

**Purpose:** Cutaneous squamous cell carcinoma (cSCC) is one of the most commonly diagnosed non-melanoma skin cancers with an increasing global incidence. Advanced cSCC includes metastatic cSCC and locally advanced tumors that are not appropriate candidates for surgery, radiation therapy, or a combination of the two. Previous systemic therapy for advanced cSCC, including cytotoxic chemotherapy agents and EGFR targeted therapies, is limited by systemic toxicities, suboptimal durations of response, and low overall survival. Programmed cell death 1 (PD-1) inhibitors are immune checkpoint inhibitors for advanced cSCC that demonstrate good responses and are generally well tolerated with some risk for severe immune-related adverse events. This study aimed to determine the aggregate objective response and disease control rate for PD-1 inhibitors, including cemiplimab, pembrolizumab, and nivolumab, in advanced cSCC.

**Design:** Pubmed, Cochrane Library, and EMBASE databases were searched up to January 1st, 2021 using the terms (Pembrolizumab OR Nivolumab OR Cemiplimab OR programmed cell death 1 OR immunotherapy) and (cutaneous Squamous Cell Carcinoma) to include eligible articles that reported treatment outcomes in patients with advanced cSCC after receiving PD-1 inhibitor monotherapy. Abstracts were excluded. Endpoints included objective response rate (ORR), disease control rate (DCR), overall survival (OS), and progression free survival (PFS) at 12 months. Data was also collected on time to response, follow-up time, toxicity data, baseline characteristics, and previous systemic treatment regimens. Random-effects models were used to estimate the pooled ORR and DCR.

**Findings:** The initial search strategy yielded a total of 1180 articles. After the screening of the titles and abstracts, 9 articles were reviewed in full. Two articles were excluded due to a lack of reported outcome data (ORR, DCR). A total of 7 articles, with data reported on 8 total study cohorts, met the inclusion criteria and were included in the meta-analysis. Pooled estimate of ORR was 44% (95% CI: 39-49%, P = 0.241, I² = 23.7%, Egger’s test 0.180) and of DCR was 66% (95% CI: 57-74%, P = 0.003, I² = 68.2%, Egger’s test 0.088). ORR ranged from 32% to 59%. DCR ranged from 52% to 80%. Five cohorts reported data on PFS at 12 months which ranged from 32.4% to 58.8%. Six cohorts reported data on OS at 12 months which ranged from 60.3% to 93.0%. Seven cohorts reported on grade 3 toxicities or above which ranged from 7.5% to 50.8%. Seven cohorts reported on median time to response which ranged from 1.5-2.3 months.
SKIN CANCER / MOHS / RECONSTRUCTION ABSTRACTS

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Purpose: Dermatologists overall perform a large number of procedures billed to Medicare though the proportion of surgical procedures. Recent data have highlighted the increasing surgical volume of dermatologists, and particularly a trend toward increasing procedural billing in the Medicare population. Whether these trends are due to a rise in diagnosis, increased utilization, or increased patient demand and interest is unknown.

Design: The objective of this study was to determine the surgical volume of dermatologists and compare it to the surgical volume in each state. The authors used the Medicare Physician and Other Supplier Public Use File (PUF), which includes detailed provider-level data for every Medicare claim. This dataset includes essentially every charge to Medicare by every physician in the United States.

Findings: Relevant codes for benign and malignant excisions, intermediate repairs, complex repairs, flaps, and grafts were determined based on current procedural terminology codes as described previously (Table 1).

Summary: Statistically significant differences between billing practices between states demonstrate variation in volume and coding practices across the nation.

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Modified Bilobe for Large Neck Dissection with Tumescent Anesthesia

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On-site MMS Leads to Reduced Surgery Wait Times: The Manhattan VA Medical Center Experience

Purpose: Despite the high incidence of cutaneous malignancies in the United States (US), access to Mohs micrographic surgery (MMS) is not uniform across the country. Access to MMS for US veterans is particularly limited; research from 2009 (Karen, JAAD 2009) and 2018 (Tam, Fed Pract 2018) shows approximately 1/3 of VHA sites provide on-site MMS, mostly in urban settings. Many Veterans Health Administration (VHA) hospitals do not have an established MMS program and are instead reliant on the VA Veterans Choice Program (VCP) (renamed Veterans Community Care Program or VCCP in June 2019), in which patients are referred to community providers for services not available locally within the VA system. Offering MMS within the VHA allows for expedited surgical intervention in a familiar environment. We sought to determine if offering VHA-based MMS would reduce the amount of time from biopsy to surgery for patients as compared to referral through the VCP.

Design: This retrospective cohort study compared pre- and post-implementation of a VHA-based MMS program. Study population included all patients referred for MMS from January 2019 through October 2020 at the Department of Veterans Affairs New York Harbor Healthcare System, Manhattan Campus. Demographic information, date of cutaneous malignancy diagnosis by biopsy, and time to MMS surgery was collected, de-identified, and stored on a secure drive. Differences between the groups were determined using a two-sample t-test assuming unequal variances. De-identified data was obtained from medical records. Patients who opted for treatment other than Mohs, were lost to follow-up, or had surgical care delayed due to COVID-19 pandemic were excluded from the analysis.

Findings: A total of 30 patients were referred for MMS through the VCP/ VCCP between January 2019 and August 2019 (pre-intervention group). Of these, 20 underwent MMS through the VCP/VCCP; six opted for alternative treatments, including standard excision (4) and intralesional methotrexate (2). Other patients were excluded due to: ineligibility for VCP/VCCP due to being a VA employee (1), underwent MMS outside of VCP/VCCP (2),...
and death from unrelated causes prior to MMS (1). Ninety-six (96) patients completed MMS at the Manhattan VHA (post-intervention group). The average age of patients undergoing MMS in our study decreased to 45.1 days. Post-intervention patients had significant shorter wait times to MMS than pre-intervention patients (p=0.0089).

Summary: Our study shows that a VA-based MMS program significantly reduced time to surgery for veterans. Advantages include patient convenience, treatment in a familiar environment, and trainee education. Furthermore, a VA-based MMS program avoids delay in case and leads to ease of interdisciplinary coordination with other subspecialty services at the VA, particularly for those with aggressive skin cancers. Challenges in the implementation of this program included dedicating a physical space for processing tissue, obtaining certification for a Mohs laboratory, specialized equipment and training for VA personnel. Limitations of our research include the small sample size and non-randomized nature of this study. Our study shows that patients had significantly shorter wait times for MMS with an on-site MMS program compared to those for MMS through utilization of the VCP/VCCP. Our findings support the establishment of MMS programs at VA hospitals across the country.

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Long-term patient satisfaction after nasal skin reconstruction

Purpose: Non-melanoma skin cancer (NMSC) has a predilection for the head and neck area, with 25-30% occurring on the nose. The majority are treated with surgical resection, such as Mohs micrographic surgery (MMS). Given central location on the face and its unique three-dimensional contour, scars from surgical treatment on the nose may pose significant psychosocial and functional morbidity to the patient. The reconstructive ladder is commonly followed to repair surgical defects on the skin, starting with primary closure to more complex reconstruction (i.e., flaps and grafts). To understand the impact of surgery on sensitive areas such as the nose, patient-reported outcome measures (PROMs), such as the FACE-Q Skin Cancer, are increasingly being used. In a study that involved over 400 patients who underwent nasal skin cancer surgery and completed the FACE-Q Skin Cancer, nose reconstructions were associated with lower scar satisfaction and appearance scores. This study evaluates long-term patient satisfaction after nasal reconstruction and analyzes the reconstructive options with the FACE-Q Skin Cancer PROM.

Design: Patients presenting with nasal non-melanoma skin cancer and undergoing Mohs micrographic surgery at Memorial Sloan Kettering Cancer Center New York, USA and Catharina Hospital Eindhoven, Netherlands from April 2017 to November 2019 were asked to participate. Patients under 18 years of age or those unable to speak or read Dutch or English were excluded. Patients completed the FACE-Q Skin Cancer - Satisfaction with Facial Appearance scale (pre-operative and one-year post-operative) and the Appraisal of Scars scale (one-year post-operative). The Satisfaction with Facial Appearance scale consists of 9 questions regarding their satisfaction with overall facial appearance (e.g., shape, contour). The Appraisal of Scars scale consists of 8 questions regarding the scars’ characteristics (e.g., color, length, thickness). There are 4 response options in a Likert-type scale that are summed and then transformed on a scale from 0 to 100. Reconstruction type, complications, and patients satisfaction were assessed. Nasal subunits were summed and categorized into a) upper nose: nasal root, dorsum, and sidewall b) lower nose: nasal ala, alar rim, and tip.

Findings: A total of 128 patients completed the pre- and post-operative scales. There were 35 (27%) surgical defects repaired with primary closures, 71 (55.5%) with flaps, and 22 (17.2%) with full-thickness skin grafts (FTSG). Of the 71 flap reconstructions, 39 were reconstructed using a bilobed flap. Patients that underwent a flap or FTSG reconstruction had higher scar satisfaction scores than primary closures (p = 0.03). A trend was seen with patients following flap reconstructions scoring 7.8 points higher than primary closures and patients with upper nose defects scoring 6.4 points higher than lower nose defects. Males were significantly more satisfied than females. There was no significant difference in the pre-operative and post-operative facial appearance scores or complication rates between the three groups (p = 0.39).

Summary: This study explored long-term patient-reported aesthetic satisfaction with multiple nasal skin reconstructive techniques. Surgeons are traditionally taught to follow the reconstructive ladder, performing simple reconstructions such as primary closures first over more complex reconstructions, such as a flap. However, in our study, we demonstrated that patients who underwent one-stage flap reconstructions for both small and large nasal skin defects had the highest scar satisfaction compared to primary closure in the long-term.

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Combined reflectance confocal microscopy and optical coherence tomography in surgical margin assessment of squamous cell carcinoma

Purpose: Non-invasive imaging devices such as reflectance confocal microscopy (RCM) and optical coherence tomography (OCT) have been used to help in the diagnosis of squamous cell carcinoma (SCC). RCM provides high-resolution images up to 250µm in skin while OCT provides deeper (up to 2000µm) but lower cellular resolution images of skin. Combined RCM-OCT enables high cellular resolution and deep tissue evaluation. The value of combined RCM-OCT has been shown in the detection and depth assessment of basal cell carcinoma prior to Mohs micrographic surgery (MMS) but has never been studied in SCC.

Design: This is a prospective enrolling consecutive biopsy-proven SCC cases referred for Mohs surgery at a cancer center from 9/2020 – 12/2020 to assess the feasibility of a combined RCM-OCT device in the diagnostic accuracy of assessing SCC residual disease and margins prior to Mohs surgery. On the day of Mohs surgery, initial surgical margins were determined and marked by a Mohs surgeon. The lesion was then imaged with a handheld RCM-OCT device, assessing the center for residual disease and assessing 4 quadrants for margin status along clinically demarcated initial Mohs margins. If SCC criteria were observed under RCM or OCT, the case was labeled as ‘RCM and/or OCT positive’; if no SCC criteria were found, case was labeled “RCM and/or OCT negative”. Mohs surgery was performed according to standard procedure (Mohs surgeon was blinded to RCM-OCT results) and Mohs frozen sections (FS) were evaluated. If residual SCC noted at FS margins, the case was labeled as 'FS positive’ and level of invasion was assessed. 15 µm-serial vertical sectioning of the tumor debulk (remaining Mohs FS block) was performed to assess the center of the lesion for residual SCC and the histopathological depth was measured. RCM and OCT findings were correlated to Mohs FS findings.

Findings: 22 patients were included. Mean age was 68 years (range 46-79); 19 (63.3%) were males. Most common location was head and neck (52.8%). To assess surgical margins using RCM-OCT, each quadrant and base of lesion imaged were considered 1 data point (5 data points per lesion) and was compared to MMS frozen sections. After analyzing 105 points, RCM-OCT had an overall agreement MMS frozen section of 92.3%, and an expected agreement of 64.7%, kappa of 78.4%. There were 20 true
positive, 3 false positive, 5 false negative, and 77 true negative datapoints. The OCT depth measurement correlated well with histopathology with an r² of 0.9.

Summary: Combined RCM-OCT may help in increasing the diagnostic accuracy to detect residual SCC and SCC margins prior to Mohs surgery. Such imaging advances may help guide SCC management and assess margins prior to Mohs surgery with potential impact on reducing cost, improving efficiency, and enhancing patient experience.

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SKIN CANCER / MOHS / RECONSTRUCTION ABSTRACTS

Lower Lip Reconstruction Following Mohs Surgery: Bringing Vermilionectomy Back

Purpose: For surgical defects involving the lower lip, reconstruction options are often limited. In general, shallow defects that do not cross the vermilion border can be allowed to heal by second intention or can be repaired with linear closure. For larger defects involving the vermilion lip, a mucosal advancement flap can be a useful repair option. However, this technique is often overlooked, with many dermatologic surgeons favoring more traditional closures such as wedge resections. While the mucosal advancement flap may appear to be daunting at first, the authors aim to demonstrate that it can be performed safely with superior cosmetic results and preservation of oral function.

Design: We describe a case series of two patients who underwent lower lip vermilionectomy with mucosal advancement flap repair following Mohs micrographic surgery (MMS). Furthermore, we review the mucosal advancement flap technique as executed in the aforementioned cases and share pearls for successful outcomes. This also serves as a comprehensive review of the available literature on the utilization of advanced lip defect repairs, as applicable to the dermatologic surgeon.

Findings: There are a number of acceptable lip closure techniques available to the dermatologic surgeon, including but not limited to, linear closure, V-wedge excision and closure, island pedicle flap, and vermilionectomy with mucosal advancement flap. This report describes the results of two patients that underwent total lower vermilionectomy and reconstruction by mucosal advancement flap after removal of squamous cell carcinoma (SCC) by MMS. One case was a 73-year-old male with a history of squamous cell carcinoma in situ located on the right inferior vermilion lip who was treated with MMS. A negative margin was achieved after three stages with a resultant defect measuring 9.0 cm x 2.2 cm. Given the location, shape, and size of the defect a mucosal advancement flap was deemed most appropriate. One week post-operatively, the wound was healing well and function of the lip was maintained. Our second case was a 90-year-old female with a history of well differentiated squamous cell carcinoma on the right inferior vermilion lip who was treated with MMS. A negative margin was achieved after two stages with a resultant defect size of 3.4 cm x 1.4 cm. Vermilionectomy with mucosal advancement flap was elected for the repair and was performed successfully. One week post-operatively, the wound was healing acceptably. Despite these expected events, both patients were highly satisfied with their results.

Summary: An experienced reconstructive surgeon considers closure options even before removing tissue. When a skin cancer is in close proximity to the lip, it is important to consider a closure plan that not only will have a favorable cosmetic outcome but will also preserve essential functions of the lip and oral competence. Total vermilionectomy with mucosal advancement flap is an underutilized repair technique that has the potential for superior repair outcomes following MMS on the lower vermilion lip.

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Periorbital Reconstructive Techniques Following Mohs Surgery or Excisions: A Systematic Review

Purpose: There are many articles in the literature on periorbital reconstruction after Mohs surgery or surgical excision, however the literature lacks a comprehensive systematic review of these reports. We performed a systematic review of the literature on this topic and collected data on study type, tumor type, tumor location, repair techniques, and surgical outcomes.

Design: The study was registered with the PROSPERO database. A comprehensive search of eight databases was performed using terms related to eyelid anatomy, Mohs and excisions, and reconstructive methods. To be included in the study, articles had to be published in English between 2005 and 2020 and contain repair data for Mohs or excision defects on the eyelid for four or more subjects. Studies with less than four subjects, literature reviews, and abstract-only publications were excluded. Two study authors independently reviewed all abstracts for potential inclusion, with any conflicts reconciled by discussion. The remaining full text articles were then screened, and any discrepancies were resolved by the senior author. Data was extracted from each article including the authors’ medical specialties, study design, subject number and demographics, defect characteristics, procedure type, reconstructive methods, complications, outcome measures, and method of outcome assessment.

Findings: 51 studies met the inclusion criteria and were included in data analysis. The first and last authors’ specialties were ophthalmology (49%), plastic and reconstructive surgery (22%), dermatology (14%), otolaryngology (4%), or were multi-specialty collaborations (12%). Only 10% of the studies were prospective. Basal cell carcinoma was the most common tumor (89%) followed by squamous cell carcinoma (7%), melanoma (1%), sebaceous carcinoma (1%), and other types (2%). The tumors were located on the lower eyelid (55%), medial canthus (31%), upper eyelid (8%), lateral canthus (4%), or a combination of these sites (2%). Approximately 61% of the studies included patients that underwent Mohs surgery for tumor resection. Reconstructive methods were reported for 3,674 cases and included linear repair (18%), advancement flap (8%), rotation flap (5%), transposition flap (3%), island pedicle flap (1%), unspecified local skin flap (21%), skin graft (23%), secondary intention (4%), tarsocconjunctival flap (3%), and combined reconstruction techniques (12%). Forty of the articles (78%) commented on the cosmetic outcomes, however only three of these articles utilized a defined grading system, objective measurements, or independent reviewers to assess the cosmetic outcomes.

Summary: This systematic review provides an overview of articles on periorbital reconstruction after oncologic resection. The methods of reconstruction in this review were diverse however local skin flaps and grafts were the most commonly reported techniques. Of the articles that commented on the cosmetic outcomes of repairs, very few utilized an organized protocol to assess cosmesis. Future reports on reconstructive techniques should consider the use of standardized assessments of aesthetic outcomes to strengthen this body of literature.
Myxoid Dermatofibroma Sarcoma Protuberas with Features of Giant Cell Fibroblastoma Successfully Treated with Mohs Micrographic Surgery

Purpose: Giant cell fibroblastoma (GCF) and myxoid type dermatofibrosarcoma protuberans (DFSP) are both soft tissue tumors with similar histologic features. While myxoid DFSPs and GCFs are uncommon, it is even more rare to have myxoid DFSPs also displaying features of GCF. We present a case of myxoid DFSP with features of GCF successfully treated with Mohs micrographic surgery (MMS). To our knowledge, this is the first report of a myxoid DFSP with GCF features successfully treated via MMS.

Design: This is a case report of a rare and unusual tumor. We discuss the case presentation, biopsy findings, surgical course, and end result.

Findings: A 40-year-old female presented with an erythematous thin plaque with a surrounding hypopigmented thick plaque on the right inframammary chest. The lesion had been present for at least a few months and was asymptomatic. Biopsy demonstrated a poorly circumscribed dermal proliferation of spindled to stellate cells in a myxoid stroma. Immunohistochemistry (IHC) showed neoplastic cells staining positively for CD34, a subset of which were also positive for Factor XIII A. IHC for S-100 was negative. The findings were consistent with those of a myxoid DFSP with composite features of GCF, and the patient was referred for MMS. The patient was cleared by MMS after a total of 2 stages. The preoperative size was 2.7 x 4.0 cm, and the postoperative defect was 4.0 x 6.3 cm. The defect was closed in the Mohs operative suite via linear repair. The patient has not had any recurrence 3 months after surgery.

Summary: Myxoid DFSP's are characterized histologically by the presence of nodules of spindle cells with an eosinophilic cytoplasm while GCF's demonstrate multinucleated giant cells, sinusoidal vessels, and a myxoid stroma. Our patient's tumor predominately displayed features of myxoid DFSP with focal areas of GCF, which is similar to other cases of this tumor reported in the literature. In all subtypes of DFSP, complete surgical removal of tumor is recommended, typically with MMS. Recent case reports have demonstrated successful treatment of myxoid DFSPs with MMS. During these MMS cases, the authors note that myxoid DFSPs can be challenging due to the pale and more hypocellular pathology. These hypocellular zones contain spindled tumor cells and should be removed in their entirety. In our case, we not only encountered the hypocellular zones of myxoid DFSP, but also the myxoid stroma with multinucleated giant cells. The location of this patient's tumor in an area of diffuse adipose tissue also added an extra layer of complexity. Given the adiposity and the hypocellularity, tumor cells can be more difficult to identify and accurately confirm tumor clearance. While recent studies have demonstrated the efficacy of MMS for classic DFSP, few studies have addressed the rare histologic subtypes that can be seen in these and other histologically similar tumors. To our knowledge, this is the first case report of a myxoid DFSP with features of GCF successfully treated with MMS. It is important for the Mohs surgeon to be aware of these rare variants of DFSP and other histologic simulants such as our case and the unique challenges they may have.

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A case of metastatic squamous cell carcinoma in a patient with recessive dystrophic epidermolysis bullosa responsive to pembrolizumab

Purpose: Recessive dystrophic epidermolysis bullosa (RDEB) is a rare, congenital dermatologic condition characterized by generalized blistering at birth with a lifelong course of chronic blistering, erosions, and scarring. Cutaneous squamous cell carcinomas (SCCs) in patients with RDEB are one of the most severe and life-threatening complications. We describe a case of a patient with RDEB who developed SCC metastatic to the lymph node, her complex and multidisciplinary management, and the eventual response of her metastasis to pembrolizumab, a programed cell death protein 1 (PD-1) inhibitor.

Design: Case report.

Findings: Our case presents the complex management of a patient with RDEB and many aggressive SCCs requiring multiple surgical resections with mohs micrographic surgery or complete circumferential peripheral and deep margin assessment with dermatology, plastic surgery, and general pathology. The patient failed treatment with epidermal growth factor receptor cetuximab and continued to require recurrent surgical intervention. She was later found to have SCC metastatic to the left axillary lymph node. Patient was treated with 4 cycles of PD-1 inhibitor pembrolizumab with resolution of her metastasis. This was demonstrated both with improvement of her enlarged lymph nodes on imaging, as well as demonstration of only keratinaceous material without malignant cells on histopathology of lymph nodes following regional lymph node dissection. Additionally, our case demonstrates durability of response with no evidence of further metastasis and imaging 20 months post-therapy demonstrating stability of nodal disease.

Summary: High grade SCCs are a known cause of morbidity and mortality in RDEB patients. Surgical resection, radiotherapy, and chemotherapy have been the mainstay of treatment in these patients, but traditional modalities have limitations. More recently, immune checkpoint inhibitors have been researched and have demonstrated efficacy for locally advanced or multiple SCCs. This case demonstrates the intricate interdisciplinary care required for RDEB patients as well as a case of durable response of metastatic SCC to pembrolizumab, a PD-1 inhibitor.

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Molecular Biomarkers and Targeted Therapies in Nonmelanoma Skin Cancer: A Review

Purpose: Conventional methods for the management of nonmelanoma skin cancers (NMSCs) include standard excision, Mohs micrographic surgery, and radiotherapy. However, select circumstances such as tumor location, extent of disease, and patient factors including comorbidities, may render conventional treatment options less favorable. In recent years, with better understanding of underlying immunologic and pathologic biomarkers involved in carcinogenesis, targeted systemic therapies have been studied and successfully employed in the management of NMSCs. This review aims to provide a comprehensive overview of relevant biomarkers and targeted therapies for NMSCs including squamous cell carcinoma (SCC), basal cell carcinoma (BCC), merkel cell carcinoma (MCC), sebaceous carcinoma (SC), atypical fibroxanthoma (AFX), microcystic adnexal carcinoma (MAC), and dermatofibrosarcoma protuberans (DFSP).

Design: Literary review.

Findings: SCC: The use of epidermal growth factor receptor (EGFR) inhibitors, which competitively inhibit the downstream intracellular RAS/MAPK signaling cascade, and immune checkpoint inhibitors (IC), which inhibit programmed cell death receptor and ligand (PD-1/PD-L1) and CTLA-4 pathways, have been most studied as systemic therapies for SCC. Cetuximab, with or without adjuvant therapies such as radiotherapy and platinum-based chemotherapy, has the greatest evidence for EGFR inhibitors and has
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Demonstrated efficacy. PD-1 inhibitors cemiplimab and pembrolizumab have also demonstrated efficacy and have been FDA approved for locally advanced and metastatic SCC. Although data is limited, EGFR tyrosine kinase inhibitors have shown promise in treatment of SCC. Potential future targets include TP53, CDKN2A, NOTCH1 and NOTCH2 tumor suppressor genes.

BCC: A majority of the research regarding BCC is based on the sonic hedgehog pathway and the interactions between patched 1 (PTCH1) and smoathed (SMO). As such, the SMO inhibitors, vismodegib and sonidegib, have shown efficacy and have been approved as targeted therapies for the treatment of advanced BCC. CD56 expression has been associated with an increased risk of non-response to vismodegib and further analysis of this correlation could lead to increased efficacy of SMO inhibitors.

MCC: Often in MCC, the PD-1/PD-L1 pathway is upregulated. Therefore, in concordance, PD-1 inhibitors such as avelumab and pembrolizumab have been efficaciously used and are US FDA approved for treatment of MCC. Additionally, a majority of tumors are positive for Merkel cell polyomavirus which may be a potential future target.

SC: Targeted therapies for sebaceous carcinomas have not been studied, although two case reports do report success with use of anti-PD1 immunotherapy. Few studies have identified alterations in p53 and higher concentrations of PD1 positive T cells in SC, which could serve as potential targets.

AFX: No studies have been conducted regarding targeted therapies in AFX. Cytological studies have identified that AFX and pleomorphic dermal sarcomas share mutations in UV-induced p53, CCND1/CDK4, HRAS, and PIK3CA. Isolated case reports have reported response of aggressive cutaneous sarcomas to pembrolizumab, but further research is needed to establish PD-1 inhibitors as a viable treatment.

MAC: There is limited research on the use of targeted immunotherapy for MAC. As MACs express c-kit, imatinib or other multitargeted tyrosine receptor kinase inhibitors may be investigated in the future as a therapeutic option.

DFSP: DFSPs are characterized by the t(17;22) (q22;q13) translocation, leading to unregulated cell growth from upregulation of PDGFRα and activation of the RAS/MAPK and PI3K/akt/mTOR pathways. Tyrosine kinase inhibitor imatinib blocks PDGFRα signaling and inhibits DFSP cell growth, and therefore is FDA approved for treatment of DFSP. In cases of imatinib resistance, tyrosine kinase inhibitors sunitinib and sorafenib have also demonstrated response in isolated cases.

Summary: Targeted immunotherapy is becoming increasingly important in the management of advanced NMSC in cosmetically sensitive areas, metastatic disease, as well as in certain patient populations who were previously unresponsive to conventional treatments or geriatric patients who do not desire extensive surgical intervention. Although more research is required, with continued advances in basic science, targeted systemic therapies may serve a promising role in the treatment of NMSCs.

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Incorporation of a prognostic 40-gene expression profile (40-GEP) test into risk assessment of a cutaneous squamous cell carcinoma (cSCC) in a Mohs micrographic surgery (MMS) treated population

Purpose: Cutaneous squamous cell carcinoma (cSCC) is the second most common skin cancer. While its metastatic rate is low, the overall incidence is high, resulting in an annual death rate estimated to surpass that of melanoma. The 40-GEP classifies these high-risk cSCC patients for metastatic risk as either low (Class 1), moderate (Class 2A), or high (Class 2B). Mohs micrographic surgery (MMS) is the current standard of care for cSCC and is an effective technique for treating high-risk cSCCs due to the ability to precisely identify and excise the entire tumor while sparing healthy tissue. The objective of this study was to evaluate the potential of the 40-GEP test to stratify metastatic risk within a high-risk cSCC population treated by MMS, representing patients with highest likelihood for complete tumor resection.

Design: Primary cSCC tumor specimens with known patient outcomes were collected within a multi-institutional study setting (33 participating centers). This clinical validation cohort consisted of tumors with one or more high risk factors that were assayed under clinical testing conditions (n=420, 63 with metastases). Within this cohort, specimens treated with MMS with confirmed clean margins (n=328, 40 metastases) were used for these analyses. All GEP testing was performed on original diagnostic biopsies, but cases were comprehensively staged including data from MMS reports. The ability of the 40-GEP to stratify risk was assessed with Kaplan-Meier and Cox regression analyses. Accuracy metrics were calculated for 40-GEP Class risk, BWH and AJCCv8 staging systems based on previously published methods (Wysong et al, JAAD 2021).

Findings: The overall metastasis rate for the MMS-treated patients (n=328) was 12.2% compared to 22.7% for those cases treated with wide local excision and clear surgical margins. Kaplan-Meier analysis demonstrated a statistically significant difference in MFS among the 40-GEP risk groups (p < 0.001, log-rank test) with the following 3-year rates: Class 1-95.4% (n=174), Class 2A-84.7% (n=137), and Class 2B-41.2% (n=17). Risk for metastasis was assessed by univariate analysis for the following variables: 40-GEP (Class 2A and Class 2B; HR=3.1 [p=0.004] and 19.0 [p < 0.001]; tumor diameter (HR=1.03, p=0.92); and presence of PNI (HR=2.3 p=0.044); deep invasion (HR=4.7 p < 0.001) and deep invasion (HR=2.1 p=0.049). Multivariate analysis using the significant univariate-assessed risk factors demonstrated 40-GEP Class (Class 2A and Class 2B; HR=2.6 [p=0.018] and 15.1 [p < 0.001]) and poor differentiation (HR=3.1 p=0.003) as significant predictors of metastatic risk. Accuracy metrics of metastatic prediction showed a higher PPV and specificity (58.8% and 97.6%) for GEP Class 2B relative to AJCC8 T3/T4 (21.7% and 87.5%; p < 0.01) and BWH T2b/T3 (19.3% and 91.3%; p < 0.01) while maintaining similar NPV and sensitivity.

Summary: The 40-GEP test demonstrated significant risk stratification for MMS-treated patients with confirmed complete margin clearance. Statistically significant survival analyses, adjusted for clinicopathological factors, and improved accuracy metrics compared to those of current staging systems, indicate that the 40-GEP adds value to current methods of risk assessment. Overall, incorporating the 40-GEP into post-MMS cSCC patient risk assessment could facilitate more personalized and improved patient management and disease related outcomes.

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Racial/Ethnic disparities in non-melanoma skin cancer based on Mohs micrographic surgery defect size: A multicenter retrospective study

Purpose: To examine racial/ethnic disparities in non-melanoma skin cancer using Mohs micrographic surgery defect sizes as a close approximation of carcinom size.

Design: We conducted an institutional review board-approved multicenter retrospective study using data from three major institutions in Los Angeles County, California, which is the most populous county in the United States. The institutions included Keck Medicine of USC, Los Angeles County
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An Observational Study of Diversity and Inclusion of Race/Ethnicity in Mohs Micrographic Surgery and Dermatologic Oncology Fellowships in the US

Purpose: The presence of minorities underrepresented in medicine (UIM) in Mohs Micrographic Surgery and Dermatologic Oncology (MSDO) is not well known. Recognition of disparities in UIM representation will aid in efforts to increase diversity and ultimately improve patient outcomes and health care delivery in MSDO. In this study, we determine the representation of UIMs and non-UIMs in MSDO fellowship in comparison to the general population and each stage of matriculation requisite to MSDO fellowship.

Design: In this cross-sectional study, race/ethnicity data from the United States (US) Census Bureau, Association of American Medical Colleges, and Accreditation Council for Graduate Medical Education from 2014 to 2018 were evaluated to analyze representation of UIMs (including Blacks, Hispanics, and American Indians/Alaska Natives) and non-UIMs in MSDO fellowship compared to the general population, college enrollees, medical school matriculants, and dermatology residents. Additionally, race/ethnicity data of MSDO applicants and matriculants from 2016 to 2019 was obtained from the San Francisco (SF) Match database. The primary outcome measure was percent representation of race/ethnicity at each stage of education needed to complete a MSDO fellowship. The secondary outcome measure was the percentage of MSDO applicants of each race/ethnicity matching into MSDO fellowship.

Findings: Hispanic/Latino patients had 17% larger Mohs micrographic surgery defect sizes as compared to non-Hispanic white patients. More notably, when comparing defect sizes of squamous cell carcinomas to basal cell carcinomas, Hispanic/Latino patients had 80% larger defect sizes compared to non-Hispanic white patients who had 25% larger defect sizes. Compared to Medicare, patients with HMO and Medicaid/HMO had 22% and 52% larger defect sizes, respectively, whereas patients with PPO had 11% smaller defect sizes.

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Slow Mohs vs wide local excision for the treatment of melanoma in situ and invasive melanoma: A retrospective study

Purpose: To determine efficacy of slow Mohs micrographic surgery vs wide local excision (WLE) in management of melanoma by examining local recurrence rates and time to event (recurrence) data.

Design: A retrospective cohort study from a community dermatology practice evaluated local recurrences and time to recurrence events. A cohort of 325 patients underwent slow Mohs (n=284) or WLE (n=41) for treatment of melanoma from December 2014 to December 2019. Follow up data was analyzed through patient chart review.

Findings: In the WLE group (n=41), the average age was 66.5 years old, 16 (39%) were female and 25 (61%) were male. Twenty-three (56%) of the patients had melanoma in situ (MIS) and 18 (44%) had invasive melanoma (IM) with a mean Breslow depth of 0.52 mm ± 0.3 mm. Sixteen (39%) were located on the extremities, 12 (29%) on the head and neck, and 13 (32%) on the trunk. In the slow Mohs group (n=284), the average age was 64 years old, 115 (40.5%) were female and 169 (59.5%) were male. Of the 284 patients,
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200 (70%) had MIS and 84 (30%) had IM with a mean Breslow depth of 0.61 mm ± 1.64 mm. Ninety-five (33.5%) were located on the extremities, 118 (41.5%) on the head and neck, and 71 (25.0%) on the trunk. A second layer was excised in 19.3% of these patients (55/284) with 34.5% (59/175) needing a third layer excised. In patients that had a third layer, 47.4% (8/19) required a 4th layer. The recurrence rate in the WLE was found to be 12.2% (6/41) with a mean time to recurrence of 62.5 months (95% confidence interval [CI]: 54.3 months – 70.7 months), (p=0.009). The mean follow-up time for the WLE group was 28.5 months. In the slow Mohs group, the recurrence rate was found to be 1.4% (4/284) with a mean time to recurrence of 71.2 months (95% CI: 68.5 months-73.9 months), (p=0.009). The mean follow-up time for the slow Mohs group was 20 months. Pearson chi-square tests and independent t-tests were performed on the categorical and continuous data, respectively. These tests demonstrated a p-value greater than 0.05 illustrating that the groups were not significantly different in ways that would confound the time to event analysis.

Summary: Nearly 20% of the melanomas in this study required an additional layer excised, highlighting the fact that there is a high rate of melanomas that extend beyond the typical margins that are excised with WLE. The low recurrence rates paired with the prolonged time to recurrence demonstrate that slow Mohs is an effective treatment for MIS and IM. With the small number of comparative analyses between slow Mohs and WLE, this study helps to demonstrate that slow Mohs is a more effective treatment than WLE for the treatment of melanoma.

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Patient Preferences Regarding Virtual Visits in Cutaneous Surgery in the era of COVID-19: A Patient-Centered Investigation from an Academic Dermatologic Surgery Practice

Purpose: We aimed to determine patient preferences for receiving dermatologic surgical care via telehealth and the variables that affect patient preferences for receiving pre-operative and post-operative care in order to develop an evidence-based patient-centered approach to the dermsurgical patient in the COVID-19 era. The key variables we studied included, but were not limited to: Demographics; socioeconomic status; medical comorbidities; prior telehealth experience; history of skin cancer surgery; History of cutaneous surgical complications; tumor characteristics including tumor type and pre-operative size; mood altering medications; baseline perceived level of attractiveness; prior COVID-19 infection; fear of contracting COVID-19; perceived level of office safety.

Design: This was a prospective patient survey-based study. Study participants were recruited from 2 sites: the outpatient dermatologic surgery clinic at the Hofstra/Northwell Department of Dermatology in Lake Success, NY and the outpatient dermatologic surgery clinic at the Hofstra/Northwell Department of Dermatology in Bay Shore, NY. This study was submitted and approved by the Northwell Health institutional review board (IRB) and we obtained informed consent from all eligible patients. All patients presenting to our clinic for scheduled Mohs surgery were eligible for study inclusion. Patients currently incarcerated, aged younger than 18 years old and those unable to speak or read English were excluded.

Eligible patients completed a pre-designed paper survey in the outpatient office on the day of their scheduled Mohs surgery visit. During the patient’s visit, a member of the research staff asked qualified patients if they would like to participate. If they desired to enroll, patients were first asked to complete the informed consent process and HIPAA forms prior to participation. The number of patients who declined was recorded. The patients were given a 4-digit randomized numeric code that helped to maintain their confidentiality and allowed us to identify their data in the future. Demographic data, including age, gender and race were collected via survey and through medical record review.

In addition to the information obtained through use of the questionnaire, the designated research staff collected the following data for each participant from the medical record: whether patient had consultation prior to surgery, age, gender, presenting tumor type, tumor location, procedure type, pre- and post-operative lesion size, type and size of reconstruction, immunocompromising conditions/medications and psychotropic medication use.

The primary outcomes of interest were patient preference for in-person vs teledermatology appointments for the pre-surgical visit and post surgical visit. All patients were asked: “For your pre-surgical consultation, if given the choice of an in-person visit or teledermatology visit on the same date and time, which type of visit would you prefer?” Response options included 1) “In-person office appointment”; 2) “Teledermatology virtual appointment”; 3) “No preference, open to either appointment”. The primary outcome is the percentage of patients who prefer teledermatology or who have no preference (i.e., a dichotomous variable formed by combining responses 2 and 3 above). Patients were asked the same question with respect to their post-surgical follow-up and asked to select one of the three options above. Similarly, the outcome of interest is the percentage of patients who prefer teledermatology or who have no preference.

Secondary outcomes included the influence of fear of contracting COVID-19 on patient preference as well as perceived level of safety of their office experience. We also sought to stratify patient preference data based on factors such as age, gender, medical conditions, self-perceived safety level of in-office experience, number of previous skin cancers, type of previous skin cancers, history of cutaneous surgery, presence of prior surgical complications, and pre-/post-operative size.

The primary purpose of the proposed study is to characterize patients’ preferred type of visit (in-person vs. teledermatology) for the pre-surgical and post-surgical periods. Accordingly, the primary outcome is to estimate the percentage of patients who prefer teledermatology or who report no preference. Thus, sample size calculations were based on the number of patients required to calculate a 95% confidence interval for this estimated percentage, rather than on the power to detect a difference via hypothesis testing. Based on an expected percentage of 60%, a sample size of 200 patients would enable us to estimate the population percentage with a margin of error of 6.8% and 95% confidence. The preliminary estimate of 60% is based on our recent experience with patient visits, which seems to suggest a preference for teledermatology.

Primary Outcomes: For both the pre-surgical visit and post-surgical visit, we will report the percentage of patients who prefer teledermatology or who have no preference, along with a 95% confidence interval for this percentage.

Secondary Analysis: We will assess the relationship between covariates of interest and the pre-surgical visit preference and post-surgical visit preference separately. We have selected 9 main covariates of interest based on those factors which are hypothesized to be most closely related to patient preferences, including: 1) age; 2) gender; 3) comorbidities; 4) history of skin cancer surgery; 5) history of cutaneous surgical complications; 6) fear of contracting COVID-19; 7) perceived level of office safety; 8) currently taking immunosuppressant; 9) perceived level of attractiveness. We will report the percentage of patients who prefer teledermatology or who have no preference, stratified according to the levels of these variables. A multivariable logistic regression model will be used to assess the independent association between each covariate above, and the visit preference outcome variable (controlling for all other covariates). In addition to assessing odds ratios, derived from the logistic regression model, we will report the adjusted percentage of patients with the outcome across the levels of the covariates of interest as an absolute measure of effect size. The Benjamini-Hochberg (BH) procedure will be used to control the false discovery rate at 0.05. This multiple comparisons procedure will be applied separately across the hypotheses tested for the pre-surgical preference, and post-surgical preference. 95% confidence intervals and
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Tertiary Revision of a Challenging Nasal Defect

Purpose: The nose is a common site for cutaneous malignancies, and proficiency in nasal reconstruction is of utmost importance to the dermatologic surgeon. The sebaceous content of nasal skin as well as the overall contour of the nose vary significantly from patient to patient leading to unpredictable wound healing in this area. When cosmetic or functional outcomes are unacceptable, it is important to have a repository of revision options to offer patients. Wound contraction, scar tissue, distortion of anatomy, and lack of tissue reservoirs make each subsequent revision attempt more risky and more difficult to perform. We present a case of successful tertiary revision surgery for a cosmetically and functionally unacceptable nasal repair following two reconstructive attempts by an outside surgeon.

Design: A 67-year-old man presented to clinic approximately one-year post-op after undergoing Mohs surgery for melanoma in situ. The left nasal sidewall and nasal ala were treated with a full-thickness skin graft at the time of Mohs surgery, but the flap failed. At four months post-op the outside surgeon revised the defect with a nasolabial transposition flap. At the time of presentation to our clinic (one-year post-op) the patient was displeased with his surgical outcome. He felt the flap was large, conspicuous, and disfiguring. He additionally endorsed left nasal cavity obstruction with both inspiration and expiration. Physical exam revealed bulbous and pin cushioned flap tissue on the left nasal sidewall, infraorbital cheek, medial canthus, and within the nasal passage. There was obliteration of the nasofacial sulcus and alar crease, ipsilateral alar elevation, significant alar rim notching, and prominent narrowing of the nasal passage. After careful consideration and discussion, the patient elected to undergo tertiary revision of the repair at our institution. The patient was positioned, prepped, and anesthetized in the standard fashion. A horizontal incision extending from the medial infraorbital cheek towards the midline (coursing just superior to the patient's native alar crease) was made. The superior portion of the native nasolabial transposition flap was then elevated, carefully thinned, and re-sutured. A full-thickness excision of the previously reconstructed nasal ala was carried out. The nasal ala was then reconstructed using a nasolabial interpolation flap in combination with an auricular cartilage graft for structural support. The flap pedicle was divided and inset three weeks post-revision.

Findings: Follow up at 7-months post-revision revealed a much-improved cosmetic result with reconstruction of the left nasal ala, alar rim, and nasofacial sulcus. The patient was pleased with the appearance of his nose and noted seemingly normal airflow through the left nasal passage. Mild persistent edema of the left lower eyelid was noted, and referral to ophthalmology for blepharochalasis is pending.

Summary: Despite the surgeon’s best efforts to counsel patients prior to reconstruction and give careful consideration to selecting the best initial reconstructive option, revision procedures will likely be necessary over the course of a career in dermatologic surgery. Implementation of judicious flap thinning combined with inferior excision and a nasolabial interpolation flap with cartilage graft may provide a useful niche repair for cosmetic and/or functional failures of a single staged nasolabial transposition flap.

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Retrospective chart review of atypical melanocytic proliferations treated with excision to assess the rate of upstaging to melanoma in situ or melanoma

Purpose: Atypical melanocytic proliferations (AMPs) describe a subset of melanocytic neoplasms that are difficult to classify as benign or malignant based on histological features. Studies have been discordant on the rate of diagnostic change of AMPs to melanoma. There has been concern that some cases of AMP diagnoses may result in overtreatment, as AMPs are often treated with conservative excision given the unclear biologic potential. The primary data objective was to better understand the frequency at which AMPs are upstaged to melanoma or melanoma in situ at our institution. The secondary data objectives were to determine if there were any factors associated with upstaging of AMPs to melanoma or melanoma in situ (MIS), while also exploring how often post-excision margins are positive with our standard 5 mm margins.

Design: A retrospective search of our institution’s database was conducted to identify all internally generated and externally referred biopsy specimen AMP cases from April 2018 - September 2020. Only patients with a biopsy diagnosis of AMP and subsequent excision were included. Additionally, cases were only selected if both the biopsy specimen and subsequent excision specimen were evaluated by our institution’s dermatopathologists. Upon identification of eligible cases, the patient age, tumor location, gender, biopsy type, and margins for both biopsy and excision were documented.

Findings: Between April 2018 and September 2020, 2282 AMP cases were identified, 709 of which met the inclusion criteria. The average age of these patients was 52.8, with a female predominance (62%). None of the 709 AMP cases were upstaged to melanoma after excision, while only three (0.4%) were upstaged to melanoma in situ. Negative excision margins were achieved in 96.07% of the cases with 5 mm margins.

Summary: The data shows that it is rare for AMPs to be upstaged to melanoma or melanoma in situ (0% and 0.4%, respectively). Five-millimeter margins appear to be adequate to achieve negative surgical margins in 96% of AMP excisions. Given the few number of cases upstaged, there was insufficient data to draw conclusions on factors associated with upstaging of AMPs to melanoma or MIS.

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Three-Dimensional Printing for Medical Education in Dermatologic Surgery: A Review

Purpose: Three-dimensional (3D) printing technology has been used in medical education to deliver complex medical information in an interactive...
and simplified fashion, thereby reducing cognitive load for the learner. 3D printed models have both increased understanding and decreased anxiety of medical procedures for both patients and trainees. Given the field 3D printing is rapidly evolving and expanding, we aim to review the application of this technology for medical education in dermatologic surgery.

**Design:** Authors searched PubMed MEDLINE for eligible studies in April 2021. Search terms included “3D printing dermatology”, “3D printing dermatologic surgery”, and “3D printing dermatology education”. All abstracts were evaluated and met inclusion criteria if the study evaluated the use of 3D printing technology for medical education in dermatologic surgery. Key features of each included article were reviewed, including primary outcomes.

**Findings:** Forty-eight abstracts were reviewed for inclusion and five abstracts were eligible for inclusion. Full text was available for four of five available studies. One article was excluded as the full text was unavailable. DeMarco et al. published on use of “3D Modeling and Mohs Surgery: A Novel Approach to Medical and Patient Education”, which discussed the successful use of 3D printing in medical and procedural education. Additionally, authors provided information regarding their development of an open-source Mohs micrographic model available for download. The authors primary aim was to stimulate further interest and development of this technology to be used in dermatologic surgery. Later, Biro et al. in “The use of 3-dimensionally printed models to optimize patient education and alleviate perioperative anxiety in Mohs micrographic surgery: A randomized controlled trial” evaluated the effect of using a standardized script and 3D printed models on perioperative patient anxiety and understanding in Mohs micrographic surgery. The State Trait Anxiety Inventory was used to quantify perioperative patient anxiety, in addition visual analog scales that for both anxiety and understanding. Data was collected at baseline and following completion of the first stage of the Mohs micrographic surgery. Patients in the 3D printed model group demonstrated significant improvements in both perioperative anxiety and understanding, when compared standardized script alone. Authors interpreted that 3D printed models could be used as a non-pharmacologic intervention, similar to personalized music, to decrease perioperative anxiety in Mohs micrographic surgery. Patel et al. reviewed “Patient education in Mohs surgery: a review and critical evaluation of techniques” and reported on the benefits of application 3D printed models for patient education in Mohs micrographic surgery, including improvement of patient understanding and decreased patient anxiety. Additionally, they concluded these models could be easily incorporated into in-person consultation. They cite disadvantages as access to use of 3D printing technology. Finally, Gupta et al. in “Improving Knowledge of Mohs Surgery in Patients and Families with 3D-Printed Models and Video Animation: A Survey-Based Cohort Study” evaluated the use of 3D printed models and a 4-minute animated illustration of the Mohs micrographic surgery technique and their impact on patient understanding, anxiety and comfort in the perioperative period. Patients were given a pre- and post-intervention 5-question survey to assess patient’s knowledge of Mohs micrographic surgery, perioperative anxiety and comfort during the surgical day. This study demonstrated statistically significant improvement in the 3D model group with animated illustration for each of the survey questions.

**Summary:** To date four studies have highlighted or demonstrated the benefits of 3D printing technology for medical education within dermatologic surgery. Two of these studies have demonstrated the association that improved patient understanding, of Mohs micrographic surgery can help decrease perioperative anxiety. As perioperative anxiety has been linked to postoperative pain and lower patient satisfaction, future investigations may aim to use 3D printing technology for additional dermatologic surgical procedures.

**A Guide to Three-Dimensional Printing for the Dermatologic Surgeon**

**Purpose:** Three-dimensional (3D) printing technology has enabled the development of accessible, customizable, low-cost models that can help simplify the delivery of medical education for patients, medical students and medical residents. Previous literature has demonstrated 3D printed models increase patient understanding of complex medical information and thereby decrease perioperative anxiety in Mohs Micrographic Surgery. Our aim is to briefly overview the workflow of developing and incorporating 3D printed models into dermatologic surgery.

**Findings:** Model Design

Model design is the foundation of 3D printing. Most models are designed using computer-aided design (CAD) programs. These programs allow development of a new CAD file with a customized shape and also allow modification of existing files. Most CAD based programs use metric measurements and solid models are generated through the connection of vertices in the x, y and z axes. Alternatively, models can be generated through digital segmentation of pre-existing medical imaging, such as CT or MRI scans, or through 3D surface scanning of existing objects. These generated models are often further processed in CAD software. Generally, CAD models are output as stl or obj file extensions, prior to generating a 3D print file.

**Generating a 3D Print File**

Once a CAD model has been designed, it must undergo file optimization in printing software. In these steps CAD files are digitally sliced into layers along the x and y axes that will later be stacked in the z axis to generate a 3D printed model. Within printing software programs, the user may customize print resolution and layer size, infill of the model and supports during the build process. These programs commonly provide a print preview of the model, estimate the amount of material required, total print time, and cost of the material used. Once complete, files are commonly output as gcode or x3g extensions which can be printed.

**3D Printers and Materials**

Most commercial 3D printers use additive manufacturing properties in which solid polymers pass through a heating element, are heated to their melting point, and are laid down in the x and y axes and stacked in the z axis. 3D printed model. Print layers are commonly 100-300 microns, which can provide both high resolution and reproducibility for each model.

Common printing materials include polylactic acid (PLA) and Acrylonitrile butadiene styrene (ABS) which are plastic polymers fed into the printer as spools of filament. Additionally, composites of multiple new materials including flexible plastics, rubbers, ceramics, and alloys have become available. Inherent to each of these materials is a different melting point, which must be adjusted for when printing. Depending on the size of the model, files can be printed in minutes to hours for larger objects. Given the light weight of these materials and relative size of models, most prints can be generated at a low cost, from cents to a few dollars. If supports were required for model printing, these can be easily removed with pliers, spatulas or hobby knives and then models are ready for use in the clinical setting.

**Summary:** 3D printing provides a new avenue to deliver complex medical information to patients, medical students and medical residents. The most important steps include model design, generating a 3D print file, the 3D printer and the materials involved in printing. Currently, most models can be printed within minutes to hours, have a low cost, resolution of up to 100 microns, are easily reproducible and once built can be rapidly integrated into the clinical setting. We hope this review provides an overview and access to this technology the current and next generation of dermatologic surgeons.
SKIN CANCER / MOHS / RECONSTRUCTION ABSTRACTS

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Melanoma Staging

Purpose: There is a substantial amount of medical literature dedicated to the role of cognitive biases in diagnostic error—some of which is dermatology-specific. However, less investigation has been performed into the process of clinical decision-making after the diagnostic process is complete, and there is value in furthering our understanding of how these decisions are made. Melanoma staging and management can serve as a useful model for an exploration into the progression, complexity, and potential role of cognitive bias in post-diagnosis clinical decision-making.

Design: We have created a prototype of a decision support app for melanoma staging and management based on the American Joint Committee on Cancer (AJCC) staging guidelines and the National Comprehensive Cancer Network (NCCN) management guidelines. In addition to providing a user-friendly and consolidated evidence-based guide for decision-making, this app can be used to help identify inflection points for variations in decision-making and any resultant research-practice gaps through interviews with dermatologists, oncologists, and otolaryngologists who are experts in melanoma.

Findings: Potential sources of variation in melanoma management and decision-making include differences in training environment, practice style and location, access to quality treatment options, as well as the level of experience of the clinician making the decisions. Additionally, personal cognitive biases and heuristics are likely to play a role, including reliance on patterns such as stereotyping, mirror-imaging, and simplistic thinking. Time constraints and an overload of ambiguous information can also lead to confusion between cause and effect, as well as reliance on groupthink or anecdotal experience. Use of a decision support tool such as our app may help mitigate these types of non-evidence-based variations in decision-making, minimize research-practice gaps, and support targeted, clinically-relevant research efforts in the future.

Summary: Clinical decision-making is a complex, often multi-stage process that requires synthesis and analysis of information—which is often ambiguous or incomplete—to formulate individualized recommendations for patients with melanoma. An evidence-based decision support technological intervention can help us better understand common variations in management and identify research practice gaps so that we can advance future educational and research efforts. Ultimately, we anticipate this data will help us provide more consistent, high-quality, and patient-centered care to our patients with melanoma.

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Periosteal flap for reconstruction of full-thickness lower eyelid defects

Purpose: Full-thickness lower eyelid defects are common after Mohs micrographic surgery (MMS). They are challenging to repair and are often referred to ocuoplastics. The posterior lamella provides support to the eyelid and requires a non keratinized mucosal epithelium to avoid corneal abrasion. Reconstructive options include wedge closure with or without canthotomy/cantholysis, tarsoconjunctival sliding flaps such as Tenzel flap, and Hughes tarsoconjunctival flap. Defects >50% have typically required the two-stage Hughes flap, leaving the patient with monocular vision for 3-6 weeks until pedicle division. Herein, we demonstrate the use of the periosteal flap for single stage reconstruction of the posterior lamella in six patients with large, full-thickness defects after MMS.

Findings: All the flaps survived after the operation. The patients were followed up from two months to 18 months post-surgery and results showed adequate functional and cosmetic outcomes in each case.

Summary: This series demonstrates the utility of the periosteal flap as a robust option for single-stage repair of full-thickness lower eyelid defects. It circumvents the need for two-stage repair, which leaves the patient with monocular vision for several weeks. These repairs can be done safely under local anesthesia by Mohs surgeons.

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Is there a smoking gun for nicotine? A Systematic Review of the Role of Nicotine in Reconstructive Surgery

Purpose: Reconstructive surgeons are faced with a dilemma when counseling patients who are active smokers: recommend total cessation of all nicotine products which is associated with extremely high rates of cessation failure or recommend nicotine replacement therapy (NRT). The direct effect of nicotine on peri-operative complications and wound healing is controversial. To our knowledge, this is the first systematic review which aims to direct this decision.

Design: A PubMed database query for relevant articles using the search terms [(nicotine OR electronic cigarettes) AND (flap OR wound healing)] was conducted. The search produced a total of 311 articles. Articles were reviewed and selected based on relevance. A total of 87 articles were included.

Findings: Smoking tobacco is detrimental to wound healing, supported by ample clinical and basic science evidence (level 1A). Prior studies have demonstrated success in reducing complication rates with perioperative smoking cessation (level 1B). Nicotine replacement therapy significantly increases the chances of smoking cessation. Basic science demonstrates both a benefit and detriment of nicotine on wound healing depending on the factor studied (level 2A). High level human studies suggest that nicotine does not have a clinically significant effect on wound healing and peri-operative complications (level 1B). Nicotine may be detrimental to flap survival, but evidence is limited to basic science (level 2A). Electronic nicotine delivery systems are shown to have a detrimental effect on wound healing in basic science models (level 2A), but evidence is lacking in human studies (level IV).
SKIN CANCER / MOHS / RECONSTRUCTION ABSTRACTS

Impact of Limited English Proficiency in Melanoma: An analysis of the SEER Database

**Summary:** A total of 8,490 adult Asian and Hispanic White melanoma patients selected from the Surveillance, Epidemiology, and End Results database (SEER, 2018, 18 Reg.). Demographics, AJCC 6th stage, and time-series events were compared between low LEP (0-12% LEP population) vs high LEP counties (>12% LEP population). Frequencies and means were compared using χ² and t-tests, respectively. 5-year overall survival (OS) was compared between low LEP vs high LEP counties using a Kaplan-Meier analysis. A Cox proportional hazards regression was performed to investigate the effects of age of diagnosis, sex, race, AJCC 6th stage, and county LEP status on 5-year melanoma OS.

**Findings:** A total of 8,490 adult Asian and Hispanic White melanoma patients were identified, of whom 660 were in high LEP counties (7.8%). Mean age of diagnosis in high LEP counties (60.3 ± 17.7 yo) was later than in low LEP counties (58.1 ± 16.9 yo, p = 0.002). Later AJCC 6th stages were enriched in high LEP counties vs low LEP counties (II: 12% vs 9%; III: 8% vs 7%; IV: 6% vs 4%; unstage: 11% vs 7%), whereas earlier stages were depleted in high LEP counties vs low LEP counties (0% vs 30% vs 35%; I: 33% vs 38%; p < 0.001). 5-year melanoma OS was lower among patients in high LEP counties (p < 0.008). In a multivariate model, county LEP status did not confer a significant hazard, whereas age of diagnosis (HR 1.04 per year, 95% CI [1.04-1.05]), male sex (HR 1.39, 95% CI [1.25, 1.56]), and higher AJCC 6th stages (I: HR 1.34 95% CI [1.10, 1.63]; II: HR 4.17, 95% CI [3.41, 5.11]; III: HR 9.95, 95% CI [8.19, 12.1]; IV: HR 39.8, 95% CI [32.9, 48.1]; unstage: 5.83, 95% CI [4.73, 7.18]) all decreased 5-year melanoma OS.

**Summary:** Our results indicate that Asian and Hispanic White melanoma patients in high LEP counties are at greater risk for being diagnosed at later stages and ages. This may help explain their decreased 5-year melanoma OS. Once diagnosed, however, LEP does not significantly affect patient outcomes as indicated by the multivariate model. Taken together, these data suggest the need to improve melanoma screening in high LEP counties to detect melanoma at an earlier stage. A limitation to this study is that it uses county level LEP data. We suggest that case-level LEP data is captured in SEER and other cancer registries going forward.

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**Purpose:** Standard discharge instructions were condensed into an 11-step post-operative wound care protocol. Patients presenting for Mohs surgery were guided through the protocol on a simulated wound. A study coordinator controlled the progress of a computer application that read each step out loud to the patient. Patients self-narrated their progress and asked clarifying questions, which could be answered by the computer from a bank of pre-recorded responses selected by the study coordinator or extemporaneously by the study coordinator if the answer was not pre-recorded. Audio, motion, and step-specific metadata (e.g., time) were collected. At periodic intervals, the steps were re-written and reorganized to facilitate improved patient understanding.

**Findings:** The standard post-operative care instructions were transformed into a condensed post-operative wound care protocol. The original post-operative instruction sheets (n=10) had an average of 33.9 (s.d.=4.6) instructions, 702.5 (s.d.=68.2) words, and 15.7 (s.d=3.4) if statements. The developed protocol had 11 instructions, 133 words, and 0 if statements and underwent four iterations. A total of 21 patients were observed performing the wound care protocol. Completion of the protocol took patients an average of 384 seconds (s.d.=109.0 seconds). The step asking the patient to “open the non-stick dressing and cut the dressing to a size that will cover the wound” resulted in the greatest number of questions asked, with 8 patients asking for clarification on how they should cut the dressing. Overall, there were 22 questions we anticipated and 45 patient questions that were unanticipated.

**Summary:** The wide variability in time spent completing the wound care protocol, requests for further clarification, and unanticipated patient questions highlights the need for individualized postoperative wound care support. Quantifiable insights into the patient experience helped us to redesign and contextualize discharge instructions. The protocol was redesigned through the revision of misinterpreted or difficult steps, which were identified as outliers in step duration or number of clarifying questions asked. Furthermore, we were able to contextualize the experience for our patients by addressing individual clarifying questions for those in need without an unnecessary complication of the protocol for others.

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**Purpose:** Merkel cell carcinoma (MCC) is a rare and aggressive neoplasm of the skin with high mortality. Prompt diagnosis and treatment are keys to
improved patient outcomes; however, it is unclear whether there is a gap in care based on proximity to large population centers. Previous studies demonstrated that MCC survival is lower in low dermatologist density areas; however, there is little evidence for an association between survival or stage at diagnosis by rurality. Given the low incidence of MCC and recent changes in MCC guidelines, associations are difficult to characterize without numerous years of historical staging data aggregated from large registries. We hypothesize that decreased MCC survival is associated with rural counties based on Surveillance, Epidemiology, and End Results registries data (SEER).

**Design:** This is a retrospective cross-sectional study using the November 2019 SEER database (18 registries). Inclusion criteria are malignant MCC cases (ICD-O-3: 8247/3) diagnosed between 2004 and 2015 in adults (≥18 yo) with diagnostic confirmation by positive histology. Exclusion criteria are MCC in situ, reporting by autopsy or death certificate only, and missing or unknown cause of death. SEER historic stage at diagnosis (stage) and 5-year survival (CSS; cause specific; OS; overall) are stratified by 2013 USDA urban-rural continuum codes (metro: metropolitan counties with ≥1M population; urban: metropolitan counties with < 1M population and non-metropolitan counties adjacent to a metropolitan area; rural: non-metropolitan counties not adjacent to a metropolitan area). In univariate analysis, frequencies and means are compared using y2 and ANOVA tests, respectively. In time series analysis, 5-year survival is compared with log rank tests on Kaplan-Meier curves.

**Findings:** A total of 6,291 malignant MCC cases meet the inclusion criteria, stratified by population density into 3,750 metro, 2,235 urban, and 306 rural cases. MCC patients are more likely to be male sex (69% vs 62%, p=0.013) and White race (97% vs 95%, p=0.033) in rural versus metro areas. Early stages are more frequent in rural versus metro areas (local: 51% vs 44%), whereas later stages are less frequent (regional: 35% vs 38%; distant: 7% vs 10%; unstaged: 8% vs 8%; p=0.048). 5-year CSS (60% vs 68%, p=0.011) and 5-year OS (38% vs 44%, p=0.007) are statistically significantly lower in rural versus metro areas. For local stage MCC only, both 5-year CSS (69% vs 81%, p=0.002) and 5-year OSS (41% vs 51%, p=0.039) are statistically significantly lower in rural versus metro areas. This relationship is not seen in regional or distant staged MCC.

**Summary:** This study suggests that there is elevated mortality associated with MCC cases in rural counties versus metropolitan counties. Paradoxically, the data also suggest that there is a higher incidence of local disease at diagnosis in rural counties versus metropolitan counties. This may be partially explained by mis-staging of MCC in rural counties given the decreased 5-year CSS and 5-year OS seen in rural counties for locally staged MCC only. Standardized MCC treatment guidelines have been evolving over the past decade. Latency in their adoption could result in an incomplete workup and mis-staging of disease in rural areas. Limitations of the study include a small sample size, changing MCC guidelines over the study period, and uneven loss to follow-up. This work does not provide specificity or causality so local studies are warranted to elucidate inconsistencies in care in rural counties.

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**Randomized Trial of Topical Application of Tranexamic Acid to Wound Bed for Hemostasis in the Setting of Granulating Wounds Following MOHS Micrographic Surgery**

**Purpose:** The topical application of tranexamic acid (TXA), an antifibrinolytic, has been shown to reduce intraoperative and postoperative bleeding in orthopedic, plastic, and maxillofacial surgeries. This study aims to determine the efficacy of topical TXA in preventing postoperative bleeding when used as an adjunct to wound care on granulating defects in the setting of Mohs micrographic surgery (MMS).

**Design:** Patients who underwent MMS with surgical defects resulting in a wound to heal by second intent were randomly selected for drug or placebo application. The placebo group received a saline-soaked non-adherent pad applied directly to the surgical defect in addition to a standard petrolatum gauze pressure dressing. The intervention group received a 25mg/ml TXA-soaked pad with the same standard dressing application. All patients were given standard wound care instructions including when to apply pressure and to call with bleeding complications. Patients were called 3 days after their surgery to answer yes/no questions about postoperative bleeding and any perceived symptoms.

**Findings:** Between October 1, 2020 and April 30, 2021, a total of 62 patients were enrolled, with 31 patients in each group. A total of 5 patients in the placebo group (5/31; 16.1%; p-value .052) reported bleeding within 48 hours after surgery. The TXA group had no reported bleeding within 48 hours (0/31; 0%). There was no statistically significant difference in antiplatelet and anticoagulant use between the two groups. No perceived side-effects were reported in either group.

**Summary:** To our knowledge, there has been no study in which topical TXA has been added to the wound care of second intention surgical defects with the aim to reduce postoperative bleeding. The reported bleeding rate in the placebo group was 16.1%, with one patient necessitating medical intervention. The TXA group had no reported bleeding complications. This difference closely approached but failed to reach statistical significance (p-value .052) due to the small sample size. Topical TXA is an inexpensive and easy topical preventative measure to consider adding to the care of granulating wounds in the setting of MMS. Given the compelling data above, the study has been reopened to increase the sample size and confirm our findings.

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**Curettage and Fractional CO2: A Modern Twist on a Fundamental Technique**

**Purpose:** There are numerous surgical modalities commonly used to treat basal cell carcinomas. To our knowledge, utilization of a fractional CO2 laser for treatment of cutaneous malignancies has not been reported in the literature.

**Design:** We report a case of a superficial and nodular basal cell carcinoma treated with curettage and fractional CO2 laser ablation.

**Findings:** A 42-year-old woman employed by the dermatology office presented with a 0.7mm pearly papule on her left inferior forehead. A small shave biopsy was performed which revealed a superficial and nodular basal cell carcinoma, extending to both peripheral margins and the deep margin. Treatment options including Mohs Micrographic Surgery, as well as curettage and electrodessication were discussed, and she decided against pharmacological treatment. The patient was concerned with scarring, and inquired about other treatment options. We elected to perform a procedure which, to our knowledge, has never been reported. We instructed the patient to wash her face with a gentle cleanser. Her forehead was then cleaned with chlorhexidine gluconate 4% solution, and was draped in a sterile fashion. A 4mm curette was used to scrape the surface of the basal cell carcinoma for 3 cycles as would be performed for a standard curettage and electrodesiccation procedure, however no electrodesiccation was performed. Hemostasis was attained with aluminum chloride solution. The patient was then treated with a fractional CO2 laser for 3 passes over the affected area, including a 3mm margin of surrounding skin. There has been no recurrence at 3 years post-procedure, with excellent results.
Eruptive Keratoacanthomas Responsive to Prednisone

**Purpose:** We aim to describe a unique case of eruptive keratoacanthomas erupting in a 72-year-old male with generalized pruritus that resolved with prednisone. Additionally, we review conditions in which multiple keratoacanthomas can arise, and the new reports of steroid-responsive keratoacanthomas.

**Design:** Herein, we describe a case report of a patient who developed eruptive keratoacanthomas in the setting of intractable pruritus. We discuss the utility of immunohistochemistry in making the diagnosis, and the limitations.

**Findings:** A 72-year-old male presented to the clinic for a pruritic rash present for 6 months. His primary care physician had been controlling the pruritus via intramuscular triamcinolone injections while investigating possible etiologies. Work-up included review of possible culprit medications as well as ruling out paraneoplastic disease. The patient then presented to dermatology with diffuse erythematous scaly plaques serpiginous borders. Punch biopsies were performed and the patient was empirically treated with permethrin 5% cream, triamcinolone 0.1% cream. Additionally, his simvastatin was stopped and his benzepril was switched to amlodipine, after discussion with his primary care doctor. One month follow-up showed his rash improved clinically, however he was found to have new excoriated nodules scattered over his scalp, upper extremities, and back. The patient was given 40mg of intramuscular triamcinolone, started on a 12-day prednisone taper. Patient underwent extensive paraneoplastic work-up that was negative. Two additional punch biopsies were performed that revealed atypical squamous proliferations with keratoacanthoma-like features. Immunohistochemistry was performed for further evaluation. Lesions stained positive for Ki67 and p53 showed wild-type pattern. CD30 stain was performed due to the rare occurrence of keratoacanthomas in CD30 lymphoproliferative disorders, but was negative. Patient was continued on prednisone with subsequent resolution of his lesions. Ferguson-Smith type KA erosion is an autosomal dominant condition with rapid-onset KA tumors in sun-exposed areas, while sporadic multiple eruptive KAs (Gryzbowski) is not familial and patients erupt with thousands of small KA tumors that characteristically can involve the airway. Drug-induced eruptive keratoacanthomas have been reported in association with BRAF inhibitors, checkpoint inhibitors, vismodegib, leflunomide, and imiquimod. 3–5 Notably, drug-induced eruptive keratoacanthomas induced by checkpoint inhibitors have been reported in association with BRAF inhibitors, checkpoint inhibitors, vismodegib, leflunomide, and imiquimod. 3–5 Notably, drug-induced eruptive keratoacanthomas induced by checkpoint inhibitors have responded to topical and intralesional steroids. 6 Our patient developed multiple keratoacanthomas in sites of repetitive trauma secondary to the generalized pruritus.

**Summary:** Eruptive keratoacanthomas are uncommonly seen and are generally thought to be associated with rare syndromes. Our patient developed eruptive keratoacanthomas which improved with systemic steroids, which to our knowledge has been previously unreported. With new reports of keratoacanthomas responding to topical and intralesional steroids introduces new questions regarding what we think we know about this entity, and brings light to new treatment modalities which can be expanded upon.

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**Eruptive Keratoacanthomas Responsive to Prednisone**

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**Summary:** With numerous treatment options for basal cell carcinomas, surgical destruction is most often the treatment of choice. Scarring is a concern with every surgical procedure, however, with proper choice of lesion, fractional CO2 lasers can be utilized to treat basal cell carcinomas with minimal scarring.
Suture Materials and Techniques for Optimal Cutaneous Wound Cosmesis: A Systematic Review

Purpose: Wound cosmesis is key to satisfaction of the surgical patient. While principles such as preservation of function, free margins, contour, and placement of scars in cosmetic subunit junction lines are widely accepted, suture materials and techniques to achieve the ideal scar vary. We performed a systematic review of the literature on how suture materials and techniques impact scar cosmesis.

Design: A primary literature search was conducted using PubMed, Ovid Medline, Cochrane, and CINAHL on December 12, 2020 for peer-reviewed publications dated between January 1, 1976 and December 1, 2020. Two authors, K.C. and A.N.E., independently searched and cross-checked the following search terms: “suture” OR “scar” AND “cosmesis”. Any differences were resolved by discussion. Article types were limited to clinical trials and randomized controlled trials with humans published in English. Review articles without original data, studies that did not evaluate the aesthetic outcome of the scar, studies that did not compare at least two different suture materials or techniques, and studies only comparing sutures with alternative closure materials (i.e. adhesive, barbed sutures, staples) were excluded. Publications meeting inclusion criteria were reviewed and information on study type, wounds, interventions, scar evaluation method, surgery type, anatomic location(s), follow-up, and outcomes was tabulated.

Findings: 499 articles were identified to meet key search terms and an additional 12 relevant records were identified through bibliography review. After full-text abstract screening, forty-three publications were included. Five studies evaluated deep suture material. For deep sutures, polyglactin-910 (PG910) has equivalent cosmesis to polydioxanone-25 (PG25) and worse cosmesis than polydioxanone (PDS) or poly-4-hydroxybutyrate (P4HB). Although the cosmetic outcome was deemed equivalent, one study showed PGC25 to have fewer extruded sutures than PG910. Twenty studies evaluated different superficial suture materials. Overall, polypropylene (PP) has equivalent cosmetic outcomes to absorbable sutures while nylon has worse. One study directly evaluated superficial suture diameter and found no difference in cosmesis between 5-0 and 6-0 fast-absorbing gut (FG). Seventeen studies evaluated suture techniques on scar cosmesis. In the five studies directly comparing percutaneous and subcuticular techniques utilizing the same suture material, the subcuticular technique improved cosmesis for PP, but worsened results for PG910. When subcuticular PG910 and PP were compared against each other, subcuticular PG910 left in place had superior cosmesis to PP. Continuous and interrupted sutures provide equivalent cosmesis, as do fewer and more widely-spaced sutures (5 mm on the head and neck and 10 mm on the trunk and extremities). Single-layer closure without superficial sutures may provide equivalent cosmesis to double-layered closure in the long term. Four studies found wound-everting methods and eversion to be beneficial in scar cosmesis, while 2 studies challenged this long-standing tenet of wound repair.

Summary: Optimal cutaneous wound cosmesis can be achieved with different suture materials and suturing techniques. Further studies are required to evaluate eversion on scar cosmesis.

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The “Whale Tail” Melolabial Interpolation Flap

Purpose: To describe a “Whale tail” flap design to decrease pedicle width and total length of the melolabial interpolation flap.

Design: The “Whale tail” flap design is a modification to the traditional melolabial interpolation flap. The difference lies in the distal half of the flap. Instead of extending the flap design of the estimated donor-site defect only inferiorly, part of the standing cutaneous defect is displaced to the lateral aspect of the flap. This allows shortening of the inferiorly oriented Burow’s triangle in a similar manner to an M-plasty and also provides another closure angle that allows the pedicle defect to be narrower. The flap is then incised to the level of subcutaneous fat and elevated. When elevated, the overall appearance of the flap resembles that of a whale’s tail with two “fins”, hence the name. The “fins” are adjusted and trimmed to match the defect shape either on the first stage or during the take down. The flap is sutured into place in standard fashion and the donor site defect is closed.

Findings: To date, we have performed this repair on 4 patients. Postoperative courses were uneventful and all wounds healed with no major complications and good cosmesis.

Summary: For larger defects on the nose that would require a wide pedicle when designing a melolabial interpolation flap, the “Whale tail” technique we have detailed here is an attractive alternative that enables the surgeon to shorten the total length and decrease the pedicle width while enabling an easier, cosmetically acceptable closure of the donor site. This technique could also be easily adapted to cover two separate nasal defects by suturing in a portion of each “fin” instead of trimming the excess. A tradeoff with this technique is that it adds an extra line to the donor site, however in our experience the final cosmetic outcome may be preferable to a higher tension and more extensive linear scar. Additional benefits include less tissue distortion due to tissue conservation and redirection of tension vectors.

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The Triple V-to-Y Island Pedicle Advancement Flap

Purpose: The V-to-Y advancement flap, also known as the island pedicle flap, is a tissue-sparing reconstruction that uses like tissue for the repair and does not require removal of dog ears. This is a durable flap with a rich random-pattern vascular supply from its pedicle of subcutaneous fat and musculature. While versatile, a single V-to-Y advancement flap is often limited in ability to cover large defects as one can narrow the pedicle only as much as necessary to adequately mobilize the flap. Here we describe two cases utilizing a triple V-to-Y island pedicle advancement flap for closure of large defects of the trunk and extremities.

Design: To perform this flap, three V-to-Y advancement flaps at 120-degree angles to each other are designed around the defect. The area is marked with the planned repair and infiltrated with 0.5% lidocaine with 8.5% bicarbonate. Repair begins with the pedicle that is suspected to have the most restricted movement. The skin is incised down to the level of the defect (usually mid to deep subcutaneous fat or fascia) and an island formed. The pedicle should be slightly narrower than the overlying island of skin. The surrounding skin is sharply undermined and the base of the flap carefully thinned to enable movement into the primary defect. Excessive pedicle thinning or undermining runs the risk of damaging the vascular supply and can result in flap necrosis. The above process is repeated with each of the remaining two islands. An absorbable suture is used to throw the key stitch to bring each of the central islands together and completely close the primary defect. The secondary defects are then closed with deep absorbable sutures behind the island, helping to push the island into place. Any remaining gaps to fat and deep dermis are closed, followed by superficial closure.

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**SKIN CANCER / MOHS / RECONSTRUCTION ABSTRACTS**

**Findings:** To date, we have performed this repair for large defects of the back and upper extremity after tumor extirpation with Mohs micrographic surgery. Postoperative courses were uneventful and all wounds healed with no major complications and good cosmesis.

**Summary:** Large and deep defects can pose a considerable reconstructive challenge, even in areas that are not traditionally considered cosmetically sensitive. By utilizing the natural advantages and tissue-sparing approach of the V-to-Y advancement flap, multiple such flaps can be combined to mobilize additional tissue reservoirs to fill large defects. We find this reconstruction to be especially helpful in cases in which alternative repair options would require longer incisions and extensive undermining far from the primary defect. Another advantage of this technique is that the length of each individual flap can also be shortened to increase survivability. These cases also highlight the importance of Mohs surgery in minimizing the size of the final wound after extirpation of large tumors, without which closure may not have been possible.

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**Crops of Papules and Papulonodular Plaques, an unusual presentation of Cutaneous Metastasis: A Case Report**

**Purpose:** Abstract: Cutaneous Metastasis refers to a growth of neoplastic cells in the skin originating from an internal malignancy. Morphologically the metastasis could take multiple morphologies. We report a case of cutaneous metastasis in a female of age 34 years. She initially presented with a 2 years history of progressive appearance of multiple asymptomatic clusters of monomorphic papulonodular lesions widespread on her trunk, lower limbs and genitalia later developed dyspnoea and weight loss. Chest CT showed moderate pleural effusion and multiple lymphadenopathies and right sided lung mass/consolidation. Histopathological evidences of cutaneous biopsy revealed cutaneous metastasis consistent with the lung primary.

**Key words:** Malignant epithelial neoplasm, metastasis, papulonodules.

**Design:** Case Report- Crops of Papules and Papulonodular Plaques was an unusual presentation of Cutaneous Metastasis, thrashed the Lung Primary in a 34yrs old female.

**Findings:** Case report

A 34 years old female, mother of 2 children presented with a two years’ history of progressive appearance of multiple asymptomatic crops of monomorphic papulonodular skin lesions widespread on her trunk (chest, abdomen, back) and also on the lower limbs and genitalia (vulva and perianal fold) sparing her upper limbs and face.

There were areas of discrete warty papules and papillomatous plaques of various sizes. The nodules were exuberant, firm to hard, some being skin coloured and the rest with fleshy violacious hue, arranged in numerous groups.

There were ulcerovegetant tumorous lesions more prominent on the right breast, clinically measuring 3 to 4 cm, indurated and infiltrated. The right nipple was distorted; however, the left was apparently normal. There was evidence of superimposed bacterial skin infection apparent on her back. There were palpable subcutaneous nodules on her right breast and left shoulder, the largest measuring 3-4 in diameter. A group of discrete posterior cervical lymph nodes was palpable measuring approximately 1 cm in diameter, mobile/ not adherent to the underlying tissue, firm yet non-tender. Her lower limbs were markedly edematous with profound vulvar swelling. The cachexia was marked too.

Histopathological findings from two of the papules were consistent with metastatic adenocarcinoma.

There was positive TTF-1 (thyroid transcription factor) expression. This factor is present uniformly in the terminal respiratory unit, which comprises peripheral airway cells and small-sized bronchioles and plays a crucial role in normal lung function and morphogenesis.

In order to locate the primary tumour, multiple laboratory investigations were carried out.

Bilateral breast ultrasound was unremarkable. CT-chest showed moderate pleural effusion, hilar and mediastinal lymphadenopathy and an area of consolidation/ mass on right. Pleural fluid aspiration was performed under ultrasound guidance and subsequent cytology was suggestive of malignant effusion. Abdominal CT-scan revealed no organ enlargements but inguinal and para-aortic lymphadenopathy was noted. Metastatic nodules were also observed in the abdomen, and pelvis and bony metastasis at L1 and L4 and T6-T12. CEA levels were markedly raised however CA 125 and CA 15.5 were unremarkable. Complete blood examination revealed bicytopenia with neutrophilic leukocytosis. Serum uric acid level was raised, rest of lab investigations were within normal range.

**Summary:** We should be familiar with the predominant morphological features of cutaneous metastasis and should be vigilant enough to account for their rapid course of cutaneous manifestations as reported in our patient and any patient presenting with these lesions with or without systemic upsets should raise our index of suspicion to further investigate the patient for internal malignancies. More over Lung adenocarcinoma are thought to respond poorly to targeted therapies with a poor survival rate.

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**High-risk cutaneous squamous cell carcinoma in patients with low-risk tumor histologic features on initial biopsy**

**Purpose:** To identify patient demographics and non-histologic, pre-operative tumor characteristics that may aid in recognizing when a cutaneous squamous cell carcinoma (cSCC) with low-grade histology on initial biopsy may possibly be a high-risk cSCC.

**Design:** A retrospective case series of high-risk cSCC cases that underwent Mohs micrographic surgery between January 2019 and January 2021 was performed; tumors with low-risk tumor histology on initial biopsy were identified.

**Findings:** Fourteen (45.2%) of 31 patients with high-risk cSCC had biopsies demonstrating low-risk histology. Of these 14, 13 (92.9%) were male, 13 (92.9%) > 50 years old, 8 (57.1%) non-Hispanic white, 6 (42.9%) Hispanic/Latino, 6 (42.9%) immunosuppressed, 7 (50.0%) involved the forehead, and 8 (57.1%) had pre-operative greatest tumor diameter > 2 cm.

**Summary:** In this case series, nearly half (14 cases, 45.2%) of the high-risk cSCCs treated with Mohs micrographic surgery in a two-year period at our institution showed low-grade tumor histologic features on initial biopsy. Factors that appear to be associated with an increased risk of being subsequently diagnosed with a high-risk cSCC include male sex, age greater than 50 years, race including non-Hispanic white and Hispanic/Latino, immunosuppression, location on the head and neck but more notably on the forehead, and pre-operative greatest clinical tumor diameter greater than 2 cm. We hope that our findings may help dermatologists, dermatologic surgeons, and other physicians and surgeons anticipate possible situations in which a seemingly low-risk cSCC may in fact be high-risk, such that the appropriate method of surgical treatment, additional radiologic imaging, and potential multi-disciplinary care may be provided.
SKIN CANCER / MOHS / RECONSTRUCTION ABSTRACTS

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Assessing Patient Comprehension of Dermatologic Surgery Terms

Purpose: Patients who understand their diagnosis and treatment are more likely to be satisfied with their care as well as more compliant with treatment. There is disparity between patients and physicians regarding health communication. Dermatologic surgery is a specialized field of medicine with medical jargon that many patients may not understand.

The purpose of this study was to compare patients’ confidence in commonly used terms in dermatologic surgery versus the accuracy of their understanding.

Design: This was an institutional review board-approved survey of patients 18 and older from an academic dermatology clinic to complete a brief in-person survey which assessed comprehension of 12-terms. Each term was presented in a sentence for context. Participants rated their level of confidence in understanding each term using a 5-point Likert scale and then defined the term (5 denoted as extremely confident). Two blinded physicians graded each definition using a 5-point scale (termed “accuracy”, 5 denoted as completely accurate). Student t-tests were used to identify associations between patient confidence and physician-graded accuracy of understanding (p < 0.05 considered statistically significant). Fisher exact tests were substituted when parametric assumptions could not be verified.

Findings: Two-hundred respondents completed the survey (96% response rate) with an average age of 57 ± 20 years. The average patient confidence in Mohs terms was 3.90 ± 0.66, the average term accuracy was 3.26±0.93. Patients overestimated their knowledge (reported a confidence score higher than the physician graded accuracy score) 44% of the time. The terms patients were least confident in included secondary intention and Mohs surgery. The terms they were least accurate with included secondary intention and defect. College educated patients were more confident (3.98 ± 0.70 vs 3.76 ± 0.70, P < 0.001) and accurate (3.34 ± 0.98 vs 3.01 ± 0.91, p < 0.0001) in their definitions compared to those without college degrees. Patients without college education also overestimated more frequently (47% vs 44% with a college degree, p=0.04). Patients over 60 were more confident (4.02 ± 0.66 vs 3.77 ± 0.67, p < 0.0001) and accurate (3.33 ± 0.92 vs 3.17 ± 0.97, p=0.0184) when compared to younger patients. Patients with previous medical experience were more confident (4.13 ± 0.55 vs 3.82 ± 0.71, p < 0.0001) and more accurate (3.48 ±0.94 vs 3.18 ± 0.94, p < 0.001) compared to those without. Patients who previously underwent Mohs surgery were more confident (4.06 ± 0.62 vs 3.77 ± 0.76, p < 0.0001), accurate (3.58 ± 0.89 vs 2.98 ± 0.99, p < 0.0001), and less likely to overestimate (39% of the time vs 49%, p < 0.0001) compared to those who had not.

Summary: There is a gap in knowledge in commonly used dermatologic surgery terms among patients. Younger patients without a higher education, and without prior medical experience appear to be at increased risk of not understanding medical jargon. Patients who have a history of Mohs surgery or patients who lack a college education may be more likely to overestimate their understanding of these terms. Obtaining these patient demographics when treating patients may help to identify and stratify patients needing additional education regarding terminology being used.

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Diffuse Dermal Angiomatosis of the Bilateral Breasts Successfully Treated with Reduction Mammaplasty

Purpose: Diffuse dermal angiomatosis of the breasts (DDAB) is a rare, reactive diffuse proliferation of capillary vessels in the skin. Clinically, DDA presents as poorly circumscribed, tender, erythematous to violaceous plaques and purpuric patches that may ulcerate. Given the rarity of DDAB, there is currently no consensus on the best therapeutic approach. Management typically involves addressing underlying tissue hypoxia or ischemia. In this report, we present a case in which DDAB was treated with bilateral breast reduction.

Design: Case report.

Findings: A 33-year-old female presented to our clinic with a four-year history of severely painful lesions on both breasts, diagnosed as granulomatous mastitis. Physical exam demonstrated pendulous breasts with ulcerations on the inner lower quadrant of the left breast and hyperpigmentation/scarring on the right and left inner lower quadrants. Prior treatments included oral prednisone and methotrexate over the last four and three years respectively. An initial biopsy demonstrated healing skin without signs of granulomatous inflammation. Morphologically, diffuse dermal angiomatosis was suspected. A thrombotic work-up was negative (prothrombin time, INR, thrombin time, fibrinogen, d-dimer, antithrombin, protein C, protein S, prothrombin G20210A mutation, beta-2-glycoprotein, and phospholipids). MR chest angiogram demonstrated widely patent subclavian arteries and internal mammary arteries. Topical nitroglycerin/ lidocaine and oral nifedipine (60 mg daily) did not improve the patient’s pain or heal the ulcers. Treatment options were discussed with the patient and she elected to pursue bilateral mammoplasty. Twelve months after surgery, the patient had had complete resolution to her ulcerations and pain. She has had no recurrence nor required further treatment. Final surgical pathology confirmed a diagnosis of diffuse dermal angiomatosis.
**SKIN CANCER / MOHS / RECONSTRUCTION ABSTRACTS**

**Summary:** Although DDAB is rare, it is important to include in the differential of a patient presenting with bilateral breast lesions to ensure proper and timely treatment. Pathogenesis likely involves reactive vascular proliferation following prolonged ischemia of tissue. This can be due to various mechanisms such as vascular occlusion, trauma/surgery, hypercoagulability, smoking, or the mass of pendulous breasts. Management typically requires mitigate the tissue ischemia through approaches such as revascularization, which appears to be most effective, or other options with variable success. These include lifestyle changes and adjunct medical therapy such as isotretinoin, oral corticosteroids, and anticoagulants. If conservative medical therapy fails, reduction mammoplasty could be considered. Reports utilizing reduction mammoplasty for DDAB management are rare but reported cases demonstrate successful outcomes. Four previously reported cases with reduction mammoplasty management detailed no recurrence with follow-up times ranging from 3 months to 2.5 years. Additionally, two patients have been successfully treated with mastectomy. This report adds an additional case with no recurrence after twelve months follow-up. Given our current understanding of pathogenesis, the efficacy of mastectomy may be explained by the reduction in tissue mass allowing for improved blood circulation and oxygenation in the remaining tissue. This report adds to and supports the limited published experience of successful reduction mammoplasty for definitive treatment after conservative management has failed. This choice should be offered to patients who are refractory to less aggressive management.

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**Topical 5-fluorouracil as an alternative to surgery for squamous cell carcinoma in situ of the head and neck during the COVID-19 pandemic**

**Purpose:** Early in the COVID-19 pandemic, the National Comprehensive Cancer Network advised short delays in office-based treatments for certain skin cancers, including squamous cell carcinoma in situ (SCCIS). While surgeries were suspended, we recommended topical therapy with fluorouracil 5% cream (5-FU) for SCCIS of the head and neck. Studies of topical 5-FU for SCCIS report clinical clearance rates of 46-100% but are limited by small cohort sizes and varying treatment regimens. Further, it is unclear whether clearance rates differ on risk anatomic locations like the head and neck. We report our experience using topical 5-FU as a nonsurgical treatment for SCCIS of the head and neck during the COVID-19 pandemic.

**Design:** Immunocompetent patients with biopsy-proven SCCIS of the head and neck who were originally scheduled for Mohs micrographic surgery (MMS) between 3/16/20 and 4/30/20 were offered topical 5-FU as an alternative to surgery during the COVID-19 pandemic. Patients were instructed to apply 5-FU cream to the affected area nightly for 8-12 weeks as tolerated and mupirocin 2% ointment every morning. Clinic follow up was recommended approximately 12 weeks after initiating treatment.

**Findings:** All 14 patients with 17 lesions agreed to topical 5-FU therapy. The study cohort included 11 (79%) men and 3 (21%) women at an average age of 78 years (SD 7.0). The average tumor size was approximately 1.0 cm (SD 0.7). Patients on average completed 8.3 weeks (SD 4.4) of topical 5-FU. 17/17 (100%) lesions clinically resolved at an average of 15.4 weeks (SD 8.7) after starting therapy. Two lesions had persistent scale at initial follow up. One received cryotherapy and the other was biopsied which showed actinic keratosis. Both had resolved clinically at subsequent follow up. One patient developed a robust irritant dermatitis necessitating premature discontinuation of topical 5-FU at 3 weeks. The remaining patients experienced no or mild local side effects. There has been no clinical evidence of recurrence in an average of 7.9 months (SD 4.3) of follow up.

**Summary:** In the early COVID-19 pandemic when access to surgical services was limited, topical 5-FU was an effective nonsurgical treatment for SCCIS of the head and neck. While MMS and surgical excision have lower rates of tumor recurrence, medical therapy may be preferred in certain clinical settings. Patient preference, medical comorbidities, functional status, tumor characteristics, and access to surgical services must be considered. Disadvantages of topical therapy include long treatment duration and potentially decreased patient compliance. Patients who opt for topical therapy should be closely monitored for tumor recurrence. Despite our cohort including higher risk anatomic locations on the head and neck that were originally intended for surgery, we achieved 100% clinical clearance with no recurrences after an average follow up of 7.9 months. Limitations of this study include the small cohort size and lack of histologic confirmation of tumor clearance following topical therapy. Larger studies assessing the optimal topical 5-FU regimen will help guide future use of this nonsurgical treatment option for SCCIS.

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**Effect of field therapy prior to Mohs micrographic surgery on the number of stages required to clear cutaneous squamous cell carcinoma**

**Purpose:** Poorly defined cutaneous squamous cell carcinoma (SCC) is often seen on sun damaged skin. It is difficult to clinically delineate one SCC from surrounding actinic keratoses and adjacent squamous cell carcinoma in situ (SCCIs). We hypothesize that neo-adjuvant treatment with field therapy (FT) prior to Mohs micrographic surgery (MMS) may better define SCC clinical margins leading to fewer surgical stages.

**Design:** We performed a retrospective consecutive chart review of patients who received MMS by the senior author from November 2017 to November 2020. Immunocompetent patients who were previously followed in our department and received MMS for SCC or SCCIs were included. Charts were reviewed to determine whether patients were prescribed FT with 5-fluorouracil (5FU), photodynamic therapy (PDT), imiquimod, or ingenol mebutate to an area that included the surgical site in the two years prior to MMS.

**Findings:** 1582 patient charts were screened, 378 of which met criteria. 73 (19%) of patients were prescribed FT in the two years prior to MMS. Patient demographics and operative characteristics were similar between the FT and no field therapy (NFT) groups, including age, gender, tumor size and area, biopsy and MMS intraoperative pathology, Brigham and Women's Hospital stage, and postoperative defect size. FT patients were more likely to have had at least one prior skin cancer (88% in FT, 67% in NFT, p < .001). The 73 FT patients received 5FU (n=47, 64%), PDT (n=16, 22%), or imiquimod (n=8, 16%). None received ingenol mebutate. Treatment protocols were varied. The average number of stages required to clear tumor was 1.64 (SD 0.83) in all patients, 1.63 (SD 0.83) in NFT patients, and 1.68 (SD 0.83, p=0.47) in patients who were prescribed FT within the last 2 years. Patients who were prescribed FT within the last year and 5-FU within the last year required 1.59 (SD 0.70, p=.30) and 1.48 (SD 0.67) stages respectively. These reductions were not statistically significant. Independent of FT status, there was no significant association between the number of stages needed to clear tumor, patient demographics, nor operative characteristics listed previously.

**Summary:** The average number of stages required to clear SCC or SCCIs may be lower in patients who were treated with field therapy in the year prior to MMS when compared to patients who were not treated with field therapy within 2 years of MMS. While not statistically significant, the trend suggests a further decrease in stage count in patients who were treated with topical 5FU in the year prior to MMS. Patients who were treated with FT were more likely to have a history of at least one prior skin cancer when compared to NFT patients.
An atypical presentation of a primary dermal leiomyosarcoma

**Purpose:** The purpose of this case report is to document an atypical presentation of a primary dermal leiomyosarcoma as it presented on a proximal extremity of a 58-year-old female. This case will briefly discuss the patient's clinical presentation, histopathologic diagnosis, clinical as well as histologic differentials, current treatment modalities and finally prognosis. A succinct review will delineate between prognostic factors between primary dermal leiomyosarcomas and subcutaneous leiomyosarcomas.

**Design:** The design of this study is a case report and review of the literature regarding treatment modalities for leiomyosarcomas.

**Findings:** A 58-year-old Caucasian female with a past medical history of atrial fibrillation, hypertension, hyperlipidemia, and obstructive sleep apnea presented for evaluation of a solitary lesion present on her left anterior shoulder that had been present for approximately 9 months prior to examination. She reported rapid growth of the lesion since its onset, but denied any symptoms including pain, pruritus, bleeding, or ulceration. Physical exam demonstrated a 1.5-cm erythematous to violaceous polypoid, well-circumscribed nodule with superficial telangiectasias. The above clinical and histopathological correlation confirmed the diagnosis of a primary cutaneous leiomyosarcoma. Immunohistochemical stains for pan-cytokeratin, cytokeratin 5/6, S100, SOX-10, CD34, and Factor XIIIa were negative. Stains for P63 stain were focally positive, but mostly negative. Stains for CD10, epithelial mucin, smooth muscle actin, and desmin immunohistochemical stains were positive.

**Summary:** Split-thickness pinch grafts offer an alternative grafting technique for reconstruction of auricular defects with cartilage exposed with excellent cosmesis and rapid healing rates.

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**Co-Authors:** Anna Bar, MD; Alexander Witkowski, MD, PhD

**Pre-operative Imaging with Reflectance Confocal Microscopy for Margin Assessment of a Three-Time Recurrent Melanoma-In-Situ**

**Purpose:** Melanoma-in-situ (MIS) of the head and neck can pose a surgical challenge due to subclinical extension of the lesion and difficulty clearly defining tumor margins. This may lead to incomplete excision and a potential increase in local recurrence rates. Methods used to evaluate margins include clinical exam, Wood’s lamp, dermoscopy, and the use of “scouting” biopsies. Here we use reflectance confocal microscopy (RCM), an in-vivo, non-invasive, skin imaging tool that provides cellular-level resolution to define clinical margins of three-time recurrent MIS.

**Design:** Case report of a 69-year-old female referred for Mohs Micrographic Surgery (MMS) after brown pigment was noted at the medial and lateral aspects of a previously treated MIS scar. Biopsies from the pigmented areas demonstrated her third recurrence of MIS.

**Findings:** Split-thickness skin grafts are not commonly utilized due to sub-optimal cosmesis in most anatomic regions except in cases of large defects of the scalp or lower extremities. However, they may additionally be a reconstructive option for larger defects of the ear, where the natural thinness of the skin can offset cosmetic concerns, in patients who do not wish to undergo larger flaps or grafts. Pinch grafts are a subtype of split-thickness skin grafts that involve collecting small islands of donor tissue and overlaying them on the wound bed with 1 to 2 millimeters of spacing between the graft and wound edge. A mesh dressing or petrolatum-impregnated gauze dressing is applied and left in place for 1 week to maintain the graft. The advantages of pinch grafts over standard split-thickness skin grafts are more minimal donor tissue requirements and the avoidance of sutures. Pinch grafts may be considered in cases when the alternative is secondary intention wound healing and an increased healing rate is preferred. We present our experience on this reconstruction method in a case series of 4 patients with an average defect size of 227 mm2 (range, 110 to 425 mm2) with exposed cartilage. Average time to re-epithelialization was 55 days (range, 29 to 84 days). The grafting procedure was tolerated well with minimal scarring of the donor site and no post-operative complications. Cosmetic outcomes of all 4 cases were considered acceptable.

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**An atypical presentation of a primary dermal leiomyosarcoma**

**Purpose:** The purpose of this case report is to document an atypical presentation of a primary dermal leiomyosarcoma as it presented on a proximal extremity of a 58-year-old female. This case will briefly discuss the patient's clinical presentation, histopathologic diagnosis, clinical as well as histologic differentials, current treatment modalities and finally prognosis. A succinct review will delineate between prognostic factors between primary dermal leiomyosarcomas and subcutaneous leiomyosarcomas.

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**Summary:** Leiomyosarcomas represent a rare soft tissue malignancy that represent < 7% of soft tissue sarcomas. Leiomyosarcomas are categorized into dermal and subcutaneous based on dermatopathology. Each subcategory varies in terms of derivation, clinical features, treatment modalities, and prognostic factors. While primary dermal leiomyosarcomas carry an excellent prognosis, there is still a risk for recurrence and potential metastasis. Therefore, regular oncologic and cutaneous surveillance is recommended.

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**Use of split-thickness pinch grafts for auricular reconstruction**

**Purpose:** The aim of this study is to demonstrate the utility of split-thickness pinch grafts for auricular repairs with exposed cartilage after Mohs micrographic surgery in patients who are not candidates for other reconstructive options.

**Design:** We performed a case series of 4 patients who underwent Mohs micrographic surgery for auricular defects size 1cm2 or greater. Time to epithelialization was recorded and cosmetic outcome was assessed after wound healing.

**Findings:** Split-thickness skin grafts are not commonly utilized due to sub-optimal cosmesis in most anatomic regions except in cases of large defects of the scalp or lower extremities. However, they may additionally be a reconstructive option for larger defects of the ear, where the natural thinness of the skin can offset cosmetic concerns, in patients who do not wish to undergo larger flaps or grafts. Pinch grafts are a subtype of split-thickness skin grafts that involve collecting small islands of donor tissue and overlaying them on the wound bed with 1 to 2 millimeters of spacing between the graft and wound edge. A mesh dressing or petrolatum-impregnated gauze dressing is applied and left in place for 1 week to maintain the graft. The advantages of pinch grafts over standard split-thickness skin grafts are more minimal donor tissue requirements and the avoidance of sutures. Pinch grafts may be considered in cases when the alternative is secondary intention wound healing and an increased healing rate is preferred. We present our experience on this reconstruction method in a case series of 4 patients with an average defect size of 227 mm2 (range, 110 to 425 mm2) with exposed cartilage. Average time to re-epithelialization was 55 days (range, 29 to 84 days). The grafting procedure was tolerated well with minimal scarring of the donor site and no post-operative complications. Cosmetic outcomes of all 4 cases were considered acceptable.

**Primary Author:** May Eligash, MD, Resident, Oregon Health & Science University, Portland, OR

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**Purpose:** Melanoma-in-situ (MIS) of the head and neck can pose a surgical challenge due to subclinical extension of the lesion and difficulty clearly defining tumor margins. This may lead to incomplete excision and a potential increase in local recurrence rates. Methods used to evaluate margins include clinical exam, Wood’s lamp, dermoscopy, and the use of “scouting” biopsies. Here we use reflectance confocal microscopy (RCM), an in-vivo, non-invasive, skin imaging tool that provides cellular-level resolution to define clinical margins of three-time recurrent MIS.

**Design:** Case report of a 69-year-old female referred for Mohs Micrographic Surgery (MMS) after brown pigment was noted at the medial and lateral aspects of a previously treated MIS scar. Biopsies from the pigmented areas demonstrated her third recurrence of MIS.

**Findings:** On the morning of surgery, the RCM device was used to examine the visible brown pigment medially and lateral to the prior surgical scar. Pagetoid cells, cellular atypia, inflammation, and irregular dermal-epidermal junction architecture were observed, consistent confirmed diagnosis of recurrent MIS. RCM was then used to examine the clinically normal skin at the borders of the visible pigment, and surgical marker was used to map an outline with negative margins within 2mm of the last atypical cell present on RCM. MMS with MART-1 immunohistochemical staining was then performed starting with a 6mm margin from the RCM template. After 1 stage, residual microscopic tumor was found persisting in 2 of 6 specimens. The histology showed increased single melanocytes and nests of atypical melanocytes on a background of solar elastosis. After stage 2, the tumor was cleared. A final margin of 1cm from the RCM template was required to achieve clearance.

**Summary:** In a meta-analysis of five studies including 909 patients, the sensitivity and specificity of RCM for diagnosing melanocytic lesions was 93% (range 89-96%) and 76% (range 69-83%), respectively [1]. RCM has the potential to aid in pre-op planning by mapping tumor margins but is not without limitations. This case demonstrates that although helpful as a starting point in delineating the minimum defect size for poorly
circumscribed lesions such as MIS, the accuracy of RCM is not sufficient to replace histology for margin control. As such, there was residual tumor beyond the RCM template in 2 of 6 specimens. One possible explanation for this discordance is the location on the temple, an area with significant sun damage. Distinguishing MIS from melanocyte hyperplasia caused by chronic sun damage can be challenging on both histology and RCM. Additionally, this case represents a three-time recurrent MIS and there may be characteristics inherent to its multiple recurrences that make it a particularly challenging lesion. A prior study using RCM to map clinical tumor margins for MIS similarly had difficulty accurately predicting margins in recurrent tumors compared to initial tumors [2]. Our findings support previous studies demonstrating RCM for pre-op margin planning may perform better for non-recurrent MIS. Despite this, RCM may play an adjunct role in MIS in several ways. By creating an initial template, the efficiency of MIS may be increased by reducing the number of stages needed to clear a tumor. Additionally, providing a starting point of the minimum defect size can aid in reconstruction planning. For example, if RCM estimates a defect will be large and may require a skin graft or the assistance of other surgical specialists, this may be anticipated. Finally, RCM may prime patients for the size of their final MIS defect, which can be large for head and neck MIS, thereby setting patient expectations and ultimately increasing satisfaction.1. Stevenson AD, Mickan S, Mallett S, Ayya M. Systematic review of diagnostic accuracy of reflectance confocal microscopy for melanoma diagnosis in patients with clinically equivocal skin lesions. Dermatol Pract Concept. 2013;3(4):19-27.2. Yelamos O, Cordova M, Blank N, et al. Correlation of Handheld Reflectance Confocal Microscopy With Radial Video Mosaicing for Margin Mapping of Lentigo Maligna and Lentigo Maligna Melanoma. JAMA Dermatol. 2017;153(12):1278-1284. doi:10.1001/jamadermatol.2017.3114

**Summary:** RCM is a promising technique for tissue characterization and margin detection, but further research is needed to refine its accuracy and reliability for MIS. RCM has the potential to improve patient outcomes by providing valuable information that can guide treatment decisions and facilitate effective communication between the physician and patient.
their experience as one marked by a high level of shared decision making. Notably, this interaction led to a portion of the patients changing their preferred treatment option.

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**Mohs surgical site infection rates and pathogens for the mask-covered face during the COVID-19 pandemic vs. the pre-COVID era**

**Purpose:** Facial masks are a vital tool in limiting the transmission of SARS-CoV-2. While beneficial, masks are associated with facial skin adverse reactions, including worsening of preexisting dermatoses, pruritus, and abrasions. Patients utilize masks made from a variety of materials, all of which cover the lower and mid face. The significance of this alteration in the epithelial environment with regards to surgical site infection (SSI) is not known. This study aimed to identify shifts in SSI rates and causative microorganisms following Mohs micrographic surgery (MMS) on mask covered areas during the COVID pandemic compared to the pre-COVID era.

**Design:** Patient data was collected via retrospective chart review of all MMS cases performed by a single Mohs College fellowship-trained dermatologic surgeon at an academic medical center outpatient clinic. Data was obtained from two 7-month time periods, with 8/6/2019 to 3/21/2020 representing the pre-facial mask “control” period and 5/6/2020 to 12/21/2020 representing the COVID period. 5/6/2020 was selected as the start date of the facial mask period because the academic hospital system and all affiliates instituted a universal mask requirement for all healthcare workers, patients and visitors at that time.

SSI was defined as a diagnosis of wound infection by the surgeon in addition to the isolation of pathogenic organisms from bacterial culture of the operative wound within the first 30 days after surgery. Facial masked sites were defined as: nose, nasolabial fold, cutaneous or mucosal lip, and chin. Cheek locations were not included due to variability in lateral facial coverage between different types of masks. The study protocol was exempted by the Washington University Institutional Review Board. Differences between the two cohorts were compared using the Chi Square and t-test. P < 0.05 was considered significant. Statistical analysis was performed using SPSS v26 (IBM, Armonk, NY).

**Findings:** 819 MMS cases were performed on 754 patients. 304 cases were performed pre-COVID and 515 during COVID. There were no significant differences in baseline demographics, skin cancer type, or surgical repair technique pre-COVID vs. COVID (p < 0.05 for all). 69 cases (22.7%) were performed on mask-covered facial locations pre-COVID with 100 such cases (19.4%) performed during COVID. 16 SSIs occurred, with 7 (2.3%) and 9 (1.7%) occurring during the pre-mask and mask periods, respectively. For mask-covered locations, infection occurred in 0/69 cases pre-COVID (0%) vs. 4/100 cases during COVID (4%) (p=0.09). Mask location SSIs composed 44.4% of total infections during COVID. All mask location SSIs during the mask period were caused by gram-negative bacteria vs. 7 of 9 SSIs (77.8%) during COVID (p=0.19). Antibiotic prophylaxis management did not change during the two periods.

**Summary:** An increased rate of SSIs of the mask-covered face, with a higher proportion of gram-negative bacterial infections were observed during the COVID-19 pandemic. The mechanism underlying these findings, whether directly mask related or secondary to changes in patient behaviors, remains unclear. Further studies are needed to evaluate the potential infectious risk of facial masking and to guide post-operative counseling and antibiotic management. Limitations of this study include the small sample size and variability in patient mask type and wearing habits.

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**Perioperative Practices in Dermatologic Surgery**

**Purpose:** Mohs micrographic surgery is generally safe and well tolerated. Surgical site infection is the most commonly encountered complication followed by poor wound healing and bleeding, typically in the setting of anticoagulation. Various perioperative practices are employed with the aim of reducing adverse events; however, implementation is variable and limited efficacy data is available. This study sought to assess perioperative practice patterns among dermatologic surgeons with regards to antibiotic prophylaxis, anticoagulation, antiseptic choice, and activity restrictions.

**Design:** Two surveys were distributed by the American College of Mohs Surgery (ACMS) and the American Society for Mohs Surgery (ASMS) to their membership via email from May to July 2021. A response time of 6 weeks was allowed prior to data analysis. The study was exempted by the Washington University institutional review board.

**Findings:** 177 surgeons participated in the surveys, with membership from ACMS (61%), ASMS (35%), or both organizations (4%) represented. Participants were at different stages in their careers and practiced in 37 states. Systemic antibiotic prophylaxis is prescribed preoperatively by 96% (162/168) and postoperatively by 91% (161/177) of surgeons for variable clinical indications. The majority of surgeons report prescribing postoperative antibiotics rarely (68%, 121/177) followed by often (20%, 35/177), always (3%, 5/177), and never (9%, 16/177). Therapeutic antiplatelet and anticoagulant medications are rarely held (3-5%, 4-7/149) or more commonly held. The majority of respondents use chlorhexidine as their primary preoperative antiseptic (74%, 110/148) followed by povidone-iodine (35%, 80/149) and sulfadiazine (25%, 33/149), and supplements known to have an anticoagulant effect (54%, 80/149) are more commonly held. The majority of respondents use warfarin as their primary anticoagulant (44%, 63/149) followed by aspirin (26%, 38/149) and anticoagulant agents (6%, 9/149), and antiplatelet medications are rarely held (3%, 4/177). Most surgeons reported holding therapeutic agents for 4-7 days postoperatively (70%, 74/105) or rarely (68%, 69/100) following poor wound healing and bleeding.

**Summary:** Perioperative practices of dermatologic surgeons with regards to antibiotic prophylaxis, management of anticoagulant and antiplatelet agents, antisepsis, and activity restrictions are variable and where applicable, often deviate from guidelines. Since the last advisory statement on antibiotic prophylaxis for the prevention of infective endocarditis and prosthetic joint infection in dermatologic surgery in 2008, major updates have been made to authoritative guidelines. These findings underscore the need for standardization and updated guidelines for perioperative practices in dermatologic surgery.

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**Patient Discomfort During Mohs Surgery Compared to Other Common Medical Procedures**
SKIN CANCER / MOHS / RECONSTRUCTION ABSTRACTS

Purpose: The purpose of this study was to evaluate patients’ level of discomfort during Mohs Micrographic Surgery (MMS) compared to other routine medical procedures.

Design: This was a prospective, cross-sectional, study approved by the University of Nebraska Medical Center Institutional Review Board (IRB). Patients were recruited at the time of their MMS at a university-based dermatology clinic with two dermatologic surgeons over a 7-month period. Two hundred seventy-three consecutive patients were approached for participation with 227 agreeing to participate on the day of surgery and 160 that were able to be reached by telephone at one month follow-up.

Findings: The overwhelming majority of patients 141/160 (88.1%) indicated that they experienced ‘a little bit’ or ‘none at all’ in regards to discomfort during MMS. There was no significant difference between those who experienced ‘very much’ or ‘quite a bit’ (19/160, 11.9%) discomfort with MMS compared to teeth cleaning (12/150, 8%), prostate exam (7/72, 9.8%) or mammogram (12/63, 19%). Interestingly, significantly more patients experienced ‘very much’ or ‘quite a bit’ discomfort with liquid nitrogen therapy than they did with MMS (p=0.004). Fewer patients reported ‘very much’ or ‘quite a bit’ discomfort with colonoscopy than they did with MMS (p=0.004). When patients were asked if they would be willing to undergo Mohs in the future if recommended by their physician, 97% reported they would have no hesitations.

Summary: This study illustrates that most patients experience minimal discomfort with MMS. Reported discomfort with MMS was similar to teeth cleaning, mammogram, and prostate exam. Interestingly, it demonstrated higher rates of patient discomfort with liquid nitrogen therapy compared to MMS, which may be due to multiple reasons, including lack of anesthetic, shorter counseling, and less post-procedural follow up. Being able to compare MMS to other common procedures can help the physician to better connect with their patients, counsel them preoperatively, and ultimately help improve their experience.

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Large Basal Cell Carcinoma In A 101-Year-Old Female

Purpose: To present a case of a 101-year-old female with large basal cell carcinoma treated with Mohs micrographic surgery and reconstructed with rotational cheek flap. To discuss the advantages of Mohs micrographic surgery in the management of basal cell carcinoma in a centenarian. To discuss the advantages of rotational cheek flap as an option for large defect on the cheek in a centenarian.

Design: Case Report.

Findings: We present a case of a 101-year-old female with a 15-year history of slowly enlarging solitary 3.5 cm x 4 cm x 2.5 cm hyperpigmented, exudative ulcerative tumor with undulating margins and with surrounding telangiectasia and associated whitish, foul-smelling discharge over the right malar area. One-year history of progressive pain (PS 10/10) prompted the patient to seek consultation. Pre-operative laboratory workup showed normal findings. Histopathology was consistent with a pigmented nodular basal cell carcinoma. Mohs micrographic surgery and rotational cheek flap were performed with good wound healing.

Summary: Despite the limited options of medical and physical management due to decreased life expectancy of centenarians, Mohs micrographic surgery (MMS) remains the standard of therapy in high risk BCC. MMS with reconstruction using the rotational cheek flap is generally safe, effective and a good modality with no increased risk of peri- and post-operative complications and no disfigurement.

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Multiple Myeloma as a Potential Risk Factor for Catastrophic Squamous Cell Carcinoma

Purpose: 1) To highlight the possible association of multiple myeloma with aggressive and advanced forms of cutaneous squamous cell carcinoma. 2) To suggest that this association should be investigated further. 3) To suggest that physicians should be cognizant of this comorbidity when treating cSCC, and consider closer follow-up of these patients for surveillance of recurrent or progressive disease.

Design: Case series and literature review.

Findings: This is a case series of two patients with multiple myeloma who were referred for Mohs micrographic surgery (MMS) for cutaneous squamous cell carcinoma (cSCC). Despite clear margins with MMS and close clinical follow up, both patients experienced local recurrences, in-transit metastases and ultimately extensive regional disease. Both patients underwent multiple surgical procedures. Patient 1 is a 70-year-old female with a poorly-differentiated cSCC of the scalp, which recurred locally twice, and was treated with concurrent post-operative radiation and cemiplimab once regional progression was noted. Patient 2 is a 73-year-old male with a locally advanced cSCC of the trapezial neck, which recurred 3 times after surgery and has progressed to significant regional disease. He is to begin XRT as well as systemic cemiplimab. Treatment is still ongoing in these patients. The advanced and recurrent nature of the cSCC found in these patients lead to the hypothesis that their underlying multiple myeloma (MM) may represent an important contributing risk factor. A literature search was performed, with a paucity of data noted on this topic. The current data is reviewed, with findings suggesting an increased occurrence of skin cancers in MM patients, with a high proportion being cSCC [1]. One large population based study found standardized incidence ratios (SIR) for nonmelanoma skin cancer (NMSC) in MM patients to be 2.22 relative to controls [2], while another found the SIR for cSCC in MM patients to be 2.44 (lifet ime) and 2.27 (post-MM diagnosis) [1]. It is unclear if this association is due to a relative state of immunosuppression from the hematologic malignancy itself, secondary to immunosuppressive agents used to treat MM, or if there is another underlying factor that increases a person’s risk for both MM and cSCC. There is no current data that addresses the growth rate, recurrence, or metastatic potential in the MM population specifically, however it is well known that MM resists more aggressively with worse outcomes in other immunosuppressed conditions [1, 3, 4]. The potential association of aggressive cSCC with MM may suggest a role for checkpoint inhibitors (i.e. PD-L1 blockade [5]) for targeting both malignancies, however the use of these agents in MM is still under study.

Summary: MM may be an important risk factor for advanced and recurrent cSCC. This potential risk might be secondary to MM induced relative immunosuppression. The two cases presented demonstrate the aggressive potential of cSCC in this patient population and the need for higher intensity treatment and surveillance. This observed association warrants further investigation, especially given the existing data that demonstrates cSCC occurs at higher rates in MM patients. Finally, we recommend physicians treating cSCC in MM patients consider this potential for aggressive disease when planning management and surveillance of these patients.

References:
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Surgical outcomes following Mohs micrographic surgery for Basal cell carcinoma on the distal third of the nose using the Vancouver Scar Scale

Purpose: Mohs micrographic surgery (MMS) is the preferred treatment option for basal cell carcinoma (BCC) on cosmetically sensitive areas such as the nose [1]. It provides highest tumor cure rates through complete margin control and allows for maximal tissue conservation [1, 2]. Repair on nasal structures is particularly challenging due to the area’s unique anatomy, varying degrees of convexity and concavity in close proximity, and the relative paucity of redundant skin to utilize [3]. The goal of this study is to assess the outcomes of surgical reconstruction, with a particular focus on local tissue flaps, full thickness skin grafting (FTSG), and secondary intention (SI) after Mohs micrographic surgery for BCC on nasal structures of the lower third of the nose, utilizing the Vancouver Scar Scale (VSS).

Design: A retrospective chart review was completed via electronic record review from June 2019 to June 2020. This research activity was determined to be exempt from Institutional Review Board oversight. There were 77 consecutive patients referred for MMS of biopsy proven BCC on the lower third of the nose, including the nasal alae, infratip, and supratip. VSS was recorded at 6 months post-operatively. VSS is a standardized grading instrument used to objectively measure a surgical scar [3]. It is comprised of four parameters: pigmentation, vascularity, pliability, and height. Based on this score, patients may fall into three categories: low (0–3), medium (4–6), and high (7–13). Descriptive statistics were recorded. Demographics, histologic subtype of BCC, pre-operative size, final defect size, depth of tumor invasion, number of stages required to clear tumor, type of repair, and sebaceous quality of the nose were recorded. We performed Pearson Chi-square and Fisher’s Exact tests to examine the association between the main predictor variables and VSS.

Findings: Of the 77 patients accepted to this study, 38 were male and 39 were female. Eleven patients were lost to follow up. The average age was 70 years old (standard deviation 10.7). Patients were predominantly Caucasian (95%), followed by Hispanic (5%). The most frequent BCC histologic subtype was nodular (48.05%) followed by infiltrative (23.38%), mixed subtype (16.88%), and superficial (11.69%). Skin malignancies were located on the infratip (22.7%), nasal ala (51.5%), and supratip (25.8%). The most frequent repair was a local skin flap (62.34%), followed by FTSG (33.77%), and SI (3.90%). Bivariate analysis demonstrated that repair type employed was significantly associated with VSS at 6 months (p < 0.0001); the use of a local skin flap on the distal third of the nose may be predictive of a low VSS at 6 months. Notably, age (p = 0.90), gender (p = 0.08), ethnicity (p = 0.52), location of BCC (p = 0.98), histologic subtype (p = 0.82), depth of tumor invasion (p = 0.60), number of stages required to clear tumor (p = 0.18), preoperative size (p = 0.6), postoperative size (p = 0.9) and sebaceous quality of the skin (p = 0.13) were not associated with a difference in VSS at 6-months post-operative.

Summary: Our findings indicate that there is a statistically significant difference in the type of repair type employed and the VSS at 6-months mark (p < 0.05). It is notable that for the 42 patients who underwent a local skin flap, 40 (95.24%) resulted in low VSS, 2 (4.76%) resulted in medium VSS, and zero resulted in a high VSS. For the 21 patients who underwent a FTSG, 9 (42.86%) resulted in a low VSS, 9 (42.86%) resulted in medium VSS, and 3 (14.28%) resulted in high VSS. Our findings mirror others showing that local skin flaps provide better surgical and cosmetic outcomes compared to FTSG. In a study investigating patient satisfaction of 86 patients after MMS, Lee et al. found that patients were more satisfied following local skin flaps versus FTSG [4]. These findings indicate that local skin flaps may result in a lower VSS at 6 months compared to FTSG or SI, therefore offering superior surgical outcomes in the treatment of BCC on the distal third of the nose.
SKIN CANCER / MOHS / RECONSTRUCTION ABSTRACTS

**Findings:** Patient #1 is a Hispanic female who presented with a nodular basal cell carcinoma of the nasal dorsum and nasal tip. Resulting defects were 0.7 x 0.7 cm and 0.8 x 0.8 cm of the nasal dorsum and nasal tip, respectively, with a depth to fibroadipose tissue after 1 stage of Mohs micrographic surgery (MMS) for both lesions. Patient #2 is a middle-aged woman who presented with an ill-defined nodular basal cell carcinoma of the nasal dorsum and right nasal supratip. After 2 stages of MMS, she had a 1.4 x 1.2 cm defect on the nasal dorsum, and after 2 stages, she had a 1.6 cm x 1.2 cm defect on the right nasal supratip. We performed the EWE flap and closed their defects with subcutaneous sutures and superficial simple running and simple interrupted sutures. Patient #1 recently underwent their repair with good wound approximation and no issues at 1 week follow-up. Patient #2 had a favorable cosmetic and functional outcome at six-month follow-up.

**Summary:** Essentially, the EWE flap shifts the superior standing cone of the original east-west flap medially to incorporate the superior defect. The inferior standing cone should still be placed exactly midline, bisecting the columella toward the intercural sulcus. Skin that would otherwise be excised as a standing cone deformity in a primary closure of a midline defect is preserved on a robust pedicle and advanced to reconstruct the paramedian defect. Depending on defect location, the superior closure segment may cross the nasal midline as it did in both our cases. However, the scar remains well camouflaged in our patient at six-month follow up. Benefits to this flap are its ease of execution, quick application, robust pedicle, good color and texture match, and tension vectors directed perpendicular to free margins. Because undermining is performed at the perichondrial plane and extended to the nasofacial sulcus bilaterally and because the defects are squared off, pincushioning is unlikely. Furthermore, this allows for single staged repair of defects that might otherwise be reconstructed with multistage interpolation flaps. Our second case shows flap viability, inconspicuous scar pattern, and no alar rim distortion with defects larger than 1 cm. Similar to the east-west flap, alternatives should be considered for alar crease or lateral nasal sidewall defects. Defects larger than 1.5 cm may not be feasible given possible unacceptable distortion ("bowing") of the nasal columella and/or flaring of the nasal alae. However, this can be at least partially mitigated by an interdomal stitch or the use of grafts from the redundant cones.

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A retrospective cohort study comparing number of Mohs stages, pre- and postoperative sizes, and repair type for chronic lymphocytic leukemia, solid organ transplant and non-immunosuppressed patients.

**Purpose:** Chronic lymphocytic leukemia (CLL) ranks among the more common cancers in the United States. Patients with hematologic malignancy such as CLL are classified as immunocompromised in the 2012 appropriate use criteria for Mohs micrographic surgery. Patients with CLL have a higher-than-expected recurrence rate of both BCC and SCC after Mohs surgery. Additionally, patients who have CLL and develop skin cancer have higher metastasis and mortality rates. Immunosuppression, both from treatments as well as the disease itself, has been proposed as one potential explanation for increased skin cancer risk and poorer outcomes in CLL. Operative surgical expectations in CLL patients treated by Mohs surgery for BCC or SCC have not been previously reported. We will compare number of Mohs stages, pre- and postoperative tumor sizes, and the type of repair used to treat BCC and SCC in CLL, solid organ transplant, and non-immunosuppressed controls. These results would be useful in operative planning and in patient counseling.

**Design:** In this retrospective cohort study, patient cohorts with CLL, solid organ transplant, and non-immunosuppressed controls will be matched by age, gender, tumor histology, time from biopsy to surgery, tumor location (H, M, L), and primary vs recurrent tumor. SlicerDicer in Epic EMR will be used to identify populations with history of CLL or solid organ transplantation who also underwent Mohs surgery for BCC or SCC at Washington University in Saint Louis between May 2018 and May 2021. These cohorts will be matched with non-immunosuppressed controls identified from the Mohs surgery logs. Charts will be manually reviewed to confirm eligibility. Primary outcomes will include number of Mohs stages, pre- and postoperative sizes, and the type of repair.

**Findings:** Study in progress. There are 80 patients with CLL that were identified by SlicerDicer. These are being compared with 80 matched solid organ transplant patients and 80 matched non-immunosuppressed controls.

**Summary:** Study in progress.

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Impact of Antibiotics on Postoperative Surgical Site Infection Rate Following Mohs Micrographic Surgery in Patients with Individual Risk Factors

**Purpose:** Surgical site infection (SSI) rate following Mohs micrographic surgery (MMS) appears to be low based on studies to date. However, the dermatologic literature surrounding SSI is less clear concerning patients with conditions generally associated with increased postoperative complications. How comorbidities such as diabetes, obesity, immunosuppression, and smoking affect postoperative SSI incidence in MMS is poorly understood. Antibiotics may be prescribed to patients undergoing MMS based on clinical judgement, as there is paucity of published literature available to provide guidelines in decision-making. Yet, the impact of antibiotics on reducing SSI incidence among patients with potential risk factors is largely unknown. To better characterize the utility of antibiotics for higher risk MMS patients, our study aims to determine the rate of SSI in a cohort of patients with individual risk factors with and without administration of peri- or postoperative antibiotics.

**Design:** We conducted a 5-year retrospective review of patients undergoing MMS at a single academic center in the United States. Exclusion criteria included patients under 18 years old and those who underwent reconstruction outside of our Department of Dermatology. Patients underwent substratification based on whether an antibiotic prescription was administered on the day of surgery. SSI incidence was evaluated in each group and compared by presence or absence of each of the following individual risk factors: diabetes, history of solid organ transplant, tobacco use, obesity, high-risk site, utilization of flap or graft for repair, and secondary intention healing. Differences in SSI rate among each analyzed variable were expressed as odds ratios. Two-sided tests with P < 0.05 were considered significant.

**Findings:** A total of 3,597 cases from 2,314 patients were evaluated for postoperative SSI. Overall rate of SSI in our cohort was calculated at 1.5%. An antibiotic prescription was administered in 1,985 (55.2%) cases, whereas no prescription was provided in 1,612 (44.8%) cases. SSI among patients who were prescribed antibiotics was 2.0% compared to 0.9% among patients who were not prescribed antibiotics (p = 0.008, OR = 2.28, 95% CI = 1.24–4.23). In patients who were prescribed antibiotics, significant differences in SSI were noted in current tobacco users compared to non-users (p = 0.0012, OR = 3.51, 95% CI = 1.64–7.54) as well as cases in which a flap or graft was utilized compared to other
Summary: In our cohort, SSI rate among those prescribed antibiotics was significantly higher than those who were not prescribed antibiotics. Among those prescribed antibiotics, tobacco use and flaps/grafts were identified as individual factors for increased risk of SSI despite antibiotic administration. When evaluating any individual risk factor, no difference in SSI was detected in patients who were not prescribed antibiotics. Further investigation is necessary regarding the etiology of increased SSI among patients prescribed antibiotics in specific clinical settings.

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Mohs surgery on the superior helix results in ulceration of an untouched antihelix

Purpose: The purpose of this presentation is to review the complex external auricular vasculature, particularly the post-auricular perforators, and highlight an interesting clinical implication that may occur if they are compromised during Mohs micrographic surgery (MMS) or reconstruction.

Design: We describe a case of antihelix ulceration that appeared seven days after MMS was utilized to treat a squamous cell carcinoma on the superior helix. In this case, the defect was repaired with a post-auricular advancement flap. We propose that a perforating artery of the post-auricular vessel was damaged during flap preparation, resulting in ischemic ulceration of the antihelix.

Findings: Three perforating vessels from the post-auricular artery serve as the blood supply to the antihelix of the anterior ear. In our case, a stellate ulceration of the antihelix occurred one week following MMS with a post-auricular advancement flap. We propose that a perforating artery of the post-auricular vessel was damaged during flap preparation, resulting in ischemic ulceration of the antihelix.

Summary: Injury may occur to one or more of the post-auricular perforating vessels during MMS or reconstruction, leading to necrosis and ulceration of the anterior antihelix. A thorough understanding of external auricular vasculature is imperative to decrease incidence of vascular injury.

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Treatment of Merkel Cell Carcinoma: A Systematic Review and Meta-Analysis

Purpose: To systematically review the published data on recurrence and mortality rates associated with various treatment approaches for Merkel cell carcinoma.

Design: Search of MEDLINE, Embase, Web of Science, and Scopus from inception to August 2015. Studies were included that reported comparative survival and recurrence data for 2 or more treatment modalities. Two reviewers independently reviewed and abstracted recurrence and mortality rates. Event rates for individual treatment arms in each study were pooled and meta-analyzed across studies using a random-effects model.

Findings: 52 retrospective studies that met inclusion criteria, revealing a total of 1,804 patients with primary Merkel cell carcinoma with data available for analyses. The recurrence rate was higher for surgery alone (53.0%) versus a combination of surgery and radiotherapy (37.5%) (odds ratio, 2.117; 95% CI, 1.408-3.183; P < .001). Combination therapy including surgery, radiotherapy, and chemotherapy had a higher mortality rate (44.6%) than did combined surgery and radiotherapy (23.2%) (odds ratio, 2.688; 95% CI, 1.196-6.037; P=.02).

Summary: The treatment of Merkel cell carcinoma with surgery plus adjuvant radiotherapy may produce lower recurrence rates.

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Surgical techniques following free cartilage grafting

Purpose: To characterize surgical techniques following free cartilage grafting.

Design: A comprehensive literature review was performed using the Embase, PubMed Medline, Cochrane Library, ClinicalTrials.gov, and Web of Science databases from inception to January 1, 2020. Studies describing free cartilage grafts harvested from the ear or nose under local anesthesia, specifically for reconstruction of facial surgical defects, were selected for inclusion. Only surgical defects from tumor resection were included.

Findings: In total, 33 studies involving 584 patients with 594 surgical defects met inclusion criteria. The mean age of patients was 63.3 ± 10.4 years. Free cartilage grafts were most commonly harvested from the ear (93.1%). The most common recipient site was the nose (88.2%), followed by the lower eyelid (9.1%) and ear (3.7%). 75.9% of surgical defects were confined to the nasal ala cosmetic subunit, and all free cartilage grafts utilized in these cases were harvested from the ear, most commonly the conchal bowl or antihelix. 12% of surgical defects involved the nasal ala and other nasal cosmetic subunits. For these multi-subunit reconstructions, 60% of free cartilage grafts were harvested from the ear and 40% from the nose. 3.7% of surgical defects involved the ear and all free cartilage grafts utilized in these cases were harvested from the ear. Both anterior and posterior approaches for harvesting ear cartilage were described. An anterior approach is beneficial due to easy accessibility and the ability to hide the donor site within the concavity of the conchal bowl. A posterior approach is sometimes favored because the donor site scar is well-concealed.

Summary: Free cartilage grafts are a versatile reconstructive option for patients with deep or cartilaginous defects with compromised structural support on the nose, ear, or eyelid.

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Understanding Perceived Barriers of Applicants to Mohs Micrographic Surgery Fellowship

Purpose: The population of the United States is becoming increasingly diverse, but the field of dermatology lags far behind with respect to workforce intersectionality, particularly the field of Mohs micrographic surgery (MMS). It is important to understand this stark discrepancy as skin cancer morbidity and mortality is highest among African Americans and
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Hispanics. This survey study investigates perceived barriers to under-represented minority (URM) groups in medicine pursuing fellowship in Mohs micrographic surgery and dermatologic oncology (MSDO).

**Design:** An IRB-approved survey was conducted between December 2020 and April 2021. The survey was distributed electronically to accredited dermatology residency programs. Demographic information was collected, and participants were asked to rate potential barriers to pursuing MSDO fellowship on a Likert scale (1 = not important and 5 = very important). Under-represented groups were defined as African American, Hispanic, Native American, and Pacific Islander. Low-income was defined as an annual household income below $40,000. Statistical analysis was performed with SPSS.

**Findings:** One hundred and thirty-three dermatology residents responded to the survey. Of the participants, 21% identified as a URM, and 13% were raised in low-income households. There was no statistically significant difference in interest in applying to MSDO fellowship reported by residents who identified as URM compared to those who did not. The majority (54%) of residents who self-identified as URM were interested in MMS and interested in applying for MSDO fellowship. The number of excisions and repairs performed during residency as well as the subjective rating of surgical confidence did not differ by gender, race, and socioeconomic group, as well as among those interested in MMS and applying to MSDO fellowship compared to those not interested and not applying to fellowship.

URMs rated the following factors significantly higher when deciding to pursue MSDO fellowship: lack of perceived diversity in target patient population (mean 3.61, SD 1.66), race/ethnicity/gender of past MSDO fellows (mean 3.25, SD 1.71), perceived attitudes of MSDO fellowships towards an applicant’s race or ethnicity (mean 3.25, 1.65 SD), and lack of diversity of trainees and faculty in MMS (mean 3.61, SD 1.47). Ratings of the following factors did not differ by race: medical school performance, chief resident position, surgical experience, the presence of MSDO faculty or fellowship program at the home institution, support of MSDO surgeon mentor, away rotations, research, financial burden and risk of not matching.

**Summary:** Overall, dermatology residents from groups historically underrepresented in medicine reported being as interested in applying for MSDO fellowship as their counterparts. Surgical experience and surgical confidence did not differ between URM groups and others. However, barriers identified by residents from URM groups included a lack of diversity in target patient populations, lack of diversity among MMS trainees and faculty, as well as perceived negative perceptions of minority residents by fellowships. This study is one of the first to evaluate barriers to diversifying the MMS workforce. The barriers we have identified are complex and require concerted efforts for improvement.

**References:**

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**Extraocular sebaceous carcinoma treated with Mohs micrographic surgery: A 24-year retrospective review of tumor characteristics and treatment outcomes**

**Purpose:** Extraocular sebaceous carcinoma is rare, with distinct features from its ocular counterpart. These neoplasms have been associated with Muir-Torre syndrome. Associated internal malignancies include gastrointestinal and genitourinary. Our objective was to assess for local recurrence, metastasis, disease-specific death, and additional malignancies in patients with extraocular sebaceous carcinoma treated with Mohs micrographic surgery at a single referral center.

**Design:** Institutional Review Board approval was obtained before conducting a retrospective review. Patients with extraocular sebaceous carcinoma treated with Mohs micrographic surgery between 1995 and 2019 were reviewed. Follow up was obtained by extensive chart review. A follow up encounter was considered valid if the patient had a dedicated skin exam with attention to the relevant site. A search was also conducted of all lifetime anatomic pathology results for additional malignancies, cutaneous and visceral.

**Findings:** Thirty-eight patients with a total of 41 extraocular sebaceous carcinomas were included. Twenty-five of the patients were male and thirteen were female. Ages ranged from 57 to 98 years (mean, 75). Thirty-one of 41 tumors (76%) were located on the head or neck. Three tumors were treated with the standard Mohs technique, processing and analyzing frozen specimens. The additional 38 tumors were treated with a modified Mohs technique using fixed tissue and permanent sectioning with overnight processing. The first layer for all tumors was excised with a 6-10 mm
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Modified Mohs Micrographic Surgery for the Treatment of Periocular Melanoma

Purpose: Periocular melanoma is extremely rare, but associated with significant disfigurement, morbidity and even mortality, especially given the risk of deeper invasion into the orbit. Studies documenting the management of periocular melanoma are limited, and very few provide information on long-term outcomes. Our objective was to report our long-term experience in the treatment of periocular melanoma using a staged, modified Mohs excision technique with rush permanent, paraffin-embedded tissue sections.

Design: We conducted a retrospective review cohort study. Patients with melanoma and melanoma in situ in the periorbital skin, defined as the upper and lower eyelid, medial and lateral canthus, conjunctiva, and brow, treated with modified Mohs micrographic surgery between 2006 and 2019 were included for review. A total sample of n = 45 subjects were included for the present study.

Findings: A total of n = 45 patients with periocular melanoma treated with modified Mohs micrographic surgery between November 2006 and July 2019 were identified, including 12 (26.7%) patients with invasive melanoma and 33 (73.3%) patients with MIS. Twenty-one (46%) patients were male and twenty-four (53%) were female. Mean age at diagnosis ranged from 51 to 93 years, with a mean of 71 years (SD: 12 years). At initial presentation, 40 (88.9%) tumors were primary, while 5 (11.1%) tumors had been previously excised. Nineteen (42%) tumors occurred on the right periocular skin, and 26 (58%) occurred on the left. Tumor locations included the following: lower eyelid (9, 20%), upper eyelid (3, 7%), lateral canthus (9, 20%), medial canthus (1, 2%), and brow (6, 13%). No tumors of the conjunctiva were identified. Of the 12 patients with invasive melanoma, subtypes included four (33%) cases of lentigo maligna melanoma, one (8%) nodular melanoma, one (8%) spindle cell melanoma, four (33%) superficial spreading melanoma, and two (17%) not otherwise specified. Of the cases of melanoma in situ, four (12%) were lentigo maligna. Median Breslow depth was 0.75 mm (IQR: 0.83mm). The median preoperative size was 1.20 cm2 and the median postoperative size was 8.68 cm2. Median surgical margins of 15 mm were required for tumor clearance in invasive melanoma and 12 mm in melanoma in-situ. Five (11%) recurrent tumors were identified, with an average time to recurrence of 3.25 years. There were no incidences of metastasis or disease-specific death at a median follow up period of 6 months.

Summary: In conclusion, we report a large series of periocular melanoma treated with modified Mohs micrographic surgery using rush, permanent, paraffin-embedded tissue sections for 100% margin control. This study further validates Mohs micrographic surgery as a durable treatment of periocular melanoma.

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An Introduction to Mohs Micrographic Surgery: A novel active learning experience

Featured at the Best of Skin Cancer / Reconstruction Abstracts on Saturday, Nov. 20 from 5:15 - 6:15 p.m. CT

Purpose: Mohs micrographic surgery (MMS) can be a challenging concept for dermatology residents and medical students to master. MMS training can vary between residency programs and even between trainees at the same program. Studies have shown that dermatology residents want more surgical training, regardless of their current training. Research has shown that active learning improves retention and is preferred over passive learning. We present a novel workshop aimed at improving the understanding of, and ability to complete, the steps involved in MMS.

Design: The MMS Workshop is an active-learning experience for dermatology residents to understand the concepts and improve skills in MMS. Residents completed the anonymous pre- and post-test surveys. Each resident was provided with a porcine skin substitute with a “tumor” drawn on. Residents were instructed on proper technique to remove the first stage, and subsequently surgically excised the first stage. Control frozen-section histopathology slides from a known positive Mohs case were reviewed and mapped as the “first stage”. Based on the map, residents proceeded to remove the second stage. A second control slide was evaluated for clearance of the tumor.

Findings: A statistically significant improvement (p < 0.05) in scores was found among all three post-graduate year levels for six of the eight questions regarding confidence in various aspects of MMS. All residents reported that this was a good educational experience, and all reported that it improved their understanding of MMS.

Summary: The MMS workshop improved resident confidence in all surveyed aspects, and is a novel tool for better conceptualization of a complex topic. This is an interactive and inexpensive activity that can be incorporated into existing dermatology resident training to improve MMS understanding and execution.

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Epithelioid Sarcoma Masquerading as a Squamous Cell Carcinoma

Purpose: Epithelioid sarcomas are high-grade mesenchymal tumors. Often, the lesion may be mistaken for squamous cell carcinoma, pyoderma gangrenosum, or even a benign entity, which can result in insufficient treatment. Dermatologists need to be aware of this rare but aggressive malignancy that is often missed by others. Clinically epithelioid sarcomas tend to arise on the extremities of adults as papules or nodules that may ulcerate. On histopathology they have a biphasic appearance with a transition between epithelioid and spindled cells. Immunohistochemistry and the expertise of a trained dermatopathologist is often helpful in making this diagnosis. Early diagnosis is critical to ensure timely surgical intervention and reduce morbidity to the patient.
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Surgery versus Surgery and Adjuvant Radiotherapy for High-Risk Cutaneous Squamous Cell Carcinomas: A Systematic Review and Meta-analysis

Purpose: The role of adjuvant radiotherapy for high-risk cutaneous squamous cell carcinomas (cSCC) after surgery with negative margins is unclear. Our objective is to conduct a systematic review and meta-analysis elucidating the utility of adjuvant radiotherapy for high-risk cSCC by examining the risk of poor outcomes for those treated with surgery vs. surgery and adjuvant radiotherapy.

Design: A comprehensive search of articles published in the past ten years was conducted in PubMed, Embase, and Cochrane Database of Systematic Reviews. Inclusion criteria were studies that reported at least one outcome of interest on high-risk cSCC. The PICOS, PRISMA, and MOOSE methods were utilized to identify eligible studies. Study eligibility and data extraction were reviewed by three authors independently. Random-effects meta-analyses using the Knapp-Hartung correction, arc sine transformation, and restricted maximum likelihood method were conducted. Our primary outcomes included local recurrence, nodal metastasis, regional metastasis, and disease-specific death.

Findings: Thirty-three studies, with patients that underwent surgery alone (31 studies) and underwent surgery and adjuvant radiotherapy (13 studies), comprising 3,867 high-risk cSCC were included. Median follow-up was 39.3 months. There were no statistically significant differences in poor outcomes between the surgery vs. surgery and adjuvant radiotherapy groups. Estimates for local recurrence based on random-effects models were 19% (95% confidence interval [CI]: 8.6%-35.4%, I^2: 91%, Tau: 0.33) for the surgery group and 8.8% (CI: 1.6%-20.9%, I^2: 73%, Tau: 0.21) for the surgery and adjuvant radiotherapy group. Regional metastases were 19% (95% confidence interval [CI]: 6.8%-35.4%, I^2: 91%, Tau: 0.33) for the surgery group and 19.7% (CI: 3.8%-43.7%, I^2: 79%, Tau: 0.22) for the surgery and adjuvant radiotherapy group.

Summary: For patients with high risk cSCC with margin-negative resection, there were no differences in poor outcomes between the surgery vs. surgery and adjuvant radiotherapy groups. Randomized-controlled trials are necessary to define the benefit of adjuvant radiotherapy in this setting.
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**Design:** We analyzed 610 Mohs micrographic surgery cases from the University of California, San Francisco (UCSF) Dermatologic Surgery Unit by randomly selecting 20 weeks of Mohs surgical case data from January 2018 through August 2020. Mohs cases performed during fully scheduled surgical days at UCSF were included in the analysis. A complex case was defined as meeting any of the following criteria: a) four or more stages for tumor clearance, b) four or more tissue sections for processing, or c) requiring advanced reconstruction (i.e., flap or graft). The dataset was split into 404 training cases and 206 prospective test cases. Using the training dataset exclusively, we developed a multivariate logistic regression model to classify case complexity, which used LASSO and five-fold cross validation to automatically select variables for inclusion in the model. The model prediction performance was assessed on the hold-out test dataset. Candidate predictor variables for each case included both patient characteristics (age, sex, immunosuppression status, history of Mohs, need for interpreter, preoperative consultation, internal or external referral, anticoagulation use) and tumor characteristics (histopathologic tumor subtype, tumor recurrence, tumor size, tumor site, appropriate use criteria (AUC) score).

**Findings:** A total of nine variables were selected for inclusion in the model: melanoma in situ, location on nose or ear, and tumor size were associated with increased complexity, whereas squamous cell carcinoma, location on cheek, jawline, neck, or lower leg were associated with decreased case complexity. Our model achieved an area under the receiver operating characteristic curve (ROC-AUC) of 0.83 on the hold-out test dataset, indicating excellent discrimination. A limitation of these findings is that the dataset was generated from a single, academic medical center featuring four Mohs surgeons.

**Summary:** In summary, we developed UMPreSS, the first machine learning, multivariate logistic regression model to predict case complexity, which can serve as a predictor of operative day length and aid in Mohs surgery case scheduling. Future directions include building an online case complexity calculator and training staff to use the model for case scheduling. Once fully implemented, prospective data (e.g., total operative day length, variance of total number of tissue sections/specimens per-operative day, and surgeon satisfaction) will be collected to assess the clinical utility of UMPreSS and further validate the model.

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**A Malignant Conundrum: Primary vs Metastatic Carcinoma Arising in the Skin**

**Purpose:** A Malignant Conundrum: Primary vs Metastatic Carcinoma Arising in the Skin.

**Design:** Case report.

**Findings:** A 69-year-old male presented with a tender, 7mm pink papule on his left cheek of over three years duration. The papule was biopsied, and histopathology revealed invasive carcinoma with apocrine differentiation. The cells were positive for AE1/AE3, CK7, EMA, estrogen, progesterone, mammoglobin, GCDFP, which can be seen in breast, salivary gland, or primary adnexal tumors. Negative stains of SOX10, S100, and MSA made mammoglobin, GCDFP, which can be seen in breast, salivary gland, or primary adnexal tumors, a salivary gland tumor less likely. p63, p40, CK5/6, and D240 were all negative, favoring a cutaneous metastasis or primary cutaneous apocrine carcinoma (PCAC). The patient had a history of acute myeloid leukemia, but no other known internal malignancies. His review of systems was within normal limits. Given the concern for metastatic breast carcinoma, the patient underwent a computed tomography of head/neck/abdomen/pelvis and breast ultrasound and mammogram, which were negative, making PCAC the more probable diagnosis. A surgical resection with 1cm margins is planned. Here, we report a case of a diagnostic conundrum: differentiating metastatic breast carcinoma arising in the skin from PCAC.

**Summary:** Metastatic breast carcinoma arising in the skin and PCAC are both rare and differentiating these based on histopathologic features is difficult. PCAC is a diagnosis of exclusion and is favored if there is no primary solid organ malignancy found.

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**Surgical delays less than 1 year in Mohs micrographic surgery associated with tumor growth in moderate- and poorly-differentiated squamous cell carcinomas but not lower-grade squamous cell carcinomas**

**Purpose:** Cutaneous squamous cell carcinomas (SCCs) and basal cell carcinomas (BCCs) are generally treatable, however larger lesions can incur higher morbidity and for SCCs, possible mortality. There is a predilection for sun-exposed sites of the head and neck, and Mohs micrographic surgery has become the standard care in this setting. Surgical delays of even several months from diagnosis to MMS treatment unfortunately remain common depending on surgeon availability and patient hesitance. Our aim was to assess whether surgical delays were associated with clinically meaningful tumor growth. The literature on this topic is very limited and results have been mixed. SCCs and BCCs were often not analyzed separately, or histologic divisions remained broad. We hypothesized that separating tumors by more detailed histology could reveal a quantifiable impact of surgical delay on tumor size.

**Design:** This was a retrospective study of patients with biopsy-proven SCCs and BCCs treated with MMS at a single academic center from 2016 to 2018. Surgical delay was defined as number of days from biopsy to MMS (range 0 to 331 days). This definition was selected given accuracy of documentation. For virtually all patients, biopsy date was also date of initial presentation to a healthcare provider. Because MMS defect size approximates tumor size, tumor growth was represented by change in horizontal major diameter (ΔMD) from biopsy to postoperative MMS defect. Multivariate analysis was utilized to screen for independent predictors of ΔMD, and linear regression was then applied to assess for relationships with surgical delay.

**Findings:** We analyzed 1101 lesions comprised of 299 SCCs and 802 BCCs. SCCs were subdivided into in-situ (n = 65), well- (n = 86), moderate- (n = 87), and poorly-differentiated (n = 56) histologies. In addition to histology, other potential risk factors for tumor growth analyzed include age, gender, biopsy size, location, recurrence, immunosuppression, diabetes, smoking, and alcohol use. Independent predictors of ΔMD for SCCs were histology and history of prior treatment. Only histology demonstrated a relationship with surgical delay times, with more aggressive histologies exhibiting faster growth rates. Poorly-differentiated lesions grew approximately 0.28cm per month of delay (p = 0.005) and moderately-differentiated lesions approximately 0.24cm per month (p = 0.016). In-situ and well-differentiated lesions were not found to enlarge with time. BCCs were subdivided into aggressive (n = 228) and indolent (n = 540) histologies. Independent predictors of ΔMD for BCCs included age, male gender, aggressive histology, location, and history of prior treatment, none of which demonstrated a relationship with surgical delay times.

**Summary:** Our results suggest surgical delays under 11 months could result in clinically meaningful tumor growth for more aggressive SCCs. This could incur higher morbidity and for SCCs, possible mortality.
may lead to larger post-operative defects and higher risk of disfigurement, recurrence, and metastasis. We emphasize the importance of timely treatment for moderate- and poorly-differentiated SCCs.

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**Basal Cell Carcinoma Necessitating Forequarter Amputation: A case report and literature review**

**Purpose:** Basal cell carcinoma (BCC), the most common malignancy of skin, is usually curable by simple excision. However, tumors greater than 5 cm in diameter are termed giant BCCs and may require extensive surgery to achieve complete resection. We present a 63-year-old woman with a large basal cell carcinoma (BCC) of the shoulder, necessitating forequarter amputation for definitive therapy.

**Design:** Case report with review of literature.

**Findings:** The patient presented to an outside hospital with fatigue and a large wound of the left shoulder with exposed bone, was diagnosed with osteomyelitis, then transferred for further management. By history, her wound began as a boil approximately fifteen years prior and became infected with MRSA requiring surgical debridement, but persisted with drainage. The patient was lost to follow up. Physical exam revealed a 27 x 14 cm wound on her left shoulder with extensive necrosis, loss of underlying subcutaneous tissues with raised, nodular edges, and exposure of proximal half of the humerus, acromion, and scapular spine. Biopsies from the wound edges revealed an infiltrative proliferation of basaloid epithelial cells with foci of stromal fibrosis and retraction artifact, typical for BCC. There were also broad zones with tumor cells displaying glassy eosinophilic cytoplasm with keratinization. The patient underwent forequarter amputation, indicated for wound closure and complete tumor excision. Histopathologic examination of the amputation specimen revealed carcinoma throughout the ulcerated tissue with involvement of the humerus and tumor-free margins. Lymph nodes were negative for carcinoma.

**Summary:** Although rare, giant basal cell carcinoma should be included on the differential of a large ulcerated lesion. The possibility of a collision tumor composed of both BCC and squamous cell carcinoma was also considered, but histopathologic findings favored a BCC with zones of squamous differentiation. In addition to illustrating drastic surgical measures indicated for management of large, neglected skin cancers, the case also demonstrates challenges with the straightforward diagnosis of BCC in samples from large lesions.

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**Prevalence of SARS-CoV-2 Infection in Asymptomatic Pre-operative Patients Scheduled for Dermatologic Surgery: A Single Center Study**

**Purpose:** Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the pathogen responsible for the coronavirus disease 2019 (COVID-19) pandemic, presents on a spectrum of disease severity, ranging from asymptomatic infection to pneumonia and fulminant respiratory failure. While asymptomatic SARS-CoV-2 infection has been a well-documented phenomenon, data regarding the prevalence of asymptomatic infection in patients scheduled for ambulatory procedures are limited. Knowledge of asymptomatic prevalence rates could be of use to dermatologic surgeons who are at increased risk of SARS-CoV-2 transmission given their case-mix, which includes a bulk of procedures performed on the head and neck. Herein we present the results of a universal COVID-19 screening protocol in asymptomatic patients scheduled for dermatologic surgery within a community-based outpatient center.

**Design:** This is a retrospective observational case series assessing patients who were scheduled for a dermatologic surgery involving the head and/or neck from June 1, 2020 to February 28, 2021. As a part of our institutional protocol, all patients underwent pre-procedural SARS-CoV-2 reverse transcription polymerase chain reaction (RT-PCR) testing three days prior to their planned procedures. A patient's asymptomatic status was subsequently confirmed through a telephone encounter one or two days after testing was performed. The primary outcome was the prevalence of asymptomatic SARS-CoV-2 infection, determined by a positive SARS-CoV-2 RT-PCR result. Secondary outcomes included the overall positivity rate and group demographics.

**Findings:** 462 patients, with an average age of 66.5 years, were included in this study. There was a slight majority of men (59.3%) and a large majority of patients identifying as Caucasian (96.5%). Eleven of 462 (2.4%) patients who were scheduled for dermatologic surgical procedures tested positive for SARS-CoV-2. Nine of 11 of those who tested positive were confirmed as asymptomatic, resulting in an overall prevalence of asymptomatic SARS-CoV-2 infection of 1.9%. The asymptomatic group had a mean age of 55.6 years and was composed of a slight majority of men (55.5%).

**Summary:** Our data demonstrates a higher prevalence rate of asymptomatic infection when compared to the prevalence rate of 0.5% observed in a study examining elective endoscopy procedures in a similar study setting. Though likely multifactorial, this difference could largely be explained by our longer study period and inclusion of the peak winter months in which most of our cases were diagnosed. Additional studies are needed to better characterize the regional prevalence of asymptomatic SARS-CoV-2 infection in the ambulatory periprocedural setting. Data derived from such studies could inform periprocedural protocols that best balance the safety of hospital staff and patients with the potential morbidity associated with delays in dermatologic surgery.

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**Crowdfunding for Cutaneous Oncological Surgery**

**Purpose:** In the past decade, crowdfunding campaigns have become increasingly utilized for fundraising to assist with medical costs. It is an aspect of patient care funding that remains largely underreported in medical literature and rarely discussed among practitioners and patients. Its use in cutaneous oncological surgeries has not been investigated to date. The purpose of our study was to better understand the use of crowdfunding campaigns and the factors determining their success for costs related to cutaneous oncological surgical procedures.

**Design:** Utilizing a crowdfunding platform, retrospective study of campaigns seeking cost assistance related to cutaneous oncological surgery and their sequela were evaluated from January 2018 to November 2019. Study inclusion required campaigns to list skin cancer type and funding data were collected. Univariate and multivariate analyses were performed.

**Findings:** 150 campaigns were included. 54% were male, and 29.3% of campaign authors were the patient. 124 campaigns (82.7%) specified fundraising for surgeries. 33 campaigns (22%) were successful (defined by study authors as receiving 70% or more of the funding goal). Of successful campaigns, 20 (60.6%) were for cancers located on the head and neck, 5 (15.2%) trunk, 0 (0%) extremities, and 8 (24.2%) unspecified. Cancers on the head and neck received an average $3879 (40.04% of funding.
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Our patient is a 38-year-old female lawyer presenting with a 3 year history of a slowly growing white plaque on her cheek. She has a history of multiple basal cell carcinomas (>50, mostly superficial subtype) on her body and a few on her face since her 20’s. On initial evaluation, there was a 2.0 x 3.0cm hypopigmented firm plaque on the right cheek. She had no stigmata of Gorlin syndrome. A skin biopsy revealed small jagged islands of squamous cell carcinoma, 5 (16.1%) of squamous cell carcinoma, 9 (37.5%) of basal cell carcinoma, 5 (16.1%) of squamous cell carcinoma, 9 (37.5%) of unspecified, and 1 (50%) listed as other were successful. Men received a mean donation of $5423 and requested a mean goal of $17,705, and women received $2735 and requested $10,275. Men achieved a mean 36.39% of the funding goal, and women a mean 38.39%. Patient-authored campaigns received a mean $4124 with a mean 40.71% goal achieved compared to a third party with a mean of $4212 and a mean 35.9% of goal achieved. Successful campaigns had a mean 280 social media shares compared to unsuccessful campaigns with 190. Short narratives received a mean $1463, achieved a mean 24.68% goal, and 11.5% were successful; long narratives received a mean $5632, achieved a mean 44.01% goal, and 27.6% were successful.

Summary: Anatomical location was not significant to a successful campaign (P value 0.09) but was significant to the donation amount received (P value 0.02) for cancers on the trunc and to the funding goal percentage achieved (P value 0.02) for head and neck. Gender did not play a role in the funding goal percentage achieved (P value 0.722) but did play a role in the donation amount (P value 0.048) with men receiving significantly more than women. Age is well known to play a significant role in the donation amount received (P value 0.001), and was more successful (P value 0.018). Campaign author type did not play a significant difference. Although cancer type had varying success, it lacked significance. Evaluating crowdfunding as an alternative financial source is more pertinent now than ever before, given its utility as a tool to mitigate patient hesitancy to undergo treatment due to financial concerns.

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Purpose: To review the Mustarde flap for large mid cheek defects in a young patient and the role of derrill fillers to correct post-surgical volume loss.

Design: Our patient is a 38-year-old female lawyer presenting with a 3 year history of a slowly growing white plaque on her cheek. She has a history of multiple basal cell carcinomas (>50, mostly superficial subtype) on her body and a few on her face since her 20’s. On initial evaluation, there was a 2.0 x 3.0cm hypopigmented firm plaque on the right cheek. She had no stigmata of Gorlin syndrome. A skin biopsy revealed small jagged islands and scirrhouss strands of basaloid cells within the dermis consistent with an infiltrating and scirrhouss basal cell carcinoma. Multiple treatment options were discussed with the patient including radiation (dismissed due to her young age), vismodegib (declined due to the side effect profile) and surgery. A representative slide from each case was independently reviewed by two Mohs surgeons (NV and AD). PRAME staining for each slide was graded 0-4+ per the scale described by Lezcano et al, with 0-2+ considered negative and 3-4+ considered positive.

Findings: Cases of melanoma in situ and invasive melanoma treated with MMS at Mayo Clinic over a 2.5 month period were included. Sequential frozen sections from these cases were stained with standard H&E, MART-1, MITF, and PRAME. A representative slide from each case was independently reviewed by two Mohs surgeons (NV and AD). PRAME staining for each slide was graded 0-4+ per the scale described by Lezcano et al, with 0-2+ considered negative and 3-4+ considered positive.

Summary: The Mustarde flap is an excellent reconstructive option for large and deep mid cheek defects, even in young patients with less tissue laxity. There is good tissue movement from multiple reservoirs including the preauricular cheek, temple and inferiorly down the neck, if required. There is a robust blood supply and incisions can be hidden at the boundaries of cosmetic subunits. Dermal fillers are a useful adjunct to correct subcutaneous tissue loss and restore facial symmetry after surgery.

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Is PRAME a Game Changer? Development and Comparison of a Melanoma Specific Immunohistochemical Staining Protocol for Mohs Surgery

Purpose: The differential expression of PRAME (PReterentially expressed Antigen in Melanoma) in melanocytic nevi and melanomas has triggered interest in its potential utility for margin assessment on formalin-fixed paraffin embedded (FFPE) permanent sections. Approximately 90% of non-desmoplastic primary cutaneous melanomas demonstrate a high rate of PRAME expression. Conversely, melanocytic nevi, lentigines and junctional melanocytic hyperplasia demonstrate overall low levels of PRAME expression. PRAME overexpression in melanomas is comparably sensitive and specific to MART-1 sensitivity and specificity for melanocytes, and accordingly, reports of PRAME’s utility in margin assessment of FFPE permanent sections have started to emerge. To date, reports on the use of PRAME in fresh frozen tissue are lacking. This was an exploratory study to: (1) assess the feasibility of using PRAME on frozen sections during Mohs Micrographic Surgery (MMS) for treatment of melanoma and (2) compare the quality and reliability of PRAME on frozen tissue relative to other validated immunohistochemical stains used as part of standard clinical practice: MART-1 (Melan-A) and MITF (Microphthalmia transcription factor).

Design: Using commercially available reagents and an automated staining system, we developed a protocol for PRAME immunohistochemical (IHC) staining on frozen tissue. Melanoma in situ and invasive melanomas treated with MMS at Mayo Clinic over a 2.5 month period were included. Sequential frozen sections from these cases were stained with standard H&E, MART-1, MITF, and PRAME. A representative slide from each case was independently reviewed by two Mohs surgeons (NV and AD). PRAME staining for each slice was graded 0-4+ per the scale described by Lezcano et al, with 0-2+ considered negative and 3-4+ considered positive.

Findings: 28 cases met criteria for inclusion, including 19 cases of melanoma in situ and 9 cases of invasive melanoma. Margin assessment by PRAME IHC was completely concordant with the interpretation on MART-1 and MITF in 85% (25/28) of cases. In cases with a negative surgical margin as determined by surgeon concordance on MART-1 and MITF, 100% (24/24) of surgical margins were negative using PRAME IHC. Of the 4 cases with a positive surgical margin, 25% (1/4) of cases were PRAME positive and 25% (1/4) of cases were PRAME negative. The remaining 2/4 (50%) were indeterminate given lack of surgeon concordance (with 1 surgeon calling each margin positive (3+/4+) and the other surgeon calling each equivocal (1+/2+)). Based on these findings, PRAME IHC sensitivity was 25-75% (depending on the interpreting surgeon) and specificity was 100%.

The quality of PRAME staining was graded as good or very good in 78% (22/28) and 68% (19/28) of cases by each surgeon compared to 100% (28/28) and 96% (27/28) of MART-1 cases and 96% (27/28) and 93% (26/28) of MITF cases. The turnaround time for the PRAME IHC stain was 45 minutes, compared to 55 minutes for MART-1 and MITF. Summary: We developed a novel PRAME IHC staining protocol for Mohs for melanoma using commercially available reagents. In our lab, the turnaround time (45 minutes) for the novel PRAME protocol is comparable to other stains employed during MMS for melanoma, including MART-1 and MITF.
The quality of PRAME IHC staining was inferior to previously validated melanocytic stains. Further refinement of the staining protocol is required to improve the reliability to the level of MART-1 or MITF.

In our study population of invasive and in situ melanomas treated with MMS, PRAME IHC was found to have a specificity of 100% and a sensitivity between 25-75%. In two cases, a dermal melanocytic proliferation was identified on frozen marginal tissue; one case interpreted as incidental dermal nevi per MART-1/MITF staining and one case interpreted as invasive melanoma. The incidental nevus stained negatively for PRAME, while the focus of invasive melanoma was diffusely positive (+++) on PRAME.

Here we report the first use of PRAME IHC for evaluation of melanoma on fresh frozen tissue. Our results confirm the feasibility of utilizing a PRAME IHC stain for melanoma margin assessment during Mohs Micrographic Surgery. Overall staining quality was lower for PRAME than for MART-1 and MITF, highlighting the need for further refinement to the protocol. The potential utility of a melanoma specific stain was demonstrated by the confirmation of marginal invasive melanoma in one case. The high concordance of tumor detection between PRAME and previously validated IHC illustrated the potential for clinical implementation with further protocol optimization. Given the differential PRAME staining pattern observed in formalin fixed tissues between melanoma, lentigines, and melanocytic hyperplasia, and our findings here, PRAME may represent an important adjunct immunostain for the treatment of melanoma at high risk anatomic sites. Further studies are needed for protocol optimization, further elucidation of the sensitivity and specificity of PRAME on frozen tissue, interrater concordance of the interpretation of PRAME staining, and external validation of our protocol.

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BCC to bone: nothing “humorous” about it. Avoiding amputation and a reconstruction without functional deficit

**Purpose:** Mohs Micrographic Surgery (MMS) has been shown to be safe in an ambulatory setting, as exemplified by a multicenter, prospective study showing complication rates of 0.72% (n=149 of 20,821 tumors). Moreover, large flaps, interpolation flaps, and large grafts have been shown to be safe in patient undergoing MMS. Large tumors of the arm with invasion through muscle and into bone are at risk of surgical amputation. MMS for large tumors provides complete clearance of a tumor, complex reconstruction to minimize morbidity, and a safe operating experience without the need for general anesthesia. The present case will showcase the ability of MMS to avoid hospitalization and operating room costs for large tumors and prevent morbidity associated with a free flap or full-thickness skin graft from a distant site.

**Design:** Resection of this infiltrative and nodular BCC invading the humerus bone with MMS, rather than partial amputation or radiation, effectively preserved the function of the patient’s left upper extremity. With a large 13 cm by 10 cm final defect, two full-thickness Burrow’s grafts were harvested from the apices of the defect to repair the site and minimize functional and cosmetic distortion. Fat grafting was used to restore the contour of the arm and to cover the exposed bone. A bolster dressing was applied so that the graft remained securely in place and in contact with the wound bed. The patient was followed postoperatively without significant complications.

**Findings:** At six-month post-operative follow-up, the patient had regained his baseline mechanical functioning of his left arm, which includes activities such as strenuous yard work and fishing.

**Summary:** The primary closure of the Burow’s triangles reduced the size of the surgical defect, and ultimately the graft-size needed for closure. Since the surgical defect was near the elbow joint, reducing the size of the full-thickness skin graft was important for graft survival and retaining joint mobility. As the humerus bone was exposed, adjacent adipose grafting was moved to provide additional coverage and protection. The laxity in the tissue of the upper arm and forearm provided an opportunity to employ the benefits of the Burrow’s graft in a large defect of the left upper extremity, sparing the patient from amputation. This case exemplifies the ability of MMS to effectively treat large tumors that otherwise would incur significant health care costs in the operating room, potential post-operative admission, or cause significant morbidity with a free flap or full-thickness skin graft from a distant site.

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Non-invasive management of skin cancer

**Purpose:** The increasing incidence of nonmelanoma skin cancer (NMSC) poses a serious public health concern. Standard care for basal cell carcinoma (BCC) requires patients to attend multiple visits for diagnosis and treatment. This pilot study describes a model of care that aims to alleviate some of the demand placed both on the specialty and on patients by utilizing a novel same-day approach to BCC management with noninvasive diagnosis, same-day treatment, and noninvasive imaging follow-up. This study evaluates the efficacy of the 1064-nm Nd:YAG laser for treating BCC while leveraging noninvasive imaging technology for diagnosis and confirmation of clearance.

**Design:** Institutional review board approval was received from Icahn School of Medicine at Mount Sinai Program for the Protection of Human Subjects (New York, New York). We performed a retrospective review of medical records of patients diagnosed by RCM and treated with a 1064-nm Nd:YAG laser, as an alternative to surgery, at the Mount Sinai Faculty Practice Associates between March 2018 and August 2018. Included in this pilot study are 17 lesions in 16 patients.

**Findings:** Fourteen lesions (14/17 [82.4%]) required 1 treatment to achieve clearance, as confirmed clinically, dermoscopically, and by OCT scanning. One lesion on the back (1/17 [5.8%]) required 2 treatments (70 days between treatments). Two lesions (2/17 [11.8%]) required 3 treatments (time between treatments: 49 and 61 days [lesion 1]; 62 and 64 days [lesion 2]). Lesion 1 was on the face; lesion 2 was on the back. Mean time between last treatment and OCT clearance scan was 103 days (median, 64 days; range, 48–371 days).

**Summary:** Our study supports the notion that the 1064-nm Nd:YAG laser is a viable option for treating BCC. All (100%) lesions cleared, most (82.4%) with a single treatment. Of course, for patients who required more than 1 treatment (17.6%), we cannot make an argument for fewer patient visits because those patients had to return for multiple laser treatments, but they were able to avoid surgery, as they had wanted. Overall, our diagnostic approach utilizing RCM as opposed to traditional tissue biopsy meant that patients’ skin cancers were diagnosed and treated the same day. Traditional approaches to BCC management usually involve multiple visits: the initial encounter, which might or might not include biopsy, and a return visit for more definitive management. Reflectance confocal microscopy enables live diagnosis and facilitates targeted same-day treatment of BCC. Our pilot study has contributed data to support the further investigation and use of the Nd:YAG laser to treat BCC in combination with early detection with noninvasive diagnosis for a more patient-driven approach. For some patients as well as for dermatologists, the potential for increased efficiency of same-day diagnosis and treatment might provide a clear advantage.

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SKIN CANCER / MOHS / RECONSTRUCTION ABSTRACTS

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Antibiotic Prophylaxis for Full Thickness and Split Thickness skin grafts in Mohs Micrographic Surgery: A retrospective case series and review of the literature

Purpose: Perioperative antibiotic usage varies for graft closures in Mohs surgery, with no clear guidelines to delineate when perioperative antibiotics are appropriate. Previous studies have demonstrated low infection rates associated with Mohs surgery as well as no association between postoperative infections and perioperative antibiotics. The purpose of this study is to evaluate postoperative infection rates in full thickness skin grafts (FTSG) and split thickness skin grafts (STSG) treated with and without perioperative antibiotics. The primary endpoint was to review perioperative antibiotic administration and development of surgical site infections. Secondary endpoints include delineating demographic, tumor, or closure characteristics that increased the risk of surgical site infections.

Findings: Preliminary data from May 2012 through September 2014 were presented regarding gender, tumor type, and defect size and location. Findings: A retrospective chart review was done evaluating all cases of full thickness and split thickness skin grafts performed by a single provider at one academic institution. After URMC institutional review board approval a CPT code search was performed through the electronic medical record at URMC and cases with full thickness and split thickness skin grafts were included. Patient age, gender, tumor type, tumor location, and perioperative antibiotic administration were recorded. Cases were then reviewed over a time of two months after initial Mohs surgery and subsequent infection and antibiotic treatments were recorded. For cases of postoperative infection additional data recorded include number of Mohs stages, type of skin graft, donor site location and size, recipient site location and size, causative infectious organism, and antibiotic prescribed. Data analysis included percentages of infection rates for those treated with perioperative antibiotics compared with those who were not given perioperative antibiotics. For those with surgical site infections, percentages were provided regarding gender, tumor type, and defect size and location.


Design: A retrospective chart review was done evaluating all cases of full thickness and split thickness skin grafts performed by a single provider at one academic institution. After URMC institutional review board approval a CPT code search was performed through the electronic medical record at URMC and cases with full thickness and split thickness skin grafts were included. Patient age, gender, tumor type, tumor location, and perioperative antibiotic administration were recorded. Cases were then reviewed over a time of two months after initial Mohs surgery and subsequent infection and antibiotic treatments were recorded. For cases of postoperative infection additional data recorded include number of Mohs stages, type of skin graft, donor site location and size, recipient site location and size, causative infectious organism, and antibiotic prescribed. Data analysis included percentages of infection rates for those treated with perioperative antibiotics compared with those who were not given perioperative antibiotics. For those with surgical site infections, percentages were provided regarding gender, tumor type, and defect size and location.

Findings: Preliminary data from May 2012 through September 2014 was included, additional data from October 2014 through March 2021 is currently being collected and analyzed. Data thus far shows the following. No perioperative antibiotics were given to 77.7% of patients and the infection rate within that group was 0.91% (5/549). Perioperative antibiotics were given to 46/595 patients (7.7%) and the infection rate for that group was 6.5% (3/46). The most common defect area was on the nose, followed by the ear and lower extremity. The most common sites of postoperative infection were on the lower leg, hand, and ear, with cephalaxin being the most frequently prescribed antibiotic. The most common infectious organism was Methicillin-sensitive staphylococcus aureus. Of the patients prescribed perioperative antibiotics, 59% (27/46) underwent 2 or more stages for tumor clearance, 50% (23/46) had skin grafts placed on a distal extremity, 41% (19/46) had a graft placed on the nose or ear, and the average graft size was 12.8 cm².

Summary: This retrospective study demonstrates the low rate of surgical site infection in full thickness and split thickness skin grafts utilized in Mohs micrographic surgery. Our preliminary data shows an overall infection rate of 1.3% in patients undergoing FTSG or STSG after MMS, thus supporting our hypothesis that the rate of surgical site infection after these procedures is extremely low. Those considered to be at the highest risk by the surgeon were placed on prophylactic antibiotics, but this number was still small at 7.7% (46/595) and even while taking antibiotics, 3/46 (6.5%) developed an infection. While the percentage of infections was higher in those receiving antibiotics, these patients were at highest risk and the overall number was still very low. Our data suggests that prophylactic perioperative antibiotics is not indicated for FTSG or STSG with the exception of a rare subset of high-risk patients. This study highlights the important role dermatologic surgeons can play in antibiotic stewardship and the prevention of antibiotic resistance.

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Rare Mucosal Lip Atypical Fibroxanthoma Treated with Mohs Micrographic Surgery

Purpose: Atypical fibroxanthoma (AFX) is a rare dermal neoplasm of low-intermediate malignant potential found almost exclusively in the non-mucosal regions of the head and neck in light-skinned elderly males who have a history of significant sun exposure. Due to its risk of misdiagnosis of more common skin lesions and possibility of metastases, AFX requires resection with either Mohs Micrographic Surgery (MMS) or local excision (WLE). The purpose of this abstract is to discuss the best comprehensive treatment for a lower lip AFX using MMS versus WLE. We report a 73-year-old female with a lower lip mucosal AFX. A literature search of lower lip AFX revealed only one case of malignant AFX on the lower lip of an elderly male and one on the lower lip in a male pediatric patient with a history of XP. The location of AFX on the lower mucosal lip makes this case notably rare.

Design: A 73-year-old female with a history of significant sun damage and non-melanocytic skin cancer presented to the clinic with the complaint of an enlarging lower lip lesion that did not improve with the use of OTC products. Examination revealed a 1.6 x 1.6 cm pink indurated nodule on the right medial, inferior vermilion of the labial mucosa. The patient underwent a shave biopsy which revealed an atypical spindle cell tumor positive for CD10 and SMA. Desmin, S100, CK-AEa/AE3, Ber-EP4 and P63 were negative. A final diagnosis of AFX was made. The patient was treated in 2 stages of MMS with a surgical margin of 0.2 cm. Postoperative dimensions measured approximately 2 x 2 cm. A mucosal advancement flap was used to repair the defect. At one-week follow-up the surgical site revealed a well-healed, linear scar absent of drainage or dehiscence and sutures were removed.

Findings: Patients treated with MMS have a recurrence rate of 2-4.6%, often within 1-3 years of resection. A retrospective study compared 91 AFX patients treated with either MMS or WLE to determine which modality provided the best comprehensive treatment; of the 59 patients treated with MMS, recurrence did not occur, whereas the 23 patients treated with WLE had a recurrence rate of 8.7%. The median margin for MMS clearance was found to be significantly smaller [0.4 cm] in comparison to 2 cm for a WLE clearance of 95%. Therefore, MMS with complete resection is preferred over WLE because the recurrence rate is reduced, the incidence of metastases is lowered, and more facial tissue is preserved providing the greatest aesthetic outcome. We considered mucosal advancement flap as the most ideal repair technique to effectively maintain normal anatomy, optimal function, and cosmetic integrity of the inferior vermilion labial mucosa. Our patient responded well to both MMS and mucosal advancement flap repair; not only was her neoplasm effectively removed and treated, but the choice in repair served as the most favorable treatment option for precise margin control, conservation of facial tissue and in addition of utmost importance, lower recurrence rate than treatment with WLE.

Summary: Following MMS for AFX removal, mucosal advancement flap reconstruction should be considered for lesions of the lower lip mucosa,
as it is a reliable method with satisfactory patient results. Furthermore, patients with a history of AFX should undergo bi-annual skin examinations for signs of recurrence or presence of new skin malignancies, as these patients represent a high-risk group for development of UV associated malignancies.

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The use of freezer paper for thin fragile specimens in Mohs surgery: An encore abstract

Purpose: Accurate and efficient frozen section analysis is crucial for tumor margin control in Mohs micrographic surgery (MMS). Methods for specimen embedding and freezing vary widely amongst surgeons. Many MMS procedures involve excision of thin, fragile specimens that can be difficult to process histologically, often resulting in tearing or curling of the tissue due to additional handling, contraction, or adherence to filter paper traditionally used in processing. We describe the use of freezer paper as a novel and effective technique for processing thin, fragile specimens that maintains tissue orientation, allowing for precise and accurate margin assessment.

Design: A technical note design is used to present the technique of utilizing freezer paper for processing thin fragile specimens in MMS.

Findings: Once the thin lesion has been excised, it is placed on freezer paper and positioned by the surgeon prior to direct placement on the cryostat, without additional handling. At the time of cryodisc placement and embedding, the original shape and orientation of the specimen is maintained. Periosteum, mucosa, and fascia have been successfully processed in this manner.

Summary: Thin, fragile specimens such as periosteum, mucosa, and fascia are commonly encountered in MMS. Accurate histologic processing of specimens is crucial to margin assessment, and thin, fragile specimens can become easily distorted during processing. Freezer paper consists of a wax coating that prevents moisture loss, allowing thin specimens to maintain full shape and diameter. Additionally, the freezer paper technique allows the surgeon to position tissue without additional handling, decreasing the risk of tissue distortion and malorientation. Freezer paper is a readily available, inexpensive, efficient, and effective means of preserving the shape and orientation of fragile specimens, optimizing tumor margin assessment.

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Squamous Eccrine Ductal Carcinoma Masquerading as an Eccrine Poroma

Purpose: Squamous eccrine ductal carcinoma (SEDC) is a rare, poorly characterized and diagnostically challenging cutaneous adnexal tumor with potential for an aggressive course. The authors present a case of SEDC, initially thought to be an atypical eccrine poroma, which was not definitively diagnosed until the second stage of a staged excision. While commonly misdiagnosed on initial histology as a squamous cell carcinoma (SCC), this is the first report of squamous eccrine ductal carcinoma initially diagnosed as an eccrine poroma. This case aims to highlight the difficulty of diagnosis of this rare entity and the need for further evaluation of atypical poromatous neoplasms especially when presenting on the head or neck. My presentation would additionally cover the current literature in regards to diagnosis and clinical management of this rare cutaneous malignancy.

Design: PubMed literature review using key words: squamoid eccrine ductal carcinoma, eccrine poroma, eccrine carcinoma, cutaneous adnexal neoplasms, poromatous neoplasm.

Findings: Only 50 cases have been reported in the literature from 1997 to 2020, with high rates of local recurrence (20%), lymph node involvement (10%) and distant metastasis (6%). Similar to other cutaneous malignancies, a history of immunosuppression is thought to be a risk factor for both development of the initial lesion and propensity for more involved course, thus an increased clinical suspicion in these patients may also be warranted. Currently clinical management has been approached similarly to an aggressive Squamous cell carcinoma with consideration of pre-operative imaging, wide local excision or Mohs when available, and consideration of adjuvant radiotherapy. However, there are no formal guidelines given the paucity of reported cases.

Summary: An initial diagnosis of an eccrine poroma on the face should be treated with a high index of clinical suspicion. Accurate diagnosis of Squamous Eccrine Ductal Carcinoma is sometimes not achieved until reaching the deepest portion of the tumor. This poorly characterized tumor with a propensity for an aggressive course requires consideration of further imaging, proper margin assessment and potential radiotherapy. Further reporting of this malignancy will help in establishing more specific guidelines for clinicians.

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Mohs Micrographic Surgery and Reconstruction of the Nipple-Areola Complex: A Systematic Review

Purpose: Mohs micrographic surgery (MMS) combines precise excision of malignant tissue with maximal tissue preservation. This technique is most important in cosmetically sensitive areas such as the face, hands, feet, and nipple-areola complex (NAC). Much of the dermatologic surgical training in reconstruction focuses on techniques to close defects of the face; however, little efforts have been performed to review reconstructive techniques on areas less commonly found to have skin cancers such as the NAC. This article seeks to review the types of NAC pathology amenable MMS and the various reconstructive techniques available to the dermatologic surgeon.

Design: A systematic review was performed to evaluate all cases of MMS performed on the NAC reported in articles from the following databases: EMBASE, MEDLINE, Cochrane Central Register of Controlled Trials, and Cochrane Database of Systematic Reviews. Articles were included if they reported MMS on the NAC. Pathology, defect characteristics, and reconstructive techniques were recorded and discussed.

Findings: The comprehensive database search identified 245 studies, 17 of which met inclusion criteria. Within the included studies, 18 patients underwent MMS for pathology of the NAC—56% had basal cell carcinoma, 33% had erosive adenoma of the nipple, 6% had squamous cell carcinoma, and 6% had invasive breast cancer. Average defect size was 6.49 cm² (range, 1.1–33.6 cm²). Reconstructive techniques included primary linear closure, C–V transposition flap, triple advancement flap, purse string closure, secondary intention, A–T advancement flap, M-plasty closure, and primary closure with delayed nipple reconstruction.

Summary: The NAC is of great cosmetic and psychologic importance to patients. Therefore, the dermatologic surgeon must have a firm understanding of the various NAC pathology amenable to MMS and reconstructive techniques available for patients undergoing MMS of the NAC. By reviewing reported pathology and reconstructive techniques, the dermatologic surgeon can continue to provide the utmost care for their patients.
SKIN CANCER / MOHS / RECONSTRUCTION ABSTRACTS

The Risk of Skin Cancer and Urinary Levels of Personal Care Product Chemicals and Metabolites in the National Health and Nutrition Examination Survey

Purpose: Several personal care product preservatives have recently been associated with an increased risk of carcinogenesis and inflammation; however, the data has been conflicting in the literature. Chemicals in personal care and consumer products such as parabens have had limited investigation as a possible cause of non-melanoma skin cancer (NMSC). We examined whether urinary levels of personal care product chemicals and metabolites were associated with an increased risk of skin cancer in patients.

Design: The 3,328 men and women in the National Health and Nutrition Examination Survey provided information on urinary levels of personal care and consumer product chemicals and metabolites from 2013-2016. Our cohort was 26.7% Hispanic, 34.9% Non-Hispanic White, 22.9% Non-Hispanic Black, and 15.6% “other”. We evaluated urinary levels of more than 11 different personal care and consumer chemicals and metabolites. We computed odds ratios (OR) and confidence intervals (CI) adjusted for age, race/ethnicity, and gender.

Findings: Personal care product chemicals and metabolites were associated with a higher risk of NMSC. Urinary benzophenone-3 (p=0.0039), ethyl paraben (p=0.0499), methyl paraben (p=0.0048), and propyl paraben (p=0.0026) were significantly associated with a risk of developing NMSC. Of the patients with NMSC, Mexican Americans showed higher mean urinary levels of methyl paraben, ethyl paraben, and propyl paraben as compared to Non-Hispanic Whites and Other Hispanics. Our data also showed a dose-response relationship between urinary levels and risk of NMSC.

Summary: Personal care product chemicals and metabolites were associated with a higher risk of NMSC in this diverse, nationally representative cohort. Our comprehensive prospective study provides evidence for an association between chemicals used in personal care and consumer products and increased incidence of skin cancers.

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The paramedian pendulum forehead flap for reconstruction of large upper central forehead defects

Purpose: The paramedian pendulum forehead flap for reconstruction of large upper central forehead defects and may be especially useful in patients with limited forehead tissue laxity.

Design: The 3,328 men and women in the National Health and Nutrition Examination Survey provided information on urinary levels of personal care and consumer product chemicals and metabolites from 2013-2016. Our cohort was 26.7% Hispanic, 34.9% Non-Hispanic White, 22.9% Non-Hispanic Black, and 15.6% “other”. We evaluated urinary levels of more than 11 different personal care and consumer chemicals and metabolites. We computed odds ratios (OR) and confidence intervals (CI) adjusted for age, race/ethnicity, and gender.

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Townhouse Full Thickness Skin Grafts: Efficiency with Less Morbidity

Purpose: Full thickness skin grafts (FTSGs) are important options in reconstructive surgery. They can provide surface covering for almost any defect, provided that the wound base has sufficient vascularity and that the appropriate donor tissue can be identified. The size of the donor site usually reflects the defect dimensions and for larger wounds, donor site morbidity can be significant. We describe a technique, which we refer to as the “Townhouse” FTSG that can resurface larger wounds effectively with less donor site morbidity.

Design: The Townhouse modification to the traditional FTSG is a simple technique for reducing the size of the donor site needed to repair a larger defect. Instead of matching the entire size of the graft to approximate that of the primary defect and then excising the graft along with dog-ears, the Townhouse modification utilizes a FTSG that is smaller than the primary defect and leverages the majority of the tissue from the fusiform excision. The Townhouse FTSG entails designing a smaller ellipse with a height that is half of the width of primary defect but with a total surface area that still approximates that of the defect. The ellipse is then excised, divided into smaller pieces, and sutured side-by-side to cover the surgical defect. Using the Townhouse technique, sizes of the primary defect and donor defect were measured and compared to the expected graft defect size (calculated based on the standard 3:1 ellipse design).
**SKIN CANCER / MOHS / RECONSTRUCTION ABSTRACTS**

**Findings:** We employed the Townhouse FTSG technique in the repair of 3 defects resulting from skin cancer extirpation. Patient 1 had a 3 cm x 3.4 cm (8.0 cm²) defect on the left dorsal hand that was repaired with a 6.5 cm x 1.7 cm (8.7 cm²) graft from the left antecubital fossa. Patient 2 had a 4 cm x 3.5 cm (11.0 cm²) defect on the nasal dorsum/tip that was repaired with an 8 cm x 2 cm (12.6 cm²) graft from the right supraclavicular neck. Patient 3 had a 3 cm x 3 cm (7.1 cm²) defect on the left concha/anthelix that was repaired with a 7 cm x 1.5 cm (8.2 cm²) graft from the left supraclavicular neck. All three patients had acceptable cosmetic and functional outcomes using the Townhouse FTSG. Using the standard FTSG design technique, these patients would have received graft sizes of 24 cm², 33.0 cm², and 21.2 cm², respectively. The Townhouse modification, therefore, resulted in an average percent decrease of 62.2% in graft size needed to repair a defect.

**Summary:** The Townhouse FTSG is a simple, versatile technique for improving the cosmesis of the donor site while achieving satisfactory outcomes in repairing larger surgical defects.

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**Trends in Medicare Reimbursement for Mohs Micrographic Surgery: 2011-2021**

**Purpose:** Centers for Medicare and Medicaid Services (CMS) have implemented Medicare reimbursement cuts for procedural services to improve reimbursement for evaluation and management (E/M) and cognitive services. These policies have affected surgical practices because they often lack a high volume of E/M services. Studies examining otolaryngology, ophthalmology, neurosurgery, general surgery, and plastic reconstructive surgery have demonstrated reductions in Medicare reimbursement over time ranging from 14% to 38%. There is a paucity of longitudinal data on Medicare reimbursement in Mohs Micrographic Surgery (MMS). We analyzed Medicare reimbursement for MMS from 2011 to 2021 to assess if the effects of these cuts were similar to other procedural fields.

**Design:** The CMS Medicare Physician Fee Schedule (MPFS) look-up tool is a database which contains individual reimbursement rates for procedures through time. We used the CMS MPFS look-up tool to obtain reimbursement rates for the MMS-related Healthcare Common Procedure Coding System (HCPCS) codes, 17311-17315, from the years 2011 to 2021. Then, using the Consumer Price Index (CPI), we adjusted the reimbursement rates for inflation into 2021 dollars using both the general CPI and a CPI for medical care.

**Findings:** Once adjusted for inflation in the cost of healthcare, the MMS procedure codes examined here experienced an average decrease in Medicare reimbursement of 20.27%. All of the MMS codes analyzed experienced an inflation-adjusted reduction in reimbursement. These decreases ranged from 17.07% to 24.86% for the codes examined.

**Summary:** This study demonstrates an average inflation adjusted decrease in Medicare reimbursement for MMS from 2011 to 2021. This reduction in reimbursement parallels the average 25% reduction seen in other procedural fields studied to date. Elucidating the relationship between Medicare reimbursement and other factors such as physician workload, practice expense, and patient outcomes requires further study.

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**Combination Approach to Management of Keloids**

**Purpose:** Keloids and hypertrophic scars are commonly encountered in dermatology, with an incidence as high as 4-16% in skin of color. 1, 2 Keloids are caused by an aberrant response to trauma and wound healing and are characterized by a scar that extends beyond the wound margin. 3 They can often present with itch, pain, or other cutaneous disturbances, and have been associated with depression and decreased quality of life for affected patients. 4, 5 Avoidance of surgery or trauma and preventative measures is the best strategy for predisposed patients. In existing keloids, intralesional steroid injections remain the standard of care at this time. 2, 7 However, response to intralesional steroid can be variable, recurrence is common, and side effects such as atrophy, pigmented changes, or telangiectasias may occur. 1, 8 Other treatments such as cryotherapy, radiotherapy, lasers, intralesional 5-fluorouracil, intralesional bleomycin, and botulinum toxin A have been described, but no treatment has thus been shown to be obviously superior. 3, 6, 9 Combination therapy is usually the preferred method in the management of keloids. 8, 9 Several studies suggest that intraleansional steroids in combination with other treatments result in better outcomes compared to intralesional injection alone. 8-10 Excision of keloids alone is not recommended due to the high risk of recurrence, ranging from 45-100% in the literature. 6, 10, 11 However, the addition of other forms of treatment such as intralesional steroid injection, radiotherapy, or hydrocolloid or pressure dressing can be used successfully to improve post-operative outcomes. 7-12-14 In an early study by Chowdhri et al., surgical excision followed by intralesional steroid injection had a success rate of 91.9% for keloids and 95.24% for hypertrophic scars. 7 In addition, surgical technique has been shown to be critical in reducing risk of recurrence as tensile forces on a wound are risk factors for keloid development. 15 Here, in a series of 10 patients, we demonstrate complete to near complete response with surgical excision and serial intralesional steroid injections over the course of 12 weeks. In nearly all cases, previous treatment with intralesional Kenalog (ILK) alone had minimal to no response. Our data confirms the role of surgery in combination with ILK, as a safe, accessible and effective method for the treatment of keloids.

**Design:** 10 cases of keloids were treated in an outpatient dermatology setting. Treatment was performed with elliptical or shave excisions, followed immediately by low-dose ILK. Repeat treatment with ILK were performed at time of suture removal, and at monthly intervals for 3 months.

**Findings:** Clinical outcomes were measured at 3, 6, and 12 months. In all treated cases, minimal to no recurrence was seen following excision and serial ILK treatments with follow-up after 1 year. Patients reported improvement both cosmetically and symptomatically, with a high overall satisfaction rate.

**Summary:** Keloids remain a challenging condition to treat in dermatology. Because keloids can be disfiguring and reduce quality of life, patients frequently seek options to improve or reduce the appearance of these scars. While several new treatments for keloids have emerged in recent years, intralesional steroid injection still remains the standard of care.2 However, these injections can provide variable results with side effects of telangiectasia and atrophy resulting in a depressed erythematous scar.1 Combination therapy seems to offer the most effective management of keloids.8, 9 Although excision alone is not recommended for the treatment of keloids due to risk of recurrence, excision with same day treatment with intralesional Kenalog (ILK) alone had minimal to no response. Our data confirms the role of surgery in combination with ILK, as a safe, accessible and effective method for the treatment of keloids.

**References:**

SKIN CANCER / MOHS / RECONSTRUCTION ABSTRACTS


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A Unique Case of Metastatic Merkel Cell Carcinoma With Unknown Primary: A Review of The Prognosis

Purpose: To review the prevalence of Metastatic Merkel Cell Carcinoma (MCC) with unknown primary, review its prognosis.

Design: A case report.

Findings: A 67-year-old male presented for a full body skin exam to identify a primary lesion for Merkel Cell Carcinoma. The patient recently had a left axillary lymph node biopsy for persistent left axillary lymphadenopathy which stained positive for Pancytokeratin AE1/AE3, CK20 and negative for TTF-1, supporting the histologic diagnosis of MCC. A Positron Emission Tomography (PET) CT of the head and neck, chest, abdomen, and pelvis was performed, which demonstrated two enlarged lymph nodes measuring 3.6 cm x 3.6 cm with SUV max of 9, 1.5 x 1.2 cm with SUV max of 6, and one non-enlarged lymph node at 0.7 cm with SUV max of 4.9. During his dermatology consultation, two lesions were biopsied and found to be squamous cell carcinoma and malignant melanoma by pathology. However, we were unable to identify a primary MCC on the skin, consistent with the diagnosis of Merkel Cell Carcinoma with unknown primary (MCCUP).

Summary: We describe a rare presentation of metastatic Merkel Cell Carcinoma with unknown primary (MCCUP) of the left axillary lymph node in a 67-year-old male without any prior history of skin cancer. Nodal MCCUP is a rare disease that primarily affects elderly white men with a high rate of recurrence. Very little is known about the MCCUP due to the low prevalence of MCC and MCCUP. According to a case series, approximately 12%-14% of patients with MCC were identified to have nodal MCCUP. Furthermore, only 21% of patients with nodal MCCUP presented with concomitant axillary/epithrocleft disease. Median survival in patients with MCCUP that undergo surgical, chemotherapy, and radiation intervention is about 9 years. In a survival analysis, patients with MCCUP may have improved survival compared to MCC with known primary (MCCKP). Patients with MCCUP also have shown to have a higher tumor mutation burden as well as enhanced immune function compared to MCCKP. In conclusion, MCCUP is a rare diagnosis that requires prompt evaluation and aggressive treatment to optimize prognosis.

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Review of Mohs surgeons’ intraoperative anxiolytic practices: A survey of the American College of Mohs Surgery

Purpose: Mohs micrographic surgery is performed primarily under local anesthesia in an office setting where the patient is awake and alert. For some patients, this can trigger procedure related anxiety, which can negatively impact patient satisfaction, experience and surgical outcomes. Pharmacologic agents and non-pharmacologic tools such as music and therapeutic videos can be used to mitigate anxiety. The frequency of pharmacologic sedation and the types selected for sedation is unknown among Mohs surgeons. This study seeks to explore the pharmacologic and alternative non-pharmacologic sedation practices in dermatologic surgery.

Design: An anonymous survey of 20 questions was approved by the executive research committee of the American College of Mohs Surgery (ACMS). The survey was distributed to all members via email. The survey included information on surgeon demographics, frequency and type of pharmacologic sedation used, and non-pharmacologic practices. Expected response rate was calculated as an average of past ACMS surveys over a two-year period. This study met the average expected response rate of eight percent to allow for the minimum of a 10% margin of error at a 95% confidence interval.

Findings: A total of 142 Mohs surgeons completed the survey. Responders are diversely distributed throughout the country. The majority of responders are in private practice (72%) and academic practice (17%). One third of responders had over 20 years of clinical experience. The majority of responders (74%) perceived that < 10% of patients had moderate-severe anxiety. Seventy-five percent of responders use pharmacologic sedation with oral administration being the most common route of administration (63%). The majority of surgeons who utilized pharmacologic sedation, prescribe Diazepam followed by Lorazepam. Forty-two percent of medications are prescribed prior to the appointment and 36% are given in clinic from office supply. Patient request (>80% of cases) and signs of physiologic anxiety (>50% of cases) are the leading reasons for prescribing pharmacologic sedation (responders selected multiple circumstances for prescribing sedating medications). Seven complications were reported with pharmacologic sedation used, with two requiring reversal. Fifty-eight percent of responders use monotherapy when pharmacologic sedation is used with two requiring reversal. Fifty-eight percent of responders (74%) perceived that < 10% of patients had moderate-severe anxiety. Seventy-five percent of responders use pharmacologic sedation with oral administration being the most common route of administration (63%). The majority of surgeons who utilized pharmacologic sedation, prescribe Diazepam followed by Lorazepam. Forty-two percent of medications are prescribed prior to the appointment and 36% are given in clinic from office supply. Patient request (>80% of cases) and signs of physiologic anxiety (>50% of cases) are the leading reasons for prescribing pharmacologic sedation (responders selected multiple circumstances for prescribing sedating medications). Seven complications were reported with pharmacologic sedation used, with two requiring reversal. Fifty-eight percent of responders use monotherapy when pharmacologic sedation is used with two requiring reversal. Fifty-eight percent of responders do not have an emergency protocol for complications. Most responders use monotherapy when pharmacologic sedation is used with only three using combination therapy. For non-pharmacologic sedation, 92% of responders use non-pharmacologic sedation, often with multiple therapies. Music is the most common followed by talking to the patient, podcasts and videos.

Summary: Surgeon perception of moderate to severe patient anxiety is low among Mohs surgeons, with the majority of surgeons reporting that < 10% of patients have moderate to severe anxiety. Seventy-five percent of Mohs surgeons use pharmacologic anxiolytics in practice with oral administration of benzodiazepines (monotherapy) being the most common medication of choice. Complications are rare and the majority of surgeons do not have an emergency protocol in place. The most common non-pharmacologic anxiolytic intervention is music. This data explores physician perception of anxiety and summarizes current anxiolytic practices among Mohs surgeons.
Adoption of Human Papilloma Virus Vaccination Among Dermatologic Surgeons: A Survey Study

Purpose: Dermatologic surgeons are frequently exposed to surgical smoke, which has been shown to contain the human papillomavirus (HPV). The evidence for transmission of HPV through surgical smoke is limited but several reports have raised concern regarding the potential for HPV-related complications associated with via the surgical plume. Anecdotally, some dermatologists believe that the occupational exposure to HPV warrants immunization for HPV. Several expert guidelines have suggested vaccination based on occupational exposure and risk. The adoption of and attitudes towards the HPV vaccine among dermatologic surgeons are unknown, and this study was designed investigate this topic among members of the American College of Mohs Surgery (ACMS).

Design: A survey was designed and was distributed to members of the American College of Mohs Surgery (ACMS). Participants completed a 12 question inventory describing their demographics, risk factors for surgical plume inhalation, safety precautions during surgery, HPV vaccination status, attitudes towards HPV risk and vaccination, and plans regarding possible vaccination if not already inoculated.

Findings: A total of 147 respondents completed the electronic survey. We found that a majority (55.1%) of respondents had not been vaccinated. Most members (79.6%) believe that HPV can be transmitted via the surgical plume. Despite this finding, use of smoke evacuators was uncommon in our cohort with few surgeons (24.5%) reporting always or usually using smoke evacuator systems. The majority of respondents (59.3%) did not consider themselves to be at high risk of contracting an HPV-related disease due to occupational exposure. Only a minority of unvaccinated surgeons (40.7%) reports plans to become vaccinated in the future. Among unvaccinated respondents, an overwhelming majority (88.9%) would be more likely to become vaccinated if further evidence emerged of human transmission of HPV via the surgical plume.

Summary: The majority of dermatologic surgeons surveyed have not received HPV vaccination. Evidence has emerged demonstrating the possibility of transmission of HPV DNA to surgeons via the surgical plume. Surgeons may be at higher risk for HPV transmission from infected lesions than previously believed. Efforts should be directed towards informing surgeons of the risks associated with HPV exposure in the clinical setting and the possible benefit of HPV vaccination.

Public Perceptions Regarding the Role of Sunscreen and Diet in Skin Cancer Prevention

Purpose: Skin cancers account for the largest proportion of cancer diagnoses in the U.S. population, afflicting approximately one-fifth of all Americans by age 70. Traditionally, studies have relied upon public health surveys and focus groups to learn about the impact of skin cancer on quality of life. With the evolution of social media, we have an additional way to gain insight into public perceptions regarding skin cancer risk. The following study focuses on public beliefs and misconceptions posted on Twitter. We chose to study the Twitter platform, as it purports to have the greatest social media reach of the available platforms. Addressing public concerns, attitudes, and misconceptions about skin cancer can help guide clinical management and primary prevention strategies.

Design: A Twitter search was conducted on publicly available, English-language posts published between January 2020 to December 2020 containing the phrase “skin cancer.” Posts written in a non-English language, posts with content not directly related to skin cancer, advertisements, and posts written by professional organizations or health professionals were excluded, as they did not represent the perspective of the lay public. Of the 1205 posts related to skin cancer, a total of 465 relevant posts met the inclusion criteria. Individual user status was searched and validated against other websites to determine author affiliation with any medical organization, hospital, or health-related company. The final posts were placed into a general emotion category (positive vs. negative) and 1 of 5 descriptive emotion categories by two reviewers (NS and MM). Any disagreement was mediated by a third reviewer (SKQ) before final classification. A Cohen’s kappa coefficient was calculated and common themes were identified. Social media reach was calculated by tabulating the sum of likes, comments, and shares.

Findings: Of the 465 posts analyzed, 419 conveyed a polarizing tone-76.6% of posts were negative, while 23.4% were positive. Of 396 posts conveying an emotion, the following were captured: 37.6% of posts displayed fear/anxiety/overwhelmed/concern; 27.8% of posts expressed frustration/doubt/skepticism; 21.7% expressed hope/gratitude/relief; 9.7% conveyed sadness/depression/loneliness/guilt, and 6.3% showed anger/denial. With regard to sunscreen, Twitter users expressed concerns about sunscreen being toxic, causing vitamin D deficiency, or playing a role in promoting skin cancer formation. The role of ultraviolet light was also disputed as having a role in skin cancer development. Another prevalent topic was the role of diet in skin cancer prevention. There were posts suggesting that coffee or vitamin B-containing foods (eg. spinach and bacon) could help prevent skin cancer.

Summary: This study reveals an emerging interest in diet as a potentially modifiable risk factor for skin cancer and also reveals misconceptions about sunscreen that could hinder skin cancer prevention efforts. Recognizing the most relevant topics and showing how widely disseminated claims hold up to the scientific literature can help us to better inform our patients.
punch biopsies obtained from the lesion revealed atypical keratinocytes limited to the epidermis, consistent with squamous cell carcinoma in situ. There is no evidence of pigment or melanocytes within the lesion. She underwent Mohs micrographic surgery followed by a full-thickness graft repair.

Summary: This case highlights an uncommon presentation of CSCC that mimicked a melanocytic lesion. Though our patient’s lesion satisfied the general criteria for CSCC, its presentation on the acral surface and pigmentation made it difficult to distinguish the lesion from other pigmented tumors such as melanoma based on clinical evaluation alone. Interestingly, our patient is rather young as CSCC is a type occurs predominately in patients aged 70 and older. We hope that this case highlights the importance of clinicopathologic correlation and the need for expanded dermatoscopy and morphologic criteria to confidently diagnose CSCCs.

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Proof-of-concept of a Mohs pathology digital whole slide imaging model for dermatology trainees

Purpose: Mohs micrographic surgery (MMS) has become an increasingly popular and competitive fellowship choice among dermatology residents, with the last decade bringing a nearly three-fold rise in participating applications and a nearly five-fold rise in unmatched positions. 1,2 At the same time, the scope of MMS has also expanded in recent years beyond its usual indications (e.g., non-melanoma skin cancer on the H-zone of the face, dermatofibrosarcoma protubersans, and lentigo maligna), with the advent of immunostaining enabling MMS for melanoma and the growing use of MMS for to upstage certain tumors, 3 as well as to remove atypical fibroxanthoma, extramammary Paget’s disease, Merkel cell carcinoma, and rare adnexal tumors. 4,5 Despite these changes, dermatology resident education on MMS pathology has lagged. While several digital resources have been developed for trainee education on general dermatopathology (e.g., PathPresenter, KikoXP, Virtual Dempath), no there are no existing digital resources for trainee education on MMS pathology. Here, we present a proof-of-concept model for digital whole slide imaging (WSI) educational platform for MMS pathology.

Design: Our model employs the free PathPresenter platform (http://pathpresenter.net), which gives users the ability to upload digital WSI cases and annotate specific features.

Findings: Through our model, cases can be arranged into either a textbook atlas format or a quiz format. Additionally, non-pathology images (e.g., Mohs maps) can be uploaded to be viewed directly beside each pathology case. Cases can be arranged into a year-based curriculum (e.g., PGY2, PGY3, PGY4, fellowship) to complement the residency-based surgical curriculum. The annotation feature allows the curriculum author to place circles or arrows around specific features on each slide (e.g., perineural invasion, tumor positivity at a specific location, inflammation) to which users can be automatically directed through a hyperlink.

Summary: Over the last decade, MMS has simultaneously become more popular as a fellowship choice among dermatology residents, as well as broader in its scope and indications. Though methods of teaching MMS pathology to trainees is currently limited, here we present proof-of-concept for a versatile, freely-distributed, chapter-based and quiz-oriented platform for sharing MMS digital WSI cases. More research is needed on future applications of this platform and best ways to integrate this into pre-existing residency program surgical curricula.

References:

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Anxiety related to patient-perceived delays in surgical treatment of skin cancer

Purpose: Patients undergoing dermatologic surgery report higher levels of anxiety compared to those undergoing non-surgical treatments. However, little is known about how patient-perceived delays in wide local excision (WLE) or Mohs micrographic surgery (MMS) influence patient anxiety. This study aims to examine associations between patient-perceived delays in surgery and patient-reported anxiety.

Design: We recruited patients undergoing WLE or MMS from August-October 2020 to complete the PSSCAN-R survey to assess anxiety and depression related to their skin cancer surgery. A retrospective chart review was conducted to collect information on patient demographics and surgical characteristics. We evaluated the concordance between self-reported (patient-perceived) delays in surgery and actual delays in surgery. Social support, anxiety, and depression were compared between patients who did and did not self-report a delay in surgery using Student’s t-tests.

Findings: In total, 27% (N=33) of patients perceived a delay in their surgery. Patients who perceived a delay in their surgical treatment of skin cancer demonstrated greater anxiety on the PSSCAN-R than those who did not perceive a delay in their treatment (p=0.04). Compared to 31% (N=28) of patients who perceived a delay in their surgery when there was a true surgical delay, just 15% (N=5) of patients perceived a delay in their surgery when they did not experience a true surgical delay. Fifty-one percent (N=18) of patients with BCC who experienced a delay in surgery also self-reported a delay, compared to 20% (N=8) with SCC and 14% (N=2) with melanoma.

Summary: Patient-perceived delays in dermatologic surgery are associated with increased anxiety surrounding skin cancer surgery.

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Changes in surgical complexity due to delays in Mohs micrographic surgery

Purpose: It is unknown if delays in treatment affect the complexity of Mohs micrographic surgery (MMS). We sought to examine how incremental increases in the time between biopsy and MMS affect outcomes related to surgical complexity during MMS.

Design: After obtaining institutional review board approval, we conducted a retrospective chart review of patients undergoing MMS for basal cell carcinoma (BCC) or squamous cell carcinoma (SCC) at a single outpatient clinic between July 1, 2019 and February 28, 2021. Our primary outcome was post-operative surgical defect size. Secondary outcomes included repair type, repair length, and number of MMS stages. Predictor variables included patient demographics (age, sex, race/ethnicity, insurance type, blood thinner use, and immunosuppression) and tumor characteristics.
Findings: Our cohort included 1588 patients, including 895 (56.9%) BCC tumors and 676 (43.1%) SCC tumors. The mean pre-operative tumor size and post-operative surgical defect size were 181.85 mm² and 390.87 mm², respectively. After controlling for confounders, the linear regression model revealed that there was a 3.36 mm² increase in the post-operative surgical defect size for every seven day increase in the time between biopsy and MMS for BCC (p < 0.0001). In contrast, there was no association between the post-operative surgical defect size and time between biopsy and MMS for SCC (p > 0.05). Increasing time between biopsy and MMS did not increase the likelihood of flap or graft repair (p > 0.05), repair length (p > 0.05), or number of MMS stages (p > 0.05).

Summary: Increasing time between biopsy and MMS was associated with a larger post-operative surgical defect size for BCC, but it was not associated with a more complex choice of repair (i.e., flap or graft), larger repair length, or increased number of MMS stages. Taken together, although BCC tumors grow larger with increasing time between biopsy and MMS, this growth does not appear to increase surgical complexity within the range of treatment delay examined.

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A systematic review of treatments for primary cutaneous angiosarcoma of the head and neck

Purpose: Angiosarcoma’s are rare malignancies with an aggressive clinical course. Dermatologic surgeons may be tasked with surgical treatment of Angiosarcoma’s, however there is a paucity of literature regarding which treatment modalities are most efficacious. Wide local excision and Micrographic surgery both have potential utility, and the purpose of this current study was to assess the current literature to determine optimal surgical technique for management of angiosarcomas.

Design: A comprehensive literature search was performed for studies focused on treatment methods for cutaneous angiosarcoma of the head and neck. Studies were included if they contained data related to overall survival and focused on primary cutaneous angiosarcoma of the head and neck. This search was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analyses guidelines, and risk of bias was assessed using the Newcastle Ottawa scale. Extracted data included participant demographics, tumor characteristics, treatment type, overall survival rate, and complications. A continuous random-effects model was performed with he primary outcome was mean overall survival time in months for the reported treatment modalities.

Findings: Forty publications totaling 1,295 patients with cutaneous angiosarcoma of the head and neck met inclusion criteria. Surgical treatments (alone or in combination with other treatments, n = 825) were used more frequently than non-surgical treatments (n = 461). The treatment modality utilized the most was wide-local-excision with radiotherapy (n = 468). The treatment with the longest mean OS was WLE with RT at 34.7 months (95% CI: 25.9-43.5) followed by WLE with CT at 28.8 months (95% CI: 6.4-51.1).

The use of Mohs was only reported in case reports or small observational studies (N = 9). Five cases were treated with MMS alone for a mean OS of 37 ± 21.5 months. Among these, four reported angiosarcoma staging: 2 were T1 (mean OS 37.0 ± 17.0 months) and 2 were T2 tumors (mean OS 44.5 ± 26.5 months). Mohs + Radiation therapy was used with 3 T1 tumors (mean OS 34.0 ± 26.9 months) and Mohs, Radiation therapy, and Chemotherapy was used in 1 patient (OS 82 months).

Summary: Clinicians should consider wide-local-excision with radiotherapy when treating a patient for primary cutaneous angiosarcoma of the head and neck. Further research is indicated to definitively establish the efficacy of Mohs Micrographic Surgery in the treatment of angiosarcoma.

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Impact of the COVID pandemic on Mohs Micrographic Surgery

Purpose: Initial uncertainty during the COVID-19 pandemic led most medical organizations to recommend postponing all non-essential visits. Unfortunately for patients with newly diagnosed skin cancers, many Mohs surgeries were included in this delay. With most procedures now resumed, it is possible to assess the impact of these recommendations.

Design: An IRB approved 15-question survey was created to assess patient outcomes, practice viability, and physician sentiment. The survey was electronically sent to fellowship trained Mohs surgeons practicing in the United States six months after the onset of the pandemic. Data was collected using redcap software and analyzed using Fishers exact tests, with p < 0.05 considered statistically significant.

Findings: A total of 303 surgeons completed the survey with an average age of 46.3±10.6 years. Respondents were mostly in private practice (81%) and suburban settings (57%). Over 80% of respondents noted a decline in case volume for at least 3 months. Average case difficulty increased following treatment delays for 68.5% of surgeons, and suburban/rural surgeons were most impacted (76.3% vs 59.6% in urban settings, p = 0.027). Adverse outcomes following delays were common: 69% reported cases of local tumor spread, 49% reported cases of advancement in tumor stage, and 20% reported cases of regional or systemic metastasis. Pandemic delays were felt to be overall harmful to patients (76% of respondents) and contributed to worsened emotional health and anxiety (76% of respondents). At the onset of the pandemic, 45% of surgeons were in agreement with practice restrictions (39% in disagreement). In hindsight, only 29% of surgeons now agree with initial recommendations (58% in disagreement). Overall, 39% of respondents had a less favorable view of recommendations now than they initially did (versus 4% reporting a more favorable view). Private practice surgeons more often viewed these recommendations negatively initially (42.2% vs 25.9% in academics, p = 0.03) and currently (62.8% vs 35.8% in academics, p < 0.001). Incidences of COVID infection were rare: 8 respondents (2.6%) reported cases of staff testing positive and 7 respondents (2.3%) reported cases of patients tested positive following their procedure. No further spread was reported in these cases. Each of these respondents, and 97% of respondents overall, felt they could take reasonable precautions to prevent COVID spread and were comfortable performing surgeries. Practice viability was moderate to severely impacted by these delays for 42% of respondents.

Summary: Combining the risks of delaying treatment alongside infrequency of spread amongst patients and staff, it is evident that surgeries should proceed and can be performed safely. Future recommendations should take into consideration these potential negative implications with delaying treatment.

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Demographic and Geographic Comparison of U.S. Counties with and without Mohs Micrographic Surgery


Purpose: Healthcare access greatly impacts skin cancer diagnosis and mortality rates. Recognition of current disparities in Mohs micrographic surgery (MMS) access can assist future policy and clinical decisions to correct them. In this study we compare the demographic and geographic characteristics of counties’ Medicare populations receiving MMS and counties with a uniquely high number of cases are identified.

Design: For the years 2014-2018, the CPT codes for MMS (17311 and 1713) were counted on a per county level across the United States per the Medicare Centers for Medicare & Medicaid Services (CMS) Medicare Part D Prescriber Database. Any county with 0 MMS CPT codes recorded were classified as “without MMS access”. The demographics of each county were derived from the CMS Enrollment Dashboard. With the dataset parsed per county, GeoDa (Chicago, USA) was utilized for geospatial cluster analysis. MMS “hotspots” were identified as counties that possessed a high average number of MMS cases compared to the national average, while also being surrounded by counties that possessed a low average number of MMS cases compared to the national average (high-low).

Findings: Three thousand eighty-four counties in the United States were analyzed; 785 (25%) counties were designated as “with MMS access” and 2301 (75%) “without MMS access”. There were no significant differences in age, ethnicity distribution, or cost per enrollee between the two designations. 74% of counties with MMS access were considered urban, while only 25% of those without access were urban (p < 0.01). The median household income was markedly higher in counties with MMS access ($71,428 versus $58,913, p < 0.01). With respect to education, more individuals in counties with MMS access possessed their General Education Development (GED) (89% versus 86%, p < 0.01) or a college degree (30% versus 19%, p < 0.01). Thirty-one counties were considered MMS “hotspots”.

Summary: The density of MMS procedures varies greatly based on geography, maintaining the urban-rural disparity matched by the distribution of MMS surgeons. Additionally, there remains a wide income and educational gap between counties with and without MMS. MMS “hotspots” may provide insight into the drivers of skin cancer development and MMS in locations that would otherwise be predicted to have few cases.

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Trends in Characterististics of Clinicians Performing Mohs Micrographic Surgery

Purpose: Mohs Micrographic Surgery (MMS) remains the gold standard treatment for non-melanoma skin cancer (NMSC) and other cutaneous malignancies. As the incidence of NMSC rises, the use of MMS has also increased, but little is known about utilization among different specialties and training backgrounds. The purpose of this study was to evaluate longitudinal changes in MMS utilization across clinician specialty as well as fellowship/non-fellowship trained surgeons.

Design: Publically available de-identified data were extracted from the 2012-2018 Medicare Public Use File (PUF). Frequencies of Healthcare Common Procedure Coding System codes 17311 and 17313 were recorded and stratified by calendar year, clinician specialty (dermatology or non-dermatology), and fellowship training status (American College of Mohs Surgery [ACMS], American Society for Mohs Surgery [ASMS], or neither). Multivariable linear regression models were constructed to predict MMS utilization by calendar year and stratified by fellowship training status and clinician specialty. Models controlled for US geographic region, years in practice since medical school graduation, and clinician gender. Longitudinal frequencies of Mohs surgeons’ clinician fellowship training status, specialty, US geographic region, years in practice, and gender were recorded with statistically significant change determined using chi squared tests of independence.

Findings: During the study period, ACMS-trained surgeons performed the vast majority (total; proportion of all cases) of MMS cases (3,408,169; 62.5%), followed by non-affiliated (1,218,752; 22.2%) and ASMS surgeons (850,711; 15.5%). From 2012 to 2018, annual MMS claims (total claims; mean claims per clinician; multivariable regression p value) increased among all clinicians (662,226 to 907,962; 310.6 to 352.1; P < 0.001), dermatologists (640,628 to 889,124; 309.5 to 351.7; P < 0.001), and ACMS-trained surgeons (388,720 to 548,707; 424.4 to 462.4; P=0.02), while ASMS and non-dermatologist surgical volume trended towards significant increases. There was a significant increase (proportion, chi squared p value) from 2012 to 2018 in surgeons affiliated with either ACMS or ASMS vs. neither (61.5% to 69.0%, P < 0.001), but not in the share of non-dermatologists (2.9% to 2.0%, P=0.99). The share of female surgeons increased significantly (26.6% to 31.1%), but no change was observed in years in practice or US geographic region (P=1 for both). ACMS surgeons had a higher proportion of female surgeons vs. ASMS or others (33.7% vs. 22.9% and 25.7%, P < 0.001).

Summary: MMS utilization continues to rise in aggregate and on a per clinician basis to meet the demand of the burden of MMS in the US Medicare beneficiary population. Non-dermatologist and non-fellowship trained clinicians are more often performing MMS to meet this need, though ACMS surgeons are meeting most of this demand. Care must be taken to ensure that patients and referring clinicians are educated on the variation in level of training in surgical removal, histologic examination, and reconstruction for both simple and complex cases. Future studies are needed to determine how best to train and utilize Mohs surgeons as the incidence of cutaneous malignancy continues to rise.

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Cost Comparison of Mohs Micrographic Surgery and Conventional Excision from Treatment of Facial Melanomas

Purpose: Treatment for facial melanoma traditionally involves a conventional excision with postoperative margin assessment (CE-POMA). Mohs micrographic surgery (MMS) offers treatment in an outpatient setting with local anesthesia and same-day margin assessment prior to reconstruction. MMS offers superior clinical outcomes for treatment of facial melanoma1,2, however, there is limited data comparing the cost of MMS to CE-POMA. This study aims to analyze the costs for melanoma surgery performed with MMS and conventional excisions in the OR (CE-OR) or outpatient setting (CE-OP).

Design: A retrospective cohort study was performed on facial melanoma patients with a Breslow depth < 1mm treated at a single institution from 2008-2018. Patients younger than 18 years and those who received a sentinel lymph node biopsy were excluded. Charts were reviewed to extract sociodemographic, tumor, and surgical procedure data. CPT codes and billing data associated with facial melanoma cases treated with MMS, CE-OR, and CE-OP were accessed from existing institutional databases. The primary outcome measure was total cost of care for a surgical encounter (including costs of excision, reconstruction, pathology, immunostains, anesthesia, facilities). Surgical care costs were calculated using Center for Medicare Services fee for service payment schedule that corresponded to the year in which the procedure was performed. A propensity score matching algorithm was used to adjust for covariates that may have affected which treatment was chosen for each patient.

Findings: Two-thousand five-hundred twenty-one facial melanoma patients received treatment with MMS (n=1640), CE-OR (n=86), or CE-OP (n=88). Analysis is in progress and will be completed well before the ASDS Annual meeting. Our hypothesis is that cost of surgical care will be influenced by the surgical setting of the procedure.
SKIN CANCER / MOHS / RECONSTRUCTION ABSTRACTS

Summary: CE-POMA is the most common method of surgical treatment of facial melanoma nationwide but MMS is an increasingly performed surgical treatment that offers numerous clinical benefits. This study will allow cutaneous oncologic surgeons to compare standardized CMS cost data to provide cost-conscious care for facial melanoma patients.

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Cost Comparison of Mohs Micrographic Surgery and Conventional Excision for Treatment of Melanomas Using the Optum Database

Purpose: Mohs micrographic surgery (MMS) offers superior clinical outcomes for treatment of facial melanoma compared to conventional excision (CE) in the outpatient setting but does not appear to be cost-effective. In this study, we sought to evaluate the costs of MMS and CE using the Optum Clinformatics Data Mart database (OCDM) from 2004-2019.

Findings: The median cost of MMS was $14,727.63 compared to CE-OR ($3,767.87) and CE-OP ($3,464.55) p < 0.001. The cost difference remained significant when controlling for age, sex, race, and geographic region.

Summary: MMS is the most common method of surgical treatment for cutaneous melanomas. However, the cost of MMS is significantly higher than CE-OR and CE-OP. Further investigation is needed to determine the cost-effectiveness of MMS compared to other surgical modalities.

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Comparison of Cancer Prevention Efficacies of Field Therapies for Actinic Keratoses

Purpose: Actinic keratoses (AKs) are precancerous lesions with a 0.1 to 0.6% conversion rate to cutaneous squamous cell carcinoma (cSCC) per year per lesion. A study comparing four field therapies used for AK destruction (5-fluorouracil, imiquimod, ingenol mebutate, and photodynamic therapy with 5-aminolevulinic acid) found that 5-fluorouracil was the most efficacious method of AK destruction at 1 year of follow-up. However, no studies have compared the efficacy of these treatments for reducing the risk of future SCC.

Findings: We identified 107,771 unique patients with an AK diagnosis who were treated with a field therapy and a prior diagnosis of AK were followed until their first surgically treated cSCC. Time-to-event analysis was performed for each treatment and a Cox proportional hazards model was used.

Summary: 5-FU was not significantly better than imiquimod or ingenol mebutate in terms of cSCC development rate after use. However, PDT/ALA showed significantly worse outcomes compared to imiquimod and 5-FU. Our results also demonstrate increased cSCC risk in patients with prior cSCC history, immunosuppression, or male sex, consistent with previously described risk factors. Given these results, it may not be appropriate to directly translate AK destruction efficacy to the ability to prevent future cSCC.

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Statistical testing was performed using Stata 16.1. A logistic regression model was used to evaluate the influence of anatomic location, age, sex, state of residence, and excision size on the likelihood of receiving an SLNB. Sizes were grouped as < 2 cm, 2-4 cm, and > 4 cm. Race was grouped as non-white and white.

Findings: A total of 235,000 patients treated with WLE were identified. A total of 284 SLNBs were performed in this time range. Overall rate for SLNB was 0.06% with a range of 0.03% - 0.07% between 2015 and 2019. Mean time between excision and SLNB was 0.2 days (standard deviation of 10.8 days) after excision, median of 0 days. 78.9% of patients had their SLNB on the same day.

Summary: The group with the highest rate of SLNB use for cSCCs was non-white males with tumors >4 cm of the head or neck. Usage by anatomic location aligns with known metastatic potential for cSCCs (1.7-4 times increase for head and neck cSCCs). SLNB use also increased with tumor size, with the largest group (>4 cm) responsible for 54% of all SLNB use in cSCCs. Self-identified non-white race was more associated with increased odds for SLNB but requires further investigation.

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Rates of Sentinel Lymph Node Biopsy Use for Cutaneous Squamous Cell Carcinoma

Purpose: Routine use of sentinel lymph node biopsy (SLNB) is not recommended for cutaneous squamous cell carcinoma (cSCC) and NCCN guidelines currently have no recommendations regarding selection criteria. However, some data suggests that SLNB may identify occult nodal metastases in patients with high-risk cSCC. This study aims to characterize SLNB rates and use patterns in the context of cSCC treatment.

Design: Patient selection

Patient data were sourced from the Optum Clinformatics database. Excision CPT codes and ICD-10 codes were used to search for patients diagnosed with an invasive SCC treated with wide local excision (WLE). Mohs surgery codes are generic and do not contain size information. As such, Mohs codes were excluded. CPT codes were used to identify patients who had a SLNB with a diagnosis of invasive cSCC. Patients were considered to have an associated SLNB with a surgically treated cSCC if the SLNB occurred within 60 days before or after the excision. Cases were anatomically grouped into head or neck and trunk or extremities.

Design: Statistical analysis

Statistical testing was performed using Stata 16.1. A logistic regression model was used to evaluate the difference in rates of SLNB by age, sex, race, and geographic region. Sizes were grouped as < 2 cm, 2-4 cm, and > 4 cm. Race was grouped as non-white and white.

Findings: A total of 235,000 patients treated with WLE were identified. A total of 284 SLNBs were performed in this time range. Overall rate for SLNB was 0.06% with a range of 0.03% - 0.07% between 2015 and 2019. Mean time between excision and SLNB was 0.2 days (standard deviation of 10.8 days) after excision, median of 0 days. 78.9% of patients had their SLNB on the same day.

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Design: A retrospective cohort study was performed using the Optum Clinformatics Data Mart database (OCDM). Patients with a field therapy and a prior diagnosis of AK were followed until their first surgically treated cSCC. Time-to-event analysis was performed for each treatment and a Cox proportional hazards model was used.

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SKIN CANCER / MOHS / RECONSTRUCTION ABSTRACTS

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Assessment of patient comorbidities in the treatment of nonmelanoma skin cancers with Mohs micrographic surgery

Purpose: To evaluate if patient comorbidity status and life expectancy influence complication rates, patient-reported problems, and general satisfaction of Mohs Micrographic Surgery (MMS) for treatment of nonmelanoma skin cancers (NMSC).

Design: This was a prospective study of 226 patients undergoing MMS at a university-based clinic. Charlson Comorbidity Index (CCI) and age-adjusted Charlson Comorbidity Index (ACCI) were used to assess comorbidities. ePrognosis for 1-year mortality risk was calculated. Patients were stratified based on meeting criteria to be labeled with Limited Life Expectancy (LLE) (defined by scores on CCI ≥ 3, ACCI ≥ 7, and ePrognosis > 6%). Complications and patient-reported problems were evaluated at 1-month postoperatively. Patient satisfaction was evaluated using the Short-Form Patient Satisfaction Questionnaire (PSQ-18), along with surveying willingness to undergo future MMS at 1 month.

Findings: Average age was 68 years old, and 61% were males. LLE criteria for CCI, ACCI, and ePrognosis were met by 23%, 16%, and 30% of patients, respectively. Complications included bleeding, hematoma, seroma, infection, dehiscence, flap or graft necrosis, and motor function deficits were measured at one month. Overall, complications after MMS were infrequent, occurring in 8% (18/226) of patients. There were no significant differences in complication rates among those with LLE when compared to the general Mohs population. Of the 226 patients enrolled, a total of 162 responded to surveys at 1-month follow up. Of these respondents, patient reported problems were reported in 79% (128/162) of patients. Problems included bruising, itching, numbness, pain, tingling, swelling, and were stratified by severity. Bruising and swelling were reported most frequently as being severe problems, occurring in 9% (15/162) for both problems. Severe post-op problems were not significantly different between the LLE and general Mohs population. Overall, patients were extremely satisfied following MMS, with 97% (151/156) of patients reporting willingness to undergo future MMS if medically appropriate. There was no statistically significant difference in satisfaction based on patient comorbidity status.

Summary: Medical decision making is a complex decision and must weigh patient factors along with preferences. Patients with multiple comorbidities or LLE do very well with MMS, have high general satisfaction with the procedure and don’t show increased risk of patient reported problems or complications.

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Integrated clinicopathologic data and gene expression profile predict sentinel lymph node positivity and recurrence-free, distant metastasis-free, and melanoma-specific survival in cutaneous melanoma.

Purpose: The American Joint Committee on Cancer (AJCC) uses population-based risk stratification for melanoma-specific survival prognosis, with poor distinctiveness between higher stages. The 31-gene expression profile (31-GEP) test for cutaneous melanoma (CM) assesses the risk of regional recurrence, distant metastasis, and melanoma-specific death using the genetic profile of the primary tumor. The purpose of this study was to demonstrate the combined ability of two independently validated algorithms, which incorporate the 31-GEP with clinicopathologic features (i31-GEP), to predict individual sentinel lymph node (SLN) positivity risk as well as provide each patient with a recurrence-free survival (RFS), distant metastasis-free survival (DMFS), and melanoma-specific survival (MSS) prognosis (i31-app).

Design: The i31-app was developed to determine 1) individual likelihood of SLN positivity using a neural network algorithm developed in 1674 patients and independently validated in a separate cohort of 1398 patients; and 2) personalized survival predictions for 5-year RFS, DMFS, and MSS using a Cox regression algorithm developed in 1581 patients and independently validated in 523 patients. To model the experience of using both i31-GEP algorithms in the app, these 523 validation cases were put through the survival portion of the app, while a subset (n = 385/523) that did not overlap with patients from the SLN positivity algorithm development cohort were processed through the SLN positivity risk portion of the app, followed by individualized survival risk estimates. Patients age, Breslow thickness, ulceration status, mitotic rate, and continuous GEP score were entered into input variables and an individualized likelihood of SLN positivity was given for each patient. Next, in addition to the variables used for the likelihood of SLN positivity, SLN status and tumor location were input for determination of 5-year survival rates.

Findings: Of the 385 patients included for SLN positivity risk, 193 (50.1%) were T1, 85 (22.1%) were T2, 64 (16.6%) were T3, and 43 (11.2%) were T4. Of T1 tumors, 63 (16.4%) were T1a with no high-risk features, 67 (17.4%) were T1a with documented high-risk features, and 63 (16.4%) were T1b. SLN biopsy was performed on 222 (57.7%) patients, of whom 64 (16.6%) patients had a positive SLN. The i31-app predicted that 112/385 (29.1%) patients had an individual SLN positivity risk < 5% (range: 1.69% – 4.98% risk), none of whom had a positive SLN (100% NPV). In addition, the i31-app predicted 273 (70.9%) patients had an SLN positivity risk ≥ 5% (range: 5.02% – 63.58% risk). Patients for whom the i31-app predicted SLN positivity risk < 5%, predicted 5-year RFS rates ranged between 2.4 – 98.6% (interquartile range [IQR]: 65.2 – 95.2%), DMFS between 4.3 – 99.3% (IQR: 78.7 – 97.4%), and MSS between 33.8 – 99.9% (IQR: 92.4 – 99.5%). Patients for whom the i31-app predicted SLN positivity ≥ 5%, those with a negative SLN (n = 139) had RFS rates ranging between 5.6 – 98.1% (IQR: 74.8 – 95.85%), DMFS between 8.6 – 99.5% (IQR: 85.0 – 97.5%), and MSS rates between 21.9 – 100% (IQR: 95.2 – 99.5%). Patients with a ≥ 5% SLN positivity risk who had a positive SLN (n = 64) had predicted RFS ranging between 0.1 – 98.4% (IQR: 64.1 – 93.9%), DMFS between 0.3 – 99.1% (IQR: 76.4 – 96.9%), and MSS between 25.2 – 99.9% (IQR: 92.5 – 99.4%). Compared with AJCC, the i31-app survival algorithm (n = 523) had higher net reclassification indices for RFS (0.33; p = 0.006), DMFS (0.53; p < 0.001), and MSS (0.97; p < 0.001). Integrated discrimination index (comparable to c-statistic or area under the curve) significantly improved for RFS (0.069; p = 0.001), DMFS (0.081; p = 0.002), and MSS (0.097; p = 0.011) compared to AJCC staging.

Summary: The i31-app provided personalized risk of SLN positivity and increased the yield of SLN biopsy from 64/322 (19.9%) patients with T1a with high-risk features and above to 64/273 (24.5%) high-risk patients (≥ 5% predicted risk); additionally, it decreased the need of performing SLN biopsy from 63 patients with T1a tumors without high-risk features to 0/112 (0%) low-risk patients (< 5% predicted risk). Further, the i31-app provided individualized 5-year RFS, DMFS, and MSS, rather than population-based averages. In contrast to AJCC, which reports a single survival rate from population-based estimates for each stage (e.g., each patient with stage IIB melanoma is given an 87% 5-year MSS prognosis), the i31-app provided an individual survival prediction for each patient. For instance, patients in this cohort with stage IIB melanoma (n = 34) had predicted 5-year MSS values ranging between 21.9% and 99.8%. Individual survival predictions were superior to AJCC predictions by both net reclassification and integrated discrimination indices. Improved personalized prognostication could lead to the identification of patients at higher risk of adverse events who may benefit from more intense management than those with lower risk. A combined approach of SLN prediction followed by survival analysis combined into a single application is a step toward individualized, risk-aligned patient management.
Cost Effectiveness of Dermatofibrosarcoma Protubera n Treated with Mohs Micrographic Surgery Compared to Wide Local Excision

**Purpose:** The efficacy of Mohs micrographic surgery (MMS) and wide local excision (WLE) in the treatment of dermatofibrosarcoma protuberans (DFSP) has frequently been compared in the literature, however, the cost-effectiveness of the two treatment modalities has not been examined. Although MMS is often perceived as the more costly option, evidence of lower recurrence rates for DFSP treated with MMS compared to WLE suggest possible beneficial downstream effects of choosing MMS over WLE. This dynamic is exaggerated in the setting of expensive second-line therapies like imatinib ($158/day) and radiation that are employed after disease recurrence. Cost-effectiveness analysis (CEA) research can be used to accurately represent real-world decisions while assessing trade-offs between costs and effectiveness (incremental cost-effectiveness ratio [ICER]). Thus, a CEA model was created to evaluate the cost-effectiveness of MMS compared to WLE for DFSP.

**Design:** We conducted a CEA according to the International Society for Pharmacoeconomics and Outcomes Research’s (ISPOR) Consolidated Health Economic Evaluation Reporting Standards (CHEERS) statement utilizing a Markov model and decision tree analysis. The costs (in inflation-adjusted U.S. Dollars) and effectiveness (quality-adjusted life years [QALY]) of MMS versus WLE for DFSP in the outpatient setting were calculated from a healthcare payer perspective over a 10-year time horizon. Published health utility, mortality, and direct-cost data associated with excision, remission, and LR were utilized to create model variables. Positive margin (MMS 0%; WLE 10.24%, cases = 811) and LR (MMS 1.40%, cases = 1,073; WLE 12.49%, cases = 2,065) rates for DFSP were calculated. Mean excision, reconstruction, and pathology costs were estimated using a range of current procedural terminology (CPT) codes and previously published data on reconstruction outcomes for melanoma given the scarcity of DFSP reconstruction data (MMS $917.91; WLE $812.65; cost difference $105.26).

**Findings:** Over 10-years, mean costs for MMS were $6,288.30 (95% CI $5,085.96 - $8,108.28) versus $22,787.07 (95% CI $13,837.75 - $33,713.28) for WLE (cost difference -$16,498.77). MMS accrued 8.23 QALY (95% CI 8.15 - 8.31) and WLE accrued 8.22 QALY (95% CI 8.14 - 8.30). MMS gained 0.01 QALY over WLE, equivalent to 3.6 days of perfect health. Incremental cost-effectiveness ratio (ICER) was -$1,295,545.40, in favor of MMS over WLE. Probabilistic sensitivity analysis revealed that MMS had a 99.9% probability (P=0.001) of being cost effective over WLE at willingness-to-pay threshold (WTP) of $0/QALY. Threshold analysis using a conservative WTP of $50,000/QALY showed WLE would not be cost-effective at an initial cost of $0. Conversely, MMS would remain cost-effective up to 16.7x its cost $15,329.10. MMS would remain cost-effective if adjuvant therapy for disease recurrence (imatinib or radiation) was $0 (ICER $9,021.16). The benefit of MMS became even more profound when adding operating room utilization and general anesthesia.

**Summary:** Despite the perceived high cost of MMS, we found MMS to be less costly and more effective than WLE for DFSP. MMS resulted in a savings of up to $16.5 million and 10 QALY per 1,000 patients. These findings are significant as they show that the utilization of MMS for DFSP can significantly reduce direct payer costs while modestly improving patient outcomes.

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Postoperative candida infection following complex periocular reconstruction

Purpose: Postoperative candida infection is a rarely reported complication in cutaneous surgery. While often part of the normal skin flora, like many opportunistic microorganisms, Candida albicans may lead to infection of skin and mucosa in the appropriate setting. Postoperative candidiasis is typically characterized by a bright red eruption with satellite pustules presenting 1-2 weeks after surgery. In contrast to the acute nature of bacterial infections, those caused by C. albicans are often delayed in onset and do not respond to oral antibiotics. We describe a case of cutaneous candidiasis after staged excision of a recurrent lentigo maligna melanoma in an immunocompromised patient.

Design: Case presentation and review of literature.

Findings: A 59-year-old female with well-controlled human immunodeficiency virus (HIV) infection presented for excision of a recurrent lentigo maligna melanoma on the left periorcular cheek. Her HIV viral load was undetectable, and CD4 counts were within normal limits on bictegravir, emtricitabine, and tenofovir alafenamide. Over a span of 12 years the patient underwent 4 wide local excisions with recurrence at another institution. Staged excision with horizontal tissue sectioning was performed with three stages required to achieve clear margins. Reconstruction occurred 5 days after the initial stage and required a complex approach. The medial canthus was reconstructed with a glabellar transposition flap, posterior and anterior lamella of the left upper eyelid with Hughes flap, full thickness skin graft from the retroauricular region and composite graft from contralateral eyelid, respectively. The infraorbital cheek was repaired with fat transfer from the buttock and a full thickness skin graft from the supraclavicular region. Following the procedure, patient was started on prophylactic oral amoxicillin-clavulanic acid as well as topical bacitracin and polymyxin. Sutures were removed in one week and the patient appeared to be healing well. However, three days after suture removal, the patient developed erythema and pustules within the graft site along with periorcular burning and pain. The wound was cultured immediately and out of concern for Staphylococcus aureus infection the patient was switched to oral ciprofloxacin, topical gentamicin and then linezolid with no improvement. The culture grew heavy colonies of yeasts further identified as Candida albicans (using flight mass spectrometry -VITEK MS system, bioMérieux SA, F-69280 Marcy L’Etoile, France) sensitive to fluconazole and voriconazole. Oral fluconazole (300 mg weekly for 4 weeks) and topical clotrimazole were immediately initiated. Rapid improvement was noted within 48 hours. The graft remained viable with excellent functional and cosmetic result at both the two and six months follow up.

Summary: If there is clinical suspicion for a candida infection, a pustule can be sampled with a standard swab typically used for bacterial culture provided that concern for candidiasis is specified on the requisition form. Treatment of SSI with C. albicans may involve removal of occlusive dressings and the use of systemic antifungal agents. Azole antifungals are the treatments of choice and work by inhibiting ergosterol synthesis resulting in disruption of fungal membranes. Fluconazole is the most commonly used agent in this class and is generally effective and well tolerated. While C. albicans resistance to fluconazole is rare, there are reports of resistance in other Candida species. It is imperative for surgeons to quickly recognize and treat postoperative Candida infections. Misdiagnosis as staphylococcal or other common bacterial infections followed by the use of broad-spectrum antibiotics can result in greater proliferation of Candida and clinical deterioration. We present this case to highlight predisposing factors to postoperative Candida infection and to recommend consideration of prophylactic antifungal therapy in high-risk patients.
Reduction in Dimple Volume in Women with Buttock Cellulite Treated with Qwo®

**Purpose:** Primary outcome measures in randomized, placebo-controlled trials (RCTs) of Qwo® (collagenase clostridium histolyticum-aaes) have evaluated changes in the global appearance of cellulite. The current aim was to provide objective evaluation of Qwo treatment on buttock cellulite dimple morphology.

**Design:** Dimple volume/depth was assessed before and after Qwo treatment using 3D image analysis. Data were from 3 studies: a phase 1, open-label (OL), single-treatment study with a Qwo dose of 0.23 mg/dimple (0.23 mg/buttock), with post-treatment volumetric assessment at Day 90; a phase 2, OL study (3 treatment sessions, each separated by ~21 days), with a Qwo dose of 0.07 mg/dimple (0.84 mg/buttock) and post-treatment volumetric assessment at Day 71; and a phase 2 RCT (3 treatment sessions, each separated by ~21 days), with a Qwo dose of 0.07 mg/dimple (0.84 mg/buttock) and post-treatment volumetric assessment at Day 73. The analysis included women who completed Qwo treatment(s) at the specified dose and had image analysis of the treated dimple. One a priori-selected dimple per treatment area per patient was analyzed; dimples with a baseline volume ≤60 mm3 were excluded to reduce bias due to baseline imbalance. To bridge and affirm subjective assessments with objective assessments, volumetric dimple data were analyzed in a subgroup of Qwo-treated women with ≥1-level improvement from baseline according to the Investigator Global Aesthetic Improvement Scale. To assess the effect of age and body mass index (BMI), data were also grouped by age (18–40 y; >40 y) or BMI (<30 kg/m²; ≥30 kg/m²).

**Findings:** 33 dimples were included. Overall, the mean ± SD percentage improvement from baseline in volume for the 33 dimples was 31.4% ± 28.4% (range, 10.1% to 73.7%); for BMI < 30 kg/m² (n=15 dimples), the mean ± median improvement was 67.2% ± 52.4% (range, 0% to 73.7%) for women aged ≥40 y (n=10 dimples) and 35.5% ± 25.8% (range, 13.1% to 73.7%) for women aged <40 y (n=5 dimples). When subgrouped by BMI, the median improvement was 51.7% (range, -6.9% to 75.9%) for women with BMI ≥60 kg/m² (n=15 dimples) and 34.1% (range, -23.3% to 49.0%) for those with BMI <60 kg/m² (n=4 dimples). For the other 14 dimples (baseline volume >110 mm³), the mean ± SD improvement was 15.8% ± 21.4% (range, -13.1% to 38.7%) in those >40 y (n=9 dimples). When subgrouped by BMI, the median improvement was 22.4% (range, -1.9% to 38.7%) in women aged ≥40 y (n=6 dimples) and 8.7% ± 3.2% (range, -13.1% to 61.1%) in those <40 y (n=6 dimples). When subgrouped by BMI, the median improvement was 18.9% (range, -1.9% to 38.7%) in women aged ≥40 y (n=6 dimples) and 8.7% ± 3.2% (range, -13.1% to 61.1%) in those <40 y (n=6 dimples). When subgrouped by BMI, the median improvement was 22.4% (range, -1.9% to 38.7%) in women aged ≥40 y (n=6 dimples) and 8.7% ± 3.2% (range, -13.1% to 61.1%) in those <40 y (n=6 dimples).

**Summary:** Buttock cellulite dimple volume and/or depth improved in women treated with Qwo. Smaller-volume dimples (<110 mm³) showed a greater improvement after Qwo treatment than larger-volume dimples. Maximal improvement in larger-volume dimples may be hampered by underlying dermal atrophy and injection strategy. Also, patient age and BMI may be important factors impacting outcomes.

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Evaluation of Microfat Grafting for Facial Rejuvenation with a Novel All-In-One Disposable Syringe-Based Fat Transfer Device

**Purpose:** Fat grafting is an increasingly popular method to address the signs of facial aging including volume loss and skin laxity. Fat injection offers patients a natural and long-term improvement. Microfat provides structural volume via viable adipocytes, while retaining stem cells with regenerative properties. Dermapose™ Refresh is the only FDA-cleared, all-in-one disposable syringe-based device that allows for fat harvesting, washing, and sizing fat with built-in tandem 1000µm and 800µm filters, allowing for re-injection of microfat in a non-surgical setting. The objective of this study was to determine the ease of use and clinical outcomes of a new all-in-one disposable syringe-based fat transfer device in a dermatologic setting.

**Design:** Following the application of tumescent anesthesia (~100-250cc dependent on harvest area), macrofat was harvested from the abdomen, outer thighs or buttocks of 14 subjects using the supplied 14G cannula (1200µm port size). Average volume of macrofat harvested was 40-50cc. Liposapirate was decanted, washed with lactated ringers 3x and sized in the Dermapose™ Refresh syringe to obtain sized microfat (800µm). The microfat was then transferred to (3cc) syringes to allow for ease of re-injection using 21 and 22G cannulas dependent on area injected.

**Findings:** Of the 14 subjects treated in this practice, an average of 40-45cc of macrofat was harvested, resulting in approximately 25-30cc of microfat available for injection. The microfat was injected in the midface, temples, lips, perioral area, neck and scalp (dependent on patient need). An immediate improvement was observed in all treated subjects as well as at 4 - 6 months follow-up post procedure.

**Summary:** Dermapose™ Refresh is a novel all-in-one disposable syringe-based device that sizes adipose tissue while retaining structural fat integrity and regenerative properties. It provides physicians a novel method of small volume fat grafting procedures in office without the need for expensive equipment and operating rooms. The closed-loop system kit is optimal to size fat and potentially provides greater adipocyte viability via increased exposure to nutrients, removal of red and white blood cells and contaminants, while preserving perivascular regenerative cells. The results of this pilot study will allow clinicians to make informed decisions regarding the use of the Dermapose™ Refresh syringe and microfat injections for long lasting outcomes.
**Design:** Data were pooled from two identically designed, phase 3, randomized, double-blind, placebo-controlled trials of adult women with moderate to severe cellulite (ratings of 3 or 4 on the Clinician Reported Photonumeric Cellulite Severity Scale [CR-PCSS] and the Patient Reported Photonumeric Cellulite Severity Scale [PR-PCSS]) on both buttocks. Fitzpatrick Skin Type (FST) category was recorded at Screening. In the current analysis, skin of color was defined as skin type IV (light brown), V (brown), or VI (dark brown or black). Patients received up to 3 treatment sessions (Qwo 0.84 mg or placebo subcutaneous in each buttock) administered on Days 1 (baseline), 22, and 43. Efficacy endpoints included composite and individual component response (≥1-level improvement from baseline in PR-PCSS and/or CR-PCSS scores in at least 1 buttock) at Day 71. Adverse events (AEs) were assessed at clinic visits and monitored throughout the trials (through Day 71 +5 days/endpoint/early termination).

**Findings:** In the overall pooled study population (N=7843), skin type was classified as skin of color (FST IV-VI), in 336 women (39.9%). Among women with skin of color, 170 received Qwo treatment and 166 received placebo treatment. A larger percentage of women with skin of color had a ≥1-level composite (PR-PCSS and CR-PCSS) response at Day 71 in the Qwo group (51.2%) versus placebo group (19.9%). For the individual components, a higher percentage of women with skin of color in Qwo versus placebo groups had ≥1-level improvement from baseline in PR-PCSS rating (68.2% vs 45.2%, respectively) or CR-PCSS rating (62.9% vs 34.9%, respectively) at Day 71. In the overall population, the most common AEs in women treated with Qwo (n=424) were injection-site bruising (77.8%), injection-site pain (47.9%), injection-site nodule (25.5%), and injection-site pruritus (14.9%). In the subgroup of women with skin of color treated with Qwo (n=170), the most common AEs were injection-site bruising (74.7%), injection-site pain (41.2%), injection-site nodule (30.6%), and injection-site pruritus (14.2%). The percentages of Qwo-treated women with an AE of injection-site discoloration (which included preferred terms of discoloration and hyperpigmentation [including post-inflammatory hyperpigmentation]) were 7.8% in the overall population (n=424), 6.5% in women with skin of color (n=170), and 8.7% in women with FST I-III (n=254).

**Summary:** In women with skin of color, treatment with Qwo for moderate to severe cellulite in the buttock was efficacious and generally well tolerated. For any injectable, the risk of post-inflammatory hyperpigmentation occurring after injection-site bruising, and which can last several months, is an important consideration in skin of color. The safety profile, including rates of discoloration / hyperpigmentation, with Qwo treatment in women with skin of color was like that observed in the overall population.

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**Novel Histology, and Clinical Outcomes with TransFORM Body Treatment**

**Purpose:** Over time human skin thins and loses elasticity, and topical treatments attempt to reverse this process. The objective of this research study was to assess the efficacy of TransFORM Body Treatment (TFB) in skin rejuvenation compared to a bland moisturizer on the extensor and volar forearms.
Findings:

Part I. Cytotoxicity on all test concentrations of AAComplex (range from 0.00001 to 0.1%) after 24 and 48 hours showed greater than 80% cell viability and 0.1% was chosen to move on with UV irradiation test. As expected, Collagen I synthesis was significantly decreased after UVA irradiation compared to without UV group control. The presence of AAComplex induced a protection against the decrease in Collagen I synthesis of fibroblasts irradiated with UVA.

Part II. UVA irradiation increased histamine, TNFa and MMP-1 production. After the positive control treatment, histamine, TNFa and MMP-1 were significantly decreased. The treatment with Lotion A significantly decreased histamine production after UVA irradiation. No modification was observed with TNFa and MMP-1. The treatment with Lotion B significantly decreased histamine, TNFa and MMP-1 production after UVA irradiation.

Summary: In conclusion, the fibroblast treated with AAComplex tended to restore the contraction suppressed by UVA and recovered collagen I synthesis capacities to the level in the control, demonstrating protective benefit on skin against photodamage. AAComplex formulated in Lotion B has the same effect as the positive control and demonstrates a curative effect against the harmful effect of UVA irradiation like Effictor which confirmed the prevention of photo-aging benefit from AAComplex.

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Assessment of Selected Mitigation Treatments on Injection-Site Bruising After Qwo® Injection for Buttock Cellulite in Women: An Interim Analysis of a Collaborative, Phase 4, Open-Label Trial

Purpose: Qwo® (collagenase clostridium histolyticum-aeas) is approved for the treatment of moderate to severe cellulite in the buttocks of adult women. In two randomized, double-blind, placebo-controlled studies, injection-site bruising was the most common adverse event (84%) after Qwo injection. The current objective was to investigate methods/treatments that may mitigate injection-site bruising after the first treatment session of Qwo for cellulite in the buttocks, and to assess injection-site pain and bother by bruising after Qwo injection.

Design: Women (18-50 years) with moderate cellulite (Clinician Reported Photonicelllrite Severity Scale score of 3) and a Hexcel Cellulite Severity Scale subsection grade for laxity, flaccidity, or sagging skin of 0 (absence) or 1 (slightly draped appearance) on both buttocks participated in the study. These women were treated on both buttocks on Day 1 (baseline) with subcutaneous Qwo (up to 12 injections and 0.84 mg dose per buttock, per the US prescribing information). For the right buttock, 6 mitigation strategies (cohorts) were evaluated: 1) no mitigation (control); 2) 24-hour use of a compression garment after Qwo injection on Days 1-3; 3) use of a cold pack 5-10 minutes after Qwo injection; 4) use of the OcMuend® (arnica) gel patch applied immediately after Qwo injection, twice daily on Days 1-2 (4 doses); 5) use of iNEnhance post-injection serum with TriHex Technology® administered 4 times daily starting on Day 1, after Qwo injection, for up to 7 days; or 6) single application of pulsed dye laser (PDL; settings at investigator discretion) between Days 1 and 7. Participants did not receive injection-site bruising mitigation treatment for the left buttock, except for those in the compression garment cohort. The degree of injection-site bruising over time was evaluated in an interim analysis on Days 1, 2, 4, 7, 14, and 22 using a photo numeric Investigator Assessment of Bruising Severity Scale (range, 0 ["none or almost no bruising"] to 4 ["very severe bruising"]). In addition, participant-reported injection-site pain was assessed using an 11-point scale (range, 0 ["no pain"] to 10 ["pain as bad as you can imagine "] that was completed on Day 1 (before and 5 and 15 minutes after injection) and on Days 2, 4, 7, 14, and 22 and bother by bruising was rated using a 4-point scale (range, 1 ["not at all bothered"] to 4 ["extremely bothered"]).

Findings: Data on injection-site bruising severity were available for 18 women treated with Qwo (cohort 1 [n=4]; cohort 2 [n=2]; cohort 3 [n=3]; cohort 4 [n=3]; cohort 5 [n=3]; cohort 6 [n=3]). The mean bruising severity rating in the right buttock generally peaked in all cohorts on Day 4. The mean bruising severity rating of the right buttock for each mitigation cohort (2-6) was reduced at ≥1 of the post injection timepoints compared with the mean rating for the right buttock of the no-mitigation cohort. However, the number of participants treated per cohort was too small for the interim analysis to draw conclusions among mitigation treatments. For the assessments conducted, participant-reported injection-site pain peaked by Day 2 (1 day after Qwo injection) in the untreated left buttock (n=16; cohort 2 [compression garment excluded]); the Day 2 mean ± standard error rating was 2.9 ± 1.8 (range, 0-6). Participant-reported bother by bruising (n=16) was highest at Day 4 (approaching mean score of 2 ["a little bothered"]) than decreased over time in both buttocks.

Summary: This interim analysis of data suggests that several techniques may mitigate the visual impact of transient injection-site bruising observed after Qwo injection. Participant-reported injection-site pain was transient after Qwo treatment and peaked within 2 days postinjection. Furthermore, participants were not substantially bothered by bruising, possibly due to physicians setting appropriate expectations.

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Perceptions and Needs in Sweat Control: A Survey of Aesthetic Patients

Purpose: Excessive sweating or hyperhidrosis, is typically viewed as a medical condition that affects 4.8% of the population. However, International Hyperhidrosis Society research suggests that one-third of US adults are bothered by excessive sweating, and further report that both negatively affect quality of life (QoL). The goal of this study was to understand if this broader group of patients are presenting to aesthetic practices; understand their current usage of sweat control treatments and their perceptions about an investigational non-invasive treatment.

Design: Participants were recruited through aesthetic dermatology and plastic surgery practices. Multiple geographies and practice types were represented. Respondents were at least 18 years old and currently receiving aesthetic treatments. The survey was self-administered online. A total of 331 patient surveys were completed.

Findings: More than half of the patients surveyed are bothered by their excessive sweating, and most of them said they would be likely to try an effective and well-tolerated noninvasive topical treatment for sweat control. Of the 331 patients surveyed, 186 (56%) are bothered by their excessive sweating yet most of them (~80%) have not tried any treatments other than over the counter products for sweat control even though their sweating has significant impact on their quality of life and they currently employ a variety of methods to cope with their excessive sweat, from avoiding raising their arms (32%), to taking more than one shower daily (25%) and changing shirts throughout the day (21%). Even though all these patients are seeing an aesthetic physician regularly for other dermatologic treatments, 29% have seen a health care provider about their excessive sweating and only 18% have been diagnosed with hyperhidrosis. When presented with the concept of a novel, non-invasive, no downtime procedure, 65% of those who are bothered would be likely to try it. The key attributes of a new product for sweat control were ranked (top 5 appealing drivers) as: efficacy at reducing underarm sweat; is FDA cleared; has very few, mild side effects; is non-invasive; and clinical studies show it is safe and works.

Summary: Despite the quality-of-life impact caused by excessive sweating, there is very little published data on patient perceptions of their excessive sweating beyond those diagnosed with hyperhidrosis. This study confirms that aesthetic patients are concerned about excessive sweating and are...
interested in a non-invasive option for controlling their sweat. This study was focused on high volume aesthetic practices, so it suggests that there may be more patients in medical dermatology practices, as well. In addition, the potential for fewer side effects and adverse events after a quick, no downtime procedure may be beneficial for and of great interest to aesthetic and other patients. Excessive sweating is prominent in aesthetic practices, and patients have a desire for a non-invasive, efficacious, no downtime treatment. Significant market opportunity with sweat-conscious consumers exists in physician offices.

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**Novel isolation and safety of Ashwagandha (Withania somnifera) seed plant-derived exosome-like vesicles**

**Purpose:** Exosome treatment for hair thinning and loss shows great promise for stimulating new hair growth. Currently, exosome hair treatments are derived from human stem cells and generally administered by scalp injections. Their use is limited by sourcing adequate quantities, purity, safety risks, regulatory barriers and cost. We demonstrated that plant-derived exosome-like vesicles (PDEVs) can be isolated from Ashwagandha (Withania somnifera) seeds and topically administered to the scalp, overcoming major limitations associated with the use of human-derived exosomes.

**Design:** Ashwagandha seed PDEVs were isolated stepwise by centrifugation and yield was quantitated by number of vesicles per diameter size by nanovessel ZetaView® analysis. Scanning electron microscopy was used to visualize isolate morphology. Human dermal fibroblast uptake of various concentrations of fluorescently labeled PDEVs was evaluated by confocal microscopy at baseline, 16, 24 and 72-hour incubations at 4 °C and 37 °C. Mammalian cytotoxicity in human follicle dermal papilla cells was measured by number of viable cells after 72-hour incubation. Abdominal full skin biopsies were also conducted to evaluate topical penetration of the PDEVs. A hair serum formulated with 1 x 10E9 and 1 x 10E10 PDEVs/ml was assessed by primary skin irritation (PI) assay of 55 total male (29.1%) and female (70.9%) human study subjects, ranging in age from 18-62. The study was conducted over 48 hours, after one topical application. In addition, a repeat insult patch test (RIPT) was conducted with the same formula, in 53 total male (92.7%) and female (67.3%) human study subjects, ranging in age from 18-62, over 9 daily applications, followed by a two (2)-week break and subsequent applications to two (2) new skin sites. A consumer perception and tolerability study were also conducted with the hair serum formulated using 1 x 10E9 PDEVs/ml, including 32 female human panelists, age 37-65, using daily topical scalp application for four (4) weeks.

**Findings:** Ashwagandha PDEV isolation yielded 1.47 x 10E12 vesicles per gram dry weight seeds (± 2.31 x 1011) with a mean diameter of 124.9 nm (± 3.9) and mode diameter of 87.4 nm (± 10.0) (n = 7). PDEVs immediately attached to dermal fibroblasts and showed robust, dose-dependent uptake into the cytoplasmic compartment at 37 °C with vesicle concentrations at and above 1 x 10E8 vesicles. Efficiency of uptake was approximately 80% and higher at 1 x 10E9 and 1 x 10E10 PDEV concentrations, whereas minimal to no uptake was not observed at 4 °C. Ashwagandha PDEVs were not cytotoxic and did not alter cell viability. When applied on abdominal full skin biopsies, Ashwagandha PDEVs were shown to penetrate the skin surface. The PI and RIPT assays resulted in no reaction (score 0) for 100% of study subjects with no reported adverse reactions. Consumer perception and tolerability evaluation resulted in no significant observations of redness/erythema, dryness/scaling, burning, stinging or itching.

**Summary:** A consistent isolation method for Ashwagandha seed PDEVs was established, with robust cellular uptake and no cytotoxicity. The PDEVs penetrate the skin surface, suggesting effective topical application, which provides a distinct advantage over human exosome therapies administered by injection. Under the conditions of this study, no indication of human dermal irritation, contact allergy sensitization potential or intolerable and undesirable effects were established after topical application of a hair serum formulated with Ashwagandha seed PDEVs. Ashwagandha seed PDEVs can provide a safe topically administered alternative to human-derived exosome injections for hair thinning and loss treatment.

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**Ashwagandha (Withania somnifera) seed plant-derived exosome-like vesicles promote cellular growth with protective effects against inflammation, oxidation and stress**

**Purpose:** Exosomes have generated interest as a regenerative therapy for inflammatory and degenerative conditions, with potential for scalp and hair applications. To avoid the use of exosomes generated from human tissue, we have established a consistent method for isolating plant-derived exosome-like vesicles (PDEVs) from Ashwagandha (Withania somnifera) seeds that can be administered topically. The purpose of this study was to investigate the biological activity of Ashwagandha seed PDEVs to determine potential utility in treating human scalp and hair conditions.

**Design:** Ashwagandha seed PDEVs were evaluated in a wound healing model using both endothelial cells (HUEVCs) and dermal fibroblasts (Platypus® Technologies). Ashwagandha seed PDEVs were further tested to stimulate HUVEC tubulogenesis and VEGF-A expression in dermal fibroblasts. Responses of inflammatory markers in dermal fibroblasts treated with Cutibacterium acnei bacterial lysate were measured with PDEV treatment. In addition, an oxygen radical absorbance capacity (ORAC) assay measuring antioxidant capacity was conducted and the number of proliferating cortisol-treated human follicle dermal papilla cells were determined with the addition of Ashwagandha seed PDEVs.

**Findings:** Ashwagandha seed PDEVs increased cellular growth in a wound healing model using both endothelial cells and dermal fibroblasts (82.8% ± 6.8%, p < 0.05 and 67.0% ± 15.2%, p < 0.05, respectively). PDEVs increased endothelial cell tubulogenesis (54.9% ± 10.7, p < 0.001) along with human fibroblast stimulation of VEGF-A (39.9% ± 14.7%, p < 0.05). In addition to stimulating markers of angiogenesis, Ashwagandha seed PDEVs mitigated bacteria-induced changes in inflammatory markers (various extents, p < 0.05), provided robust ORAC antioxidant activity (+51.2% ± 6.9% Trolox equivalent, p < 0.01) and reduced cortisol-induced growth arrest in human follicle dermal papilla cells (11.9% ± 8.1%, p < 0.05).

**Summary:** Ashwagandha seed PDEVs provide a promising new plant-derived, exosomes-like functional ingredient to provide cellular protection from stressors and promote optimal cellular regeneration. Since hair growth is influenced by oxidative stress, inflammation and follicle regeneration, we believe these PDEVs have the potential to be used in scalp and hair conditions to promote hair growth.

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**Perceptions of acquired ptosis: Insights from a patient survey**

**Purpose:** Acquired ptosis is a common condition of the upper eyelids, but it is likely to be underdiagnosed and undertreated, particularly among patients in whom the characteristic drooping of the eyelids is mild or moderate. To
understand the impact of acquired ptosis on patients, it is important to assess patient perceptions about this condition. A survey was conducted to obtain insight into the experience of patients with acquired ptosis.

**Design:** Participating eye care professionals (ECPs) identified patients with a diagnosis of acquired ptosis for enrollment in an industry-sponsored study, in which participants self-administered a recently approved oxymetazoline 0.1% & #37; : ophthalmic solution once daily. In the pre-treatment survey, enrolled patients reported, via an electronic questionnaire, basic demographic information and their perceptions regarding ptosis and its effects on their appearance and vision. Data from this pre-treatment survey, collected between September 5, 2020 and January 16, 2021, are reported here.

**Findings:** Two hundred and forty-nine (249) patients provided responses to the pre-treatment survey. Overall, 78% & #37; (n=193) of respondents were female and 68% & #37;: (n=170) were >55 years old. Most respondents (86% & #37;: [n=214]) indicated an awareness that they were experiencing drooping of one or both eyelids prior to speaking with their ECP, and approximately half of respondents (55% & #37;: [n]=124) reported that they had initiated the discussion about ptosis with their ECP. When provided with reference images, most patients indicated that their ptosis was mild or moderate in at least one eye (left eye: 39% & #37;: mild, 29% & #37;: moderate; right eye: 36% & #37;: mild, 31% & #37;: moderate). From a list of responses provided, the symptoms or concerns that respondents most commonly associated with their ptosis were “tired or sleepy looking eyes,” (75% & #37;: of females, 68% & #37;: of males) “eyes don’t look symmetrical,” (58% & #37;: of females, 38% & #37;: of males) “heaviness of eyelids,” (53% & #37;: of females, 37% & #37;: of males) “reduced field of vision,” (48% & #37;: of females, 52% & #37;: of males) and “constantly raising eyebrows” (38% & #37;: of females, 44% & #37;: of males). When the patients who indicated an awareness of their ptosis prior to meeting with their ECP were asked to assess visual effects of their ptosis, most respondents indicated that their ptosis “moderately” or “strongly” (77% & #37;: [n]=165/214) affected their field of vision. Emotional manifestations of ptosis were also commonly reported, though differences were observed between female and male respondents. While similar proportions of females (42% & #37;) and males (41% & #37;) reported that their ptosis affected their self-esteem, females more commonly agreed that their ptosis affected their confidence (43% & #37;: of females, 33% & #37;: of males), and males more commonly agreed that their ptosis affected their social interactions (33% & #37;: of males, 20% & #37;: of females). Overall, these emotional effects were most frequently reported among patients in the youngest age group (respondents <35 years old).

**Summary:** Surveyed individuals with acquired ptosis reported a range of aesthetic, visual, and emotional challenges related to the condition. These results suggest that a more active approach to discussing, diagnosing, and treating even mild to moderate ptosis may help to alleviate these commonly encountered issues.

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**Method for Evaluating Smoothing Effect of VITRO-SKIN® after Chemical Peel Treatment**

**Purpose:** Chemical peels have the ability for the consumer to achieve more smooth-looking skin through the exfoliation and careful removal of damaged skin cells across the treatment area. There are several types of chemical peels of varying acid strength including but not limited to lactic, salicylic, retinol, and trichloroacetic acid (TCA) peels - the former will be the focus of this work. Each of these peels employ different active ingredients or combinations of actives thereof. The two products evaluated for this work are formulations which contain 20% TCA, 10% lactic acid and 6% TCA, 12% lactic acid. In this research, we report our findings, particularly with respect to microscale and nanoscale changes at the surface of a skin-mimicking substrate, namely VITRO-SKIN®.

**Design:** Atomic Force Microscopy (AFM) allowed for visualization and quantification of surface roughness (Rrms) at the nanoscale while Bright Field Light Microscopy (LM) allowed for visualization of surface changes at the microscale. Employing these two complementary techniques allowed for the smoothing effect of TCA to be realized.

**Findings:** The local roughness of the skin surface (30um x 30um) showed, on average, 6.5 times and 2.5 times decrease for the 20% TCA, 10% lactic acid and 6% TCA, 12% lactic acid, respectively suggesting an overall smoothing effect was observed clinically.

**Summary:** Using this correlative pre-clinical method, the smoothing effect of chemical peels can be evaluated using surface techniques like light microscopy and atomic force microscopy. These techniques allow for the qualitative and/or quantitative assessment of changes in topography which may be linked to clinical findings.

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**Midface Volumization: A multilayering injection technique for soft tissue hyaluronic acid fillers designed for dynamic facial movement**

**Purpose:** Well-contoured and balanced fullness in the midface contributes to natural, youthful, and attractive outcomes. Volume loss associated with facial aging commonly occurs first in the deep fat compartments and later in the more superficial fat layer. Favorable treatment outcomes can be achieved with patient-centered approaches that consider the progressive impact of aging on midface anatomy, dynamic facial expressions, and rheological and physical properties of fillers. Frequently, hyaluronic acid (HA) products intended for midface use are designed for firmness and support, rendering them unsuitable for reflation of volume loss in the superficial plane. The authors’ clinical experiences of optimal injection techniques for midface volumization, using a new range of dynamic HA-based fillers (Resilient Hyaluronic Acid [RHA®]), are described.

**Design:** The layering technique involves placing the filler in the deep and superficial midface fat compartments using a needle, cannula, or both with the aim of achieving natural looking outcomes at rest and during motion. Injection technique and product selection should consider facial anatomy, degree and location of volume loss, skin thickness, and product characteristics, including the stretch and dynamic strength of each filler.

**Findings:** Recommended techniques for injection into the static deep facial fat compartments include a single small bolus of product via needle or cannula, each into the lateral suborbicularis, medial suborbicularis, and deep medial cheek fat compartments, as well as the deep periorbital fornix space. For bolus injections with needles, the needle of choice is inserted bevel down with a 90-degree angle to the skin surface to ensure proper placement of the product in the respective fat pad. For cannula injections, the lateral single cannula entrance point is located 1 to 2 cm below the orbital rim on a line drawn vertically down from the lateral canthus, called the Redka-Galadari (RG) point. For the more mobile superficial fat compartments, a fanning technique using a needle or cannula creates a canopy over the structural support provided by the deep fat compartment injections. The RG point can serve as the lateral entry point. RHA 4 has the highest dynamic strength of the products in the RHA collection, yet it has sufficient stretch to allow it to be injected into both the deep and superficial facial fat compartments. RHA 2 is suitable for superficial placement, especially in the anteromedial aspect of the cheek owing to its very high stretchability. For optimal anteromedial midface volumization, RHA 3 may also be considered for placement in the deep fat compartments in patients with thin skin and in the superficial fat compartments in patients with normal or thick skin owing to its balanced dynamic strength and stretch properties.
**Efficacy and Tolerability of a Hyaluronic Acid-Based Serum and a Peptide-Rich Cream for the Face and Neck in Subjects with Photodamaged Skin**

**Purpose:** Highly effective barrier properties of the stratum corneum inhibit delivery of topical ingredients containing large molecules to desired targets in the skin. A novel, adaptable delivery system utilizes a lipophilic coating that works concurrently with select ingredients to facilitate delivery of large molecular weight actives to the skin. This study aimed to evaluate the efficacy, tolerability, and subject satisfaction of a topical skincare regimen comprised of a Hyaluronic Acid-based serum (InF-HA) and a peptide-rich cream (InF-P) containing large molecular ingredients designed to smooth the appearance of lines and wrinkles and improve the overall quality of skin.

**Design:** A 12-week, single-center, open-label study evaluated the efficacy and tolerability of twice-daily application of a two-part skincare system to the face and neck in female subjects, 45-65 years of age with mild to moderate photodamage. Investigator assessments based on a 6-point scale (0 [None] to 5 [Severe]) evaluated changes in skin tone, skin texture, and lines/wrinkles from baseline over 12 weeks. Subject satisfaction was assessed and Adverse Events (AEs) were captured over the 12-week period.

**Findings:** Seventeen subjects completed the study; mean age was 52 years, and subjects represented Fitzpatrick Skin Types II-VI. Improvements from baseline in the appearance of facial skin texture (79%), lines/wrinkles (50%) and skin tone (44%) occurred at week 12. Improvements in neck appearance were demonstrated in skin texture (68%), skin tone (48%) and lines/wrinkles (36%). No AEs occurred related or possibly related to the use of study products. After 12 weeks of use, all subjects reported an overall improvement in the appearance of their skin and that their skin looked and felt smoother; 88% of subjects reported that their skin looked more radiant, with 82% of subjects reporting that their skin looked firmer.

**Summary:** Twice-daily application of a topical skincare regimen comprised of an HA-based serum and a peptide-rich cream led to substantial improvements in skin texture, skin tone, and lines/wrinkles on the face and neck. Subjects reported a high level of satisfaction with the study regimen, with all subjects noting that skin looked and felt smoother and more radiant after 12 weeks.

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**A comprehensive diagnostic offering increases rates of actionable results of the 23- and 35-gene expression profile tests for use as ancillary diagnostics for difficult-to-diagnose melanocytic lesions**

**Purpose:** Diagnostic discordance in suspicious melanocytic lesions is well documented and it is particularly prevalent among difficult-to-diagnose cases for which histopathology may be insufficient for a definitive diagnosis. The 23-gene expression profile (GEP) and 35-GEP tests are clinically available objective ancillary tools designed to aid in the differentiation of melanocytic lesions with ambiguous histopathology. The tests are based on algorithms incorporating differential gene expression of 14 or 32 discriminant genes, respectively, to produce results of benign, intermediate, or malignant. With over 35,000 clinical samples tested to date, the 23-GEP has shown accuracy metrics of over 90% sensitivity in numerous clinical studies that included patient outcomes. However, the 23-GEP historically had ~23% of cases receiving either a technical failure or an intermediate result, which can be perceived as nonactionable. The more recently available 35-GEP test was developed to address this shortcoming and showed both an increased sensitivity in the first validation cohort and a decreased nonactionable rate of 8.5% in clinical orders. Today, both the 23- and 35-GEP are offered from a single laboratory as part of a comprehensive diagnostic offering (CDO) workflow. Clinical samples are processed first through the 23-GEP test, and if a technical failure or intermediate result is received, processed to the 35-GEP. Here we report metrics from this clinical workflow.

**Design:** The study included clinical cases submitted to Castle Biosciences for CDO testing reported between June 3 and July 31, 2021.

**Findings:** From 582 clinical samples that received CDO testing, the 23-GEP gave an actionable result of benign (56.2%) or malignant (21.3%) in 77.5% of cases, which is comparable to past reporting for this test. Nonactionable classifications of the 23-GEP test were 11.7% intermediate and 10.8% technical failure. These 131 cases were reflexed to the 35-GEP, and an additional 19.2% of originally submitted cases received an actionable result; the technical failure rate for the 35-GEP test was 2.5%. Only 4 cases received an intermediate 35-GEP test result (0.7%). The CDO clinical workflow increased the rate of an actionable report from 77.5% to 96.7% when compared with 23-GEP testing alone.

**Summary:** The CDO workflow has significantly improved reporting of clinically actionable results from a historic and current rate of ~77% to over 96%.

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**Efficacy and Safety of Calcium Hydroxylapatite with Lidocaine for Improving Jawline Contour**

**Purpose:** One of the key indicators of facial aging is sagging of the jawline, which can have a significant impact on a patient’s appearance. Surgical intervention is not required in all cases of jawline rejuvenation and using soft tissue augmentation could restore the profile and youthful appearance of the jawline. The objective of this study was to demonstrate the effectiveness and safety of calcium hydroxylapatite with lidocaine [CaHA (+); Radiesse® (+)], following deep (subdermal and/or supraperiosteal) injection, to improve the contour of jawline.

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**Design:** Healthy eligible patients, with moderate or severe ratings on the Merz Jawline Assessment Scale (MJAS), were randomized 2:1 to receive treatment with CaHA (+) or to control. Patients in the control group remained untreated until Week 12, when they received delayed treatment. Touch-ups were allowed in both groups, and re-treatment was allowed in the treatment group only. Effectiveness was evaluated on the MJAS, patient and investigator Global Aesthetic Improvement Scales, and FACE-Q™ questionnaires. Adverse events were recorded over a 60-week period.

**Findings:** At Week 12, the treatment response rate (≥ 1-point MJAS improvement) for the treatment group was 93/123 (75.6%) patients, compared to 5/57 (8.8%) patients in the control/delayed-treatment group. The difference between response rates was statistically significant (p < 0.0001), showing superiority of treatment over control. Patients and treating investigators reported satisfaction with aesthetic improvement throughout the study. A total of 76/113 (67.3%) patients who responded to treatment 12 weeks after initial injection also demonstrated improvement 48 weeks after the initial treatment. The study demonstrated a favorable safety profile, with no unexpected adverse events reported over the study duration.

**Summary:** CaHA (+) is a safe and effective treatment for improving the contour of the jawline.

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**Evaluation of skin tissue effects from treatment with a novel hand-held plasma energy device**

**Purpose:** Hand-held plasma energy devices used in aesthetic medicine create discrete microthermal skin surface wounds through ionization of atmospheric nitrogen gas, which conveys electrical energy from the device to the skin's surface in a contactless fashion. The plasma energy delivered to the skin results in a controlled microthermal injury at the skin surface and zones of thermal coagulation in the dermis. This results in immediate skin contraction and stimulation of fibroblasts, thereby prompting neo-collagenases and further tightening of the skin. Small crusting remains for up to one week during the regenerative healing process before falling off and revealing rejuvenated skin. The objective of this histology study was to determine the depth, width, and degree of thermal spread with the first FDA-cleared hand-held plasma energy device.

**Findings:** All Plasma IQ™ microthermal wounds consisted of dual zones of tissue injury (irreversible coagulation and reversible collagen denaturation), and extended to the superficial reticular dermis, irrespective of the setting used. Device power had the greatest impact on microinjury width and extended to the superficial reticular layer, Device power appears to be the main determinant of microthermal wound width and depth but does not affect thermal spread. The lack of significant variances in wound depth and width but similar collateral coagulation across evaluated pulse durations suggests that injury is self-limiting, with increasing tissue coagulation and impedance restricting further injury. These data will help clinicians make informed decisions regarding treatment technique with the Plasma IQ™ device for applications including dyschromia, photodamage, rhytids, acne scarring and promotion of localized skin tightening.

**Submission:** Janine Hopkins, MD, Hopkins Dermatology, Monroe, LA

**Safe and Controlled Application of Therapeutic Products to Wounded Skin using a Novel, Patented Sterile Applicator**

**Purpose:** Therapeutic products, such as platelet-rich plasma, stem cells and other serums are frequently applied to wounded tissue to enhance wound healing. Controlled wounds are often created in clinical practice from procedures such as microneedling or laser resurfacing. Often in clinical practice, the serums are applied to wounded skin via open ended syringes and spread using a gloved finger. In this method, the syringe hovers over the tissue while the product is dripped onto the surface which does not allow for controlled application of the product on to the tissue. Using a gloved hand may be uncomfortable to the patient, adulterate the product and contaminate the tissue. Another method involves dripping the product from a needle attached to the syringe which poses an unwanted risk of needle stick to the patient and provider. To address the unmet need for controlled, sterile and safe application of therapeutics to wounded tissue, a novel device was created.

**Design:** A simple applicator was designed consisting of a smooth, circular disc perforated by multiple microores on a Luer lock base with the ability to attach to any standard Luer lock syringe. The applicator is made of a medical grade polymer with a smooth interface and simple, easy to use design to be supplied as a sterile, single use only FDA class 1 medical device accessory.

**Findings:** When attached to a standard Luer lock syringe, the novel, patented applicator allows for the sterile, controlled application of a variety of therapeutic products to wounded tissue. The device allows the clinician to control the application of products to wounded tissue alleviating the risk of needle sticks and non-sterile contact to the tissue. By using the sterile applicator, the clinician no longer needs to touch the tissue with gloves to spread or apply product. The therapeutic product can pass directly from the syringe through the applicator onto the tissue. Once used the applicator is easily removed and discarded.

**Summary:** Safe, sterile, controlled application of therapeutic product to wounded skin can be achieved using this novel, patented applicator that attaches to standard Luer lock syringes currently used in practices performing procedures that create controlled intentional wounding or in clinics treating

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**Efficacy and Tolerability of a Double-Conjugated Retinoid Eye Cream in Subjects with Fine to Moderate Wrinkles of the Periorbital Region**

**Purpose:** The periorbital region is susceptible to premature skin aging and among the first areas to manifest age-related changes. Retinoids are highly effective but can be irritating, limiting use in this vulnerable area. A hydrating formulation comprised of a double-conjugated retinoid/alpha
hydroxy acid (lactic acid; AHARet-EM) has been developed to address photoaging of the periorbital area. This study evaluated the efficacy, tolerability, and subject satisfaction of nightly application of AHARet-EM, and a regimen that included application of a peptide-rich eye cream (InF-E; AM) and AHARet-EM (PM).

**Design:** A 12-week, dual-center, open-label study evaluated nightly application of AHARet-EM in subjects 35-65 years of age with fine to moderate lines/wrinkles in the periorbital area (3-7 score based on the Fitzpatrick Classification Wrinkle Scale [FCWS]). A subset of subjects applied AHARet-EM (PM) and InF-E (AM). Investigator assessments at baseline, 4, 8, and 12 weeks were based on the 9-point FCWS for lines/wrinkles (1 [Fine Wrinkles] to 9 [Deep Wrinkles]) and a 6-point scale (0 [None] to 5 [Severe]) for texture, erythema, and under-eye darkness, puffiness, and dryness. Subject satisfaction and Adverse Events (AEs) were captured over 12-weeks.

**Findings:** Twenty-six subjects, Fitzpatrick Skin Type III-VI, completed the study (n=16, AHARet-EM; n=10, AHARet-EM/InF-E). Subjects applying AHARet-EM demonstrated significant improvements from baseline at week 12 in the appearance of lines/wrinkles (33%; p < .0001), texture (37%, p < .0001), erythema (37%; p< .004), and under-eye darkness (41%; p < .001), puffiness (95%; p < .0001), and dryness (94%; p < .0001). Significant improvements from baseline were demonstrated in subjects using the AM/PM regimen at week 12 in the appearance of texture (33%; p< .002), erythema (68%; p< .001), and under-eye darkness (32%; p< .007), puffiness (64%; p< .01) and dryness (90%; p < .0001). No AEs occurred related/possibly related to use of the study products. High levels of subject satisfaction were reported over 12 weeks.

**Summary:** Nightly application of a hydrating, double-conjugated retinoid eye cream demonstrated significant improvements in the appearance of lines/wrinkles, under-eye darkness, puffiness and dryness of the periorbital area at 12 weeks. Morning application of a peptide-rich eye cream afforded additional benefits. The study products were non-irritating, and subjects reported high levels of satisfaction throughout the study.

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**Evaluation of a Silicone Gel for Improving the Appearance of Scars Arising from Multifactorial Conditions**

**Purpose:** Silicone-based treatments have been widely used for the management of signs and symptoms of cutaneous scarring. The silicone is believed to provide a semi-occlusive film which helps normalize barrier function, increase hydration, and stimulate cellular signaling pathways. While silicone gel sheeting is often considered the standard of care, it is not practical for use in flexible areas such as joints and often not preferable for use in conspicuous, exposed regions such as the face or extremities. Therefore, a variety of gel-based, dispensable options have become available in tube or pump format which offer convenience and are shown to be effective. One significant detraction to many of these topical silicone products is their poor aesthetic, which often translates to lack of compliance. Emerging formulation technology has made possible great advances in the patient experience. The goal of the present study was to evaluate the efficacy, tolerability and perception of a topical scar gel containing 95% silicones and 0.5% allantoin on subjects with variably located scars arising from multifactorial conditions.

**Design:** This single-center, 12-week clinical study was conducted on 30 healthy subjects (26 females and 4 males) aged 22-51 (mean = 38) with Fitzpatrick skin type ranging from II-V and at least 1 scar which had developed within the previous 1-3 months. There was a distribution of subjects who possessed scars arising from surgeries/procedures (13), burns (9) or abrasions (12). The scars were located on the torso, appendages or face and varied in length from 1-5 inches unless it was a facial scar which was smaller. Subjects with keloid scars were excluded from the study, but 4 subjects with hypertrophic scars were enrolled. The subjects were instructed to apply a thin layer of the topical gel 2-3 times daily as needed for the course of the study. Evaluations were conducted by clinical grading for parameters according to the Manchester scale (color, matte appearance, contour, distortion, texture) in addition to redness and skin smoothness at baseline and at weeks 2, 4, 8, and 12. Objective and subjective tolerance parameters were evaluated and global and close-up digital images of the area of interest were collected at all time points. In addition, all subjects responded to self-assessment questionnaires.

**Findings:** From week 2, there were statistically significant improvements in the clinical grading assessments for redness and smoothness when compared to pre-treatment baseline. By week 4, all clinical parameters except matte appearance and distotion showed statistically significant improvement versus baseline which continued to increase in magnitude through week 12.

**Summary:** The 12-week clinical study demonstrated improvements for all types of scars assessed regardless of scar origin and size or body location and skin type. The product was well tolerated and well perceived by subjects who expressed an observable benefit in overall scar quality and greatly appreciated the non-sticky, non-greasy texture.
Efficacy of Firm & Tone Body Lotion for Upper Arms in a Double-Blind, Randomized, Vehicle-Controlled Clinical Study

**Purpose:** To assess the efficacy of Firm & Tone Body Lotion (FTB) when used over the course of 12 weeks by women with lack of firmness on the upper arms.

**Design:** A double-blind, randomized, 12-week study comparing FTB and a vehicle control was conducted. Patients assigned to either treatment applied designated product twice daily (morning and evening) on the upper arms. Included patients were females 30–65 years of age with a Fitzpatrick skin type I–V, mild to moderate visual lack of firmness and sagging in the upper arms, and body mass index (BMI) 19–30 kg/m² with a willingness to maintain BMI ±2 kg/m² within baseline. Investigator assessments, instrumentation evaluations, and patient questionnaires were performed. Characteristics and outcomes were summarized descriptively. Changes from baseline were evaluated with a paired t test or Wilcoxon signed-rank test, as appropriate. Comparisons between treatments were evaluated with a 2-sample t test or Wilcoxon rank-sum test, as appropriate.

**Findings:** Forty-four patients completed treatment (FTB, 30; vehicle control, 14). Patients randomized to FTB showed significant improvements in the upper arms (all P < 0.05) at week 12 compared with baseline for investigator assessments of crepiness (21.7%), skin smoothness (24.3%), skin tone evenness (8.9%), body skin texture (14.8%), body skin firmness (8.2%), and sagging (5.4%). Significant improvements in the upper arms (all P < 0.05) at week 12 compared with baseline in patients randomized to FTB were observed for instrumentation analyses of skin firmness (extensibility, 16.4%) and epidermal and dermal tissue density (19.4%), and for skin hydration (15.5%). The improvements in investigator and instrument assessments of skin efficacy parameters at week 12 were accompanied by significant improvements in self-perceived efficacy (P < 0.02) and overall satisfaction with the appearance of their skin following FTB treatment versus vehicle control.

**Summary:** FTB provided significant improvements in the upper arms compared with baseline and vehicle control across multiple investigator assessment and instrumentation evaluation parameters while improving self-reported efficacy and satisfaction in most patients.

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Relabotulinum Toxin – A Novel, High-Purity BoNT-A1 in Liquid Formulation

**Purpose:** Introduction and Objectives: Botulinum toxin (BoNT) has been used clinically for 40 years and is commonly used for aesthetic purposes. Most BoNTs on the market are lyophilized and need to be reconstituted in combination with tryptophan as stabilizing agents and is animal origin-free. The goal was to produce a liquid formulation of pure BoNT-A1 that is complex-free.

**Design:** Methods: Manufacturing of relabotulinumtoxinA (relaBoNT-A1) was done using an in-house isolated Clostridium botulinum type A1 strain. The purification process consisted of fermentation, filtration, and chromatography methods in combination with techniques to avoid harsh processing steps and open handling of toxic solutions. BoNT purity was assessed using Ultra-High–Performance Liquid Chromatography–Size Exclusion Chromatography (UPLC-SEC) and SDS-PAGE (sodium dodecyl sulphate–polyacrylamide gel electrophoresis). In the UPLC-SEC analysis, relaBoNT-A1 was separated on a Waters BEH™ SEC column and analyzed using absorbance (A280). The specific activity was determined using mouse LD50 potency data in combination with total protein analysis using the µBCA method.

**Results:** Production of 98% pure relaBoNT-A1 was shown by UPLC-SEC analysis and SDS-PAGE. The specific activity of relaBoNT-A1 was ~2.0×108 U/mg total protein, confirming that the purified relaBoNT-A1 is active. The stable liquid formulation was achieved with polysorbate 80 in combination with tryptophan as stabilizing agents and is animal origin-free.
Conclusions: RelaBoNT-A1 has been produced in a stable liquid formulation using modernized purification processes resulting in robust production of complex-free relaBoNT-A1 with high specific activity.

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Real-World Effectiveness and Safety of Qwo: An Interim Analysis for the Treatment of Thigh Cellulite in Women

Purpose: Studies to date have focused on Qwo® (collagenase clostridium histolyticum-aaes) efficacy and safety for the treatment of moderate to severe cellulite. There is limited availability of Qwo data in a more “real-world” population (ie, women with mild to moderate cellulite), and there is a need to provide additional data on Qwo treatment of thigh cellulite using the technique found to be most efficacious and well tolerated in a previously conducted phase 2a, open-label trial. The objectives were to report data from a prespecified interim analysis for Qwo-treated thigh cellulite in the ongoing phase 3b REAL™ study of thigh and buttock cellulite and from the Photography and Imaging eXPerimentaL Study (PIXELS™) sub study on Qwo-treated thigh and buttock cellulite.

Design: The real-world, open-label, multicenter (REAL) study included women aged 18 to 60 years with mild to moderate cellulite (Clinician Reported Photographic Cellulite Severity Scale score of 2 or 3) and a Hexsel Cellulite Severity Scale subsection grade for laxity, flaccidity, or sagging skin of 0 (absence) or 1 (slightly draped appearance) on both posterolateral thighs or both buttocks. Women received up to 0.84 mg (18 mL) of Qwo subcutaneously in up to 12 dips per posterolateral thigh or buttock per treatment session, undergoing up to 3 treatment sessions, each separated by ~21 days (Days 1, 22, and 43). Day 90 (interim analysis cutoff) and Day 180 were follow-up visits. The primary study endpoint was percentage of responders (defined by ≥1-level improvement in Investigator Global Aesthetic Improvement Scale score for either thigh) at Day 90. Patients reported bother due to their cellulite using the recently validated, 11-item BODY-Q Appraisal of Cellulite (4-point scale per item; 1 [“extremely bothered”]) to 4 (“not at all bothered”); total score range, 11-44). A subset of women from the REAL study participated in the concurrent PIXELS sub study, in which high-definition photography and 3D imaging scan of thigh or buttock cellulite treatment areas occurred on Days 1 (baseline), 22, 43, 90, 135, and 180. Skin roughness was measured quantitatively using the 3D-image scanning results.

Findings: A total of 22 women with mild to moderate thigh cellulite (44 thigh treatment areas) were included in the interim REAL study analysis (thighs with mild cellulite, 68.2%; moderate cellulite, 31.8%; mean patient age, 42.3 years; Fitzpatrick skin type II-IV, 90.9%; mean body mass index, 24.2 kg/m2). Investigators reported high percentages of responders at Day 90 for Qwo-treated left thigh (81.8%), right thigh (77.3%), or either thigh (86.4%). Patient-reported bother due to cellulite was reduced at Day 90, as shown by improvement in BODY-Q Appraisal of Cellulite mean total score from 17.9 (Day 1) to 33.2 (Day 90); 15.3-point mean improvement. Injection-site bruising and pain were the most frequently reported treatment-related adverse events (AEs), occurring in 81.8% and 50.0% of patients, respectively. Treatment-related AEs were generally mild to moderate in intensity (88.0%) and most resolved within 21 days (85.5%). High-definition photographs supporting the efficacy of Qwo for the treatment of buttock cellulite were available for 8 women. For the PIXELS sub study, which was conducted at 3 sites, preliminary data on skin roughness for women with thigh cellulite will be presented.

Summary: Qwo treatment of mild to moderate thigh cellulite was generally well tolerated, effective, and associated with marked reductions in patients’ reported bother due to cellulite overall. Preliminary data from 3D image scan analyses suggest improvement from baseline in skin roughness in Qwo-treated thigh cellulite, supporting the clinical goal that improvement in dimples reduces surface irregularities and contributes to a smoother silhouette.

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KB303, An Innovative and Minimally Invasive HSV-1-Based Therapy to Improve Skin Elasticity

Purpose: Cutaneous aging affects many layers of the skin, leading to wrinkling, atrophy of the dermis, and loss of elasticity associated with damage to the underlying elastin (ELN), a key extracellular matrix protein which provides resilience and elasticity to tissues and organs. The field of aesthetic product development has long strived for an approach capable of stimulating deposition of full-length elastic fibers in treated skin; however, such a therapy remains lacking. To this end, we engineered KB303, a replication-defective HSV-1 gene therapy vector for the targeted delivery of human ELN as a novel therapeutic option to improve skin elasticity.

Design: We explored KB303’s ability to transduce clinically relevant human skin cells and express and secrete mature ELN in vitro, as well as to confirm proper tissue localization of the transgene without toxicity or systemic vector distribution in vivo. This preclinical program used, in part, primary human dermal fibroblasts and epidermal keratinocytes harvested from young and aged patients in vitro and 8- to 13-month-old mice in vivo as representative models for studying ELN supplementation.

Findings: In vitro, KB303 readily transduced primary human male and female fibroblasts and keratinocytes, inducing full-length ELN expression, proper maturation, and subsequent protein secretion. In vivo, young and aged immunocompetent mice were intradermally injected with low or high dose KB303, with tissues being harvested at different time points (4 to 96 hours post-infection). Successful vector transduction and subsequent ELN expression was observed in a dose-dependent manner at both the transcript and protein levels. Immunofluorescence /immunohistochemistry data revealed that the exogenously expressed human protein localized to the mouse dermis, signifying proper delivery to the targeted skin layer. Histological evaluation of skin tissue sections indicated no obvious signs of vector-induced toxicity. In addition, Verhoeff-Van Gieson (VVG) staining confirmed proper elastic fiber formation and deposition.

Summary: Results from these in vitro and in vivo proof-of-concept studies and safety assessments support the application of KB303 for the treatment of age- or environment-related loss in cutaneous elasticity.

Industry Presenter: Deanne Robinson, MD, Co-Founder, Modern Dermatology of Connecticut, skinbetter science, LLC, Phoenix, AZ

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Efficacy and Tolerability of a Double-Conjugated Retinoid Cream Containing Salicylic Acid in Subjects with Mild to Moderate Blemish-Prone Skin

Purpose: Topical retinoids are a foundational component of treatment for patients seeking clearer skin. In addition to their comedolytic properties, retinoids influence the rate of cellular turnover and improve the appearance of photoaged skin. Cutaneous irritation often accompanies use leading to reduced adherence and suboptimal outcomes. A double-conjugated molecule comprised of a retinoid and an alpha hydroxy acid (AHA; lactic) has uniquely been formulated with salicylic acid (SA) for blemish-prone skin. The purpose of this study was to evaluate visible improvements in
Skin clarity, tolerability and subject satisfaction from baseline following application (PM) of AHA-Ret SA in adults with blemish-prone skin.

**Design:** A 12-week dual-center, open-label study in subjects with mild to moderate blemish-prone skin evaluated global improvements in skin clarity from baseline at 4, 8, and 12 weeks using a 5-point scale (0 [Clear] to 4 [Severe]). Adverse Events (AEs) and subject satisfaction were captured throughout the study. A secondary analysis conducted in a subset of subjects evaluated quantitative changes in pores utilizing digital imagery (Canfield VISIA-CR; Canfield Scientific, Inc., Parsippany NJ).

**Findings:** Twenty subjects were enrolled; 19 subjects completed the study. Mean age was 32 years, and the majority of subjects were female. Mean percent improvements from baseline in skin clarity were demonstrated at weeks 4 (43%; p < .0001), 8 (48%; p < .0001) and 12 (50%; p < .0001). Mean percent visible improvements from baseline in pores were observed at 4, 8, and 12 weeks (33% [p < .0001]; 21% [p=.04] and 25% [p=.0006], respectively). AEs were mild and transient. All subjects reported that the overall appearance of their skin improved and was healthier looking after 8 weeks. Quantitative analysis (n=6) demonstrated an 18% mean improvement in the appearance of pores from baseline at week 12.

**Summary:** Treatment with a double-conjugated retinoid/AHA cream containing salicylic acid was highly tolerable and demonstrated early clinical improvements in the appearance of skin clarity and pores. Subjects reported high levels of satisfaction in the overall appearance and quality of skin.

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**Primary Pembrolizumab Versus Placebo in High-Risk Locally Advanced Cutaneous Squamous Cell Carcinoma: Phase 3 KEYNOTE 630 Study**

**Purpose:** Approximately 208±37 of patients with high-risk locally advanced (LA) cutaneous squamous cell carcinoma (cSCC) experience local disease recurrence within 5 years of standard-of-care surgical resection and adjuvant radiotherapy (RT). Treatment options are needed to improve patient outcomes. The PD-1 inhibitors cemiplimab and pembrolizumab have antitumor activity and manageable safety in LA or metastatic cSCC. KEYNOTE-630 (NCT03833167) is a randomized, double-blind, phase 3 study designed to investigate adjuvant pembrolizumab in patients with high-risk LA cSCC.

**Design:** Eligible patients have histologically confirmed LA cSCC with ≥1 of the high-risk features: histologically involved nodal disease with extracapsular extension with either ≥1 lymph nodes (LNs) > 2 cm in diameter or ≥2 LNs involved; any gross cortical bone invasion or skull base invasion and/or skull base foramen invasion; or any index tumor with ≥2 of the following: tumor ≥4 cm with a depth > 6 mm or invasion beyond subcutaneous fat, multifocal perineural invasion for nerves ≥ #60; 0.1 mm in diameter (≥3 foci) or any involved nerve ≥0.1 mm in diameter, poor differentiation and/or sarcomatoid and/or spindle cell histology, cSCC that has recurred within 3 years in the previously surgically or topically treated area, or satellite lesions and/or in transit metastases. In addition, patients must have an ECOG performance status of 0 or 1, have undergone complete macroscopic resection of all known cSCC disease (with/without microscopic positive margins), have received an adequate postoperative dose of RT (hypofractionated or conventional), have completed adjuvant RT ≥4 weeks and ≤16 weeks from randomization, and have provided a tumor tissue sample for PD-L1 testing. Patients must be disease free ≥28 days from randomization. Patients are randomly allocated 1:1 to receive pembrolizumab 400 mg every 6 weeks or matching placebo for up to 9 cycles (approximately 1 year) or until disease recurrence, unacceptable toxicity, start of new anticancer treatment, or patient withdrawal. Randomization is stratified by extracapsular extension (yes vs no), cortical bone invasion (yes vs no), and prior systemic therapy (yes vs no). The primary end point is recurrence-free survival, per investigator review with biopsy confirmation. Secondary end points are overall survival, safety, and health-related quality of life. Imaging of tumor and associated draining LNs by CT or MRI is being performed every 12 weeks until the end of year 2. Adverse events (AEs) are being monitored throughout the study and for 30 days after treatment end (90 days for serious AEs). AEs are being graded in severity per NCI CTCAE v4.0. Patient-reported outcomes are being assessed on day 1 of cycles 1 to 3, and then every 2 cycles (every 12 weeks) until the end of year 2. Patients in the placebo arm with biopsy-proven disease recurrence before the end of year 5 may be eligible for crossover to pembrolizumab (<18 cycles). Patients who experience disease recurrence >6 months after completion of 9 pembrolizumab cycles and before the end of year 5 may be eligible for pembrolizumab retreatment (<18 cycles). Enrollment of ~570 patients is planned. Recruitment is currently ongoing in 20 countries.

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**Enzymatic Subcision and Remodeling After Qwo® Subcutaneous Injection: A Porcine Tissue Histology Study**

**Purpose:** Qwo® (collagenase clostridium histolyticum-aaes) injection is approved for the treatment of moderate-to-severe cellulite in the buttocks of adult women. Qwo provides durable improvement in cellulite appearance, but a common adverse event with Qwo-aaes is injection-site bruising. A porcine study was conducted to further determine the subdermal impact of Qwo.

**Design:** Ten 3-cm x 3-cm square sites (5 on the left [L] and 5 on the right [R], with 1 cm separating each site) were marked on swine for treatment on Days -42, -29, -25, -23, -21, -8, -4, and -2, relative to the day of sample collection, which was identified as Day 0. Animals received a single subcutaneous injection of Qwo 0.07 mg/0.3 mL as a single treatment on Days -21 (L1), -8 (L2), -4 (L3), and -2 (L4); and 2 treatments, separated by 21 days, on Days -42 and -21 (R1), -29 and -8 (R2), -25 and -4 (R3), and -23 and -2 (R4). Placebo injections were administered at sites L5 (Day -2) and R5 (Days -23 and -2). Each injection was administered, using a syringe with a 31-gauge, 8-mm needle, as three 0.1-mL aliquots into a “skin tent” at each marked site.

**Findings:** Three animals completed the study. Histology showed lysis/disintegration of interlobular subdermal septae in Qwo-treated tissue. As collagen support was lost, blood leakage from the thinner endothelial venules was observed in L3 (Day -4), L4 (Day -2), and R4 (Days -23, -2) injection sites. This correlated with site bruising/edema. Collagen neogenesis and subdermal structural reorganization were evident as early as 4 days after Qwo dosing in L3 (Day -4) and clearly defined in L2 (Day -8) and R2 (Days -29, -8) injection sites. Marked subdermal fat and collagen structural reorganization was evident at L1 (Day -21) and R1 (Days -42, -21) injection sites. No changes were seen with placebo.

**Summary:** Qwo injection was associated with Enzymatic Subcision and Remodeling (ESR™), which involves lysis of mature, collagen-rich septae, stimulation of neocollagenesis, and reorganization of adipose lobules.
Evaluation of the Efficacy and Tolerability of a Retinol Containing Neck Cream

**Purpose:** Neck skin has an inherently different physiology than facial skin, with a thinner and more extensible dermal layer. Factors such as collagen loss, platysmal weakening, local subcutaneous fat accumulation, sun exposure, and gravitational force combined with the neck’s constant movement, contribute to age-related changes such as prominent wrinkles and horizontal banding that are deeper than on the face. The goal of this testing campaign was to evaluate the efficacy and tolerability on the neck of a cream containing 0.2% retinol, tripeptide, and glaucine, and to gain insight as to the cutaneous mechanism of action through histological analysis of biopsy samples.

**Design:** A double-blinded clinical study was conducted over the course of 16 weeks on 50 subjects aged 40-60 who presented with mild-to-moderate signs of aging on the neck. Subjects applied the cream to the neck once daily for the first week and then twice daily for the remainder of the study as tolerated. Clinical grading, tolerance evaluations, and subject self-assessments were conducted at baseline, and weeks 4, 8, 12, and 16. An additional, smaller trial was conducted over the course of 12 weeks on 11 subjects aged 55-75 who presented with mild-to-moderate signs of aging on the neck and with usage as described previously. Elliptical, full-thickness biopsies were obtained at baseline and week 12, fixed in formalin and analyzed by immunohistochemistry.

**Findings:** In the larger trial, after 4 weeks of treatment, subjects showed statistically significant improvement in neck skin texture, firmness, elasticity, and skin tone evenness. By week 8, significant improvement in more prominent signs of neck aging such as horizontal lines, sagging and crepiness were observed. The degree of improvement continued to increase in magnitude through week 16. The cream was well tolerated and patients reported visible improvement in the appearance of their neck skin. Analysis of biopsies showed a statistically significant increase in the expression of dermal matrix proteins elastin and lumican.

**Summary:** Taken together, the results of the described clinical studies illustrate the efficacy of a cream containing 0.2% retinol, tripeptide, and glaucine to improve signs of aging on the neck. The histological analysis suggests that the stimulation of dermal matrix proteins may play a role in the observed cosmetic benefits.

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**Enhanced Uptake of 2% Salicylic Acid Following 1440-nm Non-ablative Fractional Diode Laser Treatment**

**Purpose:** Although topical medications directly target the site of dermatologic conditions, limited uptake across the stratum corneum may impede their clinical efficacy. Non-ablative fractional laser pretreatment is a promising approach to enhancing topical uptake. Compared to ablative lasers, non-ablative fractional lasers have less effect on the stratum corneum, can minimize thermal side effects, and can shorten postprocedural downtime. However, the relationship between uptake and device settings must be quantified to optimize topical treatments. In this ex vivo analysis, we quantified uptake of topical 2% salicylic acid, a common component of antiaging topicals, after pretreatment with a 1440-nm non-ablative fractional diode laser (Clear + Brilliant® laser system; Solta Medical, Bothell, WA) with varying treatment densities.

**Design:** Excised human abdominal skin tissue samples of 500-µm thickness were pretreated with a low-power 1440-nm laser using either 80 or 320 microscopic treatment zones (MTZ)/cm2 or received no laser pretreatment. Following laser pretreatment, 2% salicylic acid was applied,

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**Improvement in the Appearance of Cellulite and Skin Laxity Resulting from a Single Treatment with Acoustic Subcision: Long-term Findings from a Multi-Center Pivotal Clinical Trial**

**Purpose:** Surface depressions and skin laxity are prevalent in the appearance of cellulite. Cellulite depressions can be improved through disruption of the subcutaneous fibrous septae. Some currently utilized approaches accomplish this through invasive techniques requiring local anesthesia and potential down time. Rapid Acoustic Pulse technology (RESONIC™, Soliton, Houston, TX) is a non-invasive approach to improving both cellulite depressions and skin laxity using acoustic subcision. Evaluations of the 12-week follow-up data showed that a single non-invasive treatment resulted in a statistically significant improvement in the appearance of cellulite depressions, as well as skin laxity, with minimal treatment pain and no post-treatment down time. The purpose of this study was to evaluate the long-term improvement (mean 60-weeks) in the appearance of cellulite.

**Design:** Women (n = 56) with moderate to severe cellulite were treated in a single acoustic subcision treatment session without anesthesia. Post-treatment adverse events (AEs) and tolerability were recorded. Cellulite outcomes were assessed by a blinded independent dermatologist panel (n = 3) using a 6-point simplified Cellulite Severity Scale (CSS), and correctly identifying post-treatment photographs from randomized pairs of pre/post-treatment photographs. Additionally, a participant satisfaction questionnaire was taken.

**Findings:** At the long-term follow-up visit, 42 participants were available for evaluation. The number of participants lost to follow up was due in large part to the COVID-19 pandemic (i.e., stay-at-home orders, lockdowns, and participant self-quarantine). The 60-week long-term mean CSS reduction was 1.09 (a 34.1% reduction from the baseline) compared to the 12-week mean CSS reduction of 1.01 (a 29.5% reduction from baseline). The difference between short-term (mean 12-week, range 11-15 weeks) and long-term (mean 60-week, range 52-67 weeks) mean CSS reduction scores were not significant (t-test, unpaired, two-tailed, p = 0.5202, t = 0.6454, df=96). The long-term post-treatment photographs were correctly identified from randomized pairs of pre/post-treatment photographs at a rate of 95.2% compared to the 12-week rate of 96.4%. A Mann-Whitney test found there was no significant difference between these rates (U = 1162, p < 0.9999, Mdn1 = 1.00 (n = 56), Mdn2 = 1.0 (n = 42)). Finally, at the long-term visit, 100% of participants reported positive satisfaction responses compared to the 12-week visit where 92.9% of the participants reported positive satisfaction responses. A Kolmogorov-Smirnov test indicated the differences between the two groups were non-significant (D=0.4, P=0.8095). No unexpected or serious AEs were noted at treatment or follow-up.

**Summary:** The improvements in the appearance of cellulite seen at the 12-week follow-up have persisted to the long-term 60-week follow-up. A single non-invasive acoustic subcision session can safely provide long-term improvement in the appearance of cellulite depressions and skin laxity with minimal treatment pain, no post-treatment down time, and high patient satisfaction. Further improvement in appearance is expected with multiple treatments over time. Additional trials to verify this are planned.

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**A double-blinded clinical study was conducted over the course of 16 weeks on 50 subjects aged 40-60 who presented with mild-to-moderate signs of aging on the neck. Subjects applied the cream to the neck once daily for the first week and then twice daily for the remainder of the study as tolerated. Clinical grading, tolerance evaluations, and subject self-assessments were conducted at baseline, and weeks 4, 8, 12, and 16. An additional, smaller trial was conducted over the course of 12 weeks on 11 subjects aged 55-75 who presented with mild-to-moderate signs of aging on the neck and with usage as described previously. Elliptical, full-thickness biopsies were obtained at baseline and week 12, fixed in formalin and analyzed by immunohistochemistry.

**Findings:** In the larger trial, after 4 weeks of treatment, subjects showed statistically significant improvement in neck skin texture, firmness, elasticity, and skin tone evenness. By week 8, significant improvement in more prominent signs of neck aging such as horizontal lines, sagging and crepiness were observed. The degree of improvement continued to increase in magnitude through week 16. The cream was well tolerated and patients reported visible improvement in the appearance of their neck skin. Analysis of biopsies showed a statistically significant increase in the expression of dermal matrix proteins elastin and lumican.

**Summary:** Taken together, the results of the described clinical studies illustrate the efficacy of a cream containing 0.2% retinol, tripeptide, and glaucine to improve signs of aging on the neck. The histological analysis suggests that the stimulation of dermal matrix proteins may play a role in the observed cosmetic benefits.
Quantifying Uptake of Eye Serum After 1440-nm Non-ablative Fractional Diode Laser Treatment

**Purpose:** The stratum corneum limits transdermal uptake of topical therapies, potentially reducing their clinical efficacy. Non-ablative fractional laser pretreatment enhances topical delivery and absorption, reduces thermal side effects, and creates microscopic treatment zones (MTZ) that spare the stratum corneum. To better understand how to optimize topical therapy, the relationship between uptake and device settings must be identified. In this ex vivo analysis, we quantified uptake of an eye serum, Obagi® Elastiderm (Long Beach, CA; 2010 formulation), using donor skin tissue pretreated with a 1440-nm non-ablative fractional diode laser (320 MTZ/cm2; Clear + Brilliant® laser system; Solta Medical, Bothell, WA). Design: Human donor skin tissue samples of 500-µm thickness were pretreated with a low-power 1440-nm diode laser (9-J pulse energy, 3-W peak power, 130-µm spot size, 320-MTZ/cm2 spot density) or received no pretreatment prior to application of eye serum. Laser-treated skin and untreated controls were analyzed using high-performance liquid chromatography at various time points up to 24 hours after application to measure cumulative permeation and retention and to calculate uptake of eye serum.

**Findings:** Skin samples pretreated with a 1440-nm non-ablative fractional laser had more than double the uptake of eye serum at 24 hours posttreatment compared to untreated controls (cumulative permeation, 39.7 vs 19.4 mg/cm2, respectively). Enhanced uptake of eye serum with laser pretreatment was evident as early as 15 minutes after application (3.9 mg/cm2) and nearly tripled by 4 hours (11.1 mg/cm2). Untreated controls did not begin to demonstrate eye serum permeation until 90 minutes after application (3.6 mg/cm2).

**Summary:** In this ex vivo analysis, pretreatment with a low-power 1440-nm non-ablative fractional diode laser not only increased overall uptake of eye serum but also achieved more rapid absorption after application compared to untreated controls. Non-ablative laser therapy at this wavelength can be a useful option for enhancing topical uptake.

Enhanced Uptake of 10% Ascorbic Acid After 1440-nm or 1927-nm Non-ablative Fractional Diode Laser Treatment

**Purpose:** The stratum corneum forms a vital protective barrier along the outer layer of the skin, but also prevents optimal uptake of topical formulations. Non-ablative fractional laser pretreatment is a promising approach to enhancing topical uptake. Unlike ablative devices, non-ablative lasers generally target dermal tissue and largely spare the stratum corneum, which minimizes overall thermal side effects and postprocedural recovery time. In addition, use of fractionation to create microscopic treatment zones (MTZ) further reduces postprocedural downtime. However, the relationship between topical uptake and device settings needs to be quantified to optimize treatment benefits. In this ex vivo analysis, we quantified uptake of 10% ascorbic acid, a common component of antioxidant and antiaging topicals, following pretreatment with low-power 1440-nm or 1927-nm non-ablative fractional diode lasers (Clear + Brilliant® laser system; Solta Medical, Bothell, WA) with varying treatment densities.

**Findings:** Pretreatment with the 1927-nm laser with 320 MTZ/cm2 enhanced uptake of 10% ascorbic acid by >4 times compared to the 1440-nm laser with 320 MTZ/cm2 (7.8 vs 1.8 mg/cm2), >15 times compared to the 1440-nm laser with 80 MTZ/cm2 (0.5 mg/cm2), and >-33 times compared to untreated control (0.2 mg/cm2) at 24 hours posttreatment. Pretreatment with the 1440-nm laser with 320 MTZ/cm2 was associated with >3-times greater uptake of 10% ascorbic acid compared to the 1440-nm laser with 80 MTZ/cm2 (1.8 vs 0.5 mg/cm2) and >7-times greater uptake compared to untreated control (1.8 vs 0.2 mg/cm2). Additionally, pretreatment with the 1440-nm laser with 80 MTZ/cm2 enhanced uptake by >2 times compared to untreated control (0.5 vs 0.2 mg/cm2).

**Summary:** In this ex vivo analysis, the greatest enhancement of 10% ascorbic acid was seen with 1927-nm wavelength pretreatment at 320 MTZ/cm2 and 1.0 W, compared to 1440-nm wavelengths at varying wattage and treatment densities. This provides a foundation for clinical studies on laser-enhanced uptake of ascorbic acid and other topicals, which can allow clinicians to better understand the relationship between quantifiable uptake enhancement and patient-centered outcomes.

Quantifying Uptake of Topical 4% Hydroquinone After 1440-nm and 1927-nm Non-ablative Fractional Diode Laser Treatment

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**Purpose:** Non-ablative fractional laser therapy, the relationship between uptake and device settings must be quantified to optimize treatment benefits. In this ex vivo analysis, we quantified uptake of 10% ascorbic acid, a common component of antioxidant and antiaging topicals, following pretreatment with low-power 1440-nm or 1927-nm non-ablative fractional diode lasers (Clear + Brilliant® laser system; Solta Medical, Bothell, WA) with varying treatment densities.

**Findings:** Pretreatment with the 1927-nm laser with 320 MTZ/cm2 enhanced uptake of 10% ascorbic acid by >4 times compared to the 1440-nm laser with 320 MTZ/cm2 (7.8 vs 1.8 mg/cm2), >15 times compared to the 1440-nm laser with 80 MTZ/cm2 (0.5 mg/cm2), and >33 times compared to untreated control (0.2 mg/cm2) at 24 hours posttreatment. Pretreatment with the 1440-nm laser with 320 MTZ/cm2 was associated with >3-times greater uptake of 10% ascorbic acid compared to the 1440-nm laser with 80 MTZ/cm2 (1.8 vs 0.5 mg/cm2) and >7-times greater uptake compared to untreated control (1.8 vs 0.2 mg/cm2). Additionally, pretreatment with the 1440-nm laser with 80 MTZ/cm2 enhanced uptake by >2 times compared to untreated control (0.5 vs 0.2 mg/cm2).

**Summary:** In this ex vivo analysis, the greatest enhancement of 10% ascorbic acid was seen with 1927-nm wavelength pretreatment at 320 MTZ/cm2 and 1.0 W, compared to 1440-nm wavelengths at varying wattage and treatment densities. This provides a foundation for clinical studies on laser-enhanced uptake of ascorbic acid and other topicals, which can allow clinicians to better understand the relationship between quantifiable uptake enhancement and patient-centered outcomes.

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**Purpose:** Non-ablative fractional laser therapy is a promising approach to enhancing topical uptake. Unlike ablative devices, non-ablative lasers generally target dermal tissue and largely spare the stratum corneum, which minimizes overall thermal side effects and postprocedural recovery time. In addition, use of fractionation to create microscopic treatment zones (MTZ) further reduces postprocedural downtime. However, the relationship between topical uptake and device settings needs to be quantified to optimize treatment benefits. In this ex vivo analysis, we quantified uptake of 10% ascorbic acid, a common component of antioxidant and antiaging topicals, following pretreatment with low-power 1440-nm or 1927-nm non-ablative fractional diode lasers (Clear + Brilliant® laser system; Solta Medical, Bothell, WA) with varying treatment densities.

**Findings:** Pretreatment with the 1927-nm laser with 320 MTZ/cm2 enhanced uptake of 10% ascorbic acid by >4 times compared to the 1440-nm laser with 320 MTZ/cm2 (7.8 vs 1.8 mg/cm2), >15 times compared to the 1440-nm laser with 80 MTZ/cm2 (0.5 mg/cm2), and >33 times compared to untreated control (0.2 mg/cm2) at 24 hours posttreatment. Pretreatment with the 1440-nm laser with 320 MTZ/cm2 was associated with >3-times greater uptake of 10% ascorbic acid compared to the 1440-nm laser with 80 MTZ/cm2 (1.8 vs 0.5 mg/cm2) and >7-times greater uptake compared to untreated control (1.8 vs 0.2 mg/cm2). Additionally, pretreatment with the 1440-nm laser with 80 MTZ/cm2 enhanced uptake by >2 times compared to untreated control (0.5 vs 0.2 mg/cm2).

**Summary:** In this ex vivo analysis, the greatest enhancement of 10% ascorbic acid was seen with 1927-nm wavelength pretreatment at 320 MTZ/cm2 and 1.0 W, compared to 1440-nm wavelengths at varying wattage and treatment densities. This provides a foundation for clinical studies on laser-enhanced uptake of ascorbic acid and other topicals, which can allow clinicians to better understand the relationship between quantifiable uptake enhancement and patient-centered outcomes.
Purpose: Non-ablative fractional laser pretreatment can enhance transdermal delivery and uptake of topicals and minimize thermal side effects that are more typical of ablative laser therapy. Fractionation can create microscopic treatment zones that spare surrounding tissue and further minimize postprocedural downtime. Clinical practice may be improved by understanding the relationship between topical uptake and energy-device settings. In this ex vivo analysis, we quantified uptake of 4% hydroquinone serum using skin tissue pretreated with either a 1440-nm or 1927-nm non-ablative fractional diode laser.

Design: Ex vivo human donor skin tissue was pretreated with either 1440-nm (1.2 W [9 mJ]) or 1927-nm (0.6 W [4.5 mJ]) or 1.0 W [7.5 mJ]) wavelengths or received no pretreatment prior to application of an in-house 4% hydroquinone serum (hydrophilic formulation). Laser-treated skin and untreated controls were analyzed using high-performance liquid chromatography at various time points up to 24 hours after application to measure cumulative permeation and retention and to calculate uptake of 4% hydroquinone serum.

Findings: Pretreatment with the 1927-nm wavelength resulted in greater cumulative uptake of 4% hydroquinone serum compared to the 1440-nm wavelength. Compared to untreated controls, topical uptake was 1.8 times greater with 1440-nm (1.2-W) pretreatment, 2.7 times greater with 1927-nm (0.6-W) pretreatment, and 4.6 times greater with 1927-nm (1.0-W) pretreatment. The 1927-nm power settings (0.6 and 1.0 W) were associated with approximately 1.5- and 2.6-times greater uptake, respectively, compared to 1440-nm (1.2-W) pretreatment.

Summary: Diode laser pretreatment with the 1927-nm wavelength resulted in greater uptake of 4% hydroquinone serum compared to the 1440-nm wavelength, despite lower peak power settings. Various low-power wavelengths can affect topical delivery differently. Higher peak irradiance at higher power settings may cause greater superficial disruption to the stratum corneum and epidermis, which can affect uptake of topical therapies.

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A Topical Antioxidant Serum Containing Silymarin Prevents Sebum Peroxidation in Oily, Blemish-Prone Skin

Purpose: Acneic skin is known to have higher levels of oxidative stress and lower levels of antioxidants than healthy skin. Research suggests that lipid peroxidation contributes to inflammation and creates a favorable environment for acne-causing bacteria. Therefore, an opportunity exists for topical antioxidant treatment to help disrupt this pathogenesis. We evaluated the propensity for a serum containing 0.5% silymarin, 15% vitamin C, 0.5% ferulic acid, and 0.5% salicylic acid to prevent sebum peroxidation both ex vivo and in blemish-prone skin.

Design: Sebum was collected from the forehead of volunteers with oily skin and exposed to UVA radiation in the presence and absence of test product. The level of peroxidized squalene was measured by HPLC. In addition, a double-blind clinical study was conducted on 53 Asian male and female subjects aged 18-50 with oily, blemish-prone skin. At baseline and week 4, swabbing of both cheeks was performed to obtain untreated samples for comparison to baseline.

Findings: Ex vivo evaluation showed that the test formula provided an 82% average reduction of UVA-induced squalene peroxidation compared to untreated. In vivo evaluation, after 4 weeks of treatment, showed significant reduction in both oiliness and squalene peroxidation compared to baseline.

Summary: The study demonstrated to have significant benefit in reducing sebum peroxidation and oiliness in blemish-prone skin. The serum was both well appreciated and well tolerated by subjects. In summary, the serum could serve as a promising antioxidant solution for oily, blemish-prone skin.

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A Dual-Skincare Regimen Formulated to target Aging at the Dermal-Epidermal Junction while Maintaining a Healthy Microbiome

Purpose: A multi-ingredient, anti-aging face moisturizer (MFM) and eye cream (MEC) were formulated with a synergistic blend of bioavailable peptides, botanical extracts, antioxidants, and microbiome technology to target intrinsically and extrinsically aged facial and periorbital skin.

Purpose #1: To determine if the MFM maintains diversity and balance of the skin microbiome utilizing in vitro and in vivo microbiome test methods.

Purpose #2: To determine if the MFM and MEC improve dermal-epidermal junction proteins and dermal proteins utilizing an in vitro full thickness tissue model.

Purpose #3: To determine the efficacy and tolerability of a dual-skincare regimen (MFM and MEC) after twice-daily use for 12-weeks in women with moderate facial photodamage, moderate crow’s feet wrinkles, and mild-to-moderate droopy upper eyelids.

Design: A multi-ingredient, anti-aging face moisturizer (MFM) and eye cream (MEC) were formulated into an oil-in-water emulsion base with a synergistic blend of retractive bioavailable peptides, botanical extracts, antioxidants including tetrahexyldecyl (THD) ascorbate (vitamin C), tocopherol (vitamin E), and coenzyme Q10 (ubiquinone), prebiotic alpha-glucan oligosaccharide, and postbiotic Pseudoalteromonas Ferment Extract.

• Microbiome: An in vitro study tested the MFM with four bacterial strains with high prevalence in the human microbiome, Staphylococcus epidermidis, Staphylococcus aureus, Pseudomonas aeruginosa, and Cutibacterium acnes. Bacterial density was measured after four timepoints (0, 6, 24, and 48 hours). Bacterial density was compared and normalized to untreated control. An in vivo study was performed to measure diversity and balance in 24 subjects after using the MFM twice-daily for four weeks. At baseline and week 4, swabbing of both cheeks was performed to obtain microbial samples. Diversity and balance were analyzed through 16S rRNA Sequencing (genomic DNA Isolation, microbiome profile, and diversity analysis). Statistical analysis was performed with *p < 0.05 achieving statistical significance.

• MatTek™ Tissue Model: Twelve full thickness skin substitutes from MatTek™ were tested with the MFM and MEC for 7 days. Untreated control handling consisted of daily rinse paralleling treated conditions but leaving the tissues treatment-free. At the end of 7 days, histological sections were either performed and stained with hematoxylin & eosin (H&E) for an overall morphological evaluation or processed with antibodies for collagen IV and elastin. Slides were observed and microphotographic documentation was acquired with EVOS 5000 imaging system (ThermoFisher Scientific, Waltham, MA) and Celleste v5.0 software was used for semi-quantitative assessment of the signal (three independent optical fields have been...
Forty-five female subjects, 35 to 65 years, Fitzpatrick skin type I-VI, with mild to moderate droopy eyelids, moderate crow’s feet wrinkles, and moderate global photodamage were recruited. Subjects applied the MFM and MEC twice-daily for 12 weeks. Clinical grading of efficacy and tolerability parameters, VISIA®-CRT imaging, raking light VISIA® analysis, skin pH, Tewameter and pinch recoil measurements were performed at baseline, weeks 4, 8, and 12. Optical coherence tomography (OCT) imaging was performed at baseline and week 12. Self-perceived improvement in skin attributes were indicated by study participants at baseline, weeks 4, 8, and 12. Statistical analysis was performed between baseline and post-baseline time-points and statistical significance was achieved at *p < 0.05.

**Findings:** The in vitro microbiome study demonstrated that the MFM did not reduce the viability of specific bacterial strains that may be beneficial and pathogenic for human skin. As a result, the product was shown to be microbiome friendly. Results from the in vitro study corroborated the in vivo study findings. The MFM was found to maintain diversity and balance of the cheek microbiome. Full thickness tissue treatment with the MFM and MEC demonstrated a 10-fold upregulation of DEJ protein collagen IV and dermal protein elastin. Skin staining with H&E demonstrated an organized epidermis, DEJ, and dermis. The IRB-approved clinical study was completed by 42 women with mean age of 55.1 years (range 42 to 65) and predominately Caucasian (76.2%), and all Fitzpatrick Skin Types were represented. The results showed effectiveness in improving intrinsic and extrinsic signs of global face and periorbital area aging after 12-weeks of twice-daily use of both the MFM and MEC. Specifically, subjects showed a highly statistically significant improvement in forehead fine lines, global face fine lines, under eye lines, and skin texture at 4 weeks. Improvement in overall photodamage, under eye crepiness, and upper eyelid appearance was demonstrated after 8 weeks. OCT measurements demonstrated a 28.6% increase in epidermal cheek thickness. Most subjects responded favorably to the skincare regimen. Both the MFM and MEC were well-tolerated by subjects and there was no statistically significant increase in scores for objective and subjective tolerability.

**Summary:** Collectively, the results from the in vitro and in vivo microbiome test, in vitro full thickness tissue model test, and IRB-approved clinical study suggest that the dual skincare regimen comprised of a face moisturizer and eye cream targets skin aging at the DEJ, all while maintaining a skin neutral pH and a healthy microbiome.

### BEST OF ORAL ABSTRACTS SESSIONS

**Skin Cancer / Reconstruction**  
**Saturday, Nov. 20 from 5:15 - 6:15 p.m. CT**

- Prevalence of SARS-CoV-2 Infection in Asymptomatic Pre-operative Patients Scheduled for Dermatologic Surgery: A Single Center Study, 
  **Alvin Li, MD**

- A Multi-Institutional Study of Shared Decision Tools in Dermatologic Surgery, 
  **Stephen Erickson, MD**

- Mohs Surgical Site Infection Rates and Pathogens for the Mask-Covered Face during the COVID-19 Pandemic vs. the Pre-COVID Era, 
  **Stephen Erickson, MD**

- An Introduction to Mohs Micrographic Surgery: A Novel Active Learning Experience, 
  **Paige Hoyer, MD**

- Understanding Perceived Barriers of Applicants to Mohs Micrographic Surgery Fellowship, 
  **Lauren Hoffman, MD**

- Randomized Trial of Topical Application of Tranexamic Acid to Wound Bed for Hemostasis in the Setting of Granulating Wounds Following Mohs Micrographic Surgery, 
  **Brianna Castillo, MD**

- Patient-Reported Outcomes and Satisfaction Associated with the use of a Hydrocolloid Dressing versus Conventional Wound Care after Excisional Surgeries, 
  **Perry Hooper, MD**

- Optical Coherence Tomography Guided and Temperature-Controlled Hyperthermic Treatment of Superficial Basal Cell Carcinoma, 
  **Katherine Glaser, MD**

- Systematic Review of Mohs Micrographic Surgery for Vulvar Malignancies, 
  **Ashley Elsensohn, MD**

- Impact of Limited English Proficiency in Melanoma: An Analysis of the SEER Database, 
  **Bryan Carroll, MD, PhD**

**Cosmetics**  
**Sunday, Nov. 21 from 2:45 - 3:45 p.m. CT**

- Post-Marketing Safety Surveillance of Delayed Complications for Recent FDA-approved Hyaluronic Acid Dermal Fillers, 
  **Joel Cohen, MD**

- MRI Multi-centre Study on High-Intensity Focused Electromagnetic Procedure Simultaneously Combined with Synchronized Radiofrequency for Treatment of Lateral Thighs: Preliminary 3-Month Follow-up Data, 
  **Melanie Palm, MD, MBA**

- Simultaneous Application of Radiofrequency and Hifem Energies for Full Body Remodeling: MRI Evidence-Based Case Study, 
  **Bruce Katz, MD**

- A prospective trial: Handsfree thermoregulated bipolar radiofrequency for face and neck contouring, 
  **Anne Chapas, MD**

- Perceptions of the Reduction of Masseter Muscle Prominence Following OnabotulinumtoxinA Treatment, 
  **Sabrina Fabi, MD**

- TikTok: Where Your Patients Are Getting Their Dermatology Information... From Non-Dermatologists, 
  **Charles Puza, MD**

- A Feasibility Study of Non-Thermal Nano-Pulse Stimulation (NPS) Technology for Treating Syringoma, 
  **Brian Biesman, MD**

- Evaluation of an Updated 6Mz RF Platform for Noninvasive Skin Tightening of the Eyelids, Face and Upper Neck, 
  **Brian Biesman, MD**

- Canada HARMONY Study: Comprehensive Panfacial Approach to Aesthetic Treatment, Including Submental Fullness, Results in Improved Patient-Reported Outcomes, 
  **Vince Bertucci, MD**

- Single Session Treatment with Low-Power Fractional Diode Laser and Cosmetic Injectables: A 5-year Safety Review, 
  **Jordan Wang, MD, MBE, MBA**