

# e-Poster Abstracts 2020 ASDS Virtual Annual Meeting

## 660 Nanometer Red Light and 2% Nitroglycerin Paste for the Management of Calcium Hydroxyapatite Vascular Occlusion in a Hemophilic with HIV-Associated Facial Lipoatrophy

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**Purpose:** Vascular occlusion is a rare complication of dermal filler injection that can lead to more severe complications including blindness and avascular necrosis of surrounding tissue. There is limited data on a reversal agent for calcium hydroxyapatite (CaHA) based dermal filler (1); and no available guidance for the management of CaHA induced vascular occlusion in patients with clotting disorders or those in whom anticoagulation is contraindicated.

We present a case of vascular occlusion in a patient with a history of hemophilia and HIV-associated facial lipoatrophy who presented one week after CaHA injections in the mid-face successfully managed with 2% nitroglycerin paste and 660 nanometer red light.

**Design:** A 59-year-old male with a history of hemophilia and HIV-associated facial lipoatrophy was managed with more than 10 treatments of CaHA and Poly-L-Lactic Acid (PLLA) dermal filler over his 20-year history. These treatments were administered by his dermatologist and routinely preceded by infusion of clotting factor VIII.

One week following his most recent treatment of CaHA dermal filler, the patient presented with pain, crusting and purpura in the infraorbital area of his right cheek. On examination, the patient had a crusted erythematous plaque associated with reticulated non-blanching erythema in the right infraorbital region of the midface, along with an injected right sclera. The patient's vital signs, Snellen visual acuity, confrontational visual fields and ocular motility were within normal limits. The patient initially noted bruising and persistent, dull, aching pain in his right cheek within 24 hours of the procedure. However, he did not report these symptoms until one week later given his previous history of minor post-procedure bruising.

The patient's presentation was consistent with vascular occlusion and compromise of infraorbital vessels for which anticoagulants or antiplatelet therapy are recommended. (2) However, he was not eligible for anticoagulation or antiplatelet therapy given his history of hemophilia.

The patient was treated with 2cc of normal saline (0.9 % NS) irrigation to the injection site; and also began a regimen of 2% nitroglycerin paste once daily and 660 nanometer red light to prevent scarring and necrosis. The patient had a total of eight, two-minute 660 nanometer red light sessions twice per week for one month; and once daily topical 2% nitroglycerin paste for 8 weeks.

**Findings:** Serial clinical evaluation of the patient demonstrated marked improvement. At 8-weeks post CaHA injection there was gradual restoration of the skin integrity and resolution of crusted plaques with minimal erythema, purpura, or skin sensitivity. At 24-weeks the vascular lesion was completely resolved with no signs of cutaneous scarring.

**Summary:** This case highlights the use of 660 nanometer red light and 2% nitroglycerin paste in the management of late presenting dermal filler induced vascular occlusion in a patient with hemophilia where anticoagulation was contraindicated.

Prospective studies have demonstrated improvement in wound healing and faster resolution of symptoms with the use of light emitting diode red light (3). In hair growth, 655 nm red light works by activating fibroblasts, growth factors and expression of type 1 procollagen and matrix metalloproteinase-9. Fibroblasts, growth factors and procollagen are involved in wound healing, while metalloproteinase-9 is also involved

in angiogenesis (4). Nitroglycerin paste works by dilating small-caliber arterioles and improving perfusion to dermal vasculature (5). These mechanisms of action likely lead to improved perfusion and scar reduction in the patient. Additionally, his impaired hemostasis likely also contributed.

Nitroglycerin paste and 660 nm red light may represent a promising treatment for the management of CaHA filler induced vascular occlusion in patients with bleeding disorders or those in which anticoagulation is contraindicated. Close follow-up is recommended. Further study of management practices in patients with impaired clotting or those in whom anticoagulants are contraindicated is warranted, as well as studies exploring the use and mechanism of action of red light therapy in avascular necrosis prevention.

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## A Case of Penicillamine Induced Elastosis Perforans Serpiginosa

**Author:** Daniel Michalik, MD, Resident Physician, Cleveland Clinic Foundation

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**Purpose:** To describe a case of penicillamine induced elastosis perforans serpiginosa presenting within a surgical site.

**Design:** Case report.

**Findings:** A 52-year-old woman presented for evaluation of two firm papules that arose within a scar nine months after excision of an SCC. She also noticed excess wrinkling of her neck over the past six years. Medication history was pertinent for a forty year history of penicillamine for cystinuria. Examination of the anterior neck revealed two 3 mm erythematous, crusted papules within a well-healed scar, in addition to increased wrinkling and redundant skin folds. Histopathology demonstrated transepidermal elimination of abnormal thick elastic fibers with perpendicular buds. Movat's pentachrome stain showed coarse tortuous elastic fibers throughout the papillary and reticular dermis.

**Summary:** Long term administration of penicillamine has been associated with dermatologic manifestations in 20-30% of patients. Penicillamine induced elastosis perforans serpiginosa (EPS) is a well described manifestation occurring in 1% of patients taking this medication. Penicillamine induced EPS can be associated with other dermal abnormalities such as cutis laxa, non-hereditary pseudoxanthoma elasticum or mucosal elastosis as a result of the same degenerative process leading some authors to suggest the broad term penicillamine induced degenerative dermatosis. Numerous treatment options have been described, including cryotherapy, intralesional kenalog, topical and oral retinoids, pulse dye laser, carbon dioxide laser and photodynamic therapy.

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## A Case of Strongyloides hyperinfection Syndrome Mimicking a Drug Rash

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**Purpose:** Recognize an uncommon dermatologic presentation of Strongyloidiasis infection. Identify predisposing factors to Strongyloides hyperinfection syndrome. Differentiate drug-induced eruptions from parasitic infection, in the setting of peripheral eosinophilia.

**Design:** Case report with review of literature.

**Findings:** An 84-year-old African-American gentleman with history of metastatic prostate cancer was admitted for peripheral eosinophilia, altered mental status and a pruritic truncal rash of acute onset. Review of systems was positive for dyspnea, fatigue, generalized weakness and diminished appetite. Physical examination revealed nontender, blanchable erythematous papules coalescing into plaques on the chest, abdomen and back. Bilateral anterior cervical lymph nodes were enlarged. A punch biopsy obtained from the left chest revealed spongiotic dermatitis with eosinophils. Pertinent laboratory studies included elevated white blood cell and eosinophil counts of 17400 and 8900, respectively, normal liver function tests and detectable Strongyloides IgG antibodies. Chest x-ray was abnormal, with CT chest demonstrating worsening interstitial lung disease and fibrosis. A lung biopsy revealed abundant eosinophils as well as larval structures consistent with Strongyloides, confirming a diagnosis of Strongyloides hyperinfection syndrome. He was empirically treated with oral ivermectin upon presentation, and his peripheral eosinophilia gradually downtrended, with concomitant improvement in his rash.

**Summary:** This case highlights an uncommon presentation of Strongyloidiasis that mimicked a drug rash given morphology of lesions and peripheral eosinophilia. The possibility of hypereosinophilic syndrome was also explored, but bone marrow biopsy did not show evidence of this entity. It is important to consider Strongyloidiasis in a patient with peripheral eosinophilia of unknown cause. Interestingly, our patient did not present with recent travel history or the characteristic larva currens rash. His Strongyloidiasis was likely reactivated in the setting of recent initiation of low-dose prednisone for metastatic prostate cancer, leading to hyperinfection syndrome.

## A Comparison of Ferric Sub sulfate Solution, Silver Nitrate, and Aluminum Chloride for Pain Assessment, Time to Hemostasis and Cosmesis in Acrochordon Snip Excision

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**Purpose:** Directly compare hemostatic, cosmesis and pain assessment outcomes of chemical cautery solutions following acrochordon removal.

**Design:** Twelve patients with six or more skin tags on the bilateral neck and/or axilla were enrolled. Two of the skin tags were cauterized with ferric subsulfate solution, two with silver nitrate and two with aluminum chloride. Pain upon application of the solution to each skin tag was assessed with a zero to ten numeric scale. Time to hemostasis was recorded for each solution. A two-week follow up appointment was conducted to document pigmentary changes and a survey was administered to assess patient satisfaction.

**Findings:** No significant variability in the time to hemostasis was seen among the three chemical cautery solutions ( $p=0.57$ ). A significant variability in the pain response was seen among the three solutions ( $p=.003$ ) Pain response was significantly lower for both aluminum

chloride (Mdn = 1.00) and ferric subsulfate (Mdn = 1.50) compared to the pain response for silver nitrate (Mdn =6.00). Among the twelve patients, three (25%) experienced a pigmentary change when exposed to ferric subsulfate solution, two (17%) experienced a pigment change when exposed to aluminum chloride, and six (50%) experienced a pigment change when exposed to silver nitrate (overall  $p=0.17$ ). No significant difference was seen in the odds of experiencing a pigmentary change or satisfaction response among the three solutions.

**Summary:** Application of three standard chemical cautery solutions exhibited significant differences in pain and pigmentary changes. Time to hemostasis was equivalent among the solutions, suggesting it may not be a guiding factor in choice of a chemical cautery solution. These results are clinically relevant in the selection of one cautery solution over another based on individual patient needs.

## A First Human Feasibility Study of Nano-pulse Stimulation (NPS) to evaluate the Potential Elimination of a Biopsy-confirmed Nodular or Superficial BCC in a Short-term Treat and Resect Study Design

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**Purpose:** Nano-Pulse Stimulation (NPS) is a non-thermal energy modality that delivers nano-second range energy pulses to tissue and directly acts on cellular organelles and membranes to cause regulated cell death. The NPS cell-specific mechanism may be well suited to targeting invasive cellular infiltration associated with superficial (sBCC) and nodular BCC (nBCC) morphology, while avoiding damage to the adjacent non-cellular dermis.

This first clinical study of NPS in non-melanoma skin cancer included histology confirmed elimination of malignant basal cell carcinoma in identified treated tumor areas and presence of CD8+ T cells in untreated tumor areas. Qualitative healing responses prior to excision were also observed.

**Design:** Prospective, open label, IRB-approved, multi-site, nonsignificant risk short-term treat and resect feasibility study. Dermatologic surgeons enrolled subjects with non-facial nodular or superficial BCC lesions of at least 5 mm x 8 mm. Prior to planned excision, a portion of the clinically apparent BCC lesion was exposed to one of 3 NPS energy levels (75, 155 or 310 mJ/mm<sup>3</sup>) covering either one or two 5x5 mm squares within the lesion. Time between the NPS application and lesion excision ranged from 20-49 days (average=29). The excised bulk lesion was evaluated for presence/absence of residual BCC in the identified treatment zone and to assess presence of CD8+ T cells proximate to BCC nests outside the NPS treatment zone. Histologic analysis included "bread loafing" or quadrant sectioning of treated area to ensure absence of residual BCC.

**Findings:** All pre- and post-treatment biopsies were evaluated by a dermatopathologist. The eight biopsy-confirmed nodular BCCs excisions ranged from 20-47 days (average=26) prior to evaluation. In all eight nBCC samples (100%), the identified NPS treatment zones were clear of BCC for all three energy levels tested. Presence of CD8 T-cells in untreated nBCC portion was observed in some, but not all tissue samples. Dermatologist assessed photographs of the eight nBCC lesions treated with NPS at all three energy levels were, on average, rated as cosmetically acceptable and scored as likely to resolve with a better cosmetic outcome as from surgical excision. However, the histologic evaluation of the two lesions treated at the highest energy

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levels (310 mJ/mm<sup>3</sup>) were indicative of potential scar development. Histological evaluations of the 21 sBCC/BCC samples were similarly clear of BCC tumor for all three NPS energy levels tested, though a portion of original BCCs may have been cleared by diagnostic biopsies prior to NPS treatment.

**Summary:** Biopsy-confirmed complete absence of any residual BCC in the known NPS treatment zone for these 8 nodular BCCs and 21 superficial BCCs indicate promising potential for treatment of both BCC-subtypes. Impressive short-term favorable healing observed with lower energy settings suggest potential for both complete nodular BCC elimination and favorable aesthetic outcomes of nodular lesions compared to wide margin excision, the current standard of care for this subtype. A larger study is planned to further evaluate the potential for NPS technology to non-surgically eliminate low-risk BCC lesions and provide favorable aesthetic outcomes compared to current excisional techniques.

## A Masquerading Case of a Lumpy Bumpy Face: A Rare Clinical Case Report of Birt Hogg Dubé

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**Purpose:** Document and report a rare clinical genodermatosis, Birt-Hogg-Dubé syndrome, through a case report with a thorough academic literature review regarding clinical presentation, histopathology, diagnostic criteria, differential diagnoses, therapeutic modalities and recommended oncologic surveillance.

**Design:** This case report documents a patient's evaluation consisting of clinical, histopathologic, radiographic and genetic diagnostics. A comprehensive review using PubMed was performed, searching for the most relevant reviews of this genodermatosis.

**Findings:** We present a 54-year-old Caucasian male who presented to the dermatology clinic for evaluation of multiple, asymptomatic, flesh-colored papules distributed on his central forehead and malar cheeks. Two shave biopsies were performed and demonstrated trichodiscomas which prompted additional work up. Upon computed tomography evaluation of the abdomen and pelvis, there was significant evidence of scattered bullae within the bilateral lower lobes, right middle lobes and lingula. Renal magnetic resonance imaging revealed two anechoic masses on the right renal pole, consistent with renal cysts. Genetic testing identified a pathogenic, heterozygous, loss-of-function mutation in the FLCN gene. The above clinical and histopathological correlation confirmed the diagnosis of Birt Hogg Dubé syndrome.

**Summary:** Birt Hogg Dubé (BHD) syndrome is a rare genodermatosis with an autosomal dominant, inactivating mutation of the folliculin (FLCN) gene. Key cutaneous features of this syndrome include benign tumors inclusive of fibrofolliculomas, trichodiscomas and acrochordons. Internal involvement is notable for lung cysts that predispose affected individuals to spontaneous pneumothoraces and an increased risk of malignant renal neoplasms, predominantly oncocytoma or chromophobe renal cell carcinoma. Clinical management for patients with BHD depends on the history, presentation and symptomatology. Initial clinical diagnostics should include a skin biopsy with histologic examination to rule out other syndromic diseases associated with multiple facial papules including Tuberous sclerosis complex, Muir-Torre syndrome, Cowden disease and Brooke-Spiegler syndrome. The mainstay management of patients with BHD syndrome is targeted towards early diagnosis and treatment of renal tumors. Therefore, lifelong oncologic surveillance with interval magnetic resonance imaging is recommended to detect for tumors given the 7-fold increased risk for developing renal neoplasia. Annual renal MRI's are preferred, and if there is a negative family history and 2-3 negative annual scans, screening may be performed every 2 years. Tumors 3cm, nephron-sparing surgical intervention is recommended.

Once the FLCN mutation has been identified in a proband, genetic testing should be offered to all relatives at risk.

## A Prospective, Non-randomized, Multicenter Pivotal Study of Nano-pulse Stimulation (NPS) Technology for Cutaneous Warts on the Feet

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**Purpose:** The unique ability of non-thermal Nano-Pulse Stimulation (NPS) technology to target cells within the treatment zone while sparing the non-cellular dermis provides the basis for the treatment of cutaneous, non-genital warts. NPS technology is a non-thermal energy modality that delivers nano-second range electrical pulses to tissue. In a reported NPS feasibility study, 85% of warts on the hands, fingers and feet had greater than 50% size reduction after 1 or 2 NPS treatments. Cutaneous warts on the feet are difficult to treat, and this larger pivotal study further examines the effects of NPS treatments on these persistent warts.

**Design:** This is a prospective, non-randomized, multicenter pivotal study to evaluate the safety and effectiveness of NPS in treating warts on the feet. Adult subjects were required to have at least 2 warts (10x10 mm maximum size), and 1 wart was designated as an untreated control. After an initial NPS treatment, subjects returned for follow-up at 7 days and then monthly through 4 months, with potential of additional NPS treatments performed at months 1, 2 and 3. A 6-point size reduction scale was utilized for the final efficacy outcome assessed 60-days after the last NPS session. Four treatment tips with the following spot sizes and energy settings (mJ/mm<sup>3</sup>) were available: 2.5x2.5mm (345), 5x5mm (155), 7.5x7.5mm (85) and 10x10mm (85)

**Findings:** Twelve subjects had a mean age of 36 years (range, 21-61), 58.3% female, Fitzpatrick Skin Types I, II, III and IV. The 33 warts on the feet were classified as 69.7% plantar, 24.2% common, and 6.1% flat warts. The vast majority of warts (81.8%) had a history of prior treatment (24.2% over-the-counter, 21.2% cryotherapy, 21.2% multiple, and 15.2% laser).

At 60 days after the last NPS treatment 45.5% of the warts (15 of 33) were clear, including 56.5% of the plantar warts. Of the 15 warts that cleared, 46.7% cleared with 1 treatment, 46.7% with 2 treatments, and 6.7% with 3 treatments. 45.5% of control warts (5 of 11 subject controls that were untreated) were clear at 120 days. Subjects reported pain of a median 2.5 at the time of treatment on a 0 to 10 pain scale, with 38.3% reporting a score of 0 or 1. 2 reports of mild hypopigmentation. There were no cases of hyperpigmentation and no serious adverse events. No significant plume from the NPS treatment was detected.

**Summary:** NPS technology cleared 56.5% of plantar warts, the vast majority of which had a history of prior treatments. NPS looks to be a promising therapy for these difficult to treat, recalcitrant plantar warts.

## A Randomized, Blinded Trial Evaluating the Safety and Efficacy of a Tripeptide/Hexapeptide Topical in Combination with Hybrid Fractional Laser for Acne Scarring

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**Co-Authors:** Jonathan Soh, MD; Mara Weinstein Velez, MD

**Purpose:** To evaluate the efficacy of a tripeptide/hexapeptide topical in wound healing and scar reduction both pre-procedure and following hybrid fractional laser treatment for acne scarring.

**Design:** Subjects with mild to moderate acne scars were prospectively randomized to receive either a tripeptide/hexapeptide topical or bland moisturizer for two weeks prior to and 90 days following hybrid fractional

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laser treatment. The laser used was a combination 2940 nm Er:YAG, ablative and 1470 nm diode coagulative laser. Settings were chosen by the principle investigator and tailored according to skin type. The laser treatment was repeated 30 days following the first treatment and the subjects continued topical application twice daily for 60 additional days. Transepidermal water loss (TEWL), colorimetry, photographs, high definition 3D imaging with roughness index, global aesthetic improvement scale, patient subjective satisfaction, as well as biopsy for histology were performed.

**Findings:** Four of the planned 10 subjects were enrolled prior to the COVID-19 pandemic, with one finishing the study by the time of abstract submission (n=2 from each arm). The erythema index (a\*) decreased from 40.07 at day 0 to 14.94 at day 90 for the one patient who completed the study, on the experimental arm. Erythema index increased by 1.48 in the experimental arm from the day of laser to treatment day +4, while the control arm increased by 3.29 in the control group (p=0.31 by 2 tailed t-test). TEWL decreased from 24.34 g/m<sup>2</sup>h at screening to 15.50 g/m<sup>2</sup>h at day 90 in the completed experimental subject. After 14 days of applying the experimental topical, the average TEWL decreased by 6.35 g/m<sup>2</sup>h, while the control arm had an increase in TEWL by 6.04 g/m<sup>2</sup>h. The Goodman and Baron qualitative scale decreased from 3 to 2 for the subject who completed the study. The 3D imaging and objective roughness index showed improvement in the 2 experimental subjects, from .76 and .61 to .38 and .45 respectively (unitless, with 0 being smoother). No subjects in the experimental arm experienced adverse events, while one subject in the control group experienced a melasma flare.

**Summary:** Preliminary results show that the experimental tripeptide/hexapeptide topical appears safe and may improve post procedure erythema following hybrid fractional laser for the treatment of acne scarring. This study presents a comprehensive set of objective measurements for patients undergoing fractional laser treatment for acne scarring in conjunction with an experimental topical agent or blinded control. Additional data will be available to present at the annual meeting.

## A Randomized, Evaluator-blinded, Multi-center Study to Evaluate Safety and Effectiveness of a Biostimulatory Poly-L-lactic Acid Injectable Implant after Changes in Reconstitution

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**Co-Authors:** Young Cho, MD; Brenda LaTowsky, MD; Heidi Prather, MD; Susan Weinkle, MD

**Purpose:** To evaluate safety and effectiveness of a biostimulatory poly-L-lactic acid (PLLA) injectable implant for correction of nasolabial folds after changes in reconstitution and injection procedures compared to US label.

**Design:** In this 48-week, randomized, evaluator-blinded, multi-center study (NCT03780244), subjects were treated to optimal correction of nasolabial folds at a single treatment regimen consisting of four injection sessions with 4-week intervals, with PLLA reconstituted with 8 mL or 5 mL sterile water for injection. The 8 mL product included an additional 1 mL 2%-lidocaine, and was injected immediately after reconstitution without standing time. Primary endpoint for effectiveness was blinded evaluation of change from baseline of both nasolabial folds at Week 48 using a validated wrinkle assessment scale (WAS)<sup>1</sup>. Aesthetic improvement and adverse events were assessed.

**Findings:** A total of 59 subjects were included in the 8 mL group and 21 subjects in the 5 mL group. Most subjects were female (95%), mean age was 51.5 years. Both groups demonstrated high WAS responder rates (at least 1-grade improvement from baseline) at Week 24 (≥75%) and Week 48 (≥67%; hence primary effectiveness endpoint met). Aesthetic improvement was high (≥86%) throughout the study. Adverse events

related to study product or injection procedure were reported by 33% of subjects in the 5 mL group and by 12% in the 8 mL group, most events being mild and transient.

**Summary:** PLLA was effective for treatment of nasolabial folds, and safety was not compromised using a higher reconstitution volume including lidocaine, administered immediately after reconstitution.

## A Retrospective Review of 18 Patients Undergoing a Combined Procedure for Acne Scars Using Subcision, TCA Peel and a Fractional Ablative 1,064 Nm Laser

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**Purpose:** Acne and its resultant scarring often have serious deleterious effects on a patient's appearance, and subsequently, their self-esteem. Treatment options for scarring are myriad with often suboptimal results. More aggressive treatments with subcision and ablative lasers show promising results but may have an increased risk of adverse effects including hyperpigmentation, especially in patients with higher Fitzpatrick skin types. This study aims to assess the efficacy and safety of a combined treatment for acne scarring using subcision, TCA peel, and a fractional ablative 1,064 nm laser.

**Design:** This is a retrospective review of 18 cases performed at a single institution. Improvement from before and after photos was assessed by three blinded physicians on a quartile scale (1=0-25%, 2=26-50%, 3=51-75%, 4=76-100% improvement).

**Findings:** 47 sets of before and after photos for 18 patients were graded by three blinded reviewers. Four patients (22.2%) were classified as Fitzpatrick Type 1, 3 patients (16.6%) as Fitzpatrick Type 2, 3 patients (16.6%) as Fitzpatrick Type 3, 7 patients (38.8%) as Fitzpatrick type 4, and 1 patient (5.5%) as Fitzpatrick 5. No Fitzpatrick 6 patients were treated in this series. There was an average improvement of 2.5 (std dev: 0.6) on a quartile scale. There were no reported serious adverse effects including scarring, infection, hematoma, hypopigmentation or hyperpigmentation.

**Summary:** Good results with a similar single day combined procedure for acne scars using a fractional CO<sub>2</sub> laser have been previously published. This study demonstrates a similar level of improvement using a fractional ablative 1,064 nm ND;Yag laser with an excellent safety profile demonstrated in this review. This preliminary data suggests that fractional 1,064 nm laser ablation may be a comparable alternative to traditional fractional CO<sub>2</sub>, with a potentially superior safety profile especially in patients with darker skin.

## A Systematic Review on the Approaches for Axillary Reconstruction

**Author:** Lauren Chen, MS, Medical Student, Tulane University School of Medicine, New Orleans, LA

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**Purpose:** Axillary defects are challenging to reconstruct. Multiple approaches are available: healing by secondary intention, split-thickness skin grafts (STSG), local flaps, regional flaps and biologics. The best technique remains unidentified. This study aimed to systematically review the literature and identify the optimal axillary reconstruction strategy.

**Design:** Multiple databases were searched for English-language literature using combinations of phrases that described the axilla and various reconstruction methods. Studies that reported axillary contracture reconstruction, primary closure of wounds, did not mention type of reconstruction utilized or discussed specific complications were excluded.

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**Findings:** Our search yielded 1,735 articles. After screening, 85 articles were manually reviewed and summarized (Table 1). Overall, the level of evidence was low (range V-III). Reported success rates varied widely: secondary intention 33%-100% (n=5), STSG 25%-100% (n=19), local flaps 44%-100% (n=20), regional flaps 33%-100% (n=48), free flaps 50%-100% (n=4), and biologics 75%-100% (n=3). Complication rates also demonstrated wide ranges. Furthermore, outcomes reporting was not standardized.

## Secondary intention

Total number of studies: 5  
Total number of axillae: 48  
Range of defect sizes: 80-88cm<sup>2</sup>  
Success rates: 33-100%  
Complications (number of studies, complication rates\*): Contracture (1; 33%), Delayed wound healing (1; 20%)

## Skin grafts (STSG)

Total number of studies: 19  
Total number of axillae: 323  
Range of defect sizes: 12-180cm<sup>2</sup>  
Success rates: 25-100%  
Complications (number of studies, complication rates\*): Partial loss (9; 9-42%), Contracture (4; 4-31%), Incomplete graft take (2; 38-40%), Total loss (2; 13-14%), Delayed wound healing (2; 8-17%), Adverse scarring (2; 2-2%)

## Local flap

Total number of studies: 20  
Total number of axillae: 220  
Range of defect sizes: 0.65-448cm<sup>2</sup>  
Success rates: 44-100%  
Complications (number of studies, complication rates\*): Total loss (4; 7-22%), Wound dehiscence (2; 18-32%), Contracture (2; 4-11%), Additional flap needed for defect closure (1; 70%), Delayed healing (1; 40%), Partial loss (1; 32%), Donor defect (1; 30%), Wound infection (1; 22%), Distal flap congestion (1; 14%), Hematoma (1; 11%), Adverse scarring (1; 7%)

## Regional flap

Total number of studies: 48  
Total number of axillae: 417  
Range of defect sizes: 0.65-725cm<sup>2</sup>  
Success rates: 33-100%  
Complications (number of studies, complication rates\*): Wound dehiscence (11; 6-28%), Adverse scarring (7; 5-33%), Partial loss (6; 6-29%), Flap trimming (6; 13-25%), Wound infection (5; 5-22%), Total loss (3; 6-17%), Hematoma (3; 5-8%), Seroma (2; 5-25%), Lymphedema (2; 5-25%), Venous congestion (2; 5-8%), Delayed wound healing (1; 14%), Donor defect (1; 11%), Additional flap needed for defect closure (1; 9%), Pyoderma gangrenosum (1; 4%)

## Free flap

Total number of studies: 4  
Total number of axillae: 16  
Range of defect sizes: 165-700cm<sup>2</sup>  
Success rates: 50-100%  
Complications (number of studies, complication rates\*): Partial loss (1; 50%), Seroma (1; 50%), Arterial thrombosis (1; 25%), Wound dehiscence (1; 25%), Lymphedema (1; 20%)

## Biologics

Total number of studies: 3  
Total number of axillae: 16  
Range of defect sizes: 112-1400cm<sup>2</sup>  
Success rates: 75-100%  
Complications (number of studies, complication rates\*): Granulation tissue overgrowth (1; 50%), Partial autograft loss (1; 50%), Wound infection (1; 25%)

\*only included studies that reported more than one patient

**Summary:** This is the first systematic review of axillary reconstruction methods. There was poor level of evidence, a wide range of success and complication rates that differed even within similar reconstruction techniques and outcomes reporting was not standardized, which prevented a meta-analysis. Larger, more rigorous studies comparing axillary reconstructive methods are needed in order to identify the best approach.

## **Abdominal Laxity Treated by a Novel 300w Large Footprint Radiofrequency Device**

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**Co-Authors:** Claire Noell, MD; Robert Weiss, MD

**Purpose:** Radiofrequency (RF) is used to create a heating effect by inducing both neocollagenesis and neoelastogenesis in subcutaneous tissue and skin. RF thermal stimulation targets water to consistently raise tissue temperature resulting in an immediate yet temporary change in the helical structure of collagen. This study assesses the safety and efficacy of a novel large footprint 60mm 300W monopolar radiofrequency device for the treatment of abdominal laxity with target temperature of 42°C.

**Design:** Ten subjects were enrolled and treated under an IRB approved prospective study protocol for the treatment of abdominal laxity with a novel large footprint 300W monopolar radiofrequency device. Subjects were treated five times at 2-week intervals. With each treatment, subjects' abdominal tissue temperature was raised to 42°C, then maintained for five minutes using a novel 60mm hand piece. Subjects were re-examined at 30 and 120 days after the last treatment.

**Findings:** Ten subjects completed their 120-day follow up after receiving five treatments at 2-week intervals. Subjects found the treatments comfortable, with a median pain score of 0/10. Treatment time was 6 minutes and 9 seconds on average. 70% of the subjects were satisfied with 4 of 10 extremely satisfied with results. Four blinded board-certified dermatologists graded subjects' pre-treatment and 120-day post-treatment images. Blinded reviewers were able to correctly identify the post-treatment image 80% of the time. 90% of subjects were improved using the Global Aesthetic Improvement Scale Assessment.

**Summary:** Use of a 300W large footprint monopolar radiofrequency device is a safe and effective method for the treatment of abdominal laxity.

## **Allergic Contact Dermatitis to Sodium Metabisulfite in Lidocaine with Epinephrine**

**Author:** Marcus G. Tan, MD, Resident Physician, Division of Dermatology, The Ottawa Hospital and University of Ottawa, Ottawa, Ontario, Canada

**Co-Authors:** Whan Kim, MD; Melanie Pratt, MD, FRCPC

**Purpose:** Many hypersensitivity reactions to local anesthetics are due to the additives present in the anesthetic solution, rather than to the anesthetic itself. Sodium metabisulfite is an antioxidant commonly added to medications, foods and fixatives in photography. It is present in anesthetic solutions with epinephrine to prevent the oxidation of epinephrine. We present the case of a man who developed allergic contact dermatitis one day after receiving lidocaine with epinephrine.

**Design:** A 53-year-old male presented to emergency with an acutely pruritic, papulovesicular eruption on his back after having undergone bilateral spinal L4/L5 rhizotomy via radiofrequency ablation for chronic lower back pain the previous day. He denied using any new personal care products or taking oral or topical medications postoperatively. He had a history of gastroesophageal reflux disease but was otherwise systemically well. His usual medications included esomeprazole, celecoxib, pregabalin, acetaminophen and hydroxyzine. Physical

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examination revealed numerous erythematous papules and vesicles on poorly demarcated, eczematous plaques. Several papules and plaques had central crusted puncta, likely from the radiofrequency cannulae and lidocaine with epinephrine infiltrations. In accordance to the North American Contact Dermatitis Group (NACDG) Patch Test Protocol, he was patch tested to the following series: 1) NACDG standard screening, 2) local anesthetic, 3) select metals, 4) steroids, 5) chlorhexidine digluconate and 6) plastics and glues (includes acrylates, epoxy and plasticizers).

**Findings:** Results of his patch test read at 96-hours: sodium metabisulfite (+++), bacitracin (+++), polymyxin-B (+++), tixocortol-21-pivalate (+++), pramoxine (++) and linalool (+).

**Summary:** The acute eruption within one day postoperatively, along with clustering of lesions around lidocaine infiltration sites and positive patch test results, suggest that the patient had developed a systemic contact dermatitis to sodium metabisulfite, present in the lidocaine with epinephrine administered perioperatively. He had been sensitized through previous surgeries. He was started on topical clobetasol ointment and recovered in a few weeks.

## Analysis of Advanced Practice Professionals Performing Dermatology Procedures from 2012-2017

**Author:** Kachiu C. Lee, MD, MPH, Assistant Professor of Dermatology, Main Line Center for Laser Surgery, Ardmore, PA

**Co-Author:** Michelle Xiong, BS

**Purpose:** Advanced practice professionals (APPs), originally intended to provide primary care services to underserved areas, have expanded into specialized fields. APPs are increasingly performing more surgical procedures in dermatology. We aim to investigate changes in excision, intermediate repair and complex repair code usage by APPs, while accounting for growth in the number of APPs, by analyzing the Medicare Physician and Other Supplier Public Use File (POSPUF) for 2012-2017.

**Design:** POSPUF was filtered for excisions, intermediate repairs and complex repairs performed by APPs. CPT codes were grouped by procedure and location on the body: benign excision (11400-11403, 11420-11423, 11440-11443); malignant excision (11600-11603, 11620-11623, 11640-11643); intermediate repair (12031-12034, 12041-12044, 12051-12054); complex repair (13100-13102, 13120-13122, 13131-13133, 13150-13153). Of these, we excluded code groups billed by fewer than 20 APPs each year from 2012-2017. Using StataSE v15.0, we aggregated number of procedures per code group, determined the distinct number of APPs billing independently for the given year, and calculated percent change in procedures and providers. For each code group, one-way ANOVA was used to compare mean procedure numbers from 2012 to 2017.

**Findings:** From 2012 to 2017, the percent increase in benign excisions (11400-11403) performed by APPs was 37.8% and increase in number of APPs was 67.7%. For malignant excisions (11600-11603, 11620-11623, 11640-11643), procedures increased by 126.4%, 31.3%, and 8.4%, respectively, while number of APPs grew by 129.8%, 64.4%, and 26.2%. Increases in intermediate repairs (12031-12034, 12041-12044, 12051-12054) were 95.3%, 47.1%, and 35.7% and in number of APPs were 104.0%, 62.5%, 37.0%. The percent changes in complex repair procedures (13100-13102, 13120-13122, 13131-13133, 13150-13153) were 220.4%, 217.2%, 109.5%, 74.3% and in number of APPs were 270.2%, 231.3%, 126.9%, and 47.1%. There was no statistical difference between mean numbers of procedures performed by APPs from 2012 to 2017 in any of the code groups.

**Summary:** Our analysis demonstrates while total number of excisions, intermediate repairs and complex repairs performed by APPs increased, this is likely attributable primarily to increasing number of APPs billing dermatologic codes as mean number of procedures per APP were stable. A limitation of POSPUF is it only captures Medicare data. While

the rising number of procedures is proportional to the growing APPs presence in dermatology, we should be aware of the increase in APPs entering the workforce and billing specialty codes. As this workforce grows, there is a need to provide additional specialty education while addressing the challenges of providing didactic and hands-on education to larger groups.

## Analysis of the Publication Rate of Abstracts Presented at National Dermatologic Surgery Meetings from 2015 to 2018

**Author:** Quoc-Bao Nguyen, MD, MBA, Resident Physician, University of Texas Health Science Center at Houston/University of Texas Anderson Cancer Center, Friendswood, TX

**Co-Authors:** Leon Chen, MD; Kyle Lauck, BS; Michael Migden, MD

**Purpose:** Abstract presentations at scientific meetings provide an opportunity to disseminate the results of studies to the academic community. Unfortunately, many of these abstracts are not published as full manuscripts. Utilizing the abstracts from the annual meetings of the American College of Mohs Surgery and American Society of Dermatologic Surgery from 2015 to 2018, we evaluated factors associated with the presentation of abstracts leading to the publication of manuscripts up to five years after abstract presentation.

**Design:** All abstracts presented at each of the two meetings were evaluated. We systematically searched for matching manuscripts indexed in PubMed up to May 2020. We used logistic regression models to determine factors associated with manuscript publication and calculated the factors' Odds Ratios (OR) and 95% Confidence Intervals (95% CI).

**Findings:** Of the included 640 abstracts, 368 abstracts (57.5%) led to the publication of an associated manuscript within 5 years or earlier. The following factors were notably associated with a statistically significant increase in likelihood of publication: oral presentation (OR 2.16; 95% CI 1.48-3.16), multicenter studies (OR 3.79; 95% CI 2.22-6.49), and sponsored or funded research (OR 1.97; 95% CI 1.12-3.46). Of note, abstracts written by university-based authors were not statistically significantly associated with manuscript publication (OR 1.74; 95% CI 0.74-1.91).

**Summary:** Not all of the abstracts presented at dermatologic surgery meetings lead to publication of an associated article in an academic journal, resulting in diminished reporting of scientific knowledge on PubMed that may be useful for the lab bench or clinical setting. Primary authors should endeavor to develop manuscripts for publication based on material initially presented as abstracts at national meetings.

## Assessing the Risk of Post-operative Complications in Chronic Kidney Disease Patients Undergoing Mohs Surgery

**Author:** Vishal A. Patel, MD, Director of Dermatologic Surgery, George Washington University School of Medicine, Washington, DC

**Co-Authors:** Rahul Raiker, BS; Haig Pakhchanian, BS

**Purpose:** Chronic Kidney Disease (CKD) is a longstanding condition that causes the gradual loss of kidney function over a period of time. Previous studies have shown CKD to be associated with multiple dermatological manifestations. In particular, CKD patients are at a higher risk for developing varying forms of skin cancer. However, the risk of complications after Mohs surgery has not been studied in CKD patients. The goal of this study was to determine whether CKD patients undergoing Mohs surgery were at a higher risk for post-operative complications compared to those without CKD.

**Design:** A retrospective cohort study was carried out using TriNetX, a global federated real time research network comprised of data from over 48 million electronic medical records. Patients were queried by ICD 10 and CPT to find variables of interest. A 1:1 matched propensity score

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analysis was conducted, adjusting for comorbidities and demographics. Adjusted Relative Risks with 95% confidence intervals were generated.

**Findings:** Patients were at a significantly higher risk for developing nine post-operative complications. These include Cellulitis/Lymphangitis (Adjusted Relative Risk [95% CI]= (2.75[1.92-3.95]), Infections (1.72[1.37-2.18]), Hematoma/Seroma (2.89[1.57-5.31]), Hemorrhage (1.72[1.28-2.31]), Pain (4.11[2.95-5.74]), Paresthesia of Skin (3.73[2.34-5.96]), Pruritus (2.28[1.42-3.66]), Muscle Weakness (3.20[1.78-5.74]), and Anesthesia of Skin (1.40[1.04-1.89]).

**Summary:** CKD patients have a significantly higher risk of developing post-operative complications after Mohs surgery. Greater care and caution must be taken when dealing with CKD patients to reduce the risk of poor outcomes.

## B.UP Technique: Safety Assessment, Effectiveness and Satisfaction. Report of 10 Cases

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**Co-Authors:** João Guilherme Finizola de Vasconcelos, MD; Leonardo Durski, MD; Ana Maria Bertelli Antonio Gallotti, MD

**Purpose:** Facial aging has been the subject of study, with constant evolution in its approach. The emergence of fillers of hyaluronic acid represented a major step in therapy and patient satisfaction. With the improvement of anatomical knowledge and, consequently, of the filling techniques, the use of hyaluronic acid gained importance.

Initially, only the grooves were directly filled, but the perception that loss of support was the cause of these grooves, started a new era of treatment in which malar support is a pillar in the approach of the middle and lower thirds of the face. More recently, in-depth anatomical studies have concluded that there is a connection between the tissues of the face through a line of ligaments, in whose lateral area the fibers are parallel and go from the temporal to the mandibular region, which allows, through its volumetric traction, a repositioning of structures and consequent lifting effect, a technique called B.UP.

**Design:** Selection of patients: 10 patients (n = 10) with moderate photoaging were selected, with ages between 42 and 53 years old.

**Technique:** It consisted of B.UP technique's three steps: temporal filling for lifting effect, restructuring and volumizing the middle third of the face. A bolus injection of 1 mL of volumizing hyaluronic acid was performed in the superficial temporal region, behind the capillary implantation line, in a subdermal plane, with a 22G cannula bilaterally. According to individual needs, the zygomatic and malar regions were also treated.

**Evaluation:** Subjective evaluation was performed, using the global aesthetic improvement scale (GAIS) and 4 questions with yes or no answers: 1) perception of lifting effect, 2) perception of rejuvenation, 3) whether this treatment would be indicated and 4) occurrence of adverse effect. The GAIS scale compares the results pre and post treatment in five degrees: worsened, unaltered, improved, very improved and exceptional improvement.

**Findings:** All patients declared exceptional improvement, according to the GAIS scale, which is compatible with 100% of "yes" answers for the perception of a lifting and rejuvenating effect and the probability of indicating the treatment. 50% reported mild and transitory side effects, such as ecchymosis (n = 2) and edema (n = 3).

**Summary:** The presence of a ligament line which crosses the face from the temporal region to the mandible and whose lateral fibers are arranged in parallel, allow, after skin distension with subdermal injection of hyaluronic acid bolus in the temporal region, the repositioning of the compartments of the middle and lower thirds of the face that had undergone caudal displacement.

The clinical reflex of this anatomical dynamics is evident in this study with the perception of a lifting and rejuvenating effect in all treated patients, as well as the inclination to indicate this approach.

The safety of the procedure is guaranteed by respecting the anatomical aspects, being the application in a superior plane to the temporal artery. Adverse effects are common to cannula filling techniques, such as transient edema and ecchymosis.

We conclude that the bolus filling of the posterior superficial temporal region (B.UP technique) is safe and allows rejuvenation with a lifting aspect in a minimally invasive manner.

## Barber's Disease as an Educational Tool to Assist with the Stylists against Skin Cancer Campaign and Promote Fund Raising for the American Cancer Society

**Author:** Lisa M. Donofrio, MD, Associate Clinical Professor, Yale University School of Medicine, New Orleans, LA

**Assisting:** Cassidy Fishman, HS Student

**Purpose:** Skin cancer of the scalp may progress because hair obstructs visibility. The ASDS Stylists Against Skin Cancer campaign unites board certified dermatologists with hairdressers to promote early detection. Barber's disease was introduced to local hairdressers to heighten interest in a subject dear to them to enhance presentation of the campaign. This was done to educate but also to fund raise for the American Cancer Society.

**Design:** An email campaign was sent to multiple hairdressers.

**Findings:** The campaign was responded to positively and funds were raised.

**Summary:** Educating hairdressers about Barber's disease is useful when promoting the Stylists Against Skin Cancer campaign of ASDS.

## Basal Cell Carcinoma Invasion of Ear Piercing

**Author:** Logan Rush, MD, Dermatological Oncology/Mohs Surgery Fellow, Saint Louis University, St. Louis, MO

**Co-Authors:** Thomas Jennings, MD, PhD; Malan Kern, MD

**Purpose:** There are rare reports in the literature of basal cell carcinomas (BCCs) arising within nasal, auricular and lip piercings. However, invasion of piercings by BCCs is not well described. We describe a case of BCC invasion of an ear piercing; and highlight the need for careful histologic examination when working on a pierced site, as the piercing can be a nidus for tumor recurrence. We also discuss how recreation of the lobule, when sacrificed, can help restore a more natural appearing contour of the auricle.

**Design:** A case report study design is used to present the case of BCC invasion of an auricle piercing.

**Findings:** A 55-year-old Caucasian female underwent Mohs micrographic surgery for a 3.2 x 4.8 cm nodular BCC of ~7 years duration on the right post-auricular crease extending onto the postero-inferior aspect of right ear lobule. Upon microscopic review of the first stage, a basaloid proliferation consistent with BCC was noted within the piercing of the right ear lobule. Tumor clearance required two stages and the postero-inferior portion of the ear lobule was sacrificed. An extensive rotation flap was utilized with acceptable cosmetic result. The ear lobule was re-created by suturing the remaining portion of the lobule and inferior helix to the anti-helix, resulting in a more natural appearance of the ear contour.

**Summary:** It is well-known that tumor cells can "shelve and skate" along paths of least resistance, and piercings can provide such an avenue for tumor invasion. Additionally, BCCs have been reported to arise within

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nasal, auricular and lip piercings. It is suspected that the proliferative stimulus and chronic inflammation of the embedded object in a piercing, as well as alloyed metals from jewelry, results in tumorigenesis (6). If not carefully examined when working on a pierced site, tumor recurrence may result. Additionally, piercings are typically located on the nose, ears, and lips—which are high risk locations independent of whether a piercing is present or not. Given the propensity for flaps in these locations, tumor recurrence can occur in a different location from the original piercing. If a portion of the ear lobule must be sacrificed, recreation of the lobule by suturing the remaining lobule and inferior helix to the anti-helix may result in a more natural ear contour.

## Burow's Graft for Small to Moderate Helical Rim Defects

**Author:** Mark M. Ash, MD, Resident Physician, University of North Carolina, Chapel Hill, NC

**Co-Authors:** Amy Blake, MD, MA; Rajat Varma, MD

**Purpose:** The utility and challenges of the Burow's graft for reconstruction of small to moderate helical rim defects after Mohs micrographic surgery (MMS).

**Design:** A case of a 68-year-old male with a history of multiple nonmelanoma skin cancers who was treated with MMS for a left superior helical rim squamous cell carcinoma. A negative margin was achieved after one stage with a resultant 1.5cm defect. Complete primary linear repair of this defect was deemed suboptimal due to a high level of tissue tension based on reapproximation of tissue with skin hooks. A joint decision was made to utilize a Burow's graft in combination with a linear closure. One week post-operatively, the wound was healing well and the contour of the auricle was maintained.

**Findings:** For patients who prefer to avoid a flap or a distantly-harvested graft, the Burow's graft can be utilized to maximize tissue conservation, maintain auricular contour and achieve satisfactory cosmesis, as demonstrated in our patient case. Of note, the Burow's graft can be either proactively employed for helical rim defects, or performed to salvage an incomplete or failed primary linear closure.

Limitations of this technique include the requirement for a rich vascular bed in the site of the defect; the potential unsuitability for deeper defects due to the need for defatting of the graft; and a small increase in risk of graft failure as a result of nearby skin-edge tension associated with the primary closure of the donor tissue.

**Summary:** Helical rim defects present an array of challenges for the dermatologic surgeon, and we hope our insight into the repurposing of an existing technique—the Burow's graft—will inform the audience on the potential benefits of this simple, single-stage reconstructive procedure in minimizing surgical intervention, achieving good cosmesis, retaining functionality and maximizing tissue preservation in this relatively unforgiving anatomic location.

## Calcium Hydroxylapatite Microspheres Provide Organization into Unorganized Collagen Networks Leading to Improvement of Skin Attractiveness

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**Co-Authors:** Davide Greco; Thomas Hengli; Bartosch Nowag; Daniela Schafer

**Purpose:** Calcium hydroxylapatite (CaHA; Merz North America) microspheres suspended in a gel carrier of sodium carboxymethylcellulose (CMC) have demonstrated restoration of volume and biostimulation leading to skin quality improvement, mostly driven by neocollagenesis of collagen type III and collagen type I. Disrupting unorganized collagens and creating a new organized collagen network may also contribute to improvement of skin attractiveness

and possibly rejuvenation of the skin. An in vitro dataset demonstrating a reorganization of collagen I fibers around CaHA microspheres is demonstrated here for the first time.

**Design:** Primary normal human dermal fibroblasts (NHDF) were cultured in growth medium (including serum). For all experiments, NHDF were incubated with a defined amount of CaHA microspheres for 7 days after collagen I network was formed. Collagen I expression, fibers and network formation were analyzed.

**Findings:** Collagen I expression of collagen fibers is increased in proximity to CaHA microspheres, and overall collagen I expression is increased after incubation of fibroblasts with CaHA microspheres. Thicker and more condensed fibers are produced by fibroblasts after incubation with CaHA microspheres for 7 days, contributing to a firm and dense collagen I network around CaHA microspheres. The maximum collagen I expression of fibers stimulated with CaHA microspheres is increased, and a collagen network is formed exclusively around CaHA microspheres after 7 days of incubation. Clearly defined collagen I strands arise out of single fibers after incubation with CaHA microspheres. Collagen I expression of cells incubated with CaHA microspheres show higher maxima compared to unstimulated fibroblasts. Distinct collagen I peaks represent a concrete collagen I fiber pattern resulting in higher values for minima and maxima. Higher organized collagen I fiber pattern resulting in a younger collagen I phenotype.

**Summary:** CaHA microspheres can reorganize collagen I fibers resulting in a firm and denser collagen network similar to that of younger skin. Therefore, CaHA microspheres may be able to rejuvenate aging skin comprising of unorganized thin collagen I fibers into skin with a highly organized and firm collagen I network and more youthful characteristics. This may in turn lead to increased skin attractiveness by tightening, increasing skin surface regularity and more uniform skin pigmentation.

## Changing the Architecture of the Midface

**Author:** Kate Goldie, DR, European Medical Aesthetics, London, England, United Kingdom

**Co-Author:** Daria Voropai, MD

**Purpose:** In this study the 'Direct Tissue Augmentation - technique (DTA)' is demonstrated. This is a novel technique for midface reshaping with a volumizing hyaluronic acid filler with a high plasticity. The filler is applied in a bilayer placement with a direct action on the subdermal and sub-SMAS tissue planes. Creating a natural and connected appearance of the midface is always a challenge. The aim of this study was to demonstrate that bilayer targeted technique will give a natural and connected appearance of the face.

**Design:** In this consecutive nonrandomized study, 11 female patients were evaluated. All patients had an age ranging between 20 and 55 years old. They were all in a healthy condition and didn't suffer from any comorbidities. Furthermore, they didn't receive any filler treatment in the cheek area before. During one week in March 2019 all patients were treated in the same clinic. They were examined pre-injection, and at two weeks, three months and six months post-treatment. During each evaluation session, 2D and 3D pictures were taken using standard positioning. Furthermore, ultrasound imaging was used before, during and after injection in order to define the anatomy, the positioning of the filler and the dermal filler longevity.

**Summary:** Volumetric 3D analysis revealed a high lifting capacity of the bilayer technique, equally the USS analysis showed unchanged hyaluronic acid deposits over the period of the follow-up time.

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## Characteristics of Matched vs. Non-matched Dermatology Applicants in the 2018-19 Application Cycle

**Author:** Jamison A. Harvey, MD, Mayo Clinic Dermatology, Scottsdale, AZ

**Co-Authors:** Jake Besch-Stokes, BS; Puneet Bhullar, BS; Collin Costello, MD; David DiCaudo, MD; Shari Ochoa, MD

**Purpose:** To compare characteristics between applicants that matched and did not match into dermatology.

**Design:** 475 applicants who applied to Mayo Clinic Dermatology in Arizona were emailed two surveys. Applicants that matched were compared to applicants that did not match. Descriptive statistics were calculated for variables of interest. Group comparisons were examined using Chi-square tests for categorical variables and t-tests for continuous variables of interest.

**Findings:** A total of 112 students completed both surveys. The median age was 27, and 68 (60.7%) were female. Fifteen (13.4%) of the applicants did not match. Gender and age were not statistically associated with matching. African American and American Indian or Alaskan Native were disproportionately represented in the non-matched applicants ( $p=0.05$ ). Only 6.4% of the matched applicants self-identified as Hispanic or Latino, compared to 21.4% of the individuals that didn't match ( $p=0.06$ ). The median Step 1 score of applicants that matched was 251 compared to 242.5 of applicants that did not match ( $p=0.04$ ). The median number of dermatology interviews of applicants that matched was 9 compared to 4 ( $p<0.01$ ). Applicants that matched had a median of 6 publications manuscripts and 3 were first author publications. In comparison, applicants that did not match had a median of 7 ( $p=0.92$ ) and 4 were first author ( $p=0.89$ ). Applicants that match had a median number of 5.5 honors in clinical rotations, compared to a median of 4.5 honors in applicants that did not match ( $p=0.08$ ).

**Summary:** In our survey of dermatology applicants, the match rate was 86.6%. Unfortunately, racial and ethnic minorities were disproportionately represented in the non-matched applicants. Applicants that matched had statistically significant higher step 1 scores and number of dermatology interviews.

## Collagen Peptides, Stem Cells, and Platelet-rich Plasma in Aesthetics: A National Consumer Survey

**Author:** Jordan V. Wang, MD, MBE, MBA, Cosmetic Dermatologic Fellow, Laser & Skin Surgery Center of New York, NY

**Co-Authors:** Christian Alborno, MD; Robert Murgia, DO, MA; Nazanin Saedi, MD; Saloni Shah, BS

**Purpose:** In recent years, patient interest in cosmetic interventions has increased substantially. Most treatments aim to reduce the visible signs of aging and promote cutaneous rejuvenation. This demand has led to a surge in novel treatment modalities, including collagen peptides, stem cells and platelet-rich plasma (PRP). However, evidence supporting their efficacy is limited and often contradictory. As interest in collagen peptide, stem cell, and PRP therapies continues to grow, understanding the perspectives of aesthetic consumers becomes more important for practitioners.

**Design:** An online survey was distributed to individual consumers in the United States who were 18 to 65 years old in March 2020.

**Findings:** A total of 55 respondents completed the survey. The mean age was 40.4 years, and 52.7% were female. Of all respondents, 20.0% had a previous cosmetic procedure, of which 45.5% will have another in the future. Overall, 18.2% were currently planning to have a future procedure, and 38.2% were considering it.

Of all respondents, 10.9%, 7.3%, and 3.6% participated in collagen peptide, stem cell, and PRP interventions respectively, while 16.4%,

9.1%, and 7.3% knew of others who had participated in them respectively. For the future, an equal percentage of respondents were interested in starting collagen peptide and stem cell therapies (38.2%), while slightly less were interested in PRP (32.7%).

In terms of familiarity, about a quarter (25.5%) of respondents were knowledgeable about both collagen peptide and stem cell interventions, while only 18.2% were knowledgeable about PRP. A slight majority were interested in learning more about stem cells (61.8%), collagen peptides (60.0%), and PRP (54.6%). Respondents generally believed them to be effective to different extents. Significantly more respondents believed collagen peptides (80.0% vs. 37.8%;  $p=0.016$ ), stem cells (100.0% vs. 40.8%;  $p=0.007$ ) and PRP (100.0% vs. 46.0%;  $p=0.022$ ) were effective for skin rejuvenation when they or someone they knew had experienced them.

The top five factors that influenced whether or not respondents participated in interventions for skin rejuvenation included personal curiosity (49.1%), price (41.8%), scientific data (29.1%), information from dermatologists (20.0%), and friends doing it (16.4%). When learning about interventions, the most utilized sources were dermatologists (52.7%), other physicians (32.7%), YouTube (27.3%), and friends (18.2%), while family and Facebook were tied (16.4%). Similarly, the top five most trusted sources included dermatologists (54.6%), other physicians (38.2%), YouTube (21.8%), family (18.2%), and friends (14.6%). Interestingly, personal references were generally more cited than social media sources.

**Summary:** Aesthetic consumers have varying degrees of knowledge and beliefs on perceived effectiveness for collagen peptide, stem cell and PRP therapies. Consumers rely on various factors when deciding to participate in cosmetic interventions.

## Collagen Powder after Curettage: A Novel Therapy for Erosive Pustular Dermatitis of the Scalp

**Author:** Angelia Stepien, DO, Dermatology Resident Physician, Orange Park Medical Center, Jacksonville, FL

**Co-Authors:** Logan Kolb, DO; George Schmieder, DO

**Purpose:** Erosive pustular dermatitis of the scalp (EPDS) is an idiopathic inflammatory eruption that can be quite distressing for patients. Treatment is often challenging and rarely results in complete resolution. We describe a successful novel treatment for EPDS using collagen powder combined with curettage that yielded complete resolution in three months.

**Design:** Biopsy proven dermatitis consistent with EPDS was anesthetized with 1% lidocaine with epinephrine then debrided of devitalized tissue and necrotic debris using gentle curettage. Once complete, 100% bovine type I collagen powder was sprinkled directly onto the wound bed, covering the entire surface, with a non-adherent dressing applied over top. The patient was initially followed every three days for collagen powder application and dressing changes, for a total of three in-office visits. The patient was then instructed to continue the regimen at home. He returned to the clinic for a three month follow-up and again at nine months after treatment completion.

**Findings:** Moderate improvement of the wound size was noted at two weeks of collagen powder use with continued reduction in wound size until complete resolution at three months. At the nine month follow-up, no recurrence of the lesion was noted.

**Summary:** Clinicopathological correlation is essential in establishing the diagnosis of EPDS. It is crucial that both clinicians and dermatopathologists are able to recognize EPDS for proper treatment to be initiated. With limited documentation of EPDS in medical literature, a general therapy algorithm has yet to be established. Due to the distressing nature of EPDS and the chronicity of the scalp lesions, it is necessary that we determine a simple, effective treatment regimen for patients. Application of collagen powder after curettage provides a novel therapy for EPDS that has shown success in our patient and should be considered in future treatment algorithms of EPDS.

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## Combination Hair Restoration Techniques in the Treatment of Severe Cutis Verticis Gyrata

**Author:** Ariana Eginli, MD, Physician Resident, Wake Forest Baptist Health Department of Dermatology, Winston-Salem, NC

**Co-Authors:** Jerry Cooley, MD; Amy McMichael, MD

**Purpose:** Traditional treatment options for Cutis verticis gyrata (CVG) primarily consist of scalp reduction with or without tissue expansion. Many of these surgical approaches result in scars, decreased hair density, and/or more apparent hair thinning on the scalp. Yet, the role of hair transplantation in CVG surgical revision is not well described in the current literature. We present a case of severe CVG treated with scalp reduction, Follicular Unit Transplantation (FUT), and Follicular Unit Extraction (FUE) as the first report utilizing this combination of techniques. Additionally, we highlight the surgical methodology that guided our approach and management in CVG correction.

**Design:** A 27-year-old black man presented with severe CVG, reportedly present since adolescence. The patient was unwilling to undergo tissue expansion and accepted the possibility of more than one reduction to achieve satisfactory results. The initial procedure consisted of a Mercedes pattern scalp reduction, resulting in the removal of almost 90 cm<sup>2</sup> of redundant scalp skin. In the second procedure ten months later, the redundant fold of occipital skin was harvested, similar to a typical FUT procedure. Over 500 follicular unit grafts were dissected under stereomicroscopy and placed within the scalp reduction scar. At this time, a small ellipse was also taken from a residual fold running diagonally from the right frontotemporal angle posteriorly. In the third procedure performed one year later, a second occipital FUT strip was removed as well as individual follicular units via motorized punch (FUE) totaling 744 follicular unit grafts, which were placed within scars and thin areas of the scalp.

**Findings:** During scalp reduction, widespread subgaleal dissection allowed significant release of tissue and mobilization towards the midline of the excision, thus resulting in improvement of ridges and furrows distant to the excision site. Overly aggressive scalp reduction was avoided to prevent the risk of reducing hair density. We found that furrows distant to the incision frequently relaxed and smoothed out in the weeks following the surgery to further support this point. For occipital folds, traditional FUT allowed for graft harvesting and as a way of reducing the folds. After the folds were correct, FUE was performed for graft harvesting to minimize scarring. Hair grafts were placed in desired locations to minimize the appearance of scars.

**Summary:** In light of the many advances in hair restoration surgery, incorporation of grafting (FUT and FUE) should be undertaken following scalp reduction for CVG. Given the severity of this patient's CVG a combination of different surgical techniques and thoughtful planning during each step of the revision process achieved the most cosmetically optimal outcome. An overly aggressive approach to address all furrows in the initial scalp reduction in patients with CVG should be avoided, as many will disappear during the healing process. If occipital folds are present, traditional FUT is ideal, both as a method of graft harvesting and as a way to reduce the folds. Once these folds are corrected, or if they do not exist to begin with, FUE is the preferred method of graft harvesting. Hair transplantation can provide a more predictable improvement by placing grafts in desired locations. When planning graft placement, it is important to consider the possibility of future hair loss due to AGA if the patient exhibits signs of AGA and has a positive family history. Finally, further treatment with scalp micropigmentation, which has become increasingly popular as a method to conceal scars and hair loss, can be pursued in the future.

## Combining Power Assisted Liposuction, Laser Assisted Liposuction and Deoxycholic Acid to Remove 7.6 L Fat

**Author:** Desmond M. Shipp, MD, Assistant Professor, Ohio State University Division of Dermatology, Gahanna, OH

**Co-Authors:** Aharon Gutterman, MD; Eyal Levit, MD

**Purpose:** Liposuction is a common procedure performed by many specialists including dermatologists. Since the inception of this procedure, it has been well-established that the maximum amount of fat that can be safely removed is 5L or 11 pounds. Any excess of this number has been associated with increased side effects including pulmonary edema and congestive heart failure, both of which are likely induced by the rapid changes in body fluid. Using the concepts of fluid replacement and intraoperative fluid ratio, tumescent anesthesia (1000mg lidocaine/1 Liter saline) coupled with conscious sedation can help minimize the above complications and allow for the safe removal of excessive fat beyond the 5L. We propose use of tumescent anesthesia and conscious sedation in combination with power assisted liposuction, laser assisted liposuction, and deoxycholic acid injections to remove excessive (>5L) fat safely.

**Design:** We present a 56-year-old woman with excessive abdominal fat. 7.6 L of abdominal, pubic and periabdominal fat was removed using a combination of tumescent anesthesia and conscious sedation followed by Power assisted liposuction and laser assisted liposuction. Additionally, at the conclusion of the liposuction procedures, deoxycholic acid injections were used to further remove stubborn areas of residual fat pockets and improve local skin tightening. Using conscious sedation and tumescent anesthesia we were able to maintain an intraoperative fluid ratio of 1.2, allowing for a larger amount of fat to be safely removed. We, similar to Rohrich et. al., define the intraoperative fluid ratio as the sum of the tumescent anesthesia infiltration volume plus the intraoperative intravenous fluid volume divided by the volume of aspiration.

**Findings:** This case is the first to demonstrate the combination of conscious sedation and tumescent anesthesia in an amalgamation (power assisted liposuction, laser assisted liposuction and deoxycholic acid injections) approach to remove and destroy excessive fat >5L (specifically 7.6L) safely without any serious complications in one treatment session.

**Summary:** Power assisted liposuction allowed for immediate fat removal. Laser assisted liposuction allowed skin tightening and melting of the fat in areas where the fat was more difficult to remove due to fibrosis. When no further tumescent fluid was deemed desirable or helpful for further fat removal, deoxycholic acid injections were performed; they provided additional long term fat removal and skin tightening in areas where further suctioning was difficult due to larger amounts of fluid. Using conscious sedation in combination with tumescent anesthesia during liposuction allowed maintenance of an intraoperative fluid ratio of 1.2, thereby allowing >5L of excess fat to be safely removed in one treatment session. Combining all of these treatment strategies allowed for safe and successful removal of over 7.6L of fat in one setting and for releasing the patient to the care of her family in a hemodynamically stable condition a few hours after the procedure.

## Complementary and Alternative Anxiolytics: A Randomized Controlled Trial of Essential Oils

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**Purpose:** Mohs surgery is an anxiety-provoking experience for many patients. Addressing such stressors enhances the therapeutic relationship with a patient, improves satisfaction and decreases perceived post-operative pain. Complementary and alternative medical approaches, such as aromatherapy, are commonly employed by patients outside the doctor's office and in other specialties. This study aimed to evaluate whether diffusing lavender essential oil during Mohs surgery would decrease the anxiety experienced by patients.

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**Design:** One hundred and forty-four patients were recruited and randomized in equal proportions to either the control group or the intervention group. The intervention group had lavender essential oil diffused, via a waterless diffuser, in their procedure suite during the entire procedure while the control group had none. Patients completed a 13-point questionnaire from the State-Trait Anxiety Inventory before and after surgery. Additionally, blood pressure and pulse were measured at baseline and after the procedure day.

**Findings:** One hundred forty-four patients enrolled in the study, and 137 completed the post-procedure questionnaire. Patients were mostly men (71.5%), with surgery to the face (73.8%) being most common. Overall demographics and baseline anxiety scores were balanced between the two groups.

The intervention group had a slightly improved overall anxiety score, with a mean improvement of 3.6 points (SD 7.7) compared to a mean decrease of 2.0 points (SD 6.6) in the control group. However, this difference was not statistically significant ( $P=0.2153$ ). Results were similar for heart rate with a trend towards improvement for the intervention group, but not statistically significant (mean reduction of 3.4 beats per minute  $p=0.1695$ ). There was no change in blood pressure.

**Summary:** This is the first randomized study assessing both physiologic and psychologic factors to diffused lavender essential oil during Mohs surgery. Aromatherapy, in this instance, did not show a statistically significant reduction in anxiety. Given the adverse effects of preoperative anxiety incorporating complementary and alternative medical approaches deserves more study.

## Consumer Views on Cosmetic Injectable Procedures: Fat Transfer, Fillers and Neurotoxins

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**Co-Authors:** Timothy Durso, MD; Nazanin Saedi, MD; Saloni Shah, BS

**Purpose:** Society's growing emphasis on aesthetic beauty has fueled a rapid growth in the aesthetic industry, especially in regard to injectable treatments. Understanding patient interest, familiarity, and knowledge of injectable procedures has important implications for facilitating their safe and appropriate use. In order to better define the perspectives of aesthetic consumers, we examined their views on cosmetic injectable procedures, including fat transfer, soft-tissue fillers and neurotoxins.

**Design:** An online survey was distributed to individual consumers in the United States in April 2020.

**Findings:** A total of 106 respondents completed the survey. The mean age was 39.9 years, and 57.6% were female. Of all respondents, 31.1% had a previous cosmetic procedure, of which 36.4% intended to have another in the future. Overall, 23.6% were actively pursuing a future cosmetic procedure, while an additional 32.2% were considering it.

For cosmetic injectables, 17.9%, 9.4%, and 9.4% of respondents had received fat transfer, soft-tissue fillers and neurotoxins respectively, while 21.7%, 29.2%, and 24.5% knew of others who had them performed respectively. The mean age of those who received cosmetic injections were 41.1 years, 31.5 years and 35.4 years for fat transfer, soft-tissue fillers, and neurotoxins respectively. Similar numbers of respondents were planning to undergo future fat transfer (25.5%), soft-tissue fillers (24.5%), and neurotoxins (20.8%), while others were still considering them (23.6%, 21.7%, and 25.5% respectively).

In terms of familiarity, respondents were similarly knowledgeable about each specific cosmetic injection (34.9%, 37.7%, and 36.8% for fat transfer, fillers, and neurotoxins respectively). However, nearly half of respondents (49.1%) wanted to learn more about fat transfer, while there was less interest in soft-tissue fillers (44.3%) and neurotoxins (38.7%). Respondents generally believed each procedure to be effective to different extents. When compared to respondents without personal

or peripheral experience with these procedures, significantly more respondents believed fat transfer (48.9% vs. 15.3%;  $p=0.00019$ ), soft-tissue fillers (49.0% vs. 12.7%;  $p=0.00005$ ), and neurotoxins (44.4% vs. 13.5%;  $p=0.00049$ ) to be effective when they or someone they knew had them performed.

The top five motivating factors for participating in cosmetic procedures were cost (48.1%), safety data (27.4%), dissatisfaction with appearance (25.5%), scientific data (25.5%) and personal curiosity (22.6%). When obtaining information about cosmetic procedures, the top five utilized sources were dermatologists (39.6%), friends (34.0%), family (34.0%), other physicians (33.0%) and Facebook (29.3%). Similarly, these were also the top 5 trusted sources, but in different order: dermatologists (45.3%), other physicians (39.6%), family (33.0%), friends (27.4%), and Facebook (21.7%). Dermatologists were the most frequented and trusted resource.

**Summary:** Aesthetic consumers have varying degrees of knowledge and beliefs on perceived effectiveness for fat transfer, soft-tissue fillers, and neurotoxins. Consumers rely on various factors when deciding to participate in cosmetic interventions.

## Current Practices for Preventative Interventions for Nonmelanoma Skin Cancers among Dermatologic Surgeons

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**Co-Authors:** Erica Leavitt, MD; Sarah Lonowski, MD, MBA; Jenny Kim, MD, PhD; Myung-Shin Sim, DrPH

**Purpose:** The purpose of this study is to assess prescribing practices for NMSC prevention among dermatologic surgeons, a group that regularly treats NMSC.

**Design:** This study was approved by UCLA's Institutional Review Board. An 8-question survey was sent to members of the American College of Mohs Surgery (ACMS). Survey responses were collected from November 2019 through December 2019. Data analysis was performed in January 2020. Chi-squared tests were used to assess statistical significance.

**Findings:** 85 responses were received. 65.9% of respondents were in private practice, 16.5% were in academic institutions and 17.6% were in other practice settings. The majority (95.3%) of respondents recommend intervention for prevention of NMSC: 84.2% recommend nicotinamide, 59.8% recommend acitretin, and 39.0% recommend topical retinoids. Nearly half (45%) of respondents recommend preventive therapies after five or more NMSCs, though over 10% of respondents recommend preventive therapies among patients without a history of NMSC, but with a history of multiple actinic keratoses. Physicians in practice for 0-5 years were 7.41 times more likely to recommend nicotinamide than those in practice 15+ years ( $p=0.017$ ). There was a trend for physicians in practice for fewer years to prescribe higher strength topical retinoids for NMSC prevention compared to those in practice for longer. Likelihood of recommending nicotinamide did not vary significantly by practice setting; however, physicians in academic settings were more likely to recommend a dosage of 500mg twice daily, while physicians in private practice were more likely to recommend 500mg daily ( $p=0.01$ ). Physicians familiar with the 2015 New England Journal of Medicine (NEJM) study on nicotinamide for the prevention of NMSCs were 11.2 times more likely to recommend nicotinamide ( $p=0.0007$ ) compared to those not familiar with the study.

**Summary:** The vast majority of surveyed dermatologic surgeons recommend pharmacologic interventions for NMSC prevention. Prescribing practices for preventative therapies vary by years in practice. Physicians in practice for fewer years were more likely to recommend nicotinamide and to prescribe higher strength topical retinoids compared to physicians in practice for longer. The reasons for these differences cannot solely be attributed to differences in practice settings as there was no significant association between years in practice and practice setting ( $p=0.135$ ). Possible explanations may include increased familiarity

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with recent medical literature and differences in comfort prescribing systemic medications. Physicians in academic practices were more likely to recommend a higher dose of nicotinamide than physicians in private practice settings. This may be related to the fact that a higher percentage of physicians in academic practice reported familiarity with the 2015 NEJM study, which utilized 500mg twice daily dosing.

Limitations include that sample population restricted to dermatologic surgeons and the inability of a generalized survey to elucidate specific prescribing trends. Studies that directly compare the efficacy of preventative interventions for NMSCs and establish guidelines regarding the threshold for initiating preventative therapies are needed. As healthcare costs rise, preventive interventions are of critical importance. Developing a method for disseminating evidence-based information regarding preventative therapies for NMSCs among physicians and patients would be valuable.

## Cutaneous Sebaceous Carcinoma - A Single Center Review

**Author:** Kathryn A. Potter, MD, Assistant Professor, Augusta University, North Augusta, SC

**Co-Authors:** Melanie Bui, MD, PhD; Glenn Goldman, MD; Rachel Madhur, BS

**Purpose:** Sebaceous carcinoma (SC) is a rare, malignant neoplasm with adnexal derivation. Sebaceous carcinomas are classified as cutaneous (extraocular) or ocular (involving eyelid) - most commonly arising from Meibomian glands (1). The treatment of cutaneous SCs (cSCs) is surgical extirpation. Several studies have recently shown that Mohs micrographic surgery (MMS) is appropriate for the treatment of SCs (2, 3).

The 8th edition of the American Joint Committee on Cancer, directs the clinician to stage eyelid sebaceous carcinomas separately from cSCs, similarly to the 7th edition (4). In a retrospective review of 63 cases of eyelid SCs, the T category of the 8th edition showed better predictability for both local recurrence and metastasis compared with the 7th edition (5). In December 2019, clinical practice guidelines for SCs were published in *Lancet Oncology* stating that cSCs can be staged using the UIC system (6).

We sought to retrospectively review outcomes of cSCs treated with MMS at our institution and to determine if staging them similarly to cSCC's would change patient treatment or prognosis.

**Design:** The authors conducted a retrospective review of cSCs treated at our institution with MMS by searching the MMS yearly case logs for keyword sebaceous.

**Findings:** A total of 14 cSCs were treated with MMS in the past 6 years. Patient characteristics are available in Table 1. None of the tumors had any high risk features to upstage them with AJCC 8 and thus they would all be stage T1. They were all smaller than 2cm, did not invade beyond the subcutis and did not show perineural invasion. The average size at largest dimension prior to surgery was 0.77cm.

The average follow up after surgery for these patients is 30 months and there has been no recurrence or regional metastases of any of these tumors.

Table I: Cohort patient and tumor characteristics (n = 14)

Characteristic
Gender, n (%) Female 3 (21.4) Male 11 (78.6)
Mean age at treatment, y (SD) 69.1 (11.8)
Immunosuppression, n (%) None 11 (78.6) Transplant 3 (21.4)
Muir Torre syndrome, n (%) No 13 (92.9) Yes 1 (7.1)
Mean preoperative diameter, cm 0.77cm
Tumor body location, n (%)
Cheek 5 (35.7)
Forehead 5 (35.7)
Nose 3 (21.4)
Scalp 1 (7.1)

**Summary:** Our study is limited by retrospective design and our small number of patients. Given the evidence from our review, the authors sought to compare our outcomes with other recent publications (Table 2). It is noted that much of what has been published regarding sebaceous carcinomas have included outcomes for both cutaneous and ocular tumors lumped into one category. Our experience is similar to several other recently published retrospective reviews with supporting evidence that cSCs are less aggressive than their ocular counterparts, and also supporting the use of MMS for the treatment of these tumors.

It is important for the clinician to be aware of the separate AJCC 8 guidelines for staging ocular and cutaneous sebaceous carcinomas and to stage them accordingly. Should a clinician encounter a cutaneous sebaceous carcinoma with aggressive features, specifically large diameter or perineural invasion, it would be prudent to stage the tumors according to the guidelines, but based on our limited, retrospective review, it appears that aggressive cutaneous sebaceous carcinomas are rare.

Table II: Review of data

Author	Number of Tumors	Size of Tumor	Cutaneous Location	Risk of Recurrence	Treatment Method
Our institution	14	0.8cm	100%	0	MMS
Brady and Hurst (3)	45	0.7cm	87%	0	MMS
Brewer et al(2)	52	1cm	90%	4.80%	MMS and WLE
Basset-Se-guin et al(7)	24	unknown	unknown	16%	WLE

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## C-V Transposition Flap for Reconstruction of the Nipple-areolar Complex after Mohs Surgery

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**Co-Authors:** Shang I Brian Jiang, MD; Grace Sohn, MD

**Purpose:** Mohs micrographic surgery (MMS) for the removal of nonmelanoma skin cancers on the nipple-areolar complex (NAC) can lead to complete or partial removal of the NAC. Defects in this location can represent a reconstructive conundrum to the Mohs surgeon. Nipple reconstruction with C-V transposition flaps are commonly applied in plastic surgery for reconstructing nipples following mastectomy.

**Design:** We review two cases of basal cell carcinoma of the NAC treated with MMS and reconstructed using the CV flap.

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**Findings:** To perform the flap, it is first designed at the position appropriate for the desired NAC. Triangulation from the sternal notch or other anatomic structures can be applied to maintain symmetry to the contralateral NAC. The direction and height of nipple projection are important considerations for this flap. Next, a C flap and two V flaps are elevated together. The V-flap donor sites are closed primarily. The walls of the nipple are then formed by the two V flaps apposed vertically. Finally, the top of the reconstructed nipple is covered by the C flap, and the flap is sutured in place

**Summary:** Following MMS for skin cancer of the NAC, C-V flaps can be considered for reconstruction of the NAC. It is a simple and reliable method shown to have high long-term patient satisfaction.

## Dermal Metastases of Cutaneous Squamous Cell Carcinoma: A Single Institution Case Series

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**Co-Authors:** Rajiv Nijhawan, MD; Divya Srivastava, MD

**Purpose:** Dermal metastasis in cutaneous squamous cell carcinoma (SCC) is a rare entity, and unfortunately, is a manifestation of end-stage disease and an independent predictor of poor prognosis. Immunocompromised populations, specifically solid organ transplant recipients, are at increased risk of invasive squamous cell carcinoma, have increased rates of metastatic disease, and may have limited treatment options given comorbidities and contraindication to immunotherapy. We describe a case series of eight patients who developed dermal metastases in the setting of cutaneous squamous cell carcinoma.

**Design:** A retrospective review was performed at a single academic institution of patients with cutaneous squamous cell carcinomas and biopsy proven dermal metastases from March 2015-May 2020.

**Findings:** Eight patients were identified, six of whom were immunocompromised with bilateral lung transplants. The other two patients were elderly (>80 years old) with significant comorbidities. Median age of entire cohort was 69 years. Six patients were males, two females, and all were of white, non-Hispanic descent.

Four patients' initial pathology was of poorly differentiated squamous cell carcinoma, two with moderately differentiated SCC, one with well differentiated SCC which recurred as poorly differentiated SCC, and one with acantholytic SCC. Locations included ear (n=3), chin (n=1), cheek (n=1), temple (n=1), and scalp (n=2), with median initial size of 10.5mm (range 7-60mm). Six patients had nodal involvement and two with perineural invasion (< 0.1mm). Five cases received wide local excision with adjuvant radiation, three of whom progressed requiring either chemotherapy or immunotherapy. Three cases were deemed unresectable at presentation of dermal metastases; two of which passed away without additional treatment, and one who is scheduled to initiate immunotherapy.

Median time from SCC diagnosis to initial treatment (Mohs or wide local excision) was 41 days (range 5-161 days). Median time from initial SCC diagnosis to time of dermal metastases was 112 days (range 22-387 days). Four of eight patients are currently deceased. Median time from diagnosis of dermal metastases to death was 140.5 days (range 29-215 days). The patient with the longest disease-free follow-up (18 months), who is currently alive, received extensive surgical resection and radiation within weeks of metastases diagnosis.

**Summary:** We report eight patients who developed dermal metastases from cutaneous squamous cell carcinoma. Immunosuppression and/or older age appear to be significant risk factors. The morbidity and mortality from this aggressive disease is significant, and thus aggressive, multi-disciplinary treatment is advocated as early as possible.

## Dermatologic Surgeons Can Positively Impact the Opioid Epidemic: A Quality Improvement Study of Pain Management in Dermatology Surgery

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**Co-Authors:** Amanda Bein, BS; Katarina Lequeux-Nalovic, MD; Howa Yeung, MD

**Purpose:** The opioid epidemic is a national emergency, and it is imperative that all physicians are engaged in reducing exposure. Among dermatologists, dermatologic surgeons prescribe the majority of opioids with the highest rates of prescription occurring in southern states. The goal of this study was to decrease the proportion of opioids prescribed and filled to less than 10% of surgeries performed and have a 0% increase in the amount of patient complaints regarding postoperative pain.

**Design:** A single-center quality improvement intervention analysis was conducted. The number of opioids prescribed and filled in a single surgical facility was obtained from the state's Prescription Drug Monitoring Program before, 1 month after, and 6 months after implementation of the quality improvement initiative. Telephone encounters regarding postoperative pain was also collected at the same specified time periods. The total number of opioids prescribed and filled and the telephone encounters relating to postoperative pain were expressed as a percentage of the total number of surgeries performed during this timeframe. Proportions of both pre- and post-intervention were compared using chi-squared tests.  $P < 0.05$  was considered significant in 2-sided tests.

**Findings:** Proportion of opioids prescribed and filled decreased from 58% to 5% at 1-month post-intervention and remained low on 6-month follow up at 4%. There was no increase in postoperative pain complaints. Rather, a decrease in complaints was noted from 8.6% to 3.1% at 1-month post-intervention and sustained on six-month follow up at 4.9%.

**Summary:** Overall, our study suggests that postoperative pain in the dermatologic setting may be managed with acetaminophen and ibuprofen, lending further support to previous data. We therefore propose to make this a guideline for all dermatologic surgeries.

## Design Modifications of the Keystone Flap Following Mohs Micrographic Surgery (MMS) Procedures

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**Co-Authors:** Lindsey Goddard, MD; Hugh Greenway, MD; Benjamin Kelley, MD; Salvatore Pacella, MD

**Purpose:** The keystone flap, first described by Behan in 2003, is a perforator island advancement flap commonly used as an alternative to primary closure, skin grafting and other local flaps in larger lower extremity and truncal defects. (1) Free perforator flaps are reported to have better donor site morbidity, simple wound care, shorter procedure time, and may be ideal for both larger and smaller circular wounds that require coverage. (2) We present a case series describing modifications of the keystone flap for facial defects following Mohs micrographic surgery (MMS).

**Design:** A retrospective, single institution case series was compiled of five cases performed in a large, outpatient dermatologic and plastic surgery office that provides care to patients from urban and rural settings. Electronic medical records were reviewed for cases performed in 2019. Patients signed a consent form for the MMS and for the use of intraoperative and postoperative photographs and videos in scientific publications. The senior author (SP) performed the closure of the cases with the assistance of junior author (LG). The micrographic surgery and the reconstruction was performed as an outpatient procedure.

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The keystone flap was used to reconstruct soft tissue defects on the face treated with Mohs micrographic surgery (MMS) of invasive squamous cell carcinoma (SCC), basal cell carcinoma (BCC), melanoma in-situ (MIS) and primary malignant melanoma. The modified keystone flap design was performed as shown in Figure 1 in all patients. Langer's lines are drawn on the patient and the flap is designed with the long axis parallel to these lines. Two opposing V-Y flaps are designed on either aspect of the defect in a curvilinear fashion. The flap is incised through skin and subcutaneous tissue just above the SMAS layer. Blunt undermining is done for mobilization of the flap and if needed, lateral SMAS was dissected to aid in movement. The flap was sutured into place with poliglecaprone 25 dermal sutures and the skin edges were secured with Nylon running crossed vertical mattress (sutures ranging in size from 4-0 to 6-0). Patients were seen for suture removal in 7-10 days.

**Findings:** All of cases were on the cheek, most commonly the lateral aspect of the cheek. Defect size varied from 34 mm to 49 mm post MMS. In one case concurrent tarsorrhaphy and canthoplasty were performed due to proximity of flap to the eyelid. There were no cases of intra-operative complications, wound dehiscence, flap loss, or flap failure. Images of the keystone closures are shown in Figures 1-5.

**Summary:** We present the use of the keystone flap for circular defects on the face as a novel, reliable and versatile alternative to skin grafting or other skin flaps. The keystone flap has many advantages over traditional wound closure techniques including reduced tension, improved aesthetic outcome, easy reproducibility, shortened procedure time with minimal flap undermining, and decreased post-surgical complications.

## Determining the Risk of Post-operative Complications in Patients Undergoing Mohs Surgery with Pre-existing Liver Disease

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**Purpose:** Patients with liver disease can present with systemic issues. Previous studies have shown liver disease to be associated with multiple dermatological manifestations. However, the risk of complications after Mohs surgery has not been studied in pre-existing liver disease patients. The goal of this study was to determine whether liver disease patients undergoing Mohs surgery were at a higher risk for post-operative complications compared to those without any form of liver disease.

**Design:** A retrospective cohort study was carried out using TriNetX, a global federated real time research network comprised of data from over 48 million electronic medical records. Patients were queried by ICD 10 and CPT to find variables of interest. A 1:1 matched propensity score analysis was conducted, adjusting for comorbidities and demographics. Adjusted Relative Risks with 95% confidence intervals were generated.

**Findings:** Patients were at a significantly higher risk for developing nine post-operative complications. These include Cellulitis/Lymphangitis (Adjusted Relative Risk [95% CI])= (2.00[1.27-3.17]), Infections (1.61[1.22-2.182]), Hematoma/Seroma (3.32[1.69-6.53]), Hemorrhage (5.64[3.79-8.40]), Pain (4.09[2.82-5.94]), Paresthesia of Skin (6.59[3.47-12.5]), Pruritus (4.15[2.57-3.66]), Muscle Weakness (2.45[1.17-5.15]), and Anesthesia of Skin (2.09[1.52-2.88]).

**Summary:** Pre-existing liver disease patients have a significantly higher risk of developing post-operative complications after Mohs surgery. Greater care and caution must be taken when dealing with pre-existing liver disease patients to reduce the risk of poor outcomes.

## Dexmedetomidine as an Ideal Sedative for Dermatologic and Cosmetic Ambulatory Surgery Procedures

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**Purpose:** Dermatologic and cosmetic dermatologic surgery may involve sedation when procedures are long or difficult to perform under local anesthesia. Propofol and ketamine are usually used in outpatient settings, and our previous studies have documented the efficacy and safety of this combination. However, it is still plagued with the risk of respiratory depression, fluctuating heart rate or blood pressure, and even late recovery.

**Aims and objectives:** Our aim for this study was to evaluate the latest armamentarium in outpatient surgery using the sedative agent dexmedetomidine, as it has been successfully used in several other specialties for ambulatory procedures.

**Design:** A retrospective analysis of 70 consecutive ambulatory surgeries requiring monitored sedation was carried out on American Society of Anesthesiologists physical status I and II patients under the direct supervision of our anesthesiologist. An initial loading dose of 1mcg/kg of dexmedetomidine was infused over 10 minutes, with a maintenance dose of 0.7-1.4 mcg/kg/hour, along with 25-35mg/kg/min of propofol, to attain complete sedation. Ramsay Sedation Scale (RSS) scores were recorded. The patients were evaluated for intra-procedural vital signs, respiratory depression, gagging, shivering, fluctuating hemodynamics, state of sedation and airway and motor recovery time, along with any post-operative complications and side effects such as nausea, vomiting or pruritis. Surgeon and patient satisfaction was also noted.

**Findings:** Dexmedetomidine was found to be far superior with comparatively lesser chances of respiratory depression at doses that were enough to keep the patient pain-free. Alongside those findings, the post-operative recovery time was much quicker, with patients attaining a Modified Aldrete Score of 9-10 within 11-12 minutes after discontinuation of the sedative. Post-surgery complications such as nausea, vomiting or drowsiness were reported to be minimal to none. The time to the first complaint of surgical site was significantly prolonged. There was no noteworthy hypotension or bradycardia that occurred for which intervention was required. Patients receiving dexmedetomidine experienced less pain and had lower analgesic requirements. It was noted that both patient and surgeon satisfaction was rated 10/10.

**Summary:** Dexmedetomidine can be considered as an alternative sedative, or even one that is superior to traditionally used propofol and ketamine combinations, for ambulatory dermatologic and cosmetic surgical procedures.

## Dilute (8.33 mg/ml) Injectable Poly-L-lactic Acid for the Treatment of Linear Morphea

**Author:** Ethan Routt, MD, ASDS Cosmetic Fellow 2019-2020, Montefiore Medical Center, Honolulu, HI

**Co-Author:** David Ciocon, MD

**Purpose:** Treatment of the cosmetic aspects of linear morphea, particularly on the face.

**Design:** This case series includes 2 patients with long standing linear morphea deemed to be inactive by their primary medical dermatologist. Both were treated with injectable poly-L-lactic acid at a dilution of 8.33 mg/ml as compared to the package insert recommended 30 mg/ml. This dilution was performed 16 ml of sterile water and 2 ml of lidocaine 1%;

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reconstitution was performed 24h prior to injection. This dilution allowed for very precise injection of the depressed plaques with a 27g needle at 1 month intervals for 2-3 treatments. Both patients had topical lidocaine 4% cream applied to the treatment area 30 mins prior to each injection session.

**Findings:** Both patients had significant improvement in the depression of their morphea plaques. One of the two patients opted to not undergo her planned 3rd treatment as she was satisfied with the outcome after only two injection sessions. Both physicians performing the treatments were also very pleased with cosmetic outcome and felt no need for further treatment in either patient. It was noted that this dilute very dilute reconstitution was easy to inject and resulted in no nodule formation in either patient. Follow up at 6 months after injection shows persistent results in both patients without evidence of disease flare or progression.

**Summary:** This small case series demonstrates positive outcomes for patients with linear morphea treated with 8.33 mg/ml poly-L-lactic acid injections to address the depressed plaques resulting from their disease process. This treatment was effective for both patients, free of complications and well tolerated.

## Disparities in Access to Mohs Micrographic Surgery in Patients with Keratinocyte Carcinoma

**Author:** Tyler J. Willenbrink, MD, Resident Physician, University of Texas at Austin, Dell Medical School, Austin, TX

**Co-Authors:** Adewole Adamson, MD; Emily Clarke, BS; Matthew Fox, MD; Anokhi Jambusaria, MD, MSCE; Megan Shelton, MD

**Purpose:** Underserved populations experience numerous challenges regarding health care access that drive health inequalities. Patients with Medicaid and other safety net insurance plans (M/SNI) have difficulty in access to care due to prolonged appointment wait times, difficulty finding providers, perceived costs, and lack of transportation. These patients have been shown to have increased morbidity and mortality across a number of outcome measures. In dermatology, patients with M/SNI have been shown to have later stage melanomas at presentation, delays in surgical treatment, and less frequent sentinel lymph node biopsies. There is limited data regarding the disparities seen in keratinocyte carcinoma (KC) treatment, including Mohs micrographic surgery (MMS), based upon insurance type.

The purpose of this study is to investigate whether the final MMS defect size (a surrogate marker for KC size) and number of Mohs layers differ based on insurance status. We hypothesize patients with M/SNI will present with more advanced tumors resulting in larger post-MMS defect sizes and more complex surgical repairs.

**Design:** This is a retrospective cohort study of all MMS patients at a single academic center from May 2017 through May 2019. The patient's insurance status was divided into 4 groups: private insurance (PI), Medicare (including patients with supplemental insurance), Veterans Health Insurance (VHI), and M/SNI. The preoperative and postoperative defect size, histologic tumor type, presence of high-risk features, and number of Mohs stages were collected for each tumor. These parameters were compared amongst the four insurance groups in the study.

**Findings:** A total of 1916 MMS procedures from 1398 patients were reviewed. Patients with M/SNI showed statistically significant larger preoperative (0.37cm) and postoperative (0.43cm) defect sizes when compared to PI. Patients with VHI also had increased preoperative (0.14cm) and postoperative (0.18cm) defects compared to those with PI. Furthermore, there was a trend towards Medicare patients having higher preoperative and postoperative defect sizes compared to PI, but this did not reach statistical significance. There were no differences in the number of Mohs stages based on insurance type.

**Summary:** Patients with M/SNI and VHI are more likely to present for MMS with larger tumors and, subsequently, have larger postoperative defects. Despite the larger preoperative size of the tumors, there was no difference in the number of Mohs stages taken between insurance types. Given MMS is performed in sensitive anatomic locations, a few millimeters increase in the tumor size can lead to a more complex repair, and may carry a negative functional and cosmetic outcome for the patient.

## Effectiveness of a 595 Nm Pulsed Dye Laser for the Treatment of Basal Cell Carcinoma Using One Single Stacked-pulse Session: A Randomized, Double-blinded Controlled Trial

**Author:** Maggie L. Chow, MD, PhD, Dermatologist / Mohs Surgeon, Skin and Beauty Center, Los Angeles, CA

**Co-Authors:** Sasima Eimpunth, MD; Michael Hamman, MD; Shang I. Brian Jiang, MD

**Purpose:** Surgical and nonsurgical methods are employed for treating basal cell carcinoma (BCC). In select clinic settings, the pulsed dye laser (PDL) has been shown to effectively treat BCCs, but few randomized controlled trials exist on this topic. Thus, we investigated the effectiveness of PDL treatment in a single session for the management of nodular and superficial BCCs on the trunk and extremities of adults using a randomized, double-blind, controlled technique.

**Design:** We used settings of fluence 7.5 J/cm<sup>2</sup>, 3ms pulse duration, no dynamic cooling, 10mm spot size, 10% overlap between pulses, and 2 stacked pulses. Histopathologic clearance upon excision of tumor with 4 mm margins was the primary outcome measure.

**Findings:** Twenty-four patients were included in the study, with 14 in the laser treatment group and 10 patients in the sham/control group. In total, 10/14(71.4%) of the tumors in the treatment group were successfully treated with no residual tumor on excisional specimen histology, compared with 3/10(30.0%) of the control group (p=0.045). Adverse effects were rare, with the most commonly reported effects being purpura and blistering.

**Summary:** Our study shows that PDL may be an effective treatment for low-risk BCCs of the trunk and extremities. Additional measures for improving success rate will be discussed.

## Effects of Sequentially Pulsed Infrared Light with and Without Visible Wavelengths on Human Skin Aging Through Whole Transcriptome Gene Expression Analysis

**Author:** Julien Lanoue, MD, Fellow, University of Vermont, Burlington, VT

**Co-Authors:** Patrick Bitter, MD; Anne Lynn Chang, MD; Tyler Hollmig, MD; Rui Li, MD; Michaella Montana, BS; Yo-Hsien Shih, MD; Jin Xu, PhD

**Purpose:** While broadband light (BBL) has been shown to reverse aging-related molecular pathways in human skin, it is unclear whether infrared (IR) light, either in combination with BBL or alone, can lead to detectable alterations in aging-related gene expression. Here, we assess the effects of sequentially pulsed infrared light (SPL) with and without visible wavelengths on human skin aging through gene expression analysis.

**Design:** After informed consent, sun-exposed forearm skin from five participants was treated with three sessions each of (1) IR wavelengths alone (800-1,200 nm, termed "SPL800+"), (2) an intervening area of untreated control region, and (3) IR plus visible wavelengths (500-1,200 nm, termed "BBL+ SPL590+"). Four weeks after the last treatment, biopsies were performed for RNA extraction and sequencing. Analysis for differentially expressed genes utilized participants as their own controls.

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**Findings:** A total of 188 genes were differentially expressed between BBL+SPL590+ and untreated skin, whereas 45 genes were altered between SPL800+ treated and untreated skin ( $p < 0.01$ ). Notably, the top 7 most significantly down-regulated genes (such as SPRR genes and IGFBP6) after SPL800+ treatment all have known aging related functions.

**Summary:** This exploratory study suggests that SPL800+ can alter molecular pathways in skin, with BBL+SPL590+ resulting in additional changes.

## Efficacy of Platelet Rich Plasma in the Treatment of Traction Alopecia

**Author:** Deborah Paul, MD, Resident, University of Rochester, Rochester, NY

**Co-Authors:** Mara Weinstein Velez, MD

**Purpose:** The use of autologous Platelet Rich Plasma (PRP) as a treatment modality for alopecia is emerging as a successful alternative when other first line treatments fail. The strongest evidence being in its use for the treatment of androgenic alopecia. Studies reviewing the efficacy in scarring alopecia such as traction alopecia remains sparse with evidence largely based on anecdotal experience or case reports, often with negative results. We present a case of previously treatment resistant, biopsy proven traction alopecia that nearly resolved with PRP.

**Design:** Case Study

**Findings:** A 27-year-old African American female presented with a longstanding history (>10 years) of treatment resistant (hairstyle modifications, class 1 topical steroids, 5% minoxidil) traction alopecia. On exam, patches of pronounced hair thinning localized to the margins of the frontal-temporal scalp with preservation of the distal anterior margins (fringe sign) was noted. Clinical findings were confirmed by histopathologic findings. She was restarted on topical steroids, minoxidil 5% foam and an antifungal shampoo. One month later, PRP treatments were initiated. She completed three treatments spaced 4-6 weeks apart with near resolution at her three month follow up without any evidence of new alopecia on examination of photographs at baseline and at follow up appointments showing increased hair density.

**Summary:** Platelet Rich Plasma is a promising and safe treatment modality for the often difficult to treat patient with traction alopecia. It can be considered as a secondary treatment option when first line agents fail or as a complement to traditional therapy. Further studies through randomized controlled trials are needed to confirm these encouraging and dramatic results.

## Enhanced Clearance of Port Wine Stains with Fewer Treatments with a Novel Large Spot, Higher Energy Pulse Dye Laser versus Previous Generation PDL

**Author:** Pooja Sodha, MD, Dermatology and Laser Surgery Center, Houston, TX

**Co-Authors:** Nader Aboul-Fettouh, MD; Paul Friedman, MD; Katherine Martin, MD

**Purpose:** A recent technological development is the novel large spot high energy pulse dye laser (NGL) with a maximum spot size of 15 mm which has been shown to be safe and effective in the treatment of erythematotelangiectatic rosacea and Poikiloderma of Civatte. Due to modifications in laser cavity design, the NGL delivers up to a maximum of 12 J with a maximum 15 mm spot size, a 50% higher energy delivery over prior generation PDL (PGL) that achieves 8J with a maximum spot size of 12 mm. We herein present use of the NGL compared to the PGL in the treatment of port wine stains (PWS) in adult and children.

**Design:** We performed a retrospective review of 72 patients with PWS treated at our site. Primary outcomes were based on improvement of PWS using baseline and post-treatment photographs which were graded by a blinded physician grader using a 5-point visual analog scale (1:0-25% improvement, 2:26-50% improvement, 3:51-75% improvement, 4:76-99% improvement, 5:100% improvement). Therapeutic energy (J) was calculated as the product of the area of the spot size ( $\text{cm}^2$ ) and the fluence ( $\text{J}/\text{cm}^2$ ) and reflects the incident energy at the skin surface.

**Findings:** 76.3% of patients ( $n=55$ , mean age 26.9 years) were treated with PGL and 23.6% achieved 76-100% improvement over an average of 8.1 treatments. 23.6% of patients ( $n=17$ , mean age 1.95 years) were treated with the NGL and 47.1% achieved 76-100% improvement over an average of 4.1 treatments. Average spot size with PGL patients was 10.9 mm with an average initial therapeutic energy of 5.4 J, whereas average spot size of NGL-treated patients was 13.7 mm with an average initial therapeutic energy of 7.3 J. The mean grade improvement for all lesions (facial and nonfacial) treated with PGL was 2.5 (median 3), and, for those treated with NGL, the mean grade improvement for all lesions was 3.4 (median 3). The mean grade improvement for NGL-treated patients was higher across all facial dermatomes (NGL vs. PGL: V1: 4.0 vs. 2.6, V2: 3.8 vs. 2.3, V3: 3.5 vs. 2.0, >1 dermatome: 3.0 vs. 2.4) and was achieved in fewer treatments for all groups. No long term adverse events were encountered in either group. Limitations include a small NGL sample size.

**Summary:** Current therapeutic approaches with smaller spot sizes, particularly in the management of adult patients, have partial benefit and are frequently associated with recurrence. In addition to the improved lesion coverage and treatment speed, the large spot, higher energy pulse dye laser (NGL) is associated with higher therapeutic energies, greater subsurface fluencies, and deeper penetration of radiant energy while maintaining a robust safety profile. NGL provided enhanced clearance of port wine stains with fewer treatments compared to PGL along all facial dermatomes, including V2, and in adult patients.

## Er:YAG Laser-assisted Delivery (LADD) of 5-fluorouracil and Corticosteroids in the Treatment of Keloids: A Case Series

**Author:** Julia Stiegler, MD, Resident Physician, University of Rochester, Rochester, NY

**Co-Authors:** Mara Weinstein Velez, MD

**Purpose:** Keloids are fibroproliferative growths occurring as an abnormal response to injury that can be disfiguring, psychosocially devastating and impair functionality. Treatment is notoriously challenging and recurrence rates are high. Laser-assisted drug delivery (LADD) is a rapidly evolving technique utilizing ablative fractionated lasers to achieve regularly dispersed deep penetration of topically applied medications. The pledge of synergistic results with this delivery technique offers a compelling alternative to intralesional keloid injections with corticosteroids and 5-fluorouracil (5-FU). Metabolites of 5-FU, a pyrimidine analogue, result in targeted death of rapidly proliferating cells, such as fibroblasts in keloids. Intralesional and carbon dioxide ( $\text{CO}_2$ ) laser-assisted delivery of 5-FU in the treatment of keloids has been recently described with promising results. Both  $\text{CO}_2$  (10,600nm) and Er:YAG (2,940nm) ablative lasers have the same target chromophore: water. However, the wavelength of Er:YAG more closely approximates the peak absorption of water (3000nm), allowing for more efficient tissue vaporization and a thinner coagulation zone compared to  $\text{CO}_2$ . Coagulated tissue is known to have less diffusivity but the in-vivo effects of coagulation zone thickness in LADD remain unclear.

To our knowledge there have been no reports of Er:YAG laser-assisted delivery of 5-FU in the treatment of keloids. We present a case series of three keloids in two patients treated with shave excision and fractional Er:YAG ablative laser followed by topical application of a 5-FU and steroid suspension.

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**Design:** The first patient was a 27-year-old Fitzpatrick Skin Type (FST) V female who presented to our dermatology office with projecting anterior and posterior left ear keloids, previously resistant to intralesional corticosteroid monotherapy. The second patient was a 23-year-old FST I female suffering from a disfiguring horseshoe-shaped plaque encompassing her entire ear lobe. All keloids were treated with the following protocol and cases of multiple keloids were treated sequentially.

During the initial visits the keloids were injected monthly with a 5-FU + corticosteroid mixture to prime the skin for laser therapy. After 2-3 months, the keloids were shave excised immediately followed by fractional 2,940nm Er:YAG ablative laser (300um depth, 4mm, 11% density) to the base. The 1:1 combination of liquid 5-FU (50mg/mL) and triamcinolone (40mg/mL) was then massaged into the wound base for increased drug penetration. Two days after the laser procedure, the patient was instructed to apply compression earrings to the surgical site. Ten days post-procedure the wound base was injected with corticosteroids and 5-FU. Similar injections were scheduled every two to four weeks for three months and subsequently less frequently.

**Findings:** All cases achieved cosmetically superior results following shave excision and a session of Er:YAG laser-assisted delivery of a topical 5-FU and corticosteroid suspension. There was no evidence of significant atrophy or hypopigmentation in either case, including in FST V skin. Both patients have remained free of recurrence. This efficient single surgical session resulted in life-changing outcomes for our young patients who regained functionality of their ears and self-confidence.

**Summary:** Refractory keloids were successfully treated with shave excision followed by Er:YAG laser-assisted delivery of topical 5-fluorouracil and corticosteroids with superior cosmetic results and no incidence of recurrence. Intralesional and LADD of 5-FU are promising horizons in the formidable challenge of keloid treatment. Dermatologists are uniquely positioned to deliver laser-assisted treatments with our deep knowledge of skin biology, disease processes and laser surgery.

## Erosive Pustular Dermatitis after CO2 Laser Resurfacing in Mother and Daughter

**Author:** Michael Abrouk, MD, Aesthetic & Procedural Chief Dermatology Resident, University of Miami Frost Department of Dermatology & Cutaneous Surgery, Miami, FL

**Co-Authors:** Robert Kirsner, MD, PhD; Natalie Williams, BSc

**Purpose:** Erosive pustular dermatitis (EPD) of the scalp is a rare disorder characterized by erythematous plaques, yellow crust and scarring alopecia. It is hypothesized that atrophic skin undergoes delayed wound healing, allowing erosive lesions to persist for prolonged periods of time. While the etiology of EPD remains unknown, trauma is often an inciting factor. We present a case of EPD occurring on the face after pulse carbon dioxide (CO2) laser resurfacing, whose mother had complications from laser resurfacing 20 years prior.

**Design:** A 71-year-old female with Waldenström macroglobulinemia underwent panfacial rejuvenation, which included fractional CO2 laser, modified rhytidectomy, fat transfer, scar revision and platelet rich plasma (PRP) for hair restoration. She noticed persistent erythema after the procedure and presented to a local dermatologist. Over the next several months, she received numerous topical and systemic medications. Two months after the procedure a biopsy was taken from the forehead, demonstrating seborrheic dermatitis with impetiginization and surrounding erosive alteration, fibrosis and telangiectasia, consistent with EPD. Two months after the biopsy, the patient was referred to our clinic for further management.

**Findings:** At the time of presentation, the patient continued to complain of facial redness and scabbing. On exam, she exhibited diffuse red plaques throughout the face and forehead with overlying scale and crusting. During the visit, the patient was accompanied by her mother, who developed identical symptoms after fractional CO2 laser over 20 years prior and we reported in the literature.<sup>1</sup> Of note, the patient did not receive a diagnosis of EPD at the time, likely due to the poor understanding of the entity over two decades ago. She subsequently healed with atrophic scarring but has been symptom-free with mild frontal alopecia.

**Summary:** The onset of EPD after CO2 laser resurfacing has been described in the literature several times.<sup>2-4</sup> Conversely, laser-induced EPD has never been reported in families, much less first-degree relatives. The occurrence of EPD in general among family members has been reported in the literature once, however both cases were idiopathic with no known inciting factors.<sup>5</sup> The manifestation of EPD in both mother and daughter after identical stimuli is intriguing, as it hints towards a genetic basis and bias towards EPD and heritable tolerability to laser therapy. To date, EPD has not been associated with any specific HLA groups or other genetic markers. While this mother-daughter pair sheds light on a possible familial predisposition to EPD and the genetic basis of wound healing in general, further studies are needed to delineate the genetic and acquired etiological factors involved.

## Evaluation of 1927nm Laser Alone or in Combination with Broad Band Light for Treatment of Signs of Photoaging

**Author:** Elizabeth L. Tanzi, MD, Director, Capital Laser and Skin Care, Chevy Chase, MD

**Co-Authors:** Chris Robb, MD; Steven Swengel, MD

**Purpose:** Non-invasive treatment options are in high demand by patients wanting to improve their appearance with less risk of side effects and post-treatment down time. Many devices ranging from fractional non-ablative laser to radiofrequency are available. A 1927nm laser treatment is an attractive option for patients seeking non-ablative fractional treatments with little to no downtime. The purpose of this pilot study is to evaluate the safety and efficacy to 1927nm laser treatment for skin rejuvenation including improvement in fine rhytides, pigmentation, erythema or telangiectasia, and skin tone and texture.

**Design:** Forty female/male subjects, ages 18 years or older, were consented and enrolled. Selection criteria were based on Fitzpatrick skin types I to VI with moderate sun-damage, aging facial with visible areas of fine rhytides, pigmentation and erythema or telangiectasia on face and/or neck. Subjects received up to six treatments with a 1927 laser only or in combination with Broad Band Light (BBL) at 2- to 4-week intervals. Pain scores were collected during each treatment visit. Follow-up visits were conducted at 1-6 weeks post final treatment. Photographs of the treatment area were taken at baseline, all treatment and follow-up visits. At the end of the study, the subjects were asked to complete a satisfaction questionnaire. Adverse events were recorded at all visits.

**Findings:** The degree of improvement at six weeks post final treatment was assessed using the Physicians Global Assessment scale showed up to 50% improvement in fine lines, and 50-100% improvement in pigment, skin tone and texture. The average pain score of 3.5 using the Numeric pain scale was reported. No adverse events reported and subjects were highly satisfied with the results achieved.

**Summary:** 1927 laser alone or in combination with BBL is a safe, effective and comfortable treatment for the visible signs of photoaging.

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## Evidenced-based Best Practice Advice for Patients Treated with Systemic Immunosuppressants in Relation to COVID-19

**Author:** Yumeng M. Li, MD, University of Miami/Jackson Memorial Hospital, Miami, FL

**Co-Authors:** Megan Cronin, MD; Joshua Fox, MD; Fabrizio Galimberti, MD, PhD; Alexander Herbst, MD; Robert Kirsner, MD; Jeffrey McBride, MD, PhD

**Purpose:** The emergence of the COVID-19 pandemic led to significant uncertainty among physicians and patients about the safety of immunosuppressive medications used for the management of dermatologic conditions. In the absence of data on the effect of immunosuppressants on COVID-19, these data could be used to make clinical decisions on initiation and continuation of immunosuppressive medications during this pandemic.

**Design:** We review available data on commonly used immunosuppressants and their effect on viral infections beyond COVID-19. Notably, the effect of some immunosuppressants on viruses related to SARS-CoV2, including SARS and MERS, has been previously investigated.

**Findings:** COVID-19 presents an unprecedented challenge to our modern society. A common concern is the continuation of immunosuppressants for dermatologic conditions. We reviewed the mechanism of action and evidence of increased infection associated with commonly prescribed immunosuppressants. Without specific data in the context of COVID-19, we have recommended considering discontinuation of oral JAKi and prednisone and careful continuation of other medications in patients currently benefitting from such treatments (Table 2). Available evidence of potential worsening of viral diseases with oral JAKi and prednisone exists, although no clear data are available for COVID-19. We also recommend careful consideration of delaying rituximab infusion on a case to case basis, given that rituximab can lead to prolonged decreased number of circulating B cells.

**Summary:** In general, reinstatement of any immunosuppressant should be considered only after a negative COVID-19 test and complete resolution of all COVID-19 related clinical symptoms. It is unclear at this time whether anti-COVID-19 IgG could be used to safely reinstate or initiate immunosuppressants in COVID-19 epidemic and non-epidemic areas.

## Examining Post-operative Complications in Inflammatory Bowel Disease Patients Undergoing Mohs Surgery

**Author:** Vishal A. Patel, MD, Director of Dermatologic Surgery, George Washington University School of Medicine, Washington, DC

**Co-Authors:** Haig Pakhchanian, BS; Rahul Raiker, BS

**Purpose:** Inflammatory bowel disease (IBD) is a group of diseases that cause chronic inflammation of the GI tract due to a dysregulated system. Studies have shown IBD has a link to numerous cutaneous disorders. In particular, IBD patients are at a higher risk for developing varying forms of skin cancer. However, the risk of complications after Mohs surgery has not been studied in IBD patients. The goal of this study was to determine whether IBD patients undergoing Mohs Surgery were at a higher risk for post-operative complications compared to those without IBD.

**Design:** A retrospective cohort study was carried out using TriNetX, a global federated real time research network comprised of data from over 48 million electronic medical records. Patients were queried by ICD 10 and CPT to find variables of interest. A 1:1 matched propensity score analysis was conducted, adjusting for comorbidities and demographics. Adjusted Relative Risks with 95% confidence intervals were generated.

**Findings:** Patients were at a significantly higher risk for developing eight post-operative complications. These include Cellulitis/Lymphangitis (Adjusted Relative Risk [95% CI]= (1.64[1.13-2.38]), Infections (1.58[1.25-1.99]), Wound Dehiscence (2.07[1.38-3.12]), Hemorrhage

(2.37[1.68-3.35]), Pain (2.08[1.46-2.96]), Paresthesia of Skin (3.68[2.12-6.36]), Pruritus (2.48[1.49-4.15]) and Muscle Weakness (2.96[1.53-5.74]).

**Summary:** IBD patients have a significantly higher risk of developing post-operative complications after Mohs Surgery. Greater care must be taken in patients with IBD to reduce the risks of complications.

## Factors Influencing Patient Satisfaction in Dermatology

**Author:** Abigail Cline, MD, PhD, Resident, New York Medical College Department of Dermatology, Brooklyn, NY

**Co-Author:** Bijan Safai, MD

**Purpose:** Patient satisfaction is a proxy for health care quality, with physicians evaluated and reimbursed based on patient satisfaction scores. Despite the growing influence of patient satisfaction, factors that impact patient satisfaction in dermatology remain unclear.

**Design:** We analyzed 225 responses to an online survey evaluating patient expectations, willingness and satisfaction regarding dermatology appointments. Patient willingness and satisfaction were measured on a 1-5 Likert scale.

**Findings:** Respondents were most willing to discuss their condition and to be examined with a dermatoscope. Respondents were least willing to wear a patient gown without underwear and to be photographed. Highly satisfying factors included a written treatment plan, provider medication recommendations and use of gloves during physical exams. Highly dissatisfying factors included waiting 60 minutes, taking off underwear with a patient gown and being photographed with a cell phone.

Patient willingness and satisfaction differed significantly by gender and age. Male respondents reported less satisfaction than female respondents if a nurse explained the treatment plan. Older respondents were significantly more willing to change into a patient gown, to be photographed, to be examined with a dermatoscope and to undergo a biopsy than younger respondents. Older and female respondents preferred written plans, while younger and male respondents preferred verbal plans. Younger respondents reported higher satisfaction with an email follow-up compared to older respondents, who preferred a phone call.

**Summary:** These findings may represent relatively easy ways to improve patient satisfaction scores. Further insight into factors affecting patient satisfaction may enhance patient experience and engagement, thereby improving clinical outcomes.

## Giant Cell Tumor of the Bone

**Author:** Garrett McCoy, MD, Medical College of Wisconsin, Milwaukee, WI

**Co-Author:** Manish Gharia, MD

**Purpose:** Giant cell tumor of the bone (GCTB) is a locally aggressive benign osteolytic neoplasm that accounts for 3-5% of all primary bone tumors. The most common clinical presentation is pain, swelling and limited joint movement at the primary site. The most common affected sites are the meta-epiphyses of long bones. Only about 1% of GCTB present on the distal phalanx. We present a case of a GCTB of the distal phalanx presenting as a purple exophytic plaque.

**Design:** Case Report

**Findings:** A 63-year-old male presented to our Mohs surgery clinic with a 6-month history of a purple plaque on his left 3rd distal phalanx. The patient initially noticed what appeared to be a bruise under the nail that expanded slowly over six months. This began to distort his nail and grew into an exophytic, minimally tender to palpation, purple plaque on the dorsal fingertip.

A biopsy of the plaque was performed, and histopathologic examination found a well-demarcated proliferation of round to ovoid cells with

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abundant admixed foamy histiocytes, hemosiderin, and scattered osteoclast-like giant cells that were CD68 positive and S100 negative. X-ray films and computed tomography (CT) scan of the left distal phalanx demonstrated a large soft tissue mass projecting dorsally and distally with extensive osteolytic destruction of the distal phalanx. The lesion did not involve an underlying tendon sheath. A diagnosis of giant cell tumor of the bone was made. The patient was referred to orthopedic surgery and underwent curettage of the lesion and bone.

**Summary:** Giant cell tumors in the skin can represent giant cell tumor of tendon sheath, giant cell tumor of bone, or giant cell tumor of soft tissue. On X-ray films GCTB appear as expansile osteolytic defects and can lead to local bone destruction. Our patient's histologic and radiographic evaluation were both consistent with GCTB. GCTB of the distal phalanx of the hand has higher rates of recurrence than conventional GCTB with recurrence rates as high as 75% after curettage and 24% after resection or ray amputation. The guidelines from the National Comprehensive Cancer Network (NCCN) recommend Chest CT to evaluate for lung metastasis. Despite the fact that our patient has not had a local recurrence, we plan to follow his CT closely for evidence of growing metastases.

## Global Patient Perspectives on Skin Quality in Facial Aesthetics

**Author:** Noëlle S. Sherber, MD, Co-founder, SHERBER+RAD, Washington, DC

**Co-Authors:** Annie Chiu, MD; Jeanine Downie, MD; Sabrina Fabi, MD; Shannon Humphrey, MD, FRCPC; Arisa Ortiz, MD

**Purpose:** As facial aesthetic procedures increase in popularity worldwide, awareness of patient-perceived aesthetic concerns may help physicians optimize patient consultations, satisfaction and clinical outcomes. However, data on patient perceptions of skin quality are limited. This study examined the importance of skin quality pertaining to facial aesthetics among global participants.

**Design:** A global, internet-based, cross-sectional Beauty Image Assessment survey questioned aesthetically conscious adults about their desired appearance and interest in or experiences with facial aesthetic treatments; physicians answered queries about their patients' facial aesthetic concerns and their own practice standards, including consultations and procedures. The 30-minute online survey addressed >40 concepts related to face and body aesthetics. Respondents were asked open-ended questions to solicit terms they would use to describe female and male overall, body and facial beauty / attractiveness. Primarily reported here are global data on survey responses regarding facial beauty / attractiveness and their correlation to skin quality. These global survey results were also stratified by sex and generation cohorts. Statistical analyses were performed at a 95% confidence level.

**Findings:** Respondents (N=14,584) were ~30% male and ~70% female, between the ages of 21 and 75 years, and from 18 countries worldwide. Millennials, Generation Xers and Baby Boomers accounted for 42%, 42% and 16% of respondents, respectively. The top five most frequent terms that respondents used to describe facial beauty / attractiveness were skin, smooth, clean, clear and natural. The top five most frequent terms describing skin quality were smooth, clean, healthy, glow / glowing and fair. With the exception of healthy, all of these skin quality terms were among the top 15 terms used to describe facial beauty / attractiveness. Subanalyses of the responses based by age group, as well as by sex, will be presented.

**Summary:** In this global, online, cross-sectional survey of aesthetically conscious adults, respondents described facial beauty / attractiveness with terms that highlighted the importance of the appearance of the skin.

Overall, both smooth and clean were skin quality terms considered most important to respondents with respect to facial beauty / attractiveness. Addressing these consumer responses could provide potentially important insights for optimizing patient consultation practices, clinical outcomes and patient satisfaction for dermatologists and plastic surgeons who treat patients seeking to improve their facial appearance and skin quality.

## Hairline Incision for the Excision of Forehead Lipomas

**Author:** Byung Ho Oh, Clinical Associate Professor, Department of Dermatology, Severance Hospital, Seoul, Seoul-t'ukpyolsi, Republic of Korea

**Purpose:** To evaluate the usefulness of the hairline incision (HI) in minimizing scars and neurovascular damage.

**Design:** Retrospective analysis was done for 30 patients with forehead lipomas who underwent excision between 2011 and 2019 at the Severance Hospital of the Yonsei University Health System, Seoul, Korea. Fourteen patients underwent DI, and 16 underwent HI. Comparison of the cosmetic outcomes, complications and patient's subjective satisfaction was performed.

**Findings:** In the HI group, superior cosmetic outcomes, including patients' subjective satisfaction and photographic assessment findings, were observed. In the DI group, there were 2 cases of skin necrosis with scarring change and three cases of recurrence. Periorbital edema was the most common complication in the HI group, which spontaneously resolved within one week.

**Summary:** Hairline incision using a loupe should be considered as a first-line treatment in the removal of forehead lipomas, because it enables complete removal of lipoma with few complications and minimal scarring. Validation of our treatment algorithm requires further exploration.

## Handheld Pen for Margin Determination in Mohs Surgery Using Single-fiber Optical Coherence Tomography

**Author:** Mahin Alamgir, MD, Physician Resident, Rutgers Robert Wood Johnson Medical School, Somerset, NJ

**Co-Authors:** Nadiya Chuchvara, BA; Xuan Liu, PhD; Babar Rao, MD

**Purpose:** Optical coherence tomography (OCT) is a cross-sectional imaging modality based on low coherence light interferometry. Within dermatology, it has found applications for in vivo diagnostic imaging purposes (Heibel, 2020), as well as to guide Mohs micrographic surgery (MMS), due to its ability to visualize skin morphology to a depth of 1.8 mm (De Carvalho, 2018). However, standard OCT probes capture a large region of the skin, making it difficult to pinpoint the exact area being imaged, hence relying on makeshift landmarks such as ink demarcation for tracking. Other ancillary devices, such as reflectance confocal microscopy, are similarly cumbersome.

**Design:** On patients undergoing MMS, we demonstrate the use of a swept source OCT system which utilizes a flexible single-fiber probe for sample illumination and signal collection. The interference signal is detected and streamed into a host computer through a frame grabber and processed in real-time using a graphics processing unit. By sweeping the single-fiber probe – the interface of which is not much larger than the tip of a ballpoint pen – perpendicularly against the skin, the user can perform a lateral OCT scan that precisely correlates to the location.

**Findings:** With this imaging tool, a Mohs surgeon can enhance determination of surgical margins for the first stage of MMS, potentially decreasing the time and number of stages required for complete tumor removal.

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**Summary:** Mohs surgeons stand to benefit from a handheld in vivo imaging device that can accurately trace surgical margins. In addition, we analyze results of a demonstration in which clinicians with various levels of experience were briefly trained to perform scans. Their images were quantitatively assessed, demonstrating that clinicians without OCT imaging experience can perform a manual scan and obtain OCT signal with high quality.

## Historical Perspective of the Paramedian Forehead Flap for Nasal Reconstruction and Its Modern Day Use in Dermatologic Surgery

**Author:** Michael Abrouk, MD, Aesthetic & Procedural Chief Dermatology Resident, University of Miami Frost Department of Dermatology & Cutaneous Surgery, Thousand Oaks, CA

**Co-Authors:** Merrick Brodsky, MD; Teo Soleymani, MD

**Purpose:** In several ancient cultures, thieves, and criminals and, in particular, adulterous women were punished by traumatic rhinectomy as a method of both physical punishment as well as emotional and social humiliation (Mazzola, Correa, Walter 85214337, Sperati). In ancient times, the nose was considered the functional and aesthetic centerpiece of the face and crucial to one's physiognomy and self-concept; amputation, therefore, presented a serious obstacle to normal livelihood (Sperati, Moolenburgh, Shokri). Thus, a need arose for nasal reconstruction to allow nasal amputees to reintegrate into society. This was particularly prevalent in India, where adulterous women were routinely punished by hemi- or total rhinectomy and cast back into society to forever wear this "scarlet letter" of humiliation as punishment.

**Design:** The first reported documentation of a pedicled forehead flap for nasal reconstruction rhinoplasty emerged between 700 and 600 BC in what is now modern-day India, published in the Sushruta Samhita (transl: Compendium of Sushruta), a medical encyclopedia considered foundational to plastic surgery and essential to the Ayurvedic school of medicine (Meulenbeld, Rây, Shokri, Puthumana). Knowledge of the "Indian flap" subsequently left India and made its way to Europe, where it was further refined over the centuries with many early attempts of anatomic variations of pedical location for a staged flap for nasal reconstruction (BL, Whitaker, Boyd, Walter, Carpué, Mazzola, Eisenberg).

**Findings:** The devastation of World War I resulted in an immediate need for surgical innovation and new techniques to help deal with the horrific trauma that soldiers experienced on the battlefield. This precipitated the development of the modern era of plastic and reconstructive surgery as a primary medical field (Thomas, Shokri, Dumont). Harold Delf Gillies, a Royal Army Medical Corps surgeon and considered one of the fathers of modern day plastic surgery, was an early proponent of the forehead flap for nasal reconstruction (Dumont, Marck, Gillies 1957). He later refined his technique, wherein he utilized an "up-and-down" tube pedicle that began over one supratrochlear vessel and passed near the hairline; this allowed for greater flap length and mobility and marked the first use of a tube pedicle (Shokri, Gillies 1935, Whitaker). Furthermore, in 1943, Gillies became the first to harvest auricular composite chondrocutaneous grafts to provide intranasal support and lining; prior to this, the skin graft itself provided the only support (Whitaker, Baker, Menick, Gillies 1943). It remains important to note that complete nasal repair demands three layers: nasal lining, structural support and external skin covering (Karagiannis).

**Summary:** In 1946, Varzstad Kazanjian presented the next significant change in the paramedian forehead flap, whereby he described the vascular supply of the nasofrontal region, designed a midline flap, and — most importantly — pioneered the primary closure of the donor site. This significantly reduced donor-site mortality (Whitaker, Kazanjian) and provided an alternative to the paramedian flap, which allowed greater flexibility in donor site depending on reconstructive needs (Haas).

## Hyperdiluted Calcium Hydroxylapatite Filler Descent to the Mucosal Lip after Perioral Region Augmentation

**Author:** Ashaki Patel, MD, Dermatology Resident Physician, Medical College of Wisconsin, Milwaukee, WI

**Co-Author:** Edit Olasz, MD, PhD

**Purpose:** To describe an adverse event following injection of hyperdiluted calcium hydroxylapatite (CaHA) filler for perioral rhytids correction.

**Design:** A 75 year-old Caucasian female presented for treatment of perioral rhytids, with no previous history of surgeries or procedures in that area. CaHA filler (premixed with lidocaine) was diluted 1:1 with normal saline and a total of 1.5 ml was injected subdermal onto the upper and lower cutaneous lips using a 1.5" 25G cannula with a lateral entry point approach and retrograde fanning technique. The treatment area was lightly massaged, and the patient tolerated the procedure well without any immediate bruising or pain.

**Findings:** Fourteen days later, the patient complained of pain, swelling, redness and a lump left upper vermilion lip. Upon questioning, she admitted to a hematoma formation on the left upper cutaneous lip that lasted about seven days after the injection. On exam, she had a palpable subcutaneous firm yellowish nodule in the submucosal region of the left upper lip consistent with deposition of calcium hydroxylapatite filler. There were no signs or symptoms of infection. Surgical exploration visualized filler material in the submucosal layer and infiltrating into the orbicularis oris muscle. The filler was surgically evacuated, and the patient recovered fully.

**Summary:** Diluted CaHA filler (with up to 0.5 ml of saline) has been used regularly by the author for rhytid effacement with the same technique in the same region without any adverse events. Hyperdilution has been recently advocated for collagen induction without lifting and "filling" purposes. This case demonstrates, that it is important to consider that dilution and especially hyperdilution (1:1 or higher) changes the rheological properties of a filler and may increase the risk of migration and displacement of the product especially in areas of high mobility. Hematoma formation and Newtonian forces may have contributed to this adverse event as well. The authors felt important to report that despite correct placement and technique, off-label use of hyperdiluted filler in the upper cutaneous lip may increase the risk of migration to the vermilion lip.

## Isolated Cutaneous Langerhans Cell Histiocytosis Treated with Surgical Excision

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**Co-Authors:** David Dorton, DO; Hailey Grubbs, DO; Richard Miller, DO

**Purpose:** Langerhans cell histiocytosis (LCH) is an infrequent clonal proliferative disorder of myeloid dendritic cells. It has a wide variety of cutaneous manifestations and retains the possibility of systemic implications. Here we present a case of isolated cutaneous LCH in an adult male. The purpose of this case report is to discuss the diagnostics and treatment course, including surgical excision in this particular clinical scenario.

**Design:** A 65-year-old Caucasian male with a history of hypertension and no history of cutaneous malignancy presented to our dermatology clinic with a chief complaint of an asymptomatic, keratotic, yellow papule on the inferior mid-forehead, first noted approximately 6 weeks prior to examination. Tangential shave biopsy of the lesion was performed.

**Findings:** Histopathologic report revealed a papule with predominantly dermal infiltrate, and an overlying neutrophilic crust. The dermal polymorphous infiltrate contained atypical mononuclear cells, neutrophils

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and eosinophils with the additional heavily neutrophilic crust above the epidermis. Ultimately, this atypical mononuclear infiltrate demonstrated lesional cells positive for CD1a, S-100 protein, CD45, CD4 and BCL-2, consistent with Langerhans cell histiocytosis. Additional stains for SOX-10, Melan-A and myeloperoxidase were negative. After referral to hematology / oncology, the patient underwent brain magnetic resonance imaging (MRI) with and without contrast and skull base-to-thigh positron emission tomography (PET) / computed tomography (CT). Brain MRI depicted mild chronic microvascular changes in the white matter, unchanged from prior study. PET/CT demonstrated no evidence of fluorodeoxyglucose (FDG) avid malignancy with no hypermetabolic osseous lesions nor FDG avid lymphadenopathy. After approval by hematology/oncology, the patient underwent wide local excision with 0.5 cm surgical margins. Specimen sent for histopathological analysis revealed reparative changes without evidence of residual LCH.

**Summary:** Langerhans cell histiocytosis is an uncommon inflammatory and neoplastic condition of myeloid dendritic cells. Traditionally, it has been classified into one of four syndromes: Letterer-Siwe disease, Hand-Schüller-Christian disease, eosinophilic granuloma and congenital self-healing reticulohistiocytosis. While LCH is predominantly seen in children, the disease is not exempt from affecting adults, albeit less frequently. Prognosis and treatment are contingent on the degree of systemic involvement. Local therapy is the treatment of choice for single-system (SS) LCH specific to the skin or bone. Furthermore, it is recommended that surgical excision be reserved to those cases of isolated cutaneous LCH with a solitary skin lesion. As the case presented above demonstrated single organ involvement of the cutaneous system, we chose to surgically excise the isolated papule. This treatment effectively removed the entire focus of cutaneous LCH with no tumor recurrence to date.

## Lack of Understanding about Surgical Masks and Respirators Among U.S. Dermatology Residents and Fellows in the Era of COVID-19

**Author:** Maggie L. Chow, MD, PhD, Dermatologist / Mohs Surgeon, Skin and Beauty Center, Los Angeles, CA

**Co-Author:** Shang I Brian Jiang, MD

**Purpose:** Surgical smoke, created by electrocautery during surgery, contains nanoparticles, carcinogenic compounds and also infectious particles. Poor awareness of the risks associated with breathing surgical smoke and lack of personal protective practices among U.S. dermatology residents has been shown in previous studies. In this era of the novel coronavirus disease 19 (COVID-19) pandemic, these issues are particularly pertinent due to the theoretical risk of viral transmission through aerosolized particles.

**Design:** Author SIBJ recently lectured dermatology residents and fellows regarding surgical masks and surgical smoke in dermatologic surgery on an online videoconferencing platform. As part of the lecture, participants were polled regarding their understanding of personal protective equipment and the risks associated with surgical smoke.

**Findings:** In total, 41 participants were included in the study, and all were residents or fellows of accredited dermatology residency or fellowship programs in the United States. Results showed that 54% of participants had not had formal lectures on surgical smoke content and management, and 50% do not use a smoke evacuator during surgical procedures. When asked why smoke evacuators are not used, 27% responded that the equipment was too cumbersome, 12% reported that they were not available at the practice or institution, 8% did not believe that smoke evacuators were necessary and 4% did not know that they were used in dermatology. Additionally, 65% had not had formal presentations on personal protective equipment or masks, though 94% wear a surgical mask during surgery. Despite the high percentage

of participants using masks, 82% did not know what type of mask they were wearing, and the remainder wore a variety of American Society for Testing and Materials (ASTM) rated level 1, 2, or 3 and European Standards (EN) 14683 rated type II masks. Following the presentation, 100% of participants said that they were likely to use a smoke evacuator if made available, and 100% of participants reported that they had a better understanding of respirators and masks.

**Summary:** In summary, the majority of dermatology trainees in our study had not been formally educated regarding personal protective equipment despite its importance during the COVID-19 pandemic. The majority were unaware of the dangers of surgical smoke and a small number of participants believed that smoke evacuators were not necessary or did not know that they were used in dermatology. The results of this quick survey during a lecture to dermatology trainees leads us to alert our educators to this knowledge gap regarding personal protective equipment in the dermatology teaching curriculum. We have shown that even a short lecture format was an effective way of disseminating information about personal protective equipment and surgical safety. We believe that safety measures are more important now during a time when risk of infection with a potentially deadly disease is high. We encourage clinical educators to emphasize the importance of personal safety to trainees during residency and especially during the COVID-19 pandemic.

## Lasers and Systemic Medications: a Combined Approach for Skin Rejuvenation

**Author:** Tyler Hollmig, MD, Director of Dermatologic Surgery, UT Dell Medical School, Austin, TX

**Purpose:** Laser and light technologies continue to become more precise, enabling highly selective, targeted therapies for individual skin conditions. Combining multiple technologies, along with systemic medications, at a single treatment session balances the promise of elegantly managing more than one skin condition in a single session against potential risks of diminished efficacy and increased side effects. Although many clinicians practice combination laser and light therapies, there is little published in way of guidelines for a safe and thoughtful approach, and few clinicians combine systemic medications in order to augment these therapies.

**Design:** We reviewed our strategies of combination laser and light therapies for treating telangiectasias, photodamage, melasma and fine lines, alongside systemic medications for patients with skin type's I-V and analyzed eight patients with these skin conditions.

**Findings:** We describe our techniques of combining multiple treatment modalities along with systemic medications in order to safely and effectively target multiple skin conditions in a single visit in various skin types. General principles include proper pre-treatment patient analysis, thoughtful order of laser and light therapies, and appropriate aftercare. Eight patients with telangiectasias, photodamage, fine rhytides, and/or melasma were treated with varying modalities during a single treatment session. Each patient experienced substantial objective improvement, with no significant side effects.

**Summary:** Thoughtful combination of multiple laser and light technologies, along with judicious use of systemic medications, allows clinicians to elegantly and precisely target various skin conditions during a single treatment session. Advantages of combination therapies include reducing patient downtime and improving the objective clinical benefit achieved during a single visit. A thoughtful approach to combining laser and light sources is critical in order to harness these advantages while mitigating a theoretical increased risks of side effects.

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## Laterally Based Island Pedicle Flap with Cheek Advancement for Defects of the Nasal Ala

**Author:** Ezra Hazan, MD, Clinical Instructor, Icahn School of Medicine at Mount Sinai, Brooklyn, NY

**Co-Authors:** Dante Dahabreh, BS; Hooman Khorasani, MD

**Purpose:** The V-to-Y advancement flap (VYAF), a type of island pedicle flap (IPF), is a successful method for repairing cutaneous surgical defects on the head and neck. For lateral defects on the nasal ala, a VYAF will extend onto the cheek, thereby crossing cosmetic units and lead to webbing. Herein we describe a unique technique to avoid alar webbing in this setting.

**Design:** The kite-shaped flap is outlined with a surgical marker, with the length of the roughly three times the diameter of the defect. A superiorly based advancement flap is drawn in the nasofacial sulcus with a standing cutaneous deformity pointing medially. The depth of the incision reaches the level of the fibro-fatty tissue and includes the richly vascularized underlying skeletal muscle on the cheek. The proximal and distal 10% of the pedicle is carefully released to enhance flap mobility. The recipient site is undermined and de-beveled. The initial stitch closes the primary defect with a buried vertical mattress suture. Once the VYAF is secured, the trailing edge is amputated and truncated at the nasofacial sulcus (Figure 1b). The cheek advancement is incised, undermined and sutured into place.

**Findings:** MMS defects of the distal nose present with unique challenges for reconstruction. The free margin, skin quality, topography, airway and patient characteristics must all be taken into account. Repair options for small to moderate sized defects of the nasal ala include a medially based VYAF, spiral flap, cheek-to-nose interpolation flap, second intention healing and full thickness skin graft. VYAF have been successfully employed for MMS1, including on the distal nose2. A laterally based nasal alar defect has a higher risk of developing webbing from the cheek to nose, making it an unsuitable option. Herein, we described the first, to our knowledge, report of truncating the distal portion of the laterally based V, YAF and advancing the cheek or lip into the secondary defect. This repair is beneficial because it's a single-stage procedure with a small overall surgical footprint. Additionally, incision lines can be kept in cosmetic boundaries of the alar crease, nasofacial sulcus and alar-facial sulcus.

**Summary:** A laterally based IPF that extends onto the cheek can be employed for small to moderate sized MMS defects of the distal lateral nose. Importantly, in order to avoid webbing and crossing of cosmetic boundaries, one must truncate the trailing edge of the IPF and then advance the cheek inferiorly or the lip superiority in order to close the defect caused by IPF truncation.

## Malignant Eccrine Spiradenoma (spiradenocarcinoma) Mistaken as an Atypical Lymph Node

**Author:** Patrick Zito, DO, PharmD, RPh, Resident, Larkin Hospital Palm Springs, Hollywood, FL

**Co-Authors:** Richard Scharf, DO

**Purpose:** The purpose of this abstract is to demonstrate a rare presentation of a spiradenocarcinoma arising in a spiradenoma mistakenly referred for a lymph node biopsy.

**Design:** We present a case report of a rare presentation spiradenocarcinoma with histopathological examination demonstrating the transformation from spiradenoma.

**Findings:** Histopathological examination was consistent with a spiradenocarcinoma visually seen arising in a long standing spiradenoma. Re-excision was performed with 2 cm margins with pathological confirmed tumor-free surgical margins. PET/CT was performed showing no clinical evidence of residual tumor.

Lymphadenopathy was unrelated to the mass. The patient has remained tumor free for three years in close follow-up.

**Summary:** A 51-year-old female with a history of hypothyroidism, snoring with witnessed apnea, and tonsillectomy was referred for evaluation of lymphadenopathy and posterior neck mass initially believed to be an atypical lymph node. The patient stated she has a stable mass present for years but recently had lymphadenopathy and pain in the mass during sleeping. Physical examination revealed 1 cm subcutaneous nodule in the posterior right neck. Nasopharyngoscopy was performed and showed no nasopharyngeal masses and patent torus tubarius. Surgical excision was performed under general anesthesia and sent for pathological analysis.

## Management of Primary Cutaneous Mucinous Carcinoma with Mohs Micrographic Surgery - A Historical Perspective

**Author:** Patrick Zito, DO, PharmD, RPh, Resident, Larkin Hospital Palm Springs, Hollywood, FL

**Co-Author:** Eduardo Weiss, MD

**Purpose:** To review the history of Mohs micrographic surgery; to review the pathological findings of primary cutaneous mucinous adenocarcinoma; and to review the evolution and role of Mohs micrographic surgery in the management of primary cutaneous mucinous adenocarcinoma.

**Design:** Historical data was collected using PubMed to search the literature up until January 2020. We then manually searched papers to identify studies that our initial search may have missed.

**Findings:** Our extensive PubMed literature review revealed that the majority of PMC cases are treated with traditional surgical excision (85.5%) and only few with MMS (9.4%). The first case of PMC treated with MMS was published in 1988 with only 20 cases reported in total. Published data reveals lower recurrence rates of PMC treated with MMS (0-7%) vs. excision (30-40%). In conclusion, MMS appears to be superior to standard excision for PMC and should be considered as first line therapy for primary and recurrent lesions especially in cosmetically sensitive areas.

**Summary:** Primary cutaneous mucinous carcinoma (PCMC) of the skin is a rare head and neck malignancy. It is resistant to chemotherapy and radiation; therefore, standard treatment includes surgical excision with 1-2cm margins. Mohs micrographic surgery (MMS) is fast becoming the gold standard for management of cutaneous carcinomas, offering maximal tissue conservation and high cure rates. We present a brief review of the evolution of MMS, highlight changing practice patterns and introduce a new therapeutic option for PCMC. MMS was developed in the 1930's by Frederic E. Mohs. Initially referred to as "chemosurgery," Dr. Mohs implemented fixed tissue techniques utilizing a chemical cauterant, zinc chloride (ZnCl). He discovered that tissue injected with ZnCl remained histologically preserved. He microscopically examined horizontal sections of fixed tissue from various tumors thereby developing the basic premise of MMS. In 1936, he successfully treated the first squamous cell carcinoma of the lower lip using MMS. The technique has since evolved and is currently applied to various cutaneous malignancies.

## Management of Vulvar Intraepithelial Neoplasms

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**Co-Author:** M. Laurin Council, MD

**Purpose:** To review the pathogenesis, clinical presentation, diagnosis and management of vulvar intraepithelial neoplasms (VIN) and to highlight the importance of collaborative management between general dermatologists, dermatologic surgeons and gynecologic surgeons in the diagnosis and management of these pre-malignant conditions.

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**Design:** Literature review was performed using PubMed search for articles related to vulvar intraepithelial neoplasm (VIN).

**Findings:** Vulvar intraepithelial neoplasms (VINs), though rare, are an increasingly common threat to women's health, with a four-fold increased incidence between 1973 and 2000 (1). Squamous cell carcinoma (SCC) is the most common malignancy to affect the vulva and it arises from two pathways: human papillomavirus (HPV)-related and non-HPV related (2). VIN represents the pre-malignant precursor to SCC and is classified as low-grade squamous intraepithelial lesion (LSIL), high-grade squamous intraepithelial lesion (HSIL), or VIN differentiated-type (dVIN) (2, 3). Vulvar LSILs are benign warts driven by low-risk HPV, while HSILs are derived from high-risk HPV types and represent moderate to severe atypia (4). dVIN is driven by chronic inflammatory conditions like lichen planus or lichen sclerosus (5). Detection of HSIL, dVIN and vulvar malignancies is limited to thoughtful history taking and thorough physical examination. Dermatologists, dermatologic surgeons and gynecologists should pay attention to color and texture change of the vulvar skin and mucosa and biopsy should be performed for any clinically suspicious, evolving or growing lesion of the vulva (6). For poorly defined VIN, gynecologists use colposcopy with 3-5% acetic acid to highlight microscopic disease (6). Management of HSIL and dVIN requires multidisciplinary collaboration between dermatologic surgeons and gynecologists. If suspicion for invasive disease is low, a gynecologist or dermatologist may manage HSIL non-surgically with carbon dioxide laser ablation, topical imiquimod 5%, or photodynamic therapy (7). If invasive HSIL is suspected, a gynecologic surgeon may perform a wide local excision (WLE) with 0.5 to 1.0 cm or a dermatologic surgeon may perform Mohs Micrographic Surgery (6). Conceptually, both HSIL and dVIN demonstrate contiguous growth and therefore are amenable to Mohs Micrographic Surgery (MMS), a technique which allows 100% margin evaluation as well as avoidance of important structures like the clitoris, urethra or anus. Following interdisciplinary discussion, either a skilled gynecologic surgeon or dermatologic surgeon can manage these challenging cases. While HSIL can sometimes be treated with non-surgical modalities, dVIN carries a higher risk of developing to invasive SCC and should be treated with WLE or MMS (8). For patients with invasive stage IA SCC of the vulva without lymph node involvement, first line treatment is WLE by a gynecologic or dermatologic surgeon with 1 to 2 cm margins (9). While there are several reports of the successful use of MMS for vulvar SCC, there is a need for future prospective studies to compare WLE to MMS for vulvar SCC not involving lymph nodes (9-11).

**Summary:** Dermatologists and dermatologic surgeons should have a robust understanding of vulvar pre-malignant and malignant conditions as patients often present to clinic with non-specific vulvar complaints. The management of patients with VIN requires multidisciplinary collaboration between dermatologists, dermatologic surgeons and gynecologists. Management of HSIL or dVIN often involves surgical management with WLE or MMS. While there are several successful reports supporting the use of MMS for vulvar SCC, there is a need for future prospective studies to compare WLE to MMS for vulvar SCC not involving lymph nodes. This review underscores the pathogenesis, diagnosis, and management of vulvar intraepithelial neoplasms.

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## Melanocytic Matrical Carcinoma in a Transplant Patient: A Case Report and Literature Review

**Author:** Logan W. Thomas, MD, Resident, UCLA, Los Angeles, CA

**Co-Author:** Teresa Soriano, MD

**Purpose:** Present a case of melanocytic matrical carcinoma in a transplant patient and provide a literature review of the disease and treatment.

**Design:** We performed a PubMed online search with the key words "matricoma" and "melanocytic" along with review of references to identify additional citations.

**Findings:** Our search yielded 14 case reports of melanocytic matrical carcinoma.

**Summary:** A 75-year-old male with a history of a liver transplant and non-melanoma skin cancer initially presented with a two-week history of a tender red 1.3 x 1.2 cm erythematous red nodule on the right elbow. Biopsy was performed consistent with a melanocytic matrical carcinoma (MMC). The lesion was treated with wide local excision with no recurrence to date. MMC is a rare variant of the uncommon pilomatrical carcinoma, occurring most often on the head/neck and upper backs of middle aged men. Nodular lesions can sometimes resemble pigmented basal cell carcinoma or melanoma. Recurrences can be frequent after excision (23% of wide local excisions, 83% of simple) and can have up to 13% rate of metastasis. There are insufficient cases to determine the incidence of recurrence following Mohs micrographic surgery. We believe that the combination of UV radiation exposure and immunosuppression post-transplant contributed to the development of this patient's rare malignancy. There are no chemotherapy regimens or radiation protocols yet established. Further studies are required with longer follow up data to establish a treatment protocol. Although rare, MMC should remain in the differential diagnosis of clinicians and pathologists caring for the immunosuppressed patient population.

## Melasma Cost and Factors Influencing Patient Satisfaction

**Author:** Carey Kim, MD, PGY4, New York Medical College, Whitestone, NY

**Co-Authors:** Abigail Ciine, MD; Bijan Safai, MD

**Purpose:** Melasma is a common hyperpigmentation disorder often involving the face and neck with approximately 5-6 million women affected annually in the United States. Patients have negatively impacted emotional well-being and quality of life often prompting medical therapies. Treatment modalities are diverse and its use is influenced by various factors including cost, physician prescribing behaviors and patients' expectations. Quantifying these factors is an essential step to identifying any disparities affecting the proper delivery of care.

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**Design:** An online survey was distributed to subjects >18 years old who reported having melasma and a working knowledge of English. Subjects completed the survey via REDCap, after recruitment through Amazon Mechanical Turk. Subjects were asked about disease severity, cost, expectations, willingness, and satisfaction related to the respondents' melasma treatment. Patient willingness and satisfaction were measured on a 1-5 Likert scale. Comparison between groups was done using Chi Square tests for proportions and Student t-tests.

**Findings:** Perceived severity of melasma, impact on quality of life, and willingness to attempt therapies differed significantly based on ethnicity and/or age (Table 1 and 2). Younger and skin of color (SOC) patients reported greater itching and scarring, and younger patients had greater decreased social activities. SOC patients reported greater willingness to try injections and surgery.

All groups were willing to pay out of pocket and considered cost a reason for not pursuing treatment. Insurance coverage differed by age and ethnicity. Younger ( $p<0.01$ ) and skin of color ( $p<0.05$ ) respondents had greater therapy coverage for melasma treatments. Prescribing behavior and patient satisfaction differed significantly by age and ethnicity. Younger ( $p<0.05$ ,  $p<0.01$ ) and skin of color ( $p<0.01$ ,  $p<0.01$ ) respondents were offered more treatment options and discounted coupons / vouchers, respectively. Younger ( $p<0.05$ ) and skin of color ( $p<0.001$ ) respondents were more satisfied with treatment outcomes, and skin of color ( $p<0.05$ ) respondents had greater satisfaction with the cost of treatment.

**Summary:** Younger and skin of color patients reported greater burden of disease, yet reported greater satisfaction with treatment outcomes and/or satisfaction with treatment costs. This group was offered greater treatment options and discounted coupons, while attempting less expensive treatment therapies. The older and Caucasian cohort had the greatest proportion of untreated patients.

Clinicians can consider improving patient satisfaction and the delivery of care in melasma patients by offering greater treatment options based on the patients' ability to pay, disease perception and willingness to attempt treatments.

## Methods to Alleviate Pain during Platelet Rich Plasma Injections into Scalp

**Author:** Natasha Atanaskova. Mesinkovska, MD, PhD, UC Irvine, Laguna Niguel, CA

**Co-Author:** Susie Suh, BA

**Purpose:** Platelet rich plasma (PRP) treatment emerges as an effective non-surgical procedure for stimulating hair regrowth in patients with alopecia. However, intradermal injections into the scalp can be painful and it is one of the most common complaints among patients undergoing the treatment. Although local anesthetics like lidocaine can be applied on the treatment area prior to injections, several studies report that lidocaine can compromise the therapeutic efficacy of PRP. We aim to investigate the effect of ice cooling and vibration on alleviating pain during the PRP treatment.

**Design:** We conducted a randomized controlled split-scalp study in 30 alopecia patients who underwent PRP treatment. On one side of the scalp, PRP injections were performed with either ice cooling or vibration. The other side was injected without intervention or with the other intervention. Subjects were randomly assigned to three groups (ice vs. no intervention = 10, vibration vs. no intervention = 10, ice vs. vibration = 10). Data were collected after the procedure using a survey form including the Visual Analog Scale.

**Findings:** In ice vs. no intervention group, all patients found that PRP injections with ice cooling was less painful than without ice cooling. On the other hand, in vibration vs. no intervention group, patients showed different opinions. While some patients preferred using vibration during PRP injections, some patients felt more pain with the vibration. In ice

vs. vibration group, 60% patients felt less pain with ice, 30% patients felt less pain with vibration and 10% felt no difference between ice and vibration.

**Summary:** Both ice cooling and vibration help to alleviate pain associated with PRP injections. They are safe and easily applicable interventions that can improve the patients' experience during the treatment.

## Microbiology of Postoperative Infections Following Dermatologic Surgery: A 9-Year Retrospective Review

**Author:** Maggie L. Chow, MD, PhD, Dermatologist / Mohs Surgeon, Skin and Beauty Center, Los Angeles, CA

**Co-Authors:** Adam Miller, MD; Shang I. Brian Jiang, MD

**Purpose:** Dermatologic surgery has historically been associated with low rates of intraoperative and postoperative complications, though surgical site infections (SSI) are the most commonly reported adverse event. Wound cultures are critical in identifying culprit bacteria and antibiotic susceptibilities, though the interpretation of results is best performed using clinical context. In dermatologic surgery, *Staphylococcus aureus* is the most commonly implicated bacteria in wound infections, followed by *Pseudomonas Aeruginosa*, *Proteus Mirabilis*, *Enterobacter* species and *Serratia Marcescens*. Understanding of commonly implicated bacteria causing postoperative infections can help surgeons in selecting appropriate prophylaxis and treatment options. Because there are no standardized guidelines, the use of antibiotics is increasing and varies widely, even within institutions. Our goal in performing the study was to describe the SSIs that we have encountered and treated over the previous eight years to identify relationships between cultured bacteria and host and clinical factors, as well as understand the bacterial resistance patterns in our geographic location to better help us treat SSIs going forward.

**Design:** Using the electronic medical record, the authors reviewed records of all patients presenting to our Dermatologic Surgery unit who was recorded to have developed a postoperative infection from 2011-20. In total, 491 patients were identified. All data analysis was performed in SPSS. Chi square analysis was applied for the analysis of categorical variables. A significance level of  $p<0.05$  was applied for final reporting.

**Findings:** Of the 491 identified patients, 292 patients were included in the analysis. The average age of patients was 68.7 years, with a preponderance of Caucasian (94.9%) male (66.3%) cases. The patients had an average of 6.23 prior Mohs micrographic surgeries and 2.4 prior cutaneous excisions. Almost 50% of patients were either current smokers or previous smokers. In terms of medical history, 9.6% of patients had a history of diabetes mellitus, 36.8% of patients had a prescribed anticoagulant and 15.8% were immunosuppressed.

Consistent with prior studies, the majority of infections were in the lower extremities (36.8%), followed by the upper extremities (17.0%) and face (16.0%). The majority of the patients had undergone Mohs surgery (64.1%), and most repairs were complex linear closures (64.7%). Polypropylene was the most commonly used superficial suture (72.3%), and simple running sutures were most frequently used (58.2%). Doxycycline (54.8%) and cephalexin (21.2%) were the most commonly prescribed prophylactic antibiotics.

Methicillin-sensitive staphylococcus aureus (MSSA) was the most commonly cultured bacterium at 38.9% of cultures, followed by pseudomonas aeruginosa (11.4%) and methicillin-resistant staphylococcus aureus (MRSA; Table 2). Cultures were negative in 8.4% of cases. Most of the MSSA cultures were resistant to penicillin (73.8%), and smaller percentages were resistant to erythromycin (17.7%) and clindamycin (12.8%). Ninety percent of the pseudomonas cultures were sensitive to all common antibiotics tested; three cultures (10.0%) were resistant to aztreonam and 1 culture (3.3%) was resistant to cefepime. For MRSA, 100% were resistant to oxacillin but only 92.9%

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were resistant to penicillin. Additionally, most cultures were resistant to cefazolin (96.4%). The culture result changed the recommended antibiotic 30% of the time.

**Summary:** In summary, of all cases of SSI in the last nine years at our institution, the majority occurred with surgical sites on the lower extremities repaired with complex linear closures. MSSA, pseudomonas and MRSA infections were the most common bacterial causes of infection. It is worrisome that some of our pseudomonas cultures are resistant to aztreonam and cefepime. It is also worrisome that MRSA is the third most common cause of SSIs in our sample, with resistance to penicillin, cefazolin and erythromycin approaching 100% and to tetracyclines approaching 10%. By sharing our results, we hope to encourage dermatologic surgeons to review their own postoperative infections to consider antibiotic prophylaxis and resistance.

## Microcannula Subcision and Retrograde Injection Technique for Treatment of Perioral Vertical Lip Lines

**Author:** Janine O. Hopkins, MD, Medical Director/Owner, Hopkins Dermatology, Monroe, LA

**Purpose:** The purpose of this presentation is to educate and teach other injectors a non-surgical treatment of perioral vertical lip lines using a microcannula subcision technique followed by retrograde injection of hyaluronic acid dermal filler.

**Design:** Patients with moderate to deep, fixed perioral vertical lip lines were given the option for treatment using a standard dermal filler injection technique with needles versus a new, novel microcannula subcision and retrograde injection technique. Informed consent for treatment was given. Photos were taken and all patients were graded to have Glogau III to IV vertical rhytides involving the upper cutaneous lip. The patients were anesthetized with bilateral intraorbital nerve blocks using a total of 2 cc of 1% lidocaine with epinephrine. The skin was cleaned with Hibiclen wash followed by alcohol prep. Using a sterile, 27 or 30 gauge one and a half inch microcannula inserted through an entry site at the upper, outer cutaneous lip at the junction of the nasolabial fold, moderate to deep upper periorbital rhytides were treated with subcision using the microcannula to breakup fibrous dermal bands thus releasing the tethered vertical lines, followed immediately by injecting a hyaluronic acid dermal filler in a retrograde, fanning pattern.

**Findings:** All patients tolerated the procedure very well with little to no pain due to the dental nerve block administered prior to treatment. Minimal bleeding or bruising were experienced during or after the procedure. All patients experienced mild to moderate post-treatment swelling that lasted on average three days. Overall, patients experienced a 1-2 grade improvement in wrinkle severity. No complications occurred during or after the procedure. All patients expressed satisfaction with the results of the procedure. In the injector's opinion, the 27 gauge microcannula offered more control than the thinner 30 gauge microcannula for the purpose of subcision.

**Summary:** In conclusion, using a microcannula subcision technique to release tethered moderate to deep Glogau III to IV vertical rhytides followed by a retrograde injection of hyaluronic acid dermal filler in a fanning pattern can safely achieve a one to two grade improvement in wrinkle severity with high patient satisfaction. This technique also addresses the underlying fibrosis that occurs at the dermal layer thereby releasing the tethered lines versus injection with dermal filler alone.

## Micrographic Surgery and Dermatologic Oncology Fellowship Locations and Practice Location Trends in the First Year as a Practicing Mohs Surgeon

**Author:** Jette Hooper, MD, Resident Physician, University of Connecticut, Bloomfield, CT

**Co-Author:** Maritza Perez, MD

**Purpose:** Fellowship location is one of the many aspects of consideration that Micrographic Surgery and Dermatologic Oncology (Mohs) Fellowship applicants consider when applying for fellowships. The desire to live and or subsequently work in a particular state may influence which fellowships an applicant applies for and ultimately ranks. The goal of this study was to determine the geographic distribution of Mohs fellowship positions and what percent of Mohs fellowship graduates continue to practice in the same state as their fellowship during their first year as a Mohs surgeon.

**Design:** There were a total of 92 Mohs fellows who were matched into American College of Mohs Surgery accredited Micrographic Surgery and Dermatologic Oncology Fellowship positions for the 2018-19 academic year. Of those, 10 fellows were excluded from the study, nine based on primary training location residing outside of the United States and one was participating in a 24-month fellowship and was still a fellow at the time of this research. Of the remaining fellows, the location (state) of their fellowship and current practice were determined via an internet search. The location of fellowship and current practice location were then compared. Additionally fellowship and practice "region" were also compared. Practice regions were defined by the five commonly delineated geographic regions of the United States: West, Southwest, Midwest, Northeast and Southeast.

**Findings:** There were 26 states that have at least one Mohs fellowship position. The states with the highest number of fellowship positions for the 2018-19 match were California with 12 (15%) positions, followed by Pennsylvania with nine (11%), then New York, Ohio and Texas all with six positions (7% each). When distributed by region, 26 (32%) of positions were located in the Northeast, 20 (24%) in the Midwest, 15 (18%) in the West and Southeast and lastly six (7%) in the Southwest. A total of 22 fellows (27%) remained as Mohs surgeons in the same state as their Mohs fellowship at slightly less than a year from graduation, while a total of 37 fellows (45%) remained in the same geographic region.

**Summary:** There are high numbers of fellowships positions concentrated in a small number of states while almost half of all states do not offer Mohs fellowship training at all. The distribution of programs requires many applicants to move out of state in order to complete their fellowship training. Although the number of fellows staying in the same state is relatively low, the portion staying in the same region is much higher. There are many potential reasons for fellows to relocate after training: Desire to move back to the state of residence prior to fellowship, saturation of area surrounding fellowship location (as many are located in large cities), non-compete agreements requiring a move outside of a designated region, etc. However, the latter two could explain why many fellows move but stay within the same geographic region.

## Microneedling for Non-surgical Scar Revision of Post-Mohs Micrographic Surgery Nasal Scars

**Author:** Michael F. Gowen, MD/MBA, Dermatology resident, Yale New Haven Hospital, New Haven, CT

**Co-Author:** Kathleen Suozzi, MD

**Purpose:** To evaluate outcomes of microneedling for treating scars from secondary intent healing following removal of nasal skin cancer with Mohs micrographic surgery (MMS); to determine if certain factors, including timing and spacing of treatments, depth of penetration and types of scars are associated with better outcomes with microneedling.

**Design:** A retrospective observational analysis of 16 patients (skin type's I-IV) who underwent MMS for nasal lesions and subsequent microneedling for scar revision after secondary intent healing at a single academic center. Patients had one to five treatments at one- to three-month intervals (average 1.5 months) with the end point being desired clinical outcome. Treatment depth ranged from 1.5-3mm with a target of pinpoint bleeding within the atrophic scar. Side effects were monitored and tracked. Other treatment modalities prior to microneedling were recorded.

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**Findings:** 100% of patients noted significant improvement in scar appearance with an average of 2.7 treatments. There was notable improvement in scar depression / indentation. Additionally patients had improved sebaceous texture on the nose which contributed to the overall improvement. There were no adverse events, common expected side effects included bruising (one-week post-treatment) and superficial desquamation (three days post treatment).

**Summary:** Microneedling is a rapid treatment for nasal scars after MMS with quick results, low cost, minimal risk and high patient satisfaction. Alster et. al (Plastic Recon Surgery 2020) recently demonstrated the effectiveness of microneedling in a variety of facial and nonfacial scars. This study supports its use as treatment for nasal scars from secondary intent healing after MMS.

## Millennial Perspectives on Body Contouring Procedures: A National Survey

**Author:** Jordan V. Wang, MD, MBE, MBA, Cosmetic Dermatologic Fellow, Laser & Skin Surgery Center of New York, NY

**Co-Authors:** Christian Albornoz, MD; Robert Murgia, DO, MA; Nazanin Saedi, MD

**Purpose:** Body contouring procedures have recently experienced a significant increase in popularity. High body dissatisfaction rates associated with sedentary lifestyles and unbalanced diets continue to fuel the demand for fat reduction and body contouring. These procedures have also become popular with younger consumers, who have continued to seek out minimally and non-invasive cosmetic treatments. With millennials representing a growing share of aesthetic patients, we decided to evaluate their perspectives on non-invasive body contouring procedures.

**Design:** An online survey was distributed to individual consumers in the United States who were 24 to 39 years old in March 2020.

**Findings:** A total of 116 respondents completed the survey. The mean age was 32.0 years, and 55.2% were female. Of all respondents, 26.7% had a previous cosmetic procedure, of which 35.5% will have another in the future. Overall, 16.4% are currently planning to have a future procedure, and 48.3% are considering it.

Respondents had varying degrees of knowledge about body contouring procedures. They generally believed them to be effective to different extents. Significantly more respondents believed them to be effective when they or someone they knew had the procedure performed (71.7% vs. 48.2%;  $p=0.010$ ). The majority (63.8%) were also interested in learning more about body contouring.

Of all respondents, 16.4% underwent a body contouring procedure, and 40.5% knew of others who had it performed. Interestingly, the majority of procedures were performed in the medical spa setting as opposed to a physician practice for both respondents themselves (78.9% vs. 36.8%;  $p=0.009$ ) and people they knew (76.6% vs. 59.6%;  $p=0.078$ ). Of the 38.8% who were certainly interested in having a body contouring procedure performed, the majority (75.6%) preferred a medical spa setting. In contrast, of the 34.5% who were possibly considering the procedure, there was instead greater preference for a physician practice (67.5%). A slight majority believed that medical spas were similar to physician-based practices in terms of safety (59.5%) and outcomes (63.8%) for body contouring procedures.

When selecting a clinic or practitioner, the top five most popular sources of information were friends (56.9%), family (53.4%), current physicians (50.0%), online reviews (28.4%) and Facebook (22.4%). When deciding between a medical spa and physician practice, the top five considerations were safety (54.3%), reputation (47.4%), reviews (46.6%), credentials (46.6%) and cost (44.0%). Interestingly, the vast majority (90.5%) will check the level of training and credentials of a medical spa practitioner before undergoing a procedure. Significantly more respondents believed physician practices were trustworthy when compared to medical spas (77.6% vs. 61.2%;  $p=0.007$ ).

**Summary:** Millennial aesthetic consumers have varying degrees of knowledge and beliefs on perceived effectiveness for body contouring procedures. There are clear disparities in consumer views between medical spas and physician practices.

## Mohs for Vulvar Melanoma in Situ (MIS)

**Author:** Sungat K. Grewal, MD, PGY-4, Dermatology Resident, University of California, San Francisco (UCSF), San Francisco, CA

**Co-Authors:** Philip LeBoit, MD; Drew Saylor, MD, MPH

**Purpose:** 1) Present a case of vulvar melanoma in situ (MIS) successfully treated with Mohs with MART-1. 2) Present a literature review on vulvar MIS. 3) Share practical pearls regarding Mohs for vulvar MIS.

**Design:** We present a case of a 66-year-old female with longstanding vulvar melanosis with biopsy proven MIS. The patient underwent one stage of Mohs using MART-1 staining. Histology from initial debulk revealed PRAME negative residual MIS. The defect was repaired with complex linear closure. A retrospective literature review in PubMed was conducted with the following terms: [Vulva OR Vulvar] AND melanoma AND situ AND [treatment OR procedure OR Mohs OR topical OR management].

**Findings:** This current literature does not describe the use of Mohs as a treatment for vulvar MIS. 137 full-text articles were identified and excluded if they were not in English (six) or did not specifically discuss primary MIS (108). 23 articles were identified.

**Summary:** 2% of all female melanomas occur in the vulva. The vulva comprises <1% body surface area, although it is ~2.5x more likely to develop melanoma compared to other locations with comparable surface area. There is limited literature on invasive vulvar melanomas (IVM), and even less in the realm of vulvar MIS. Within this small collection, treatment and outcome data is often not differentiated between IVM and vulvar MIS. Current recommendations are based on treatment guidelines for IVMs, which are managed like cutaneous melanomas (AJCC) despite biological differences in mucosal melanomas. Surgical treatment is the mainstay of treatment for localized vulvar melanomas, yet the ideal surgical approach and optimal margins are unknown. Radical vulvectomy increases morbidity but does not improve patient survival or recurrence rates when compared to wide local excision [1]. Breslow's depth, ulceration status, and a clear margin significantly predict vulvar melanoma specific survival [2]. The Mohs technique is attractive as it confirms clear margins in a stepwise manner, with the possibility of avoiding radical excision or vulvectomy. However, using the Mohs technique to treat vulvar MIS is currently not specifically described in the literature. We offer the following practical pearls when performing Mohs for vulvar MIS:

**Pre-operatively:** 1) Pre-operative counseling should include unique post-operative complications (psychosocial impact and possible urinary / bowel / sexual dysfunction). We recommend collaboration with gynecology and plastics to identify optimal reconstruction techniques. 2) Identifying the patient's baseline pigmentation is critical, especially in the setting of vulvar melanosis. Scouting biopsies of additional lesions can be helpful when comparing vulvar MIS to a given patient's background vulvar melanosis.

**Intra-operatively:** Vulvar MIS can be difficult to distinguish from vulvar melanosis on histology. Vulvar melanosis is characterized by an increased number of melanocytes in the basal layer (>1:4). In contrast, vulvar MIS has contiguous melanocytes, melanocytic nests, and/or the presence of melanocytes with enlarged nuclei or thick elongated dendrites that ascend into the outer aspect of the epithelium. MART-1 immunostaining can facilitate visualization of these key features.

**Post-operatively:** A sanitary napkin with vaseline can create a comfortable pressure dressing. For monitoring, baseline photos of the vulva may be essential to catch subtle change, especially in the setting of background vulvar melanosis.

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## Mohs Micrographic Surgery for the Management of Primary Cutaneous Mucinous Carcinoma - A Case Series

**Author:** Patrick Zito, DO, PharmD, RPh, Resident, Larkin Hospital Palm Springs, Hollywood, FL

**Co-Authors:** Hamza Bhatti, DO; John Howard, DO; Eli Saleeby, MD; Eduardo Weiss, MD

**Purpose:** Primary cutaneous mucinous carcinoma (PCMC) is a rare head and neck malignancy. It is resistant to chemotherapy and radiation. Due to the high rate of recurrence, adequate excision with generous margins of 1-2cm is standard management. Mucinous carcinoma rarely originates in the skin; the majority of examples in the skin are cutaneous metastases. A recent review of National Cancer Institute's Surveillance PCMC showed the highest incidence was among those aged 60 to 79 years, black ethnicity, and non-eyelid head and neck.

Mohs micrographic surgery (MMS) is fast becoming the gold standard for management of cutaneous carcinomas, offering maximal tissue conservation and high cure rates. The first case of PCMC treated with MMS was published in 1988. Published data reveals lower recurrence rates of PCMC treated with MMS (0-7%) vs. excision (30-40%). The aim of this study is to present three cases of PCMC treated with MMS. We discuss the clinical spectrum, surgical management, gross pathologic features, reconstruction and demographics.

**Design:** A prospective, two-institution case series of three patients with PCMC diagnosed and managed with MMS

**Setting:** Private practice

**Methods:** Patients were identified through biopsy and histopathological examination. Patients underwent extensive oncological investigation and radiologic evaluations to rule-out a metastatic primary malignancy. Patients then underwent MMS with a permanent section to allow special staining if necessary.

**Findings:** Two male patients were identified ages 59 and 60 years and one female patient age 61. Both males were of Hispanic origin while the female was Caucasian. Tumors were located on the left cheek, parietal scalp and upper right eyelid, and all three lacked a previous history of skin cancer or other malignancy. Extensive oncological evaluation was unremarkable for a distant primary malignant source. Treatment with MMS was undertaken, and reconstruction of cheek and scalp defects were performed with O to L advancement flaps, while the upper eyelid reconstruction was performed by oculoplastic surgery with a single advancement flap. All patients remained recurrence free between 10-12 months with ongoing follow-up.

**Summary:** Conclusions: Based on our results, MMS technique can be considered as a treatment option for PCMC. Permanent sectioning is advised to allow the full array of special stains that may be useful markers for these tumors. Given the association of mucinous carcinomas and cutaneous metastasis, a complete and thorough investigation for potential metastatic primary is prudent prior to embarking on definitive treatment using MMS.

## Multidisciplinary Approach between Mohs and Head and Neck Surgeons in the Management of Recurrent Cutaneous Squamous Cell Carcinoma with Perineural Invasion

**Author:** Margo Lederhandler, MD, Mohs surgeon, Dermatologist, Private Practice, Larchmont, NY

**Co-Authors:** Hao Feng, MD, MHS; Roy Geronemus, MD; Azita Khorsandi, MD; Mark Urken, MD; Mykayla Sandler, BA; Monica Xing, BA

**Purpose:** This case is being submitted in order to highlight several important teaching points. First, it is an excellent example of perineural invasion – clinically, radiologically and histopathologically. Second, it demonstrates the joint approach between Mohs micrographic surgery and head and neck surgery (HNS), who worked together to clear the tumor, each utilizing their own expertise: the Mohs surgeon cleared the tumor peripherally and to the level of the infraorbital foramen, after which the HNS completed the resection, which necessitated drilling of bone.

**Design:** Case Report

**Findings:** A 71-year-old white man with a history of recurrent cutaneous squamous cell carcinoma (CSCC) of the left nasolabial fold presented for Mohs micrographic surgery (MMS). The original CSCC was treated with MMS two years prior at an outside institution. Initial biopsy revealed superficial squamous cell carcinoma. Two years later, the recurrence was detected as a new palpable mass in the same region with associated facial numbness involving the ipsilateral cheek and nose. MRI revealed infiltrative changes involving the soft tissue of the left nose, left maxillary sinus and left infraorbital nerve with suggested involvement at the level of the infraorbital foramen. Three stages of MMS were performed, with clearing of the peripheral margin of the tumor and perineural extension was traced to the infraorbital foramen. The post-operative defect measured 4.0 cm x 4.4 cm. The patient was referred to Head & Neck surgery (HNS) for extirpation of remaining tumor, which involved drilling of the anterior face of the maxilla in order to resect an additional 3 cm of the infraorbital nerve. Intraoperative frozen sections as well as permanent sections confirmed clearance of the tumor. A posteriorly based cervicofacial advancement flap was performed to reconstruct the defect. The patient was advised to undergo adjuvant radiation therapy to the left facial region. At one-month post-op, the surgical site was well healed, however the numbness overlying the left medial cheek and nose persisted.

**Clinical Question or Interest:** This case is being submitted in order to highlight several important teaching points. First, it is an excellent example of perineural invasion – clinically, radiologically and histopathologically. Second, it demonstrates the joint approach between MMS and HNS, who worked together to clear the tumor, each utilizing their own expertise: the Mohs surgeon cleared the tumor peripherally and to the level of the infraorbital foramen, after which the HNS completed the resection, which necessitated drilling of bone.

Perineural invasion (PNI) heralds poor outcomes from CSCC. A recent meta-analysis found PNI to be associated with increased risk of local recurrence (RR 4.3), metastasis (RR 2.95), and disease-specific death (RR 4.06).[1] PNI occurs in 2.5% to 5% of primary CSCC.[2,3] Risk factors such as PNI of large-caliber nerves with diameter of 2cm or greater, invasion beyond the subcutaneous fat or beyond a depth of 4mm, and multiple nerve involvement, among other non-PNI risk factors, are at high risk for poor outcomes such as nodal metastasis and death. [4] Adjuvant radiation is considered in certain cases of CSCC with PNI, though there is little consensus among Mohs surgeons when this is warranted.[5] Complex cases of recurrent CSCC with clinical findings suspicious for PNI warrant extreme caution, and often benefit from multidisciplinary management.

**Summary:** This case is a key example of how perineural invasion may present clinically. The radiologic image and histopathology from the MMS clearly demonstrate involvement of the infraorbital nerve. It is an important example of the multidisciplinary cooperation between MMS and HNS.

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## Nasal Reconstructive Techniques Following Mohs Surgery or Excisions: A Systematic Review

**Author:** Kathryn T. Shahwan, MD, MSDO Fellow, Ohio State University Medical Center, Blacklick, OH

**Co-Authors:** Murad Alam, MD, MBA; Caitlin Bakker, MSt; Rebecca Kimyon, BS; Ian Maher, MD; Adam Mattox, DO

**Purpose:** A wide variety of reconstructive techniques for post-oncologic defects on the nose have been described, however the literature lacks a comprehensive systematic review. The objectives of this study were to compile nasal reconstruction data, determine author specialties, explore outcome measures utilized, and assess the overall quality of evidence.

**Design:** The study was registered with the PROSPERO database. A comprehensive search of eight databases was performed using terms related to nose anatomy, Mohs and excisions, and reconstructive methods. To be included in the study, articles had to be published in English within the last 15 years and contain repair data for Mohs or excision defects on the nose for four or more subjects. Case reports / series with less than four subjects and literature reviews 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, outcome measures and complications.

**Findings:** The database search retrieved 1,017 articles, and 111 were eligible for inclusion in the study. Most of the first and last authors (61%) were dermatologic surgeons, followed by plastic surgeons (14%), a combination of specialties (13%), otolaryngologists (7%), oral maxillofacial surgeons (3%) and ophthalmologists (2%). Over 98% of the articles were observational cohort studies or case series; two clinical trials were included, but these reported repair data only as an aside. The average number of subjects was 151, with 85% of the studies having fewer than 100 subjects. Approximately 19% of defects were in zone 1, 22% in zone 2, <1% in zone 3, and 2% in multiple zones; the rest could not be determined. Mohs was performed in 82% of cases, whereas excision was performed in only 15%. Reconstructive techniques included second intention healing (4%), linear closures (26%), grafts (23%), advancement flaps (3%), rotation flaps (5%), transposition flaps (7%), island pedicle flaps (2%), forehead flaps (7%), melolabial flaps (6%), unspecified local (7%) or interpolation (1%) flaps, and free flaps (<1%). Only 19% of studies utilized graded aesthetic and/or functional outcome measures, whereas most only included subjective comments (55%) or did not address these outcomes at all (26%).

**Summary:** This systematic review demonstrates the wide variety of nasal reconstructive methods described in the literature. Although many articles have been published on this topic, the overall quality of evidence is low as most are small, observational studies lacking structured outcome measures.

## Non-invasive Arm Lifting and Calf Toning Using High Intensity Focused Electromagnetic Field (HIFEM) Procedure: Ultrasound Assessment

**Author:** Bruce E. Katz, MD, Director, Juva Skin & Laser Center, New York, NY

**Co-Authors:** Diane Duncan, MD

**Purpose:** The sagging aesthetic appearance of arms and calves is predominantly caused by arm muscles laxity and by excessive fat deposits. High Intensity Focused Electromagnetic Field (HIFEM) procedure was found to affect both of these tissues, and it is expected that the same effect could be seen on arms and calves. Current study investigates the efficacy of HIFEM application on arms and calves.

**Design:** Total of 19 females and two males with average age of 45.8±14.5 participated in the study. Sixteen subjects underwent treatments of arms (biceps b. and triceps b.) while 14 subjects received calf treatments (nine subjects received both arm and calf treatments). The treatment procedure consisted of four sessions and treatment of each muscle group (biceps b., triceps b., gastrocnemius) lasted for 20 minutes. The evaluation was performed at baseline and at 1-month follow-up. Ultrasound imaging was used to measure muscle and fat thickness. Weight and circumference were recorded and digital photographs were obtained.

**Findings:** The ultrasound measurements showed that the thickness of biceps brachii was increased by 15.48% (+2.2mm; SEM=0.5mm) while the thickness of triceps brachii increased by 13.69% (+2.0mm; SEM=0.7mm). The thickness of fat layer across the arm was reduced by 12.33% (-1.0mm; SEM=0.43mm). The subjects undergoing calf treatments showed 12.96% (+1.9mm; SEM=0.64mm) thickening of the gastrocnemius muscle accompanied by 13.11% (-0.8mm; SEM=0.5mm) reduction in the fat layer thickness. The arm circumference increased by 1.04 cm and the calf circumference was increased by 0.37 cm. The weight remained unchanged. No adverse events were reported.

**Summary:** The observed muscle thickening and fat reduction effect of the HIFEM procedure correlates with the outcomes of abdominal treatments reported in previous studies. As such, HIFEM treatment of calves and arms extends the application possibilities of HIFEM based devices.

## Novel Biomaterial Containing Gelatin, Manuka Honey, and Hydroxyapatite Enhanced Secondary Intention Healing in Mohs Surgical Defects on the Head and Extremities

**Author:** Matthew M. Wallace, MD, Resident Physician, Vanderbilt University Medical Center Department of Dermatology, Nashville, TN

**Co-Authors:** Anna Clayton, MD; Stacy McMurray, MD; William Stebbins, MD

**Purpose:** To elucidate if a novel biomaterial containing gelatin, Manuka honey and hydroxyapatite supplement enhances secondary intention healing for surgical defects after Mohs surgery on the head and extremities.

**Design:** Case series. Patients were treated with Mohs surgery for non-melanoma skin cancer with secondary intention healing for surgical defects. Biomaterial was applied for each patient to supplement enhance secondary intention healing. Once granulation tissue filled the entire wound bed to the epithelial level, patients continued standard wound care until complete re-epithelialization was achieved.

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**Findings:** Patient 1. Left tibia 1.9 x 1.9cm defect to deep dermis. Complete re-epithelialization at week 6.  
Patient 2. Left calf 1.6 x 1.6cm defect to deep dermis. Complete re-epithelialization at week 6.  
Patient 3. Right tibia 1.8 x 1.3cm defect to deep dermis. Granulation filled entire defect by week 4, patient unable to follow-up until week 8, and complete re-epithelialization noted at that time.  
Patient 4. Left calf 1.6 x 1.2cm defect to mid dermis. Complete re-epithelialization at week 6.  
Patient 5. Vertex scalp 2.7 x 2.6cm defect to periosteum. Complete re-epithelialization at week 5 from start of biomaterial use, post-operative week 8. Initial surgical defect reduced with purse string suture.  
Patient 6. Left tibia 1.8 x 1.5cm defect to deep dermis. Week 3, granulation tissue filled entire defect. Patient declined further follow-up, satisfied with outcome.  
Patient 7. Right posterior pinna. 4.9 x 2.7cm defect to perichondrium. Near complete re-epithelialization at week 4.  
Patient 8. Left frontal scalp. 3.7 x 3.4cm defect to periosteum. Near complete re-epithelialization at week 9.5.  
Mean time to complete re-epithelialization was 6 weeks (42 days). No infections or complications were observed in this small case series.

**Summary:** In each case, the authors noted rapid proliferation of granulation tissue at the wound base with minimal clinical signs of inflammation (e.g., erythema and edema) at the wound periphery. There were no infections, and patients reported minimal discomfort or pain during the course of therapy. The mean time in this small sample size to complete re-epithelialization is shorter than secondary intention healing times reported in the literature for the head and legs. Limitations of this series include small sample size and its observational nature. Further prospective, comparative studies are needed to fully elucidate the impact on wound healing, optimal treatment protocols and cost-benefit of use.

## Novel Technology with Continuous Glucose Monitoring for Psoriasis

**Author:** Michael Abrouk, MD, Aesthetic & Procedural Chief Dermatology Resident, University of Miami Frost Department of Dermatology & Cutaneous Surgery, Thousand Oaks, CA

**Co-Authors:** Andjela Egger, BS; Shireen Golpanian, BS

**Purpose:** Metabolic syndrome includes the presence of high fasting glucose/insulin resistance, hypertension, dyslipidemia, and abdominal obesity.[1] Several studies have suggested an increased prevalence of metabolic syndrome in psoriatic patients

**Design:** In a nationally representative sample of U.S. men and women, the prevalence of metabolic syndrome in patients with psoriasis was nearly double that of controls (40% vs. 23%, respectively). [4] In a prospective study of female nurses in the US, psoriasis was independently associated with an increased risk of diabetes and hypertension.[5] In a cross-sectional study utilizing a large database studying the association between psoriasis and diabetes, psoriasis was significantly associated with diabetes independent of age and gender.[6]

**Findings:** Treatment of underlying metabolic derangements has been shown to improve severity of psoriasis. In one case report, a patient with psoriasis and metabolic syndrome who utilized a treatment program implemented by nutritionists and endocrinologists exhibited an improvement in both conditions after only four months of diet and appropriate therapeutic regimen.[7] In a study of 303 obese patients with moderate-to-severe plaque psoriasis, a 20-week dietary intervention in addition to physical exercise significantly reduced psoriasis severity.[8] In another cross-sectional observational study, authors examined the role of a healthy eating pattern (i.e. the Mediterranean diet) on severity of psoriasis in a group of treatment-naïve patients. They found that a higher percentage of psoriatic patients had a lower adherence to the Mediterranean diet compared with BMI-matched controls.[9]

**Summary:** Continuous glucose monitoring (CGM) provides information about fluctuations in glucose levels throughout the day and was originally developed to help identify unwanted periods of hypo- or hyperglycemia in diabetic patients.[10] Studies have shown that CGM improved glycated hemoglobin levels and helped enhance the management in type 1 diabetics motivated to use this technology.[11] Given the well-studied association between metabolic derangements including insulin resistance and psoriasis, there could be an important role for CGM in the psoriatic patient who wishes to improve his or her symptoms via treatment of underlying metabolic derangements through nutrition and diet.

## Novel Treatment of Calcifications from Dermatomyositis with Picosecond and CO2 Laser

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**Co-Author:** Jill Waibel, MD

**Purpose:** Treating cutaneous calcifications poses as a clinical challenge with limited satisfactory treatment options. Dystrophic soft tissue calcifications are a potential long-term cutaneous consequence of dermatomyositis.<sup>1</sup> Calcinosis deposits may be located in the skin, deep fascia or intramuscular connective tissue. These hard nodules are painful and may form a fistula and ulcerate draining chalky calcium through the skin. Treatment modalities with surgical excision and medications such as diltiazem, bisphosphonates, sodium thiosulfate have been used to control calcinosis progression in dermatomyositis with limited success.<sup>2</sup> Carbon dioxide (CO<sub>2</sub>) lasers have demonstrated some efficacy as well as shock wave lithotripsy, but neither has yielded consistent clearance of cutaneous calcifications.<sup>3,4</sup>

Acoustic shockwaves generated during picosecond lasers induce optical breakdown (LIOB) creating cavitation bubbles in the skin.<sup>5</sup> The explosive vaporization and mechanical expansion caused by picosecond lasers within the skin without harming the epidermis, was theorized to be a good non ablative approach to shatter calcification clusters before their extrusion. Using a large beam size with the wavelength of 1064nm was essential to contribute to skin penetration to reach the overall cluster thickness. After this deep "inner" fragmentation for an enhanced liquefaction, we used a fractionated ultrapulsed ablative CO<sub>2</sub> laser to open deep 120 micron wide "release channels". The fractional ablative carbon dioxide lasers (Lumenis UltraPulse SCAAR FX Yokneam, Israel) allows to reach a depth of 3.5mm in a single, controlled pulse with minimal collateral heating.

**Design:** Here we present a case of ulcerated calcifications in the setting of dermatomyositis in a 62-year-old female patient successfully treated with same session picosecond and ablative fractional CO<sub>2</sub> laser. The patient had the calcifications over 10 years with significant pain. The patient had calcifications throughout her body however the calcifications in the hip areas were ulcerating with increasing discomfort. She had failed all prior pharmaceutical therapies. The right hip was treated with three laser treatment sessions. The initial treatment was with the Picosecond Laser (PiQo4, Lumenis, Yokneam, Israel) 1064 nm fluence 0.76 J/cm<sup>2</sup> 800 ps pulse duration 10 mm spot immediately followed by fractional ablative carbon dioxide laser (Lumenis UltraPulse Encore, Yokneam, Israel) energy 90 mJ density 3%, 200Hz which resulted in a melting of the calcium into a liquid which easily extruded from the skin (Figure 1).

**Findings:** One month later, the right hip was treated again with another round of fractional ablative carbon dioxide laser (energy 130mJ, scan size 2mm, pulse count 1, density 3%, 200Hz, topical Aquaphor). This resulted in significant clinical improvement with presumed photoacoustic disruption of the calcinosis cutis subcutaneous nodules with the picosecond laser followed by CO<sub>2</sub> laser treatment to express the subcutaneous contents after only three total laser treatment sessions.<sup>5</sup> (Fig. 1, 2)

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**Summary:** Calcinosis Cutis can present a clinical challenge with a paucity of efficacious or satisfactory treatment options. With the use of picosecond lasers to disrupt the subcutaneous calcium nodules sequentially followed by fractional ablative CO2 laser treatment. While this treatment regimen will need additional evaluation it could be a minimally invasive treatment option for patients with calcinosis cutis.

## Novel Use of Porcine Urinary Bladder Extracellular Matrix Dressing in the Management of Pyoderma Gangrenosum on the Breasts

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**Co-Authors:** Kerry Hennessy, MD; Jake Laun, MD; Lauren Kuykendall, MD; Lucia Seminario-Vidal, MD, PhD

**Purpose:** Pyoderma gangrenosum (PG) is a rare, chronic and recurrent neutrophilic dermatosis characterized by necrotic ulcers. It is frequently associated with systemic disease and is also recognized as a paraneoplastic phenomenon. While much progress has been made in characterizing the pathogenesis and clinical features of this disorder, it remains very difficult to treat in many cases. Treatment of PG lacks standardization, and there is a relative paucity of high-level evidence to support guidelines for management. Novel wound matrices have potential to aid in the management of difficult to treat PG ulcers. Porcine urinary bladder-derived extracellular wound matrix (ECM) in conjunction with negative pressure wound therapy (NPWT) to treat PG on the legs has had reported success in the literature, and our aim was to further explore the use of these matrices with NPWT in PG wounds at a different anatomical site.

**Design:** Case report and review of the literature.

**Findings:** A woman in her 30s with a history of breast cancer developed PG wounds of the breasts after bilateral mastectomies and subsequent latissimus dorsi myocutaneous flap reconstructions. Promptly after diagnosis, she was treated with high dose systemic corticosteroids (prednisone 1mg/kg/d). After 12 days of immunosuppression, the patient underwent debridement of her wounds bilaterally with placement of novel porcine urinary bladder-derived ECM to her wounds. NPWT with a wound vac system was utilized for four weeks. She was treated with adjuvant dapson and continued systemic corticosteroids, which were slowly tapered over the course of 3 months. The patient underwent two additional applications of porcine urinary bladder extracellular wound matrices as an outpatient.

Complete wound closure was noted at post-operative day 76. Durable response was maintained, and at the time of writing this abstract, the patient did not develop any new wounds and did not require additional immunosuppression more than six months after initial debridement.

**Summary:** In current practice, surgical intervention and skin grafting are infrequently employed for fear of worsening PG ulcers or development of similar ulcers at the donor site by pathergy, and if they are used it is often as a last resort. However, given this patient's success as well as another reported case in the literature (Dillingham et Jorizzo, 2019), it is the authors' belief that with a robust perioperative anti-inflammatory regimen and in conjunction with NPWT, there is an opportunity to utilize novel wound matrices and skin substitutes early in the management of PG.

## OnabotulinumtoxinA vs. PrabotulinumtoxinA-xvfs.- a Randomized, Double-blind, Split-face Comparative Study on Time to Onset, Rhytid Appearance and Patient Satisfaction in Forehead and Glabellar Lines

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**Co-Authors:** Natasha Bhatti; Pharm D. Candidate; John Howard, DO; Muneeb Ilyas, DO; Eli Saleeby, MD; Gabriella Vasile, DO; Eduardo Weiss, MD

**Purpose:** To compare the onset to action of onabotulinumtoxinA and prabotulinumtoxinA-xvfs in treating dynamic rhytids of the forehead and glabella. Both onabotulinumtoxinA and prabotulinumtoxinA-xvfs are FDA approved formulations of botulinum toxin A. This is the first study comparing the onset of action, rhytid appearance and patient satisfaction for forehead and glabellar lines of these two toxins.

**Design:** Baseline photographs of resting face, maximal frown lines, and maximal forehead raising lines were taken of each patient in similar lighting. OnabotulinumtoxinA 50 unit vial was reconstituted with 1 mL sterile normal saline and prabotulinumtoxinA-xvfs 100 unit bottle was reconstituted with 2mL sterile normal saline. Patients were randomly assigned to receive both onabotulinumtoxinA and prabotulinumtoxinA-xvfs injected to opposite sides of the face in an alternating sequence from one patient to the next.

Sixteen patients with dynamic rhytids were evaluated and received equal volumes of one toxin to each side of the face into the frontalis muscle and corrugator muscles on right and the other toxin into the frontalis muscle and corrugators on the left. Injection volumes were unique to each patient and their underlying facial characteristics.

Injections into the corrugator muscles and frontalis muscles were done intradermally by a single blind injector. After the initial injection on day 0, patients took digital photographs of themselves daily of glabellar and forehead lines upon maximal exertion using a camera phone for 10 days.

Two blinded evaluators performed subjective assessment using a scale of 1 to 4 of movement, rhytid improvement and onset to action. Each side of the patient's glabella and forehead were evaluated using baseline and post-treatment photographs. Patients completed a satisfaction questionnaire using a scale of 1 to 5 on days 2, 4, 6, 8, 10 to self-assess their satisfaction with the treatment overall and subjective time to onset of the toxin on their right and left sides. Inclusion criteria: Patients with a minimum 6-month history of no botulinum toxin injections into the glabellar region and/or forehead. Patients must have dynamic rhytids in glabella or forehead. Patients with no history of allergic reaction or negative adverse effects from botulinum toxin in the past.

Exclusion criteria: Patients with previous facial cosmetic surgery, permanent fillers, tissue augmentation with silicone. Planning a facial cosmetic surgery procedure during study period. Botulinum toxin injected into glabella or forehead within 6 months. Patients with a history of allergic reaction or negative adverse effects from botulinum toxins. Patients with a history of myasthenia gravis, ALS, any neuromuscular disorder. Patients who are currently pregnant or breastfeeding.

**Findings:** A total of 16 patients between the ages of 28 to 75 years of age met inclusion criteria and were enrolled into the study. Patients underwent split face injection of onabotulinumtoxinA group and prabotulinumtoxinA-xvfs with alternating sides of the face to reduce evaluation bias. Statistical analysis of the onset of toxin, wrinkle appearance, improvement analyzed by blinded evaluators, patient information and patient subjective satisfaction scores is currently pending.

**Summary:** To evaluate the effectiveness, wrinkle appearance, and onset to action of onabotulinumtoxinA vs. prabotulinumtoxinA-xvfs. The study is ongoing currently and will be completed with the results and statistical analysis by the time any revisions or final poster presentation submission is due.

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## Online Availability of Neurotoxin and Injectable Cosmetics

**Author:** Yumeng M. Li, MD, University of Miami/Jackson Memorial Hospital, Miami, FL

**Co-Authors:** Michael Abrouk, MD; Megan Cronin, MD; Fabrizio Galimberti, MD; Brian Morrison, MD

**Purpose:** The number of patients seeking cosmetic procedures, particularly neurotoxins and fillers, is on the rise. Although generally well tolerated and safe, neurotoxins and injectable fillers can have serious complications. There is also a growing trend of self-injecting unregulated neurotoxins and fillers under the guidance of YouTube tutorials and online forums. The authors speculated that a large number of injectable fillers and neurotoxins can be purchased online without a prescription or medical license.

**Design:** Search of online vendors, including eBay and Amazon, was performed between April and June 2019. Within the same time span, a search was performed on the Google search engine using the following keywords combined with the key phrase "for sale": neurotoxins, Botox, Xeomin, Dysport, filler, hyaluronic acid, Sculptra, Radiesse, Juvederm, Restylane, Bellafill, Belotero, acid peel, PDO thread and laser device. The first 60 listings were reviewed from each search and revealed easy consumer accessibility to numerous neurotoxins and fillers without verification of provider status.

**Findings:** Commonly used injectable cosmetic products including fillers and neurotoxins were available for purchase online without prescription or verification of medical license. Intriguingly, some of the products were available from within the United States, although the majority of products were sold from international vendors. This represents an additional risk to patients given that imported products may be counterfeited with unclear short- and long-term risks and consequences. Additionally, most vendors provided detailed description of the product for sale without any indication of possible adverse reactions. Instruments necessary to perform cosmetic procedures were also readily available for purchase online.

**Summary:** A wide variety of medical grade cosmetic fillers and neurotoxins were available for purchase online without prescription or requirement of proof of medical license. This poses a significant potential risk to patients. To improve the safety of patients undergoing cosmetic injections, emphasis should be placed on fortifying government regulations, improving practitioner qualifications and empowering the public to make informed decisions regarding undergoing cosmetic procedures.

## Oral Minoxidil for Androgenetic Alopecia Heart Rate Monitoring with Apple Watch

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**Co-Authors:** Andjela Egger, BSc; Fabrizio Galimberti, MD PhD; Rachel Shireen Golpanian, BA; Yumeng Li, MD; Antonell Tosti, MD

**Purpose:** Low-dose oral minoxidil (OM) is a very popular new treatment option for female pattern hair loss (0.25-1.25mg daily), and more recently for male pattern hair loss (MPHL) and alopecia areata. 1-5 One of the most recent studies showed improvement in 37 patients (90.2%) who were given OM 2.5mg or 5.0mg daily for a minimum of six months, with a low rate of adverse effects (29.3%): hypertrichosis in 10 patients (24.3%), lower limb edema in two patients (4.8%) and shedding in one patient (2.4%); as well as, absence of electrocardiogram (ECG) alterations as opposed to previously found in 10% of patients by Luengarun et al.<sup>3,5</sup> In the author's practice however patients quite often complain of tachycardia and we thought that monitoring pulse rate in a cohort of patients taking the medication can give a better idea of possible cardiovascular effects of low doses of the drug.

**Design:** Our study reports continuous heart rate monitoring with the Apple Watch Series 4 throughout an average treatment duration of three months in four male patients (age 29 to 39 years old) treated with low-dose OM (2.5mg-5mg); 3 patients were treated with 2.5mg daily and 1 patient was treated with 5mg daily.

**Findings:** Throughout treatment there was no difference in resting heart rate, active heart rate, heart rate variability or electrocardiogram. Hypertrichosis involving the arms, hands and trunk were noted in 2 patients taking 5mg and 2.5 mg daily, respectively, confirming systemic absorption of the drug. No peripheral edema or increased shedding at the beginning of treatment was noted.

**Summary:** Previous considerations with oral minoxidil and potential cardiovascular sequelae including tachycardia, pericardial effusion, and pericarditis have been a concern with high dose oral minoxidil. With continuous heart rate monitoring using the Apple Watch we demonstrated that low dose oral minoxidil does not cause appreciable clinical change in resting heart rate, active heart rate or heart rate variability throughout treatment.

## Oral Photoprotection Supplements in the United States

**Author:** Sophia Akhiyat, MD, Medical College of Wisconsin, Milwaukee, WI

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**Purpose:** Oral photoprotective agents, such as vitamin derivatives, dietary animal substances and plant extracts, have introduced a modality of UV protection to the market. For example, polypodium leucotomos fern extract has been formulated into an oral pill and marketed as a UV protective adjuvant strategy in decreasing risk of cutaneous photoaging and photocarcinogenesis. Ingredients in oral photoprotection formulations have demonstrated antioxidant, anti-inflammatory and immunomodulatory properties. Our objective was to systematically review evidence on the efficacy of oral photoprotective agents.

**Design:** Ingredients that we selected for review included those studied by minimal erythema doses or in vivo or ex vivo studies measuring mitigation of UV-induced cutaneous changes. MEDLINE (PubMed) was searched for systematic reviews and randomized placebo-controlled trials evaluating oral polypodium leucotomos, beta-carotene, lycopene, L-glutathione, N-acetylcysteine, nicotinamide, vitamin E and vitamin C.

**Findings:** Polypodium leucotomas demonstrated excellent antioxidant capability, prevention of erythema in UV-exposed human skin, protection against visible light-induced effects, and inhibitory effects on UV-induced cutaneous damage as well as mutagenesis in both mice and humans. High intake of B-carotene decreased UVB-induced erythema in dose- and duration-dependent fashions as well as UVA-induced pigmentation. Lycopene decreased erythema and inhibits HO-1, mtDNA deletion, ICAM-1 expression, MMP-1, polymorphic light eruption, and skin tumor formation. L-glutathione demonstrated inhibitory effects on melanogenesis activity and oxidative stress due to UVB irradiation in mice. N-acetylcysteine demonstrated protective effects in an ex-vivo study of nevi exposed to UV oxidative stress. Nicotinamide demonstrated 29% reduction in actinic keratoses, prevented suppression of Mantoux reactions, and lowered the rate of new non-melanoma skin cancers and actinic keratoses development. Vitamin C monotherapy did not prevent deleterious effects of UV radiation in the skin nor did it impact the level of cutaneous erythema. Vitamin E monotherapy similarly did not reduce in UV-induced cutaneous damage. However, when vitamin C and E were combined, they exhibited a synergistic effect in the increasing of the minimal erythema dose.

**Summary:** Oral photoprotective agents may serve as a promising oral adjunct to other primary photoprotective strategies.

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## PD-1 Inhibitor Associated Bullous Pemphigoid Emerging After Cessation of Therapy

**Author:** Jennifer DeSimone, MD, Director Cutaneous Lymphoma and High Risk Dermatology, Inova Schar Cancer Institute, Great Falls, VA

**Co-Author:** Bhumi Patel, MS-4

**Purpose:** Bullous disorders are a group of skin and mucous membrane diseases caused by the development of autoantigens to varying proteins in the basement membrane zone. Oncologic therapy, utilizing immune modulators, acts by disinhibiting lymphocytes in order to enhance the anti-tumor response to many different malignancies. The mechanism of checkpoint blockade of programmed cell death 1 (PD-1) and programmed cell death ligand 1 (PDL-1) pathways is known to cause autoimmune side effects. Immunotherapy driven attack of cutaneous autoantigens may rarely result in bullous diseases such as bullous pemphigoid, the most frequent bullous dermatosis. Why some patients develop immune related bullous pemphigoid and others do not remains unclear but is thought to be due to an attack of T-lymphocytes on common structural protein antigens (BP180 and BP230) found on both the malignant tumor cells and the basement membrane. When these skin toxicities are severe, it may require interruption of immunotherapy. Most reported cases of bullous disorders associated with anti-PD1 therapy occurred during therapy. There is no published evidence, per our literature review, of post-immunotherapy related bullous pemphigoid. We report a case of bullous pemphigoid arising after the conclusion of therapy with a PD-1 inhibitor, suggesting potentiation of lymphocyte disinhibition resulting in delayed cutaneous autoantigen targeting.

**Design:** A 65-year-old male with recurrent stage IV melanoma, with lung and skin metastases, and a non-V600 BRAF mutation, was treated with 480 mg intravenous Nivolumab (PD-1 inhibitor) given every four weeks. The patient achieved a complete metabolic response on a positron emission tomography (PET) scan, and treatment was subsequently concluded after 14 total monthly doses. Two months after completion of Nivolumab, our patient presented to the clinic with annular erythematous plaques with peripheral vesicles and 1-1.5cm bullae, densely distributed on bilateral upper and lower extremities. He had no prior history of any blistering disorder or cutaneous autoimmune disease.

**Findings:** A skin biopsy was then performed, and a tapering dose of oral prednisone was initiated. Biopsy results revealed a subepidermal blistering process with eosinophilia, consistent with bullous pemphigoid. Oral prednisone was bridged to 0.05% clobetasol ointment. In parallel, 500 mg Tetracycline QID and 500 mg Nicotinamide TID were added. Follow up clinical exam showed synchronous improvement in some lesions and eruption of new lesions. Further radiologic studies showed durable clearance of the melanoma and no evidence of recurrence.

**Summary:** Checkpoint inhibitor therapy is indicated for solid tumors including metastatic melanoma and non-small-cell lung cancer. As a class, the immune modulators are associated with autoimmune side effects, including cutaneous autoimmune phenomenon. We have observed that the anti-tumor response in successful patients persists many months after cessation of therapy. In our case, we present an interesting post-therapy autoimmune side effect manifesting as bullous pemphigoid. His skin improved with standard bullous pemphigoid therapy. This observation highlights the long-term immune modifications resulting from the use of checkpoint inhibitors, and provides insight into proper management of these patients during and after treatment.

## Persistent Development of in Situ and Early Invasive Cutaneous Squamous Cell Carcinomas (cSCC) in Patients on Successful PD1 Inhibitor Therapy for Locally Advanced cSCC

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**Co-Author:** Kelly McCoy, MS-4

**Purpose:** The treatment of locally advanced and metastatic cutaneous squamous cell carcinomas (cSCC) is challenging. In many cases, the burden of disease is beyond what can be managed with surgery and radiation therapy. The medical management of unresectable tumors has historically defaulted to head and neck SCC protocols, resulting in unfavorable outcomes. In September of 2018, the anti-programmed cell death protein 1 (PD-1) antibody, cemiplimab, received an indication for advanced cSCC.

PD-1 inhibitor therapy is becoming the new gold-standard treatment for advanced cSCC through its ability to achieve higher and more durable response rates as well as a more favorable side effect profile compared to chemotherapy and EGFR inhibitors. In a 2019 phase II follow up trial of 59 patients with metastatic cSCC treated with cemiplimab, an objective response rate was seen in 29 (49%; 95% CI 40-63) patients with a median time to response of 1.9 months (range 1.7-9.1). The effects of cemiplimab are durable as median duration of response has yet to be reached at 12-month follow up. In a larger phase II trial published in 2020, cemiplimab treatment had an objective response rate in 34 (44%; 95% CI 32-55) of 78 patients with locally advanced cSCC. Median time to response was 1.9 months (range 1.9-3.7) with a complete response in 10 (13%) patients and partial response in 24 (31%) patients.

As the use of cemiplimab for high risk cSCC increases, an interesting phenomenon has been observed. Among responders, target tumors recede while superficial cSCCs remain unaffected and patients continue to develop new superficial and small invasive cSCCs on treatment. It appears that PD-1 checkpoint inhibition generates an adequate immune response in deep and/or metastatic cSCCs but permits the persistence and new growth of in situ and early invasive cSCCs.

**Design:** Case series of two patients who had persistent in situ and early invasive cSCC despite successful PD-1 inhibitor therapy for their locally advanced cSCC lesions. The patients were followed in an outpatient clinic from 2019 through the completion of their cemiplimab courses, with office visits every three weeks.

**Findings:** Patient 1 is a 72-year-old male who presented to the clinic with multiple squamous cell carcinomas in situ (SCCis) and actinic keratoses (AK) of the head and neck as well as recurrent high-risk SCC (BWH stage T3) of the right ear despite auricectomy and radiation. He received cemiplimab 350 mg IV every three weeks starting in June 2019 for his locally advanced cSCC with impressive reduction in size per photos (photo). However, the cemiplimab course had no effect on the numerous SCCis and AKs of his neck and face which persisted despite one year of treatment and he developed two new invasive SCCs on the left ear(photo).

Patient 2 is an 80-year-old male presenting to the clinic for treatment of recurrent invasive SCC (BWH stage IIB) of the left pre-auricular area after prior excision and radiation as well as a new second lesion of cSCC on the right temple. The left pre-auricular lesion had high-risk features of diameter > 2cm and invasion beyond subcutaneous fat. He began treatment with cemiplimab 350 mg IV every three weeks in March 2019 with complete clinical response in his right temporal and left pre-auricular tumors within three months (photo). However, during cemiplimab treatment in August 2019, he developed a 7 mm keratotic papule on his dorsal left hand (photo). When biopsied, the papule was consistent with SCC-KA subtype, and he developed a second 0.9 cm keratotic papule on his dorsal left hand adjacent to the first in September 2019 (photo). These lesions did not regress and required Mohs surgery. Throughout the next year of PD1 inhibitor therapy, the patient developed two more lesions to the left (SCC- KS subtype) and right (SCCis) nasal

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bridge and another papule on his right nare clinically concerning for SCC/BCC (photo).

**Summary:** Case series of two patients, we observed that PD-1 inhibitor therapy effectively targeted deep dermal, perineural and subcutaneous cSCC tumors but failed to generate immune clearance of superficial cSCC. These observations raise questions about the immunogenicity of cSCC by stage, and the impact that PD-1 inhibition has on the superficial cutaneous microenvironment.

Possible mechanisms for the variation in treatment responses include tumor biology and T cell recruitment factors. A high mutational burden from chronic UV damage makes cSCC very susceptible to immunotherapy with checkpoint inhibitors. Thus, low rates of mutational burden found in early stage SCC may not be sufficient to generate an adequate T cell response. The persistence of in situ and locally advanced cancers could be due to a lack of immunogenic tumor antigens that are present in greater quantities in advanced SCCs. In addition, early stage SCCs may not be sufficiently differentiated from their tissue of origin for sufficient T-cell recognition. T cell recruitment in the subcutaneous tissue is superior to that in the epidermis and upper to mid dermis. This effect could be attributed to local immunosuppressive factors in the more superficial compartments of the skin that are not present in subcutaneous tissue.

## Photodynamic Therapy as Neoadjuvant Treatment for Cutaneous Squamous Cell Carcinoma in Situ

**Author:** Jake X. Wang, MD, Dermatology Resident, Yale New Haven Hospital, New Haven, CT

**Co-Authors:** Sean Christensen, MD, PhD; Nour Kibbi, MD; David Leffell, MD

**Purpose:** Photodynamic therapy (PDT) has been shown to be effective for squamous cell carcinoma in situ (SCCis). Our group recently reported an initial complete response rate of 77.9% for SCCis treated with aminolevulinic acid (ALA) and blue light PDT. Even without an initial complete response, SCCis may still benefit from the use of PDT as neoadjuvant therapy prior to definitive surgery. The purpose of this study is to describe the clinical outcomes of SCCis with incomplete response to PDT.

**Design:** This is a retrospective study of patients with SCCis treated with PDT at a single academic institution from 2013-19. Twenty-three cases without an initial complete response to PDT were identified by medical record review. Four cases were subsequently excluded due to insufficient follow-up data. Patient demographics, lesion features, treatment details and clinical response were obtained from the medical record. Cases were evaluated for partial response, defined as a reduction of at least 30% in lesion diameter or documentation of partial response based on clinical description. Treatments following PDT were reviewed, and initial lesion size as well as defect size after definitive surgery were recorded.

**Findings:** Nineteen cases without initial complete response to PDT were analyzed. Median age was 74 years (range 55-94). Lesions varied from 0.6 to 7.0 cm in diameter with a median of 2.0 cm. Six lesions were treated with a single PDT session, nine with two sessions, and four with three sessions. Across all treatments, median ALA incubation time was 2.0 hours (range 1.0-16.0). Thirty-five treatments were performed with blue light and one was performed with red light illumination. Thirteen of 19 (68.4%) lesions had a partial response to PDT and six had no response. Among immunosuppressed patients, three of six (50%) had partial response. Median follow-up duration after PDT was 37 months.

All cases received additional definitive treatment after PDT, including Mohs surgery (n=9), electrodesiccation and curettage or shave excision (n=4), topical 5-fluorouracil or imiquimod (n=3), and cryotherapy (n=3). Complete response after definitive treatment was confirmed in 18 of 19

cases (94.7%). One case treated with 5-fluorouracil was lost to follow-up. Of 13 SCCis cases that were treated surgically after PDT, 38.5% (5/13) had a surgical defect that was smaller in diameter than the initial clinical lesion. The average decrease in maximum diameter in this group was 50.4% (range 30.0-82.9% decrease), and all of these cases had a partial response to initial PDT. In 3 cases, partial response to PDT was initially documented and definitive treatment was deferred; progression of disease was subsequently observed and treated with Mohs surgery 13-19 months after initial PDT. All 3 cases had surgical defects larger than the original clinical lesions (increase in diameter 75-220%).

**Summary:** Among SCCis without a complete response to PDT, a majority exhibited partial response and were successfully treated with subsequent surgery. Neoadjuvant PDT prior to definitive surgery for SCCis may facilitate simpler surgical procedures with decreased morbidity compared to surgery alone. This may be particularly beneficial for patients with broad lesions of SCCis or those who are poor candidates for excisional surgery. However, delayed surgical treatment was associated with increased surgical defect diameter in three cases, suggesting the need for close clinical monitoring.

## Picosecond Laser Toning for the Treatment of Erythema Dyschromicum Perstans

**Author:** Shraddha Desai, MD, Director of Cosmetic and Surgical Dermatology, Dermatology Institute, Naperville, IL

**Purpose:** Erythema Dyschromicum Perstans (EDP) is a poorly understood condition with a significant psychosocial impact. Unfortunately, treatments are limited with poor efficacy. Picosecond lasers are now commonly used for the treatment of benign pigmented lesions and as such was used to treat a patient with EDP with good and sustained clearance of pigment.

**Design:** A 56-year-old female patient with biopsy proven EDP underwent a series of 1064nm picosecond laser toning treatments spaced 4-6 weeks apart to the face and neck after a successful test spot. Photographs were taken at each visit to document improvement.

**Findings:** The patient had significant clearance of pigment on her face and neck, which was sustained at one year. She had mild erythema post-treatment without significant adverse effects. She was very happy with her results and referred her son, who has similar findings for treatment.

**Summary:** Picosecond laser toning is a safe and effective method for the improvement benign pigmented lesions including EDP. It offers another therapeutic option for this rare condition which can negatively impact self-esteem.

## Polymyxin B-induced Skin Hyperpigmentation

**Author:** Yumeng M. Li, MD, University of Miami/Jackson Memorial Hospital, Miami, FL

**Co-Author:** Fabrizio Galimberti, MD, PhD

**Purpose:** Polymyxin B (PMB) is a potent antibiotic targeting gram-negative bacteria, and is associated with serious side effects including nephrotoxicity, neurotoxicity, and hypersensitivity reactions.

PMB is a therapeutic option for the management of infections caused by multi-drug resistant (MDR) bacteria and used in combination with other antibiotics when options are limited.

**Design:** A case presentation and review of literature will be presented.

**Findings:** We describe the case of a 30-year-old female patient with a complex medical history who underwent a multi-visceral transplantation complicated by intra-abdominal infections. Subsequently, patient developed diffuse skin darkening after initiation of intravenous PMB for treatment of MDR *Pseudomonas aeruginosa*. Her skin hyperpigmentation was most prominent on her face and forearms.

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Hyperpigmentation peaked at around two weeks following PMB initiation and was discontinued after three-weeks when the possibility of PMB hyperpigmentation was raised and other causes were ruled out. Skin biopsy showed hypermelanosis of the basal layer and melanin deposition in the dermis. Overall clinical picture was consistent with PMB-induced hyperpigmentation. The patient demonstrated some improvement in discoloration within 4 weeks of PMB discontinuation.

**Summary:** We report here a case of PMB-iH along with clinical course, dermoscopy findings, and histological findings. Given the resurgence in PMB usage to treat MDR bacteria, clinicians should be aware of this potentially long-lasting adverse reaction.

## Postoperative Outcomes of Localized Skin Flaps Used in Adult Patients of Oncologic Reconstructive Surgery of the Cutaneous Upper Lip: A Systematic Review

**Author:** Mathew N. Nicholas, MD, Dermatology Resident, University of Toronto, Toronto, Ontario, Canada

**Co-Authors:** Airiss Chan, BSc; Daniel Eisen, MD, DABD; Kaitlin Fuller, MLIS; Jocelyn Jia, BS

**Purpose:** Our study is the first to compare the complications as well as functional and cosmetic outcomes of the currently published reconstructive techniques related to oncological reconstruction of the upper lip.

**Design:** A comprehensive literature search based on PRISMA guidelines using subject headings, keywords, and textwords was conducted by a health sciences librarian on Dec. 14, 2019. Based on the search parameters, 2,958 unique articles were screened for inclusion. Two reviewers independently reviewed all studies for inclusion and exclusion criteria and 15 final articles were included for data extraction. The articles were additionally reviewed by two reviewers for bias based on the ROBINS-1 criteria.

**Findings:** The included articles examined complications as well as functional and cosmetic outcomes of Ergotrid flaps, VY advancement flaps, rotation flaps, island pedicle flaps, Zisser flaps, melolabial rotation flaps, Karapandzic flaps, orbicularis oris musculomucosal flaps, subcutaneous pedicle flaps, alar crescent flaps, and propeller facial artery perforatory flaps. The complications reported for each flap when available included wound infection, hemorrhage / hematoma, wound dehiscence, tumour recurrence and flap necrosis. The functional outcomes reported included salivary continence and microstomia and aesthetic outcomes reported included patient satisfaction and need for revision surgery. Overall, given the inconsistent reporting outcomes, comparison of different flaps reported in literature was challenging. Complications and functional impairment were generally low for all flaps discussed in literature; however, poorer cosmetic outcomes were noted for VY advancement flaps. Bias for the included articles were generally high due to their lack of controlling confounding variables, non-randomization when selecting patients, and their inconsistent and selective outcome measuring and reporting.

**Summary:** Upper lip anatomy is functionally and cosmetically complex. Our study is the first to compare the complications as well as functional and cosmetic outcomes for flaps used for this anatomical subunit. Our results provide dermatologic surgeons an overview of reported flaps in literature and key outcomes for each flap that may provide support for or against using a specific flap for a specific patient needing oncologic reconstructive surgery of the cutaneous upper lip.

## Primary Dermal Melanoma: A Review

**Author:** Michael Abrouk, MD, Aesthetic & Procedural Chief Dermatology Resident, University of Miami Frost Department of Dermatology & Cutaneous Surgery, Thousand Oaks, CA

**Co-Authors:** Jacob Beer, BS; Andjela Egger, BS; Teo Soleymani, MD; Natalie Williams, BS

**Purpose:** Primary dermal melanoma (PDM) is a rare type of melanoma that originates in the dermis and/or subcutaneous fat with no involvement of the epidermis. It falls under the category of solitary dermal melanoma, which presents as firm, skin-colored nodules. Solitary dermal melanomas can arise from: 1) a primary melanoma with a regressed epidermal component, 2) distant subcutaneous metastasis or regional in-transit metastases from a primary lesion at an occult or regressed primary site, or 3) a true PDM. This literature review describes the current understanding of PDM from diagnosis to prognosis, with the goal of ultimately improving the management of this challenging condition.

**Design:** A literature review was conducted by searching various databases (PubMed, Embase, Ovid MEDLINE, and GoogleScholar) to examine clinical studies related to PDM.

**Findings:** PDM is a rare subtype of melanoma confined to the dermis without an epidermal component. The overall incidence of these tumors is less than 1% of melanomas, although this may be an underestimation due to the conventional classification of these lesions as in-transit metastases from an unknown primary or distant skin metastasis. Approximately 1 in every 10 lesions of dermal melanomas labeled 'unknown primary' is estimated to be a PDM. Although malignant transformation of dermal melanocytic lesions is rare, blue nevi, dermal melanocytoses and particularly nevus of Ota are linked to the development of PDM. PDM typically presents as firm, skin-colored nodules, and lesions are often misdiagnosed as they do not follow the classic ABCDE criteria of standard cutaneous melanomas. In addition, they may be morphologically impossible to distinguish from cutaneous metastatic melanoma (CMM) or other types of cutaneous melanomas. PDMs are significantly more likely to arise in younger individuals (mean age 51), have an associated nevus and have a Clark level greater than III when compared to CMM. Histologically, PDMs are significantly more likely to have a lower mean mitotic level, as well as lower levels of staining for p53, Ki-67, cyclin D1, and D2-40 compared to CMM. At a molecular level, PDM can be further differentiated from CMM with gene expression-profiling. PDMs are significantly more likely to demonstrate class I (low risk) genetic signatures compared to CMMs. In contrast to non-primary dermal melanomas, PDMs have a relatively excellent prognosis. The 5-year survival rate for PDM is estimated to be between 73-100%. This prognosis is more favorable than dermal melanoma secondary to in-transit metastases or distant skin metastases. However, it is similar to the overall prognosis of stage II primary melanoma. PDM should be treated as any early stage cutaneous epidermal melanoma. Early surgical management with wide local excision, sentinel lymph node biopsy and clinical follow-up are adequate therapeutic measures.

**Summary:** While rare, PDM is clinically challenging with regards to both diagnosis and management. Distinguishing PDM from CMM is crucial in determining treatment, prognosis and level of surveillance. Future research to help differentiate this subtype from its mimickers is needed, particularly within the realm of molecular testing as it may also affect prognosis. Ultimately, larger, prospective studies are warranted to develop management algorithms for PDM.

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## Prospective Clinical Trial of the Latest Generation of Noninvasive Monopolar Radiofrequency for the Treatment of Facial and Upper Neck Skin Laxity

**Authors:** Kunal Angra, MD, Cosmetic Laser Dermatology, San Diego, CA

**Co-Authors:** Marwan Alhaddad, MD; Monica Boen, MD; Mitchel Goldman, MD; Elika Hoss, MD; Ramya Kollipara, MD; Michael B. Lipp, DO; Douglas Wu, MD, PhD

**Purpose:** Aging of the face and upper neck is a multifactorial process that causes changes in all layers of the skin, subcutaneous tissue and deeper structures. Gradual degradation of dermal structural integrity over time manifests clinically as excessive skin laxity. Traditional modalities to address this concern include laser resurfacing and surgery. However, the risks associated with these procedures and the accompanying recovery period can be deterrents. As such, the demand for non-invasive skin tightening has risen due to the promise of safety, efficacy, and minimal downtime. This represents the first study to evaluate Thermage FLX (Solta Medical, Pleasanton, CA), a fourth-generation noninvasive monopolar radiofrequency device with a larger treatment tip and a new vibrating hand piece for improved efficiency and patient comfort, respectively.

**Design:** Twenty subjects were enrolled in this prospective, single-center clinical trial. After satisfying all inclusion / exclusion criteria, baseline standardized photographic documentation was obtained with the 3-dimensional Canfield Vectra system. The face and upper neck were treated with a single monopolar radiofrequency treatment. Follow-up evaluation was conducted at 1, 3, and 6 months post-treatment by an expert investigator. Canfield Vectra was also used to obtain follow up photography.

**Findings:** Preliminary results of all 20 patients at one and three month follow up visits show statistically significant improvement of the Investigator Fasil Skin Laxity Grading (FLR) score for cheekbone roundness, melolabial folds, jowls, platysma bands, and horizontal folds. Additionally, the Investigator Global Aesthetic Improvement Score was 3.20 (improved) and 3.15 (improved) at 1 and 3 month follow up visits, respectively. Average subject pain score was 6.15 (0-10 scale; 10-severest) during the procedure, and immediate post-procedure adverse effects were limited to trace/mild erythema and trace edema.

**Summary:** Based on preliminary results at 1 and 3 month follow up visits, the latest generation monopolar radiofrequency device significantly improved midface, lower face and upper neck skin laxity based on the FLR score. Investigator Global Aesthetic Improvement Score showed overall improvement as well. Additionally, treatments were well-tolerated and immediate post-procedure adverse effects were rare, temporary and benign.

## Quantitative Analysis of Frozen Section Histology as a Quality Control Measure in Mohs Micrographic Surgery

**Author:** Michael J. Davis, MD, Dermatology Resident, Dartmouth Hitchcock Medical Center, Lebanon, NH

**Co-Authors:** Matthew LeBoeuf, MD PhD; Jessica Wilson, MD

**Purpose:** To implement our previously described methodology for quantitative analysis of frozen section histology as a quality control metric for a histotechnician.

**Design:** The histotechnician watched the Mohs surgeon gross fifty pieces of tissue from Mohs Micrographic Surgery (MMS) cases. Subsequently, the histotechnician independently grossed twenty-four pieces of tissue. The tissue was embedded sectioned, and stained by another histotechnician noting depth of sectioning for each section placed on the slide. The Mohs surgeon reviewed the tissue sections, noting whether sections were complete or incomplete. These values were compared to two hundred eighteen tissue blocks grossed by the Mohs surgeon.

**Findings:** The histotechnician achieved complete sections at an average depth of 281µm and 4.2 sections compared to the Mohs surgeon's depth of 285 µm and 4.0 sections. Consistent with the outcomes from our prior study, pieces of tissue less than 1cm in size achieved complete sections at a decreased depth compared with pieces of tissue measuring 1-2 cm. Our previously described methodology to analyze frozen section histology can be used to qualitatively ensure competency in tissue grossing.

**Summary:** Histotechnology is a critical component of MMS and allows for the unique combination of high cure rates and healthy tissue preservation. Yet, multiple previous studies have described differences in training and process among histotechnicians, and there is currently no standardized training or certification required of a Mohs histotechnician. In our previous study, we demonstrated a methodology based on measuring depth and number of tissue sections that was able to statistically differentiate between experienced histotechnicians. In this study, we implemented this methodology to quantitatively confirm the competency of a histotechnician at tissue grossing by identifying no statistically significant difference in measured outcomes compared to the previously measured lab standard. The results from this study support our methodology as a potential quality control metric that can be used to evaluate the performance of Mohs Fellows and histotechnicians throughout the various steps of the tissue sectioning process.

## Rare Case of Extraocular Sebaceous Carcinoma Treated with Mohs Micrographic Surgery in a Patient with Lynch/Muir-Torre Syndrome

**Author:** Oben Ojong, DO, Dermatology Resident, Larkin Community Hospital Palm Springs Campus, Miami, FL

**Co-Authors:** Hamza Bhatti, DO; Eli Saleeby, MD

**Purpose:** Sebaceous carcinomas (SC) are rare adnexal neoplasms with incidence of 0.23 per 100,000 per-years. Extraocular sebaceous carcinomas make up about 25% of SC. Due to the rarity of extraocular sebaceous carcinomas, there is a lack of standardized treatment guidelines for the management of these tumors in the literature. The goal of study is to show that Mohs Micrographic Surgery (MMS) is a superior treatment option for localized well differentiated extraocular sebaceous carcinomas.

**Design:** Case report on a rare case of localized extraocular sebaceous carcinoma on the left cheek, treated with MMS; in a patient with family history of Lynch/Muir-Torre syndrome. Additionally we did a pubmed search to perform a retrospective review of literature on patients with extraocular sebaceous carcinoma treated with MMS vs wide local excision.

**Findings:** A recent study based on SEER data from 2001-2012 with 58 Muir-Torre Syndrome (MTS) patients, revealed that MTS is associated with increased aggressiveness of sebaceous carcinomas. However, SC did not affect overall mortality in these patients. This finding was consistent with other studies in the literature. Retrospective literature review and patient data from the National Cancer Database show that extraocular sebaceous carcinomas occur in seventh decade with a male predominance. Most of these tumors were less than 10mm and were determined to be of head and neck origin. Wide local excision with 5-6mm margins was the most widely used treatment, followed by Mohs Micrographic Surgery following suite. 565 extraocular sebaceous carcinomas of the head and neck have been described in literature, making up about 25% of sebaceous carcinomas. Of these, 148 were treated with MMS. A multivariate cox regression analysis showed Mohs Surgery was associated with overall longer survival than surgical excision with negative margins in localized sebaceous carcinoma. Wide local excision of extraocular SC has reported local recurrence rates of 4% to 37% and nodal metastatic rates of 3% to 28%. Distant metastasis occurs in 2% to 10% of cases, and cancer-specific mortality occurs at a reported rate of 0% to 30%. By contrast, sebaceous carcinoma cases treated with MMS reportedly recur locally in 11% to 12% of tumors and metastasize regionally in 6% to 8% of cases.

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Most localized extraocular sebaceous carcinomas are well differentiated with a lower rate of regional lymph node metastasis compared to the ocular variant, though metastasis have been reported in both. Therefore, it is suggested that sentinel lymph node biopsy only be performed when there is clinical lymph node involvement in extraocular sebaceous carcinomas. Sebaceous carcinomas are considered to be radio resistant therefore the use of adjuvant radiation therapy is controversial. Radiation therapy has been used successfully in one case of extensive extraocular sebaceous carcinoma. Chemotherapy may be attempted with metastasis albeit being controversial.

**Summary:** Mohs micrographic surgery is superior to wide local excision of localized extraocular sebaceous carcinomas in patients with Muir-Torre/Lynch syndrome. We therefore recommend MMS due to the superior rates of survival, decreased recurrence rate, tissue sparing and better cosmesis. Patients with MTS/Lynch syndrome should be followed up closely for internal malignancies.

## Rare Clinical Presentations of Merkel Cell Carcinoma; Two Case Reports and a Review of Literature

**Author:** Attiya Haroon, MD, Resident, Rutgers/RWJMS, Freehold, NJ

**Co-Authors:** Ann John, MD; Varun Ranpariya, BS; Cindy Wassef, MD

**Purpose:** To report rare clinical presentations of Merkel cell carcinoma and review of literature to summarize the tools that may aid in earlier diagnosis of MCC as well as implications of primary tumor location in prognosis. Merkel cell carcinoma (MCC) is a rare and aggressive neuroendocrine skin tumor that typically presents as an erythematous or violaceous nodule in elderly white males with an extensive history of sun exposure. MCC tends to favor sun-exposed areas on the head or neck, but has also been described on the extremities and trunk. Although MCC is rare, the total incidence in the US is increasing. It is projected to exceed 2800 cases/year in 2020 and will likely rise to 3250 cases/year in 2025.

**Design:** Herein, we report two rare clinical presentations of MCC occurring on the extremities and literature review.

**Findings:** Clinical exam was consistent with cyst vs other and biopsy/excision was performed. Histopathology with immunohistochemistry analysis (CK20, synaptophysin, CD56) later confirmed the diagnosis of MCC. We summarize tools from literature review that may aid in earlier diagnosis of MCC as well as implications of primary tumor location in prognosis. Guidelines for diagnosis and prognosis involve skin and lymph node examination, biopsy (suspicious lesion and sentinel lymph node), histological assessment, imaging and consultation with a multidisciplinary tumor board.

**Summary:** MCC is an aggressive malignancy with a poor prognosis and a high risk of local recurrence and nodal metastasis. It is imperative to include MCC in differential diagnosis of sudden and rapidly growing cyst/nodule in order to manage the disease at an early stage and potentially improve prognosis.

## Safety, Pharmacodynamic Response and Treatment Satisfaction with OnabotulinumtoxinA 40 U, 60 U and 80 U in Subjects with Moderate to Severe Dynamic Glabellar Lines

**Author:** Sue Ellen Cox, MD, President, Aesthetic Solutions, Chapel Hill, NC

**Co-Authors:** Mitchell Brin, MD; Suzanne Bruce, MD; Steven Fagien, MD; Dee Anna Glaser, MD; Edward Lain, MD, MBA; Xiaofang Lei, PhD; Corey Maas, MD; John Maltman, PhD; Melanie Palm, MD, MBA; Sara Sangha, PhD; Steven Yoelin, MD

**Purpose:** OnabotulinumtoxinA (onabotA) 20 U reduces glabellar line (GL) severity at maximum frown for up to 4 months. Small dose-ranging studies with limited sample sizes have suggested that >20 U doses

may increase efficacy and duration of response for GLs. The safety, pharmacodynamic response, and treatment satisfaction with onabotA doses >20 U were evaluated in subjects with moderate to severe dynamic GLs.

**Design:** A 48-week, multicenter, double-blind, randomized, placebo-controlled, parallel-group study compared the safety and pharmacodynamic response of single onabotA 40, 60, and 80 U doses with the approved 20 U dose and placebo in female subjects aged  $\geq 18$  years with investigator-assessed moderate or severe dynamic GLs on the Facial Wrinkle Scale (FWS). The primary efficacy endpoint was the percentage of subjects with investigator-assessed  $\geq 1$ -grade FWS improvement from baseline at maximum frown (responder rate) at week 24. Secondary endpoints included estimated median time to return to baseline GL severity (median duration of response) and proportion of responders reporting "mostly" or "very satisfied" on the Facial Line Satisfaction Questionnaire (FLSQ). Treatment-emergent adverse events (TEAEs) were assessed.

**Findings:** Of the 226 subjects in the modified intention-to-treat population, 88.9% were white, with a mean (SD) age of 48.0 (12.2) years. The placebo and onabotA groups had comparable overall baseline demographic characteristics, including baseline GL severity at maximum frown. Utilizing a constant injection volume of 0.05 mL per site across all onabotA doses, investigator-assessed responder rates for placebo and onabotA 20, 40, 60, and 80 U at 24 weeks were 0%, 16.0%, 32.0%, 30.6%, and 38.5%, respectively, with statistically significant ( $p < .05$ ) between-group differences favoring onabotA 40 and 80 U vs 20 U. Median duration of response was also longer for all higher onabotA doses ( $\geq 24.0$  weeks) vs 20 U (19.7 weeks), with statistically significant ( $p < .05$ ) between-group differences favoring higher onabotA doses vs 20 U at week 24. FLSQ item scores demonstrated high subject satisfaction, with statistically significant ( $p < .05$ ) between-group differences favoring higher onabotA doses vs 20 U at week 24. TEAE incidence and severity did not show an onabotA dose-response effect. One subject each experienced mild eyelid ptosis (80 U group) and eyebrow ptosis (20 U group); both events resolved without sequela.

**Summary:** This pharmacodynamic dose-response study showed increased duration of treatment response and patient-reported satisfaction with escalating onabotA doses compared with 20 U for treatment of moderate to severe GLs. There were no dose-related safety signals.

## Scar Measurement with Augmented Reality Mobile Technology

**Author:** Arjun Dayal, MD, Resident Physician, University of Chicago Medicine, Chicago, IL

**Co-Authors:** Daniel Eisen, MD; Victoria Lee, PhD

**Purpose:** Several subjective and objective modalities have been developed to characterize scarring and assess treatment response. Objective measures of scar surface area include planimetry and 3D imaging, but these techniques are cumbersome or require specialized equipment. Augmented reality (AR) systems such as ARKit (Apple Inc., Cupertino, CA) can process visual input from a camera in real time and perform a variety of computational tasks, including measuring the length and surface areas of irregular objects like scars. The objective of this study is to assess the accuracy and reliability of scar surface area and length measurements using a mobile application that utilizes AR technology.

**Design:** Three one-dimensional (1D) and two two-dimensional (2D) shapes were drawn with a skin marking pen on various areas of the "IL Duomo" head model by SimSkin (Chicago, IL) to simulate surgical scars of various sizes. We selected several sites on the model to test the performance of the application in flat, convex, and concave areas. Several dots were placed around the simulated scars to add texture to the otherwise featureless surface of the model's skin.

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Length and surface area measurements for the simulated scars were made in quintuplicate using the "Tape Measure" application (Level Labs, LLC) by three trained operators on an iPhone 11 Pro. To avoid biasing the measurements, the operators were blinded to the actual dimensions of the simulated scars until the measurements were completed. The operators were allowed to redo measurements that were obviously wrong using feedback provided by the application's interface.

The true lengths of the 1D scars were determined by measurement with a ruler. The true surface areas of the 2D scars were calculated using geometric formulas of the area of a right triangle and circle. Percent and absolute errors were calculated by comparing the mean of the measurements to the true lengths and surface areas.

## Scar Tissue That I Wish You Saw: Patient Expectations Regarding Scar Treatment

**Author:** Abigail Cline, MD, PhD, Resident, New York Medical College Department of Dermatology, Brooklyn, NY

**Co-Authors:** David Ginsberg, MD; Bijan Safai, MD

**Purpose:** The emotional impact of scarring is underestimated by the medical community. Patients may benefit from cosmetic or functional improvement of hypertrophic, keloid, or disfiguring scars. What role patients' expectations play in electing specific treatments remain to be seen. A better understanding of expectations may aid dermatologists in providing beneficial and satisfying care.

**Design:** We analyzed 187 responses to a 25-question survey evaluating patient expectations for medical treatment of scars and willingness to comply with therapy. Patient willingness was measured on a 1-5 Likert scale.

**Findings:** The most common scar symptoms were embarrassment, redness, and tenderness. Respondents' most anticipated results from treatment included reduction, removal, and softening. They were most willing to use topical therapy and least willing to undergo surgery. Responses varied significantly by gender, age, and race. Women reported embarrassment more often than men, and were more willing to use topicals than men. Younger respondents reported more symptoms and were more likely to have already seen a physician for treatment of their scars. Older respondents expected scar reduction as a result of their care, their younger counterparts expected removal. Compared with Caucasians, Asian respondents had more associated symptoms, were more likely to have seen a physician, and were more willing to undergo invasive therapies including laser, injections and surgery.

**Summary:** A better understanding of what therapies patients are willing to attempt, and their expectations from those therapies could help improve compliance and satisfaction when treating scars.

## Skewed Distribution of Medical Spas and Aesthetic Physician Practices: A Cross-sectional Market Analysis

**Author:** Jordan V. Wang, MD, MBE, MBA, Cosmetic Dermatologic Fellow, Laser & Skin Surgery Center of New York, NY

**Co-Authors:** Christian Albornoz, MD; Paul Friedman, MD; Claire Noell, MD; Nazanin Saedi, MD; Christopher Zachary, MBBS, FRCP

**Purpose:** Medical spas are cosmetic facilities that can offer many minimally invasive and energy-based treatments that were once traditionally performed at physician-based practices. As medical spas continue to proliferate, there has been a lack of standardized regulations, which has resulted in strikingly disparate regulatory practices across state lines. In a rapidly changing field, it may benefit practitioners to better understand the market in which they practice. Our study offers a current cross-sectional analysis of the cosmetic market for medical spas and aesthetic physician practices in the most populous cities in the United States.

**Design:** Data collected in November 2019 from medical spas, dermatologic surgeons and plastic surgeons in the 30 most populous cities in the United States. Descriptive ratios were calculated, including numbers per 10,000 persons of the city's total population, and various local factors were examined.

**Findings:** The top 5 cities by population were New York, Los Angeles, Chicago, Houston and Phoenix. The 5 cities with the greatest number of medical spas were New York (374), Houston (297), Los Angeles (227), Las Vegas (211) and Chicago (166). The 5 cities with the greatest number of aesthetic physicians were New York (365), Houston (135), Chicago (122), Dallas (106) and San Antonio (79). Population size had significant relationships with number of medical spas ( $p < 0.000001$ ) and aesthetic physicians ( $p < 0.000001$ ).

For number of medical spas per 10,000 persons, the top 5 cities were Las Vegas (3.27), Denver (1.56), Austin (1.48), Houston (1.28) and San Diego (1.09). For number of aesthetic physicians per 10,000 persons, the top 5 cities were Boston (1.02), San Francisco (0.83), Dallas (0.79), Washington D.C. (0.71) and Austin (0.69). For ratio of medical spas to aesthetic physicians, the top 5 cities were Las Vegas (9.17), Denver (3.86), San Jose (3.65), Los Angeles (3.39) and Phoenix (2.48). The mean ratio of medical spas to aesthetic physicians was 1.82. In total, 73.3% of cities had more medical spas than aesthetic physicians. When comparing by region, cities in the West had the greatest mean number of medical spas per 10,000 persons (1.17) followed by the South (0.73), the Northeast (0.45) and the Midwest (0.33). For aesthetic physicians, the Northeast had the greatest mean number per 10,000 persons (0.62) followed by the South (0.52), the West (0.44) and the Midwest (0.38). Median household income had no significant relationship with either number of medical spas ( $p = 0.4498$ ) or aesthetic physicians ( $p = 0.3210$ ).

**Summary:** In the United States, certain cities have experienced an unequal distribution and impact of medical spas. This may affect consumer decision-making for the practice setting that they select, which could ultimately impact patient safety and outcomes.

## Smoke Evacuation in Dermatology Offices during the COVID-19 Era: A Cross-sectional Survey

**Author:** Perry Hooper, MD, Dermatology Resident, Indiana University School of Medicine, Indianapolis, IN

**Co-Author:** Syril Keena Que, MD, MPH

**Purpose:** The associated hazards of surgical smoke have been well documented. However, there is limited data about smoke evacuation practices among dermatologists. Such information is especially relevant at this time, as dermatologic procedures often involve exposure to aerosolized particles, which can carry viruses like COVID-19.

**Objective:** Examine the barriers underlying historically low utilization of smoke protection.

**Design:** An online survey was distributed to residency programs via the Association of Dermatology Professors (ADP) listserv. Data was analyzed using SAS 9.4.

**Findings:** Sixty-one (71.8%) dermatologists reported use of smoke evacuators during < 50% of dermatologic procedures. Respondents with more experience and greater case volumes tended to report more frequent use of smoke evacuation, though results were not statistically significant ( $p = 0.229$  and  $p = 0.100$ , respectively). The most commonly reported barriers to smoke evacuation were limited staffing (63.5%), set-up time (61.2%), cost (51.8%), and lack of training (44.7%). Sixty-seven (70.8%) respondents reported that a hands-free evacuator could potentially increase the use of smoke evacuation in their practices.

**Summary:** Smoke evacuation remains low among dermatologists despite the known risks. Identifying the reasons for low compliance and receptiveness to potential solutions is a step toward improving safety practices relating to smoke evacuation.

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## Subjects Are Highly Satisfied with Two Treatments of Abobotulinumtoxin A Year: Results from Multi-center, Year-long, Longitudinal Study

**Author:** Ava T. Shamban, MD, Santa Monica, CA

**Co-Authors:** Joel Cohen, MD; Carolyn Jacob, MD; Kian Karimi, MD; Corey Maas, MD; Joel Schlessinger, MD

**Purpose:** Real-world re-treatment intervals for botulinum toxins vary. Observational studies with Abobotulinumtoxin A (ABO) have shown that median re-treatment periods range from 5 to 6.5 months and subject satisfaction with treatment remains high throughout, suggesting this may be a preferred treatment interval for ABO. The purpose of this study was to evaluate subject satisfaction with a twice-yearly re-treatment period.

**Design:** This open-label, multi-center, interventional study evaluated subject satisfaction following two on-label injections of 50U of ABO in the glabellar lines at baseline (T1) and 6 months (T2) with an optional 12 month re-treatment. The primary endpoint was subject satisfaction at 12 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).

**Findings:** Ninety-five percent of subjects (N= 120) were 'highly satisfied' or 'satisfied' with two treatments of ABO a year at study end. For both treatment cycles, subjects were happier with their glabellar lines' appearance and their overall psychological wellness at 1 month post-treatment and results continued to be improved from baseline at 6 months. Subjects reported a median onset of effect of 2 days for both treatments, with approximately 30% responding at 24 hours. A  $\geq 1$ -grade improvement from baseline in investigator-assessed GLSS was reported at 6 months for 37% (T1) and 50% (T2) of subjects.

**Summary:** These results indicate that almost all subjects are satisfied with ABO treatment every six months as evidenced by high satisfaction scores, overall psychological wellness, and clinical improvement.

## Successful Clinical Application of Intratumoral Injection of Influenza Vaccine to Sensitize Metastatic Cutaneous Squamous Cell Carcinoma to Cemiplimab and Radiotherapy

**Author:** Fan Di Xia, MD, Resident Physician, Harvard Combined Dermatology Residency Training Program, Boston, MA

**Co-Authors:** Emily Ruiz, MD, MPH; Ann Silk, MD, MS

**Purpose:** Injection of United States (US) Food and Drug Association (FDA)-approved unadjuvanted seasonal influenza vaccine has been shown in mouse models to reduce melanoma tumor growth and sensitize resistant tumors to checkpoint inhibitors. Herein, we present to our knowledge the first report of a human response to intratumoral injection of influenza vaccine to sensitize a metastatic cutaneous squamous cell carcinoma to cemiplimab and radiotherapy.

**Design:** Clinical case report.

**Findings:** A case of a 59 year-old male with a history of long-term immunosuppression presenting with metastatic cutaneous squamous cell carcinoma refractory to radiation and immunotherapy with cemiplimab. Given progression of disease despite therapy, the patient was given intratumoral injections of the FDA-approved Flubok Quadrivalent recombinant influenza vaccine. The patient received 2 cycles of intratumoral Flubok vaccine in May and June 2019 and resumed radiotherapy and cemiplimab therapy. PET-CT scan in November 2019 showed decreased metabolic activity, and the most recent PET-CT scan in 2020 showed resolution of disease activity, with clinical regression of the tumor.

**Summary:** To our knowledge, this is the first report of a human response to intratumoral Flubok vaccination, which turned a "cold" tumor to a "hot" tumor that became more responsive to combination radiotherapy

and cemiplimab with remarkable resolution of disease. Compared to other tumoral injections such as Talimogene laherparepvec (TVEC), injection of the influenza vaccine is much less expensive. The influenza vaccine is priced at less than US \$100, while the cost for a course of TVEC is approximately US \$65,000. Formal studies are needed evaluating the clinical efficacy of intratumoral injection of Flubok Quadrivalent recombinant influenza vaccine in CSCCs as well as other tumors.

## Successful Treatment of Mons Pubis and Inguinal Crease Hyperhidrosis with Onabotulinum Toxin A

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**Co-Authors:** Sara Perkins, MD, Mariam Totonchy, MD

**Purpose:** Hyperhidrosis of the groin can be a significant source of embarrassment and can affect the personal and professional lives of patients. Studies have shown that Botulinum toxin A is safe and effective for the treatment of axillary, palmar, and plantar hyperhidrosis. Several case reports and case series have also shown efficacy with its use in the inguinal folds, sacral cleft, and intergluteal cleft, however there are no reports of treatment of mons pubis hyperhidrosis with neurotoxin. We present a case of a young woman, successfully and safely treated with Onabotulinum toxin A for severe mons pubis and inguinal fold hyperhidrosis.

**Design:** Single case report of Onabotulinum A use in the suprapubic region, restricted to the superior mons pubis, and inguinal folds for successful treatment of hyperhidrosis.

**Findings:** A 21-year-old, otherwise healthy nursing student, presented for evaluation and treatment of generalized hyperhidrosis. She was able to control her axillary symptoms with anti-perspirants; however, the hyperhidrosis of her groin was severe and complicated by malodor. This caused her significant social distress and interfered with her ability to attend class. She had to change her undergarments 3-5 times day due to saturation through her clothing. She failed treatment with 20% aluminum chloride, propantheline bromide, and glycopyrrolate. The patient's most bothersome sites were in her superior mons pubis and bilateral inguinal folds, with active perspiration noted on initial exam. A 15 x 3-cm grid was drawn in each inguinal crease, and a 13 x 5-cm grid was drawn over the superior half of the mons pubis. A total of 200U of Onabotulinum toxin A were diluted in 8mL of bacteriostatic 0.9% saline. Topical lidocaine-prilocaine was applied 1 hour, followed by injection of 150U into the suprapubic and inguinal regions, and 25U per axillary vault. Each grid mark was injected with 2.5U (0.1cc) of toxin. The patient reported mild burning at some of the injection sites, but this quickly dissipated and she tolerated the procedure well. The patient noticed significant improvement in perspiration by 3 weeks post-injection, changing her undergarments 1-3 times per day. The results lasted for approximately 3 months and she has received treatment every 3-4 months since her initial treatment. After each subsequent treatment session, she noted the onset of the effect was faster (~1.5 weeks), and she rarely required an undergarment change due to hyperhidrosis throughout the day. She has not had difficulty with urination or sexual function and notes improvement in her quality of life.

**Summary:** A case of severe mons pubis and inguinal hyperhidrosis that was successfully treated with Onabotulinum toxin A. While treatment of inguinal crease hyperhidrosis has been reported, this is the first case to our knowledge of treatment of mons pubis hyperhidrosis with neurotoxin.

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## Suicide and Mohs Surgery

**Author:** Alyssa G. Ashbaugh, MD Candidate 2021, Medical Student, University of California - Irvine, School of Medicine, Berkeley, CA

**Co-Authors:** Adam Rotunda, MD; Thuy Rotunda, MD

**Purpose:** After one of our Mohs patients suffered a self-inflicted gunshot wound during our care, we were inspired to explore prior reports of this rare and unfortunate event. While several studies in the dermatologic literature have found a relatively high prevalence of suicidal ideation in patients with acne, psoriasis, and atopic dermatitis, there have been no reports or reviews of suicide during the care of Mohs patients. We therefore review suicide risk factors in head and neck cancer patients in order to increase awareness of suicide risk in this patient population, who often undergoes Mohs micrographic surgery. Additionally, we discuss interventions that can reduce the risk of patient suicide and provide support to physicians who have experienced a patient lost to suicide.

**Design:** A search for peer-reviewed articles was performed on the PubMed database using search terms including, but not limited to, 'Mohs micrographic surgery' or 'head and neck cancer' and 'suicide' or 'suicide prevention.'

**Findings:** Patients with squamous cell carcinoma of the upper aerodigestive tract have a higher standardized mortality ratio compared with the general population. Risk factors for completed suicide in the head and neck cancer population include male gender, elderly age, and white race, in addition to widowed, divorced, or separated marital status. Given that these risk factors are present in many Mohs patients, it is important that dermatologic surgeons are aware of the possibility of depression and suicide risk in their patients. Several interventions are important to identify and help vulnerable patients, such as attempts to connect with patients emotionally and screening with the Patient Health Questionnaire or the Primary Care Screener for Affective Disorders. Additionally, for these patients, timely referral to a psychiatrist or therapist and informing family members of the concern for self-harm is warranted. Finally, we recommend that clinicians who have experienced a patient committing suicide review the case, without patient identifying details, with a close colleague or support group to help them cope with potential feelings of guilt, shame, sadness and fear of judgement.

**Summary:** To our knowledge, there are no prior reports examining any association between Mohs micrographic surgery patients and suicide. Future studies should be conducted to examine this connection, and raise awareness of this sorrowful outcome during the care of head and neck cancer patients.

## Surgical Pearls for Graft and Suture Technique

**Author:** Sergey Arutyunyan, DO, Chief Dermatology Resident, Larkin Community Hospital, Davie, FL

**Co-Authors:** Hamza Bhatti, DO; Tara Howard, BS; Eduardo Weiss, MD; Martin Zaiac, MD

**Purpose:** The purpose is two-fold. The first is to provide a surgical pearl for creating a skin graft using a simplified technique. The second pearl is to demonstrate a suture technique that allows for adequate wound edge eversion, hemostasis and can be useful in high tension closures while remaining simple to remove.

**Design:** Pearl #1: We describe a skin grafting technique that consistently and reliably estimates the size and shape of surgical defects. The technique is simple, effective, can be done without using instruments such as scissors, and utilizes materials readily available on the surgical tray. This technique is outlined below in four steps:

1. The sanguinated surgical defect/wound bed is covered by a 4"x4" woven gauze sponge. The gauze sponge is stamped onto the wound bed, allowing it to stain with blood. The border of the stained area reveals an outline of the exact size and shape of the wound bed.

2. The stained gauze is placed onto the donor site with the stained area facing up.
3. A skin marker is used to penetrate through the stained border of the gauze, producing dots on the donor skin site.
4. The gauze is removed, revealing the pen dots on the graft site. The dots are connected outlining the shape and the size of the needed graft. The skin graft is harvested from the donor site and is used to complete the repair.

Pearl #2: We propose that a running horizontal mattress with alternating simple running loops technique be used in lieu of vertical mattress sutures. For ease of visualization a schematic of the proposed suture technique is provided. As can be noted, two horizontal running mattress sutures are placed consecutively. This is followed by an intermittent simple loop and the entire sequence is repeated for the entirety of the wound length until the wound is closed. An example of sutured wound is included in this presentation. This method accomplishes adequate wound eversion while simplifying the suture removal process by providing exposed suture loops which can be easily cut. This technique minimizes trauma and saves time during suture removal.

**Findings:** The graft template method we describe is a simple, effective, and rapid way to accurately develop a template for harvesting the appropriately sized graft from a donor site. With regards to our suture technique, the simplicity of removal of the sutures is balanced with the benefits of wound eversion, hemostasis, and ability to perform on high-tension wounds.

**Summary:** Although technically simple, harvesting and placing skin grafts can be a time-consuming procedure. Our technique aims to simplify and save precious time while performing this procedure. The running horizontal mattress with alternating simple running loops technique offers all of the benefits of the vertical mattress sutures without the difficulty of removal. Simplifying the suture removal process improves patient's comfort and minimizes the suture removal encounter time.

## Survival Outcomes in Patients with Extra mammary Paget's disease: Analysis of the National Cancer Database

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**Co-Authors:** Jeremy Etkorn, MD; Ramie Fathy, MD; Christopher Miller, MD

**Purpose:** Extra mammary Paget disease (EMPD) is a rare cutaneous adenocarcinoma which presents as a chronic eczematous disease with a relatively slow-growing lesion. Little is known about EMPD survival patterns and there is a paucity of literature examining how demographic and socioeconomic factors impact patient outcomes. As such, we sought to analyze survival outcomes and treatment patterns in EMPD patients using the National Cancer Database (NCDB).

**Design:** We identified 1,360 patients diagnosed with EMPD confirmed by histology between 2006 and 2016. We used descriptive statistics to compare sociodemographic and clinical characteristics as well as univariable and multivariable Cox proportional hazards-regression analyses to assess associations with overall survival.

**Findings:** The mean survival time for all patients was 117.95 ± 2.11 months. Univariate analysis showed a worse survival outcome associated with: male gender, older age, Medicare insurance, and extra-genital site. Treatment wise, receiving surgery was associated with a better survival, while receiving radiation was associated with worse survival. Multivariate analysis revealed that age >70 years (HR 2.92, 95% CI 1.25-6.95, p=0.014) and Medicare insurance status (HR 1.55, 95% CI 1.08-2.22, p=0.017) were both associated with worse survival; while Genital site (HR 0.66, 95% CI 0.43-0.93, p < 0.02) was associated with better survival compared with extragenital sites. Multivariate analysis failed to demonstrate an association of survival outcomes with either surgery or radiotherapy.

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**Summary:** This study showed that older aged above 70 years, Medicare insurance and extragenital site can serve as independent predictors of reduced overall survival. While surgery is associated with better outcomes, the study failed to show that either surgery or radiation can serve as independent predictors of overall survival.

## Telemedicine Platforms Used in Academic Dermatology during the COVID-19 Pandemic

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**Purpose:** The COVID-19 pandemic exposed areas of vulnerability in the health care system and forced drastic changes to emphasize telemedicine over traditional care. This transition was notably seen in academic dermatology departments, which have historically formed the majority of teledermatology users. As such, it is of interest to identify the telemedicine platforms used in these settings. This review describes the practice of teledermatology across several academic institutions, focusing on the particular platforms used.

**Design:** A literature review using various databases (PubMed and GoogleScholar) and an informal survey of various academic institutions were conducted to determine which teledermatology platforms are used at academic institutions.

**Findings:** During the COVID-19 pandemic, dermatologists were frequently called upon to provide remote care. This shift to telemedicine was particularly prevalent among academic institutions, which have previously comprised the majority of teledermatology users. While one initial consideration in this shift was reimbursement for virtual services, the Centers for Medicare and Medicaid Services amended policies to allow providers to be paid in a fee-for-service manner for virtual services. With new, less restrictive reimbursement policies in place, many academic institutions began expanding or adopting teledermatology practices. To date, there is not a listing of the platforms that academic institutions use for teledermatology. The American Academy of Dermatology has a listing of electronic records vendors; however, these are largely designed for private practice dermatology and many are not scalable for use in an academic practice. When considering the practice of teledermatology, the main classifications are store-and-forward and synchronous practices. In reviewing the literature and conducting informal surveys of several academic dermatology practices, it is clear that Epic is the most widely used platform for synchronous teledermatology. These virtual visits are conducted through Epic using Zoom for audio and visual functionality. Notably, Epic is the only electronic health company permitted to use Zoom's application program interface. For store-and-forward practices, customized platforms are typically added to Epic by individual institutions. Depending on patient preference and institutional availability, both synchronous and store-and-forward practices are conducted, usually with Epic as the base platform.

**Summary:** In the era of COVID-19, dermatology has seen a massive shift to telemedicine, with academic institutions taking the lead in this transition. In an examination of the platforms used across institutions, Epic appears to be the leading platform in both synchronous as well as store-and-forward practices. In the synchronous practice, this is largely due to Epic's contractual relationship with Zoom. While the pandemic has disrupted dermatology practices, the transition to virtual practices as well as the uniformity in the use of Epic across institutions presents the opportunity to create a standardized and optimized virtual visit.

## The Effect of Platelet Concentrations on the Efficacy of Platelet Rich Plasma Treatments

**Author:** Ezra Hazan, MD Clinical Instructor, Icahn School of Medicine at Mount Sinai, Brooklyn, NY

**Co-Authors:** Hooman Khorsani, MD; Michael Tassavor, MD; Carlos Wesley, MD

**Purpose:** To determine the effect, if any, the relative or absolute increase in platelet concentration from platelet rich plasma (PRP) has on clinical outcome.

**Design:** A retrospective chart review of all PRP patients who had photos before and after 2 treatments of PRP for hair loss. One blinded reviewer independently rated which set of photographs showed improvement, if any. Photographs included both global and magnified shots, where available. We analyzed the recorded platelet concentrations prior to and after PRP centrifugation and compared it to the subjective assessment of efficacy for each patient.

**Findings:** Three independent values were assessed for correlation with outcome: serum platelet concentration (SC), concentration after centrifugation (CC), and relative concentration factor (CF). Pearson's correlation coefficient of these variables were SC -0.14 (p=.49), CC .032 (p=.86), CF .20 (p=.17). Though serum platelet concentration and concentration factor showed negative and positive correlation with outcome, respectively, the results were not statistically significant.

**Summary:** PRP is a well-known treatment for both male and female pattern hair loss. This study shows a consistent increase in platelet concentration of between 4-20x baseline is obtained with our PRP system. Serum platelet concentration, concentration after centrifugation, and relative concentration factor had no statistically significant correlation with outcome. This may be due to insufficient power, a non-linear correlation, or a plateau effect -- after a certain increase in concentration, there are diminishing returns.

## The Efficacy of Polydioxanone Threads Embedding for Hair Regrowth in Scarring and Non-scarring Alopecia

**Author:** Natasha Atanaskova Mesinkovska, MD, PhD, Clinical Instructor, Icahn School of Medicine at Mount Sinai, Brooklyn, NY

**Co-Authors:** Susie Suh, BA; Katerina Yale, MD

**Purpose:** Platelet-rich plasma (PRP) and microneedling have been two mainstream non-surgical procedures for treating hair loss. Recently, the insertion of polydioxanone (PDO) threads into the scalp is gaining attention as an alternative therapy for stimulating hair regrowth. Although the exact mechanism of action is unclear, it is hypothesized that as the embedded threads dissolve, they stimulate microcirculation and neo-collagenesis, which can enhance anagen induction in hair follicles. However, the evidence on the effectiveness of PDO threading on hair regrowth is scarce. More studies are needed to substantiate the therapeutic value of PDO threading in alopecia patients.

**Design:** Five patients with androgenetic alopecia and four patients with scarring alopecia, including frontal fibrosing alopecia and lichen planopilaris, were evaluated in the study. Prior to the treatment, photographs of the affected scalp area were taken. The procedure was performed by aseptically inserting PDO threads into the dermal layer of the affected scalp. Each patient was treated with 10 to 20 PDO threads in combination with PRP treatment. Efficacy was evaluated at least 8 weeks following the treatment by the patient's self-assessment and the modified global photograph assessment by an expert panel. The photographs were assessed using the standardized 7-point rating scale by three clinicians.

**Findings:** Overall, the photograph assessment by three clinicians demonstrated a slight hair regrowth in both AGA and scarring alopecia after PDO thread embedding in addition to the PRP treatment. Although

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most patients could not discern the effect conferred by PDO thread embedding, they showed satisfaction with the procedure and expressed their interest in getting the PDO threading at the next visit. Moreover, patients under age 50 showed better hair growth response to scalp threading.

**Summary:** Our clinical observation of nine patients demonstrates that PDO threading may be effective for stimulating hair regrowth in AGA and scarring alopecia when combined with PRP treatment. However, the efficacy of PDO threading alone cannot be determined due to the confounding effect of PRP and other medications. Therefore, it needs to be further evaluated with a larger number of subjects with an appropriate control group.

## The First Chinese Case of Pediatric Subungual Melanoma: A case Report and Literature Review

**Author:** Yuanshen Huang, MD, PhD, University of Toronto, Ontario, Canada

**Co-Authors:** Xixue Chen, MD; Hang Li, MD; Ping Tu, MD; Yang Wang, MD, PhD; Yicen Yan, MD

**Purpose:** Longitudinal melanonychia (LM) presents as vertical linear hyperpigmented streaks in the nail plate. Etiologies include benign diseases (e.g. melanocytic nevus) and malignancies (e.g. subungual melanoma). Pediatric subungual melanoma, however, is rarely reported in any race, and has not been reported in Chinese.

**Design:** Case report and literature review.

**Findings:** A 13-year-old girl presented with a painless black macule affecting her left thumb nail. It started as a 1-mm wide black nail streak 4 years ago, which progressively widened to 6mm. 4 months ago, a pale area appeared in the middle of the proximal nail plate. She had no prior trauma, other diseases or family history of nail pigmentation or melanoma. Physical examination revealed an 8mm black macule on her left thumb, with a hypomelanotic area on the proximal nail plate. Irregular pigmentation extended to the hyponychium. There was no palpable lymphadenopathy. An excisional biopsy was performed. Pathology revealed an increased number of atypical melanocytes mostly in the basal layer, with single cells predominating over nests. The atypical melanocytes stained positive for S100, Melan-A and HMB-45. A diagnosis of subungual melanoma was made after review by 3 dermatopathologists. We performed slow Mohs micrographic surgery to excise the tumor with a 5mm margin. Histopathologic studies confirmed the diagnosis of a subungual melanoma with a Breslow depth of 0.7 mm, and all margins were clear. 1-year follow-up showed no signs of local recurrence or metastasis.

From 1967 to 2019, only 19 cases of pediatric subungual melanoma were reported. The mean age at diagnosis was 6.7 years and the mean duration between age of onset and biopsy was 4.7 years. All patients underwent surgical treatment. Postoperative follow-up was reported in 8 cases. Regional lymph node metastasis was reported in 1 case, and no local recurrence or distant organ metastasis was reported.

**Summary:** To our knowledge, this is the first Chinese case of pediatric subungual melanoma. While regular follow-up is appropriate for most pediatric LM patients, closer follow-up and lower threshold for biopsy is recommended in the presence of alarming features, such as rapid progression, pigmentary change, and Hutchinson sign.

## The Implementation of Educational Videos in Mohs Micrographic Surgery for Improved Patient Comprehension: A Review of Literature

**Author:** Kristyna L. Gleghorn, MD, Dermatology Resident, University of Texas Medical Branch, Galveston, TX

**Co-Authors:** Antonio Jimenez, BS; Richard Wagner Jr., MD

**Purpose:** Mohs Micrographic Surgery (MMS) is a surgical procedure that is performed by trained Mohs surgeons for the removal of skin cancers. The surgery removes narrow, pathologic tissue margins until histopathological tumor clearance is confirmed. It is performed for 3.5 million patients annually. Patient education about the procedure and post-surgical expectations are important aspects of patient satisfaction, safety, and favorable clinical outcomes. To date, it is reported that patients understand less than half of the information communicated to them by physicians. Technological advancements in healthcare have sought to bridge the patient-physician communication gap. Video education has become a popular, innovative tool to explain standardized health information to patients in a simple and interactive manner. The objective of this literature review is to determine if video education is a well-suited tool for patient education and satisfaction in MMS.

**Design:** A review of literature was performed using the PubMed database from 2000-2020. The articles selected focused on the implementation of educational videos in Mohs surgery for either an overview of the procedure, the informed consent process, and post-surgical wound care instructions.

**Findings:** A total of 5 articles were found that met the criteria for review. The clinical endpoints of each article included the following: the effect of media (text/e-mail/video) on anxiety, knowledge, and patient satisfaction, patient perception of media for the transmission of medical information, patient preference of a medical provider or media outlet for MMS education, and if pre- or post-surgical education was more effective. The results demonstrated that patient comprehension was similar when education was provided by either a medical provider or a media outlet; however, some studies showed that patients preferred media education over a provider. One article also noted how patients had more knowledge about the risks and benefits of Mohs surgery after video education was utilized. Lastly, one article demonstrated how patient comprehension of Mohs surgery was similar between pre- and post-operative education.

**Summary:** Public health is interdependent on patient education. Technological innovations such as high-definition, interactive video modules have demonstrated effectiveness in bridging the patient-physician communication gap in other specialties. MMS is a complex surgical procedure that necessitates patient comprehension for informed consent and adequate post-surgical wound care instruction. The implementation of educational videos for MMS has demonstrated promise. The results of the review indicate that multimedia has the potential to be as effective as physician instruction – and is sometimes even preferred. In addition, one article noted how video education increased a patient's recognition of MMS risks and benefits. While more research needs to be done on the utilization and effectiveness of videos for MMS education, this review highlights the widespread patient acceptance of digital media for patient care and health education.

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## The Origins of “Maskne”: Do Facial Masks Lead to Adverse Skin Reactions? Non-Invasive Imaging Evidence

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**Co-Authors:** Fiore Casale, MD; Rachel Elsanadi, BS; Michael Higgins, MD; Niki Nourmohammadi, MPH; Cristina Nguyen, MD; Katerina Yale, MD

**Purpose:** Amidst the COVID-19 pandemic, healthcare workers and the general public are required to wear face masks for the protection of others and themselves. Current literature has reported an increase in facial skin temperature, acne flare, pruritus, discomfort, and various other adverse skin reactions. New imaging modalities, such as high-resolution 3-D imaging, have emerged as tools that help quantify and assess skin volume, erythema, and topography. The use of high-resolution imaging to assess the adverse facial skin reactions of N95 and paper masks has not been described.

This study aims to compare subjective self-assessment of facial skin roughness, rhytides, volume, and erythema after N95 and paper mask application to objective findings as assessed by high-resolution 3-D imaging after six hours of usage.

**Design:** This prospective cohort, single arm study (n=30) involved the application of N95 and paper masks to the face for a duration of 6 hours. A high-resolution 3-D imaging system (Cherry Imaging, Israel) was used to obtain facial image analysis at baseline and after 6 hours of application of both N95 and paper masks. The images were analyzed using the program software for erythema, rhytide area and depth, and facial volume area.

**Findings:** Cherry images and analysis demonstrated striking differences in facial erythema after 6 hours of wear of both N95 and paper masks. Patients displayed increases in roughness after paper mask usage, and decreases in roughness after N95 usage. The area of volume distribution and rhytides across the face increased in both patients after wearing a paper mask. There were no statistically significant differences between facial skin roughness, rhytides, and volume.

**Summary:** We have provided compelling preliminary data showing a difference between erythema, area of volume distribution, and rhytides before and after 6 hour wear of N95 and paper masks. We plan to present our data on 30 patients, applying the same metrics to fabric masks.

## The Quest for Reliable Methods of Lipolysis: Analyzing Adipose Tissue Metabolism using Diffuse Optical Spectroscopic Imaging (DOSI)

**Author:** Natasha Atanaskova, Mesinkovska, MD, PhD, UC Irvine, Laguna Niguel, CA

**Co-Authors:** Amanda Durkin; Victor Lee, BS; Niki Nourmohammadi, BS, MPH; Christopher Huy Phan; Timothy Quang, PhD; Seraphim Telep, BS; Bruce Tromberg, PhD; Katerina Yale, MD

**Purpose:** To accommodate an increased consumer desire for weight loss and fat removal, there is a recent emergence of devices for fat reduction. The challenges with these modalities, such as noninvasive lipolysis, are to quantify their effectiveness: reduction of subcutaneous adipose tissue, the number of treatments, and chronicity. Until recently, there has been no reliable way to quantitatively assess fat loss after these procedures. Diffuse optical spectroscopic imaging (DOSI) is a novel, noninvasive imaging modality that analyzes adipose tissue physiology through measuring abdominal lipid fraction, water fraction, and hemoglobin. Previously used to study breast cancer, DOSI has been adapted to quantify and monitor adipose metabolic changes at other anatomic sites. This has created a need to better understand DOSI as an imaging modality and standardize its use. To examine the utility of DOSI as a reliable tool in studying fat metabolism over time, after meals, and inter-user variability.

**Design:** BMI and abdominal circumference were recorded for five subjects. DOSI measurements were collected in a 7 x 4 grid (12 x 6 cm) across the lower abdomen. Four abdominal grid images were taken per day, repeated over three days, for a total of twelve measurements per subject. Daily measurements were collected in the morning (fasting and 1-hour post-meal) and evening (1- and 3-hours post-meal) by two separate DOSI operators. MATLAB was used to calculate the average lipid fraction, water fraction, oxyhemoglobin, and deoxyhemoglobin within each grid image. These fractions were then used to calculate tissue optical index (TOI) as a measure of fat metabolism. To examine inter-operator variability, one subject was separately measured by three different operators in succession. Statistical analysis was performed with paired T-tests.

**Findings:** All five subjects (2 men/3 women, age 22-31) had a BMI between 18-24 and abdominal circumference between 66-87 cm. Daily DOSI imaging result trends were consistent for each individual subject over the three days. When data from all five subjects was averaged, there were no statistically significant overall changes in hemoglobin, water, lipid, or TOI over multiple days, time of day, or after food consumption. Lastly, there was no significant difference noted when comparing multiple DOSI operators on the same subject, noting low inter-operator variability.

**Summary:** Demonstrate that abdominal DOSI measurements are consistently independent of time of day and fasting status of human subjects. Furthermore, there was a lack of a significant inter-operator variability. When the same DOSI imaging protocol is followed, results collected on the same subject with varying imaging time, day, fasting status, and DOSI operator are comparable. These findings support the use of DOSI imaging as a reliable tool to study adipose tissue metabolism and promotes its use as a method to quantify and assess the effectiveness of noninvasive lipolysis and body contouring modalities.

## The Traditional Removal of Dermatitis Papulosa Nigra to Address the Male Skin of Color Aging Face

**Author:** Abraham Kazemi, MD, Resident Physician, New York Medical College, New York, NY

**Co-Authors:** Marc Zachary Handler, MD; Bijan Safai, MD, DSC

**Purpose:** Dermatitis papulosa nigra (DPN) affect the medical, cosmetic, and quality of life (QoL) aspects of skin of color (SOC) patients' lives. Medically, these lesions can grow over time in sun-exposed areas, leading to skin irritation when caught on clothing, itchiness, inflammation and bleeding. In terms of male aging concerns, DPNs cause considerable grief, affect social relationships, contribute to an aged appearance, and ultimately lead to a poor QoL. Generally, the age-related psychological distress inflicted by DPNs causes male SOC patients to present to a dermatologist for treatment.

**Design:** Conventional surgical treatment modalities include electrodesiccation (ED), cryotherapy, curettage, dermabrasion, and scissor/shave excision. SOC physiology is unique in that it is particularly sensitive to trauma, reacting with post-inflammatory hyperpigmentation, post-inflammatory hypopigmentation, or keloid formation as major adverse events in the healing process, even with ED and cryotherapy.

**Summary:** We utilized ED on low settings and wet gauze curettage in the gentle, surgical management of DPNs to address ethnic male facial aging, and achieved successful, safe, and cost-effective facial rejuvenation. Our patient expressed great concern due to his facial DPNs. These lesions negatively impacted his self-image and caused emotional distress, therefore adversely influencing his QoL. The patient experienced no major adverse events with ED and wet gauze curettage, thus emphasizing the continued relevance and practicality of these traditional surgical tools over modern lasers in the dermatologist's arsenal to manage DPNs.

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## The Use of the Surgical Marking Pen for Deep Margin Visualization in Mohs Micrographic Surgery: A Simple Trick of the Trade

**Author:** Elizabeth Cusick, MD, Chief Resident, University of Rochester, Rochester, NY

**Co-Authors:** Ritesh Agnihotri, MD; Mariah Brown, MD; Franki Lambert Smith, MD

**Purpose:** Mohs micrographic surgery (MMS) allows for histological margin control of cutaneous neoplasms while preserving tissue. An important hallmark of MMS is maintaining tissue integrity during excision of thin or complex surgical layers. 1, 2 Preserving deep margin integrity can be difficult to achieve when obtaining Mohs stages on friable tissue such as fat or muscle or in areas where multiple anatomic tissue planes are present, such as the medial canthus. A potential pitfall known as “buttonholing” may occur if a layer of non-uniform depth is inadvertently taken, preventing full visualization of the deep margin. 1-3 previous studies have proposed intraoperative staining methods with methylene blue or gentian violet to mark the tissue to ensure complete sampling of the deep margin on these difficult Mohs stages.4-7

**Design:** We expand upon this concept of deep margin identification by describing a practical and cost-effective approach using a surgical marking pen.

**Findings:** Through this simple technique, the surgeon can confidently take the deep margin and ensure that the margin is complete without requiring any additional tools to the surgeon’s surgical tray. First, a sterile surgical marking pen is used to uniformly color the tissue targeted for excision with ink. After the Mohs layer is removed, the surgeon ensures that no visible ink remains on the wound underneath the tissue being excised. This provides visual confirmation that the deep margin is complete. If visible ink remains in the surgical defect, the surgeon knows that buttonholing has occurred and has a guide to highlight precisely where he or she must take additional tissue to ensure complete margin sampling.

This technique provides an additional benefit to the Mohs histotechnician by providing a visual confirmation that the true deep margin is being processed. The histotechnician can see the ink on the frozen tissue as the layer becomes thinner during processing. If pen ink is visible at the base of the tissue, the technician will be alerted that tissue integrity has been compromised, thereby preventing analysis of the true deep margin.

**Summary:** The surgical marking pen staining technique is a simple tool that allows Mohs surgeons to ensure complete sampling of the deep margin when taking thin, complex tissue layers. Compared to previously described techniques, this technique has the advantage of being both convenient and cost effective, using a standard component of a surgical tray – the surgical marking pen.

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## The Utility of Surgical Smoke Evacuation during Dermatologic Surgery

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**Co-Authors:** Leonora Bomar, MD; Phillip Williford, MD

**Purpose:** The purpose of this study was to measure toxic organic chemicals in surgical smoke during dermatologic procedures and to determine the utility of smoke evacuation.

**Design:** Over a 14-day study period in an outpatient dermatologic surgery unit, the level of volatile organic compounds (VOCs) generated by surgical smoke was measured with and without smoke evacuation.

**Findings:** The peak levels of VOCs were significantly higher without smoke evacuation (0 [IQR: 0, 1.5] vs 0 [IQR: 0, 0.3],  $p < 0.01$ ), but statistically significant differences were not found for carbon monoxide ( $P=0.11$ ) and hydrogen cyanide ( $P=0.10$ ) levels between the groups.

**Summary:** While peak VOC levels were lower with smoke evacuation during electrosurgery, the effect of this reduction on the development of acute and chronic side effects from inhaling surgical smoke is not known.

## Think Inside the Triangle: Two Nasal Defects

**Author:** Adam Chahine, MD, Dermatology Resident, Orange Park Medical Center, Jacksonville, FL

Co-author(s): Stefanie Altmann, DO; George Schmieder, DO

**Purpose:** A case where multiple sizable defects were present on the nose following Mohs surgery. The goal is to invoke thought processes on how one might approach multiple facial defects, understand various considerations, and ultimately how to employ techniques to achieve optimal cosmesis.

**Design:** A case of a 78-year-old female who presented to the clinic for surgical management of a biopsy-proven nodular basal cell carcinoma on her right nasal sidewall and a squamous cell carcinoma in situ on her left nasal bridge. The two lesions were evaluated carefully and we opted to treat both on the same day with Mohs micrographic surgery. After surgical clearance, two defects measuring 1.2 and 1.6 cm remained. Various repair options were considered including Rieger dorsal nasal flap, skin grafting, and a nasal tip rotation flap. Ultimately a nasal tip rotation flap was performed, closing both defects with one maneuver.

**Findings:** When presented with multiple defects, Burrow’s triangles can be versatile tools to enclose and eliminate defects during skin advancements, rotation flaps, and transposition flaps. The nasal tip rotation is performed by angling the inferior triangle towards the nasal tip and rotating the dorsum of the nose to close the defect. By performing a nasal tip rotation, you can incorporate two lesions into a single closure.

**Summary:** An experienced reconstructive surgeon considers closure options even before removing tissue. When multiple skin cancers are in close proximity, it is important to consider a closure that not only will have a favorable outcome, but it may also guide you towards or against performing the second surgery on the same day. A combined closure, when appropriate, may lead to increased patient satisfaction while decreasing morbidity.

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## Three-way Split Treatment of Tattoo with Different Picosecond Lasers

**Author:** Kunal Angra, MD, Cosmetic Dermatologist, Dermatology Specialists, San Diego, CA

**Co-Authors:** Michael Lipp, DO; Douglas Wu, MD, PhD

**Purpose:** Picosecond pulse duration lasers (PS) developed for the treatment of tattoos have improved clinical efficacy and reduced adverse effects compared with traditional Q-switched lasers. PS produce greater power by delivering energy over a shorter period of time. Today, there exist multiple PS, which vary in terms of wavelength, pulse duration (PD), and peak power. Comparative studies are lacking and needed. The purpose of this study is to compare three different PS in treating a single tattoo.

**Design:** A case of a 27 year-old Caucasian female presenting for removal of a blue tattoo wing on her upper mid-back. Her tattoo was divided into three areas and each area was treated to whitening with different PS in non-fractionated mode. The left portion of the wing was treated with the following laser settings: 1.6 ns PD, 650 nm wavelength, 2.37 J/cm<sup>2</sup> fluence, and a 3 mm spot size. This laser restricted itself to the nanosecond PD range in order to treat at the appropriate wavelength for a blue tattoo. The middle portion was treated with the following laser settings: 600 ps PD, 755 nm wavelength, 5.25 J/cm<sup>2</sup> fluence, and a 2 mm spot size. The right portion was treated with the following laser settings: 300 ps PD, 785 nm wavelength, 4.00 J/cm<sup>2</sup> fluence, and a 2 mm spot size. The patient was re-evaluated 3 months post-procedure.

**Findings:** At 3 month follow-up, investigators noted improvement based on before and after pictures with all PS. In decreasing order, improvement was noted on the right portion of the tattoo wing, the middle portion, and lastly, the left portion.

**Summary:** The efficiency of blue tattoo ink clearance seems most dependent on PD. Shorter PD allows for greater power and a potentially more robust photoacoustic effect, leading to greater efficiency at treating tattoos. PD may therefore play a significant role even when the differences are only a few hundred picoseconds.

## Top 100 Most Cited Papers in Mohs Micrographic Surgery: A Bibliometric Analysis

**Author:** Vishal A. Patel, MD, Director of Dermatologic Surgery, George Washington University School of Medicine, Washington, DC

**Co-Authors:** Haig Pakhchanian, BS; Rahul Raiker, BS

**Purpose:** This study aims to make a bibliometric analysis of the studies on Mohs micrographic surgery between the years 1900 and 2020 and identify important trends as well as active authors, universities, scientific journals, countries, and citation analyses within the field of research.

**Design:** The 100 most cited articles related to Mohs micrographic surgery were searched in Thomson ISI Web of Science® using the keywords “Mohs Surgery”, “Mohs Micrographic Surgery”, “Micrographic Surgery”, “Margin Control Surgery”, “Margin Control Excision”, “CCPDMA”, “Complete circumferential peripheral and deep margin analysis”, “Slow Mohs”, “En Face Surgery”, “En Face Excision”, “Staged Excision”, and “Mohs” in the title field. The search results were selected for three categories: Dermatology, surgery, and oncology. In addition, the search results were limited to journal articles.

**Findings:** As of April 2020, the top 100 highest cited articles had up to 7010 citations with the most cited article having 267 citations. The top cited publication was “Mohs Surgery Is the Treatment of Choice for Recurrent (Previously Treated) Basal-Cell Carcinoma” written by Rowe, DE in 1989. The top university that contributed most was Harvard University, and the top two authors who contributed most were Brodland, DJ (n = 10) and Vitalli, JA (n = 9) from University of Pittsburgh. Most papers were published in the Journal of the American Academy

of Dermatology (n = 33). Fourteen countries contributed to list with the most contributions from the United States (n = 77). The year 2005 accounted for the highest amount of top 100 highly cited journal articles on this topic (n = 11).

**Summary:** This study presents a detailed list and analysis of the 100 most cited articles in Mohs micrographic surgery. It gives insight as to what topics are highly cited and of interest to researchers in the field.

## Topical Treatment for Postinflammatory Hyperpigmentation: A Systematic Review

**Author:** Marcus G. Tan, MD, PGY-4 Resident Physician, Division of Dermatology, The Ottawa Hospital and University of Ottawa, Ottawa, Ontario, Canada

**Co-Authors:** Christine Jo, BSc; Whan Kim, MD; Carly Kirshen, MD, FRCPC; Karina Nabieva, BHSc; Douglas Wu, MD, PhD, FRCPC

**Purpose:** Topical measures are the standard of care for treatment of post inflammatory hyperpigmentation (PIH). However, there has not been any study reviewing the evidence for the variety of therapies that exist. Our objective was to perform a systematic review of the literature to evaluate the evidence for topical treatments of PIH.

**Design:** We included English-language studies that evaluated topical medications for treatment of PIH. We excluded studies that did not contain original data, studies that evaluated energy-based devices such as lasers, studies that involved primary hyperpigmentation disorders (e.g. melasma) and in-vitro or animal studies. We searched PubMed, MEDLINE, and EMBASE databases from conception to December 2019. Search terms included “topical”, “postinflammatory”, “hyperpigmentation”, “hypermelanosis”, “hyperchromia” and “dyschromia”. To determine the quality of evidence of each study, we used a modified Grading of Recommendations, Assessment, Development and Evaluation (GRADE) scale.

**Findings:** Forty-two of 1031 studies met the inclusion criteria with a total of 1658 subjects. These included 17 prospective controlled studies, 18 prospective uncontrolled studies, 1 retrospective study, and 6 case reports. Topical treatments for PIH included sunscreen, hydroquinone, non-hydroquinone lightening agents, retinoid, corticosteroid, antimicrobial, chemical peel, plant derived product, and other combination treatments. Topical agents that were supported by the greatest number of high-quality studies included retinoids (4 studies, 593 subjects) and hydroxy acids (4 studies, 104 subjects). Other agents with high-quality studies included plant-derived products (3 studies, 54 subjects), corticosteroids (2 studies, 35 subjects), sunscreen product (1 study, 230 subjects), and niacinamide (1 study, 16 subjects). Common adverse events reported include desquamation (27.2%), burning/stinging (22.7%), dryness (15.7%), and pruritus (15.2%).

**Summary:** Topical agents with high-quality evidence and the greatest number of studies included retinoids and hydroxy acids. Limitations include a lack of consistent outcome measures and myriad of treatment combinations and protocols that make it difficult to compare efficacy.

## Transdermal Delivery of Hyaluronic Acid to the Infraorbital Region Using Iontophoresis

**Author:** Ronald L. Moy, MD, Moy Fincher Chippis Facial Plastics and Dermatology, Beverly Hills, CA

**Co-Authors:** Hiren Kolli, BS; Mandy Majidian, BA

**Purpose:** The safety, tolerability and efficacy of iontophoresis in the treatment of infraorbital hollows with hyaluronic acid (HA).

**Design:** Prospective non-randomized split-face trial. Single center, private practice with a dedicated research department. Patients with clinically diagnosed infraorbital hollows.

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**Findings:** Patients received treatments every two weeks with an iontophoresis machine (Dermoelectroporation, Mattioli Engineering, Florence, Italy) for a projected total of four treatments. Dry gauze was used to strip the stratum corneum prior to delivery of 2.5cc of a 1:5 HA: NS solution to the right undereye at a current of 3A. The left undereye was not treated for comparison. Photos were taken at the initial visit and before each treatment. Physician assessment of clinical photos was used to judge overall improvement and improvement to infraorbital hollows and rhytides. Investigator improvement scores, and patient satisfaction scores for overall improvement were recorded as well.

**Results:** We enrolled three patients, average age 28 years (range 26-31 years), with Fitzpatrick Skin Types I-IV, with infraorbital hollows. Two of the three patients have completed three treatments, with an average of two weeks between treatments. As patient recruitment and treatments are ongoing, to-date improvement is shown at the two-week follow-up after having received only one treatment of HA iontophoresis. Assessment of photography of the two featured patients using the Allergan Infraorbital Hollows Scale revealed improvement from moderate at initial presentation to minimal. Both patients who completed treatments self-reported visible improvement of hollowness and rhytides.

**Summary:** Transdermal delivery of hyaluronic acid can be achieved through iontophoresis, providing a safe alternative to injection. In doing so, the risks of HA injection such as edema, bruising and, most seriously, vascular occlusion can be eliminated. Patients noticed increased undereye smoothness and reduced hollowness and rhytides on the treated side. Results were demonstrated by investigator and patient assessments, as well as evaluations by three independent dermatologists utilizing photographs obtained from a professional camera used by trained medical assistants. Further evaluation should focus on optimum removal of the stratum corneum prior to HA delivery, duration of effect and development of a handpiece adapter that comfortably fits the undereye. Patient recruitment is ongoing to expand sample size and increase the accuracy of these results.

## Treatment Approaches and Outcomes Associated with the Use of AbobotulinumtoxinA for the Treatment of Hyperhidrosis: A Systematic Review

**Author:** Hassan Galadari, MD, Assistant Professor, UAE University, Dubai, United Arab Emirates

**Co-Authors:** Ibrahim Galadari, MD; Inna Prygova, MD; Alessio Redaelli, MD; Riekie Smit, MD

**Purpose:** AbobotulinumtoxinA (aboBoNT-A) is a botulinum neurotoxin type A treatment that has been used to treat excessive sweating (hyperhidrosis), which affects various parts of the body. To our knowledge, no systematic literature reviews of the evidence on approaches and outcomes associated with aboBoNT-A treatment of hyperhidrosis have been published. We carried out a systematic literature review to identify all relevant published data.

**Design:** The Embase, MEDLINE® and Cochrane Library databases were searched for relevant observational studies (OSs), randomized controlled trials (RCTs) and non-RCTs, with no date or country restrictions. Bibliographies of review articles and recent congress proceedings (published between 2017 and 2019) were also searched. Articles were screened using predefined eligibility criteria; data were extracted from included articles.

**Findings:** Of 191 articles identified, 23 were considered relevant (3 OSs [13.0%] 10 RCTs [43.5%] and 10 non-RCTs [43.5%]) and were included for data extraction. These articles provided data on axillary (13 [56.5%]), palmar (7 [30.4%]) and forehead (1 [4.3%]) hyperhidrosis, compensatory hyperhidrosis of the back following thoracic sympathectomy (1 [4.3%]),

Frey's syndrome (1 [4.3%]) and diabetic gustatory sweating (1 [4.3%]). Outcomes related to practice or technique (23 [100.0%]), onset or duration of action (23 [100.0%]), sweat quantification (19 [82.6%]), safety (17 [73.9%]), patient satisfaction (9 [39.1%]) and health-related quality of life (3 [13.0%]). All articles reported that aboBoNT-A reduces sweating. A mean duration of aboBoNT-A action for axillary hyperhidrosis of up to 10 months was observed.

**Summary:** The articles identified describe a range of treatment approaches and demonstrate positive outcomes associated with aboBoNT-A treatment of multiple types of hyperhidrosis.

## Treatment of Benign Pigmented Lesions with a 595 Nm and 660 Nm Picosecond Laser

**Author:** Alison Kang, MD, Laser & Skin Surgery Center of Northern California, Sacramento, CA

**Co-Author:** Suzanne Kilmer, MD

**Purpose:** Benign pigmented lesions of the dorsal hands are common. Removal of these lesions can give a more youthful appearance. A laser with 595 nm and 660 nm wavelengths delivered at a 450-picosecond pulse width is evaluated in the treatment of benign pigmented lesions of the hand.

**Design:** This was an IRB-approved, prospective, multi-site, non-randomized study. 28 subjects were enrolled and treated. For each subject, one hand received a series of 595 nm treatments while the other hand received a series of 660 nm treatments. Up to three treatments, 30±7 days apart, were performed. Pre- and post-treatment photos were obtained at each visit and a final photo 30 days following treatment completion was obtained.

Three blinded evaluators compared baseline versus final photos to determine the percentage of pigmentary clearance. Investigators and subjects scored overall aesthetic improvement on the Global Aesthetics Improvement Scale. Subject satisfaction was measured using a Patient Satisfaction Questionnaire. Average pain scores during treatment were recorded using a Numeric Rating Scale.

**Findings:** For the 595 nm wavelength, 96% of the post-treatment images were correctly identified. Of those, 48% were "Excellent Improvement", and 30% were "Good Improvement". For the 660 nm wavelength, 89% of the post-treatment images were correctly identified. Of those, 8% were "Complete Improvement", 32% were "Excellent Improvement", and 20% were "Good Improvement". 93% (595 nm) and 89% (660 nm) of the subjects were satisfied with the treatments. 93% (595 nm) and 89% (660 nm) of the subjects reported improvement. 89% (595 nm) and 86% (660 nm) of the investigators reported improvement. Average pain was 1.9 (595 nm) and 1.2 (660 nm). Temporary treatment effects included darkening, erythema, frosting, and scabbing/peeling. No serious adverse events were reported.

**Summary:** This study demonstrates that a 595 nm and 660 nm picosecond laser is safe and effective for the treatment of benign pigmented lesions of the hands.

## Treatment of Infraorbital Fat with a Microneedling Radiofrequency Device

**Author:** Michael B. Lipp, DO, ASDS Cosmetic Fellow, Cosmetic Laser Dermatology, Ventura, CA

**Co-Authors:** Kunal Angra, MD, Mitchel Goldman, MD; Erika Hoss, MD; Ramya Kollipara, MD

**Purpose:** Microneedling with radiofrequency (MNRF) has been an excellent technology for treating wrinkles, skin laxity, and acne scars by causing collagen contraction and neo-collagenesis [1]. Additionally, radiofrequency technology has been shown to reduce fat by inducing fat cell apoptosis [2]. Recently, MNRF has been employed to treat

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infraorbital fat bulging [3]. Apart from blepharoplasty, not many treatments exist for infraorbital fat reduction. Case-reports exist of deoxycholic acid injections used off-label for infra-orbital fat reduction [4]. We present a single centered, retrospective case series review of 4 subjects with lower eyelid fat bags treated using MNRF.

**Design:** Three of the 4 patients with infraorbital fat bags were treated 4 times with an average period between each treatment of 2.33 months. One subject received only one treatment. A monopolar MNRF device (Intracel, Jeisys Perigee) was used with the following treatment settings: Treatment Level: 4-6, 3 passes each at 0.5mm or 0.8 mm, 1.5mm and 2.0mm. Standardized photography was taken prior to each treatment.

**Findings:** All subjects had significant improvement based on physician evaluation of standardized before/after photography and all the subjects perceived significant improvement as well. All 4 subjects experienced bruising immediately post-procedure which resolved within 1-2 weeks.

**Summary:** MNRF is a promising technology that may have utility as a non-surgical alternative for the treatment for infraorbital fat and lax skin in patients not desiring blepharoplasty. Prospective control studies are needed to validate the use of MNRF for infraorbital bags.

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## Treatment of Malignant Melanoma, an Update

**Author:** Sarah E. Yagerman, MD, SLSS, New York, NY

**Co-Author:** David Goldberg, MD, JD

**Purpose:** While the incidence of malignant melanoma continues to rise, we find ourselves in the most exciting time of promising therapeutics for this potentially fatal malignancy. As novel diagnostic and therapeutic tools are being developed at an explosive pace, it is incumbent on the dermatologic surgeon to remain abreast of the landscape in order to serve as a guide to their patients. This review aims to update the reader on guidelines in melanoma diagnosis and management, with a focus on the relevant treatments currently on market.

**Design:** A systematic review of published data for current treatments was accomplished with a PubMed search for entries "Melanoma," "Melanoma and Treatment," and "Advanced cutaneous melanoma." An additional search was then conducted based on new staging guidelines and relevant topics of this paper.

**Findings:** An update in melanoma staging as published by the AJCC as well as novel surgical techniques including Mohs micrographic surgery for melanoma and adjuvant systemic therapies all point to an emphasis on individualized treatment.

**Summary:** Awareness of the evolving diverse treatments of melanoma will prepare the dermatologic surgeon to make the best decisions in collaboration with medical and surgical oncologists.

## Treatment of Pagetoid Reticulosis (Woringer-Kolopp Disease) with 308-nm Excimer Laser Phototherapy

**Author:** Stefanie Altmann, DO, Dermatology Resident, Orange Park Medical Center, Jacksonville, FL

**Co-Author:** Adam Chahine, MD; Karthik Krishnamurthy, DO, FAOCD, FAAD

**Purpose:** To propose an effective and minimally invasive treatment modality for localized pagetoid reticulosis (Woringer-Kolopp disease), an extremely rare variant of mycosis fungoides.

**Design:** A case report of a 56-year-old female with localized pagetoid reticulosis (Woringer-Kolopp disease) successfully treated with 308-nm excimer laser phototherapy.

**Findings:** Pagetoid reticulosis (Woringer-Kolopp disease) is an extremely rare variant of mycosis fungoides, accounting for less than 1% of all CTCL cases. It is characterized by a solitary psoriasiform or hyperkeratotic patch or plaque, usually on an extremity and it has a slowly progressive, indolent course. Due to its rarity, limited treatment recommendations exist. Preferred treatment methods include radiotherapy or surgical excision, while less invasive treatment modalities are infrequently reported.

A 56-year-old female with a solitary lesion of pagetoid reticulosis on her left wrist presented to clinic for treatment. Her diagnosis was previously confirmed with histology showing spongiotic dermatitis with epidermotropic lymphocytes (CD3+:CD4+:CD7+) along with positive tissue T-cell clonality studies. The patient was presented with various treatment options and elected for a minimally invasive approach. Treatment with topical mechlorethamine and then topical bexarotene 1% gel was attempted initially. The patient was not able to tolerate either topical therapy due to irritation and burning, and these medications were discontinued. 308-nm excimer laser phototherapy was then trialed. The patient received 2-3 treatments per week for a total of 64 treatment sessions over a two-year period. Dosing was started at minimal erythema dose (MED) of 250 mJ/cm<sup>2</sup> and steadily increased to up to 1050mJ/cm<sup>2</sup> throughout her treatment course. The area treated decreased in size from 40 cm<sup>2</sup> to 8 cm<sup>2</sup> over the treatment sessions. The patient exhibited significant improvement with complete clinical clearance maintained at 6-month follow up.

**Summary:** This case demonstrates the successful use of 308-nm excimer laser phototherapy as a safe, well-tolerated treatment option for localized pagetoid reticulosis. This modality may provide a minimally invasive treatment alternative compared to the standard radiotherapy or surgical excision.

## Treatment of Squamous Cell Carcinomas of the Nail Unit: A Review of the Literature

**Author:** Melissa A. Levoska, MD, Resident Physician, University Hospitals Cleveland Medical Center, Case Western Reserve University, Cleveland, OH

**Co-Authors:** Bryan Carroll, MD, PhD; Anne Ning, BA; Christina Wong, MD; David Zheng, BA

**Purpose:** Although squamous cell carcinoma of the nail (nSCC) is the most common nail unit malignancy, to date there is no definitive standard of care. Treatment options include topical therapies, radiation therapies, local surgical excision (LSE), wide surgical excision (WSE), Mohs micrographic surgery (MMS), and digital amputation. Our aim was to assess current literature on nSCC treatment to determine first-line treatment for the disease.

**Design:** A systematic review of PubMed, Medline, and Scopus for articles published from inception to April 2020. Search terms were "squamous cell carcinoma" and "nail"/"nail unit"/"subungual" and "treatment"/"wide excision"/"local excision"/"en bloc excision"/"amputation"/"functional treatment"/"conservative

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treatment”/“topical treatment”/“cryotherapy” and “recurrence”/“metastasis”/“survival.” Our inclusion criteria consisted of all English language articles presenting original research on treatment of squamous cell carcinomas of the nail unit with a sample size of at least five patients and primary or secondary endpoints of recurrence rates. Case reports, case series with fewer than five patients, reviews, and editorials were excluded. Data including type of intervention, post-operative complications, follow-up times, recurrence rates, metastatic disease, and survival was extracted from full-text articles.

**Findings:** Our literature search identified 202 unique studies, 15 of which were included in this review and contained a total of 341 patients and 408 nSCCs. The majority of studies (11, 73%) were retrospective reviews; the remaining four studies were case series. Most studies published prior to the year 2000 reported treatment of nSCC with either MMS (55%) or amputation (43%). Between 2000 and 2015, the most common treatment modality assessed was WSE (37%), while MMS and amputation composed only 22% and 10% of the treatments reported, respectively. After 2015, studies have largely focused on MMS (58%) and WSE (27%). Follow up ranged from 3 months to 17 years, during which a total of 23 patients (7%) experienced recurrence of their nSCC. Overall recurrence rates were 15% (n=2) following radiation therapy, 100% (n=2) following phototherapy, 3% (n=2) after digital amputation, 6% (n=10) after MMS, 8% (n=8) after WSE, and 53% (n=10) following LSE.

**Summary:** The limited data available suggest MMS and WSE are favored as first-line treatments for nSCC. While the overall recurrence rate following amputation was lowest out of the treatment options reported in the literature, functional outcomes are an important consideration. Further research and more consistent reporting of outcomes are necessary to determine optimal first-line treatment for nSCC.

## Triggered! Varicella Zoster Reactivation Induced by Topical 5-fluorouracil

**Author:** Cassandra J. Beard, DO, MPH, Dermatology Chief Resident, Orange Park Medical Center, Jacksonville, FL

**Co-Authors:** Karthik Krishnamurthy, DO; Shawn Schmieder, DO

**Purpose:** Discuss treatment complications with 5-fluorouracil in patients treated with tofacitinib. Highlight the importance of recognizing patient populations at risk for developing Varicella zoster reactivation with 5-fluorouracil treatment. Prevent treatment complications and provide education to patients about how to reduce risk factors.

**Design:** Case presentation.

**Findings:** A patient treated with tofacitinib developed Varicella-zoster reactivation of the forehead after treatment with topical 5-fluorouracil. To our knowledge, this is the first reported case of this complication. Viral culture confirmed the presence of Varicella zoster, and the patient was treated with valacyclovir and given a STAT ophthalmology consult. His primary care provider temporarily held his tofacitinib. Unfortunately, the patient has had occasional episodes of pain in this area as well as subtle visual field defects despite normal vision testing and exam with ophthalmology.

**Summary:** There are reports of HSV flares in association with topical 5-FU treatment, but to our knowledge there have not been reports of VZV reactivation. Trauma is hypothesized to trigger virus reactivation by irritating the distal ends of nerves where the virus lies dormant in the dorsal root ganglion. In the setting of immunosuppression, reduced immune surveillance lowers the threshold for viral replication to progress unchecked. Therefore, it is possible that topical 5-FU may be able to act as a trigger for VZV reactivation in this patient population. In addition to the above mechanisms, 5-FU use could serve as a trigger simply due to the stress of experiencing an exuberant reaction to 5-FU, even in the absence of immunosuppression. 5-FU has been utilized in dermatology since the 1960s, yet VZV reactivation is uncommon. HSV, on the other hand, is sometimes seen as a complication of treatment in

susceptible individuals. This discrepancy is likely due to the difference in virulence between the two viruses. There is a chance, however, that a VZV reactivation to 5-FU treatment may be misdiagnosed clinically as an exuberant reaction to the topical 5-FU. Indeed, we were not convinced that our patient's eruption was viral in nature until viral culture confirmed the presence of VZV.

We believe this scenario will become increasingly more common as the use of JAK inhibitors such as tofacitinib increases. Treatment of actinic keratoses and chronic sun damage is of utmost importance, especially in immunosuppressed patients, to prevent the progression to invasive carcinomas. Therefore, the use of 5-FU should not be discouraged in these patients. Rather, if VZV reactivation after 5-FU application becomes an increasingly encountered phenomenon, it may be prudent to consider prophylactic antiviral treatment. Furthermore, it may be prudent to recommend shingles vaccination prior to starting treatment with a JAK inhibitor. Lastly, if VZV reactivation does occur in these patients, they should be educated about airborne and contact precautions until dissemination is ruled out, and about isolation from children, immunocompromised, and pregnant women.

## US Dermatology Resident Responses About the COVID-19 Pandemic: Results from a Nation-wide Survey

**Author:** Yumeng M. Li, MD, University of Miami/Jackson Memorial Hospital, Miami, FL

**Co-Authors:** Michael Abrouk, MD; Fabrizio Balimberti, MD; Michael Kaiser, BS, ; Robert Kirsner, MD

**Purpose:** The COVID-19 pandemic has drastically changed resident training in the United States. Here we explore the early perceived effects of COVID-19 on dermatology residents through an electronic sample survey and identify possible areas for targeted improvement in lieu of a possible second wave of COVID-19 cases.

**Design:** Institutional IRB approval was obtained. On April 3, 2020, a survey of link with 25 questions was sent to dermatology program coordinators to be disseminated among dermatology residents in the US. The survey was closed on April 13, 2020. All questions were optional and no personal identifiers were collected.

**Findings:** A total of 140 dermatology residents from 50 different residency programs across 26 states responded to the survey. Majority of respondents (85%) reported negative effect of COVID-19 on their overall wellness. Despite the vast majority of residents (92%) speculating that COVID-19 will have negative long-term effects on the economy, only 33% agreed or strongly-agreed that it will impact their job prospects. Tele dermatology was widely implemented following the declaration of national emergency (96% of represented residencies compared to only 30% prior to), with heavy resident involvement. Majority of residents (99%) reported having virtual didactics and that they were beneficial. Most residents were uncomfortable with the prospect of being reassigned to a non-dermatology specialty during the pandemic. Additionally, 22% of residents felt that their leadership were not transparent and prompt in addressing changes relating to COVID-19.

**Summary:** Dermatology residents were negatively affected by COVID-19 in respect to their well-being, clinical training, and education. Several areas of improvement were identified that could improve our preparedness for a second wave.

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## Use of a Fractionated Carbon Dioxide Laser to Treat Joint Contractures from Chronic Sclerotic Graft versus Host Disease in a Pediatric Patient

**Author:** Janelle S. Nassim, MD, Dermatology Resident, Harvard Combined Dermatology Residency Training Program, Boston, MA

**Co-Authors:** Jennifer Huang, MD; Sandy Tsao, MD

**Purpose:** Chronic graft versus host disease (GVHD) is the leading cause of non-relapse associated morbidity and mortality among transplant recipients. Sclerotic cutaneous GVHD can result in joint contractures, which can significantly limit mobility and ambulation and negatively impact quality of life. We investigate whether fractionated carbon dioxide laser resurfacing alone or with fractionated drug delivery of topical triamcinolone would provide a safe and effective improvement of joint contractures in a pediatric patient with well-controlled sclerotic GVHD.

**Design:** A 4-year-old male with a history of acute megakaryoblastic leukemia status-post stem cell transplantation complicated by multi-organ chronic GVHD was referred for evaluation of persistent sclerotic changes of the ankles and feet. His GVHD was well controlled on subcutaneous interleukin-2. Despite regular physical therapy, he demonstrated persistent joint contractures and skin tightness with very limited ankle range of motion upon dorsiflexion and plantar flexion and limited ability to ambulate. Examination of his ankles and feet revealed diffuse skin tightening with indurated, shiny skin. Serial fractionated carbon dioxide laser treatment risks and benefits were reviewed extensively and parental consent for laser surgery was obtained. In an unblinded split-body trial, the patient was treated with fractionated carbon dioxide (CO<sub>2</sub>) laser treatment alone (single pass, 10mJ/cm<sup>2</sup>, 15% density) to his right ankle and fractionated CO<sub>2</sub> laser assisted drug delivery (single pass, 10mJ/cm<sup>2</sup>, 15% density) with topical triamcinolone acetonide 10mg/mL suspension to his left ankle. A second treatment was performed 6 weeks later with fractionated carbon dioxide (CO<sub>2</sub>) laser treatment alone to the right ankle (two passes, 15mJ/cm<sup>2</sup>, 15% density) and fractionated CO<sub>2</sub> laser assisted drug delivery (two passes, 15mJ/cm<sup>2</sup>, 15% density) with topical triamcinolone acetonide 10mg/mL suspension to his left ankle.

**Findings:** Physical examination revealed notable skin softening, slightly improved joint flexibility and slightly reduced contractures of both ankles six weeks after the second fractionated CO<sub>2</sub> laser treatment. His left ankle revealed slightly more improvement in flexibility when compared to his right ankle. His parents reported improved patient ambulation. No side effects were observed. No GVHD reactivation was noted.

**Summary:** Fractionated carbon dioxide laser surgery can provide a safe and effective improvement in joint contractures in patients with quiescent sclerotic GVHD. An improvement in flexibility and mobility may be achieved after serial laser treatments. Fractionated carbon dioxide laser drug delivery of triamcinolone acetonide may provide more clinical benefit compared with fractionated carbon dioxide laser treatment alone. The greatest limitation to laser treatment includes potential GVHD reactivation. Careful selection of patients with quiescent disease in collaboration with all patient healthcare providers, utilization of conservative treatment parameters and judicious follow-up are paramount in reducing this risk. Longitudinal follow-up and larger patient cohort studies are needed to determine the degree and duration of clinical benefits which may be achieved.

## Use of AbobotulinumtoxinA for Cosmetic Treatments in the Neck and Middle or Lower Face: A Systematic Review

**Author:** Hassan Galadari, MD, Assistant Professor, UAE University, Dubai, United Arab Emirates

**Co-Authors:** Ibrahim Galadari, MD, Inna Prygova, MD; Alessio Redaelli, MD; Riekie Smit, MD

**Purpose:** AbobotulinumtoxinA (aboBoNT-A) is a botulinum neurotoxin type A treatment that has been used for cosmetic treatment of the neck and middle or lower face, including minimizing moderate or severe lines caused by movements and contractions, modulating masseter muscle power and hypertrophy and reducing gummy smile. We carried out a systematic literature review to identify published evidence on treatment approaches and outcomes of aboBoNT-A when used as a cosmetic treatment for the neck and middle or lower face.

**Design:** The Embase, MEDLINE® and Cochrane Library databases were searched for relevant observational studies (OSs), randomized controlled trials (RCTs) and non-RCTs, with no date or country restrictions. Bibliographies of review articles and recent congress proceedings were also searched. Articles were screened using predefined eligibility criteria.

**Findings:** Of 560 articles identified, 10 were considered relevant (3 OSs [30.0%] 2 studies reporting data from one RCT [20.0%] and 5 non-RCTs [50.0%]) and were included for data extraction. These articles provided data on 'gummy' or asymmetric smile (2 [20.0%]), masseter muscle volume (2 [20.0%]), perioral wrinkles (2 [20.0%]), marionette lines (4 [40.0%]), nasal wrinkles (2 [20.0%]) and the platysma (4 [40.0%]). The most common outcomes were injection practice and technique (10 [100.0%]), efficacy (9 [90.0%]), safety (9 [90.0%]) and patient satisfaction (6 [60.0%]). Efficacy results were positive, including reduced wrinkles (6 [60.0%]), masseter muscle volume (2 [20.0%]) and the degree of gummy smile (1 [10.0%]) compared with before treatment.

**Summary:** We identified various treatment approaches and positive outcomes associated with aboBoNT-A as a cosmetic treatment for the neck and middle or lower face.

## Use of Kinesiology Tape in Dermatologic Surgery to Improve Surgeon Posture and Decrease Long-term Strain and Injury

**Author:** Joanna Dong, MD, Resident Physician, University of Miami Miller School of Medicine, Department of Dermatology and Cutaneous Surgery, Miami, FL

**Co-Authors:** Michael Abrouk, MD; Cameron Chesnut, MD

**Purpose:** Methodology to prevent work-related musculoskeletal injury amongst dermatologic surgeons is a crucial topic that warrants greater discussion within the field. The importance of this is gravely highlighted in studies of morbidity amongst our surgery and procedural colleagues, in which over half of all surgeons experience work-related pain and over 10% affected by the long-term sequelae of such injuries such as a leave of absence, practice restriction, or early retirement. Optimized ergonomics (e.g. patient and surgeon positioning, adjustment of table height, use of assistants) are the predominant means of injury prevention in surgical fields, yet there is still risk of strain and injury in spite of these healthy practices. Thus, further creative methods are necessary to promote sustainable work practices within the field of dermatologic surgery and prevent work-related injury.

**Design:** Use of kinesiology tape (KT) to augment surgeon postural stability, a technique that can be seamlessly integrated into practice without altering workflow. Such practice, when utilized regularly on high-volume surgery or procedural days in which excessive axial flexion, lateral flexion, and rotation are anticipated, may serve to alleviate short-term musculoskeletal strain, prevent pain in the long-term, and preserve career longevity.

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**Findings:** KT has been utilized in sports injuries, performance enhancement, physical rehabilitation, and treatment of orthopedic and pain disorders. The mechanism of action is attributed to the tape hypothetically providing a proprioceptive input when stretched along a muscle plane and changing afferent motor and sensory signaling. In meta-analyses, KT has been shown to provide a non-inferior reduction in pain from musculoskeletal injury when compared to more traditional rehabilitative modalities and can be used as adjunctive treatment.

The anatomic regions of highest rates of pain for the surgeon are the back, neck, and shoulders/arms. Thus, to directly address these areas and to facilitate functionality, we recommend the application of KT in two paraspinal strips running in parallel from mid-neck to mid-back as well as a horizontal strip across bilateral shoulders. The consistent elastic pull in the horizontal and vertical axis promotes correct posture during surgery. The senior author (CC) has been using KT for 6 years during surgery, and the proprioception provided by the bilaterality of the paraspinal strips running in parallel has served as an important piece of feedback, especially for lateral flexion and rotation, and spinal movements that are less frequently discussed in surgical ergonomics.

**Summary:** The benefits of KT for the surgeon or proceduralist are multi-fold: 1) its elastic pull after application serves as a continuous tactile reminder for maintaining an upright and non-contorted posture 2) correction of posture in the long-term can provide durable freedom from work-related injury and 3) if effective for reducing pain, it is a time-saving option compared to traditional rehabilitation with less risks than analgesics.

## Using Expression of Glioma-associated Oncogene Homolog 1 as Biomarker for Hedgehog Pathway Inhibition with Sonidegib Treatment in Patients with Advanced Basal Cell Carcinoma

**Author:** Michael R. Migden, MD, Professor, Anderson Cancer Center, Houston, TX

**Co-Authors:** Reinhard Dummer, MD; Ralf Gutzmer, MD; John Lear, MD; Li Liu, PhD; Nicholas Squitieri, MD

**Purpose:** Sonidegib, a Hedgehog pathway inhibitor, is approved to treat adult patients with locally advanced basal cell carcinoma (laBCC) not amenable to curative surgery or radiation therapy and for the treatment of metastatic BCC (mBCC) in Australia and Switzerland. In the pivotal BOLT (Basal cell carcinoma Outcomes with LDE225 [sonidegib] Treatment) study, durable efficacy and manageable toxicity of sonidegib 200 mg once daily (QD) was demonstrated through 42 months in patients with laBCC and mBCC.

**Design:** BOLT was a randomized, double-blind, multicenter phase 2 study; patients were randomized 1:2 to receive sonidegib 200 or 800 mg orally QD, respectively. This secondary analysis used expression of Glioma-associated oncogene homolog 1 (GLI1) as a biomarker to evaluate the extent of Hedgehog pathway inhibition by sonidegib in patients with laBCC and mBCC. Biopsies were collected at screening, weeks 9 and 17 pre-dose, and within 21 days following the last dose of study drug. GLI1 expression at screening was used as baseline measurement. Gene expression at all examined timepoints was evaluated using reverse transcriptase polymerase chain reaction. Association between GLI1 expression and select efficacy and safety assessments was assessed.

**Findings:** The study enrolled 230 patients, with 79 and 151 receiving sonidegib 200 and 800 mg QD, respectively. Patients with laBCC represented 91.0% and 91.6% of the biomarker population, and 83.5% and 84.8% of the intent-to-treat population for the 200 and 800 mg groups, respectively. At week 17, GLI1 expression was reduced from baseline by a median percentage (95% confidence interval) of 97.5% (80.3%–98.8%) and 95.0% (80.7%–97.5%) for nonaggressive laBCC, 88.7% (54.6%–93.0%) and 97.0% (77.5%–98.9%) for aggressive laBCC,

and 99.1% (96.4%–99.6%) and 99.3% (95.9%–99.9%) for mBCC in the 200 and 800 mg groups, respectively. Significant decreases in GLI1 levels from baseline were observed in patients with disease control (complete response, partial response, or stable disease), with median percent reduction ranging from 74.5%–97.9% and 95.7%–98.0% at week 9, and 90.8%–99.5% and 96.1%–97.0% at week 17, for the 200 and 800 mg groups, respectively.

**Summary:** Substantial repression of GLI1 was observed in patient subgroups stratified by sex, age, BCC cytological subtype, lesion site, Eastern Cooperative Oncology Group performance status, baseline number of BCCs, and previous radiotherapy. These results support the need for further clinical studies on the effect of sonidegib on hedgehog pathway biomarkers in patients with laBCC and mBCC.

## Using in Vivo Reflectance Confocal Microscopy to Monitor Residual Melanocytic Atypia in a Post-excision Scar

**Author:** Aattiya Haroon, MD, Resident, Rutgers/RWJMS, Freehold, NJ

**Co-Authors:** Nadiya Chuchvara, BS; Jennifer Cucalon, BS; Samavia Khan, BS; Babar Rao, MD

**Purpose:** Residual melanocytic atypia after excision of a melanoma poses a difficult therapeutic question: whether or not to pursue an additional excision. A background of sun-damaged skin is particularly confounding, as it can be difficult to determine clear histopathological borders of meaningful atypia. While it is recommended that atypical melanocytic proliferations be re-excised with “clear margins” to reduce the risk of recurrence of melanoma, this often proves difficult due to poorly defined borders. The heterogeneity of these ambiguous lesions results in histopathological reads that are not always standardized or specific. Thus, clinicians and surgeons may look to ancillary modalities to enhance diagnostic capability and guide management on an individualized basis.

**Design:** Case report of a 40-year-old woman presented to us with a linear scar on her left shoulder status post wide excision. She had previously undergone biopsy of a 7 mm lesion, which came back positive for melanoma in situ, lentigo maligna type, extending focally to one lateral margin of the specimen (tumor stage Ia). Wide excision was performed. Histopathological margins were once again positive, this time for “atypical lentiginous melanocytic hyperplasia.” The patient now had a 6 cm scar on her left shoulder, with which she was cosmetically dissatisfied. The benefits and consequences of re-excision were then weighed. Instead of pursuing a third invasive procedure, we evaluated the margins of the post-excision scar using reflectance confocal microscopy (RCM), the only non-invasive skin imaging method with near-histopathological resolution.

**Findings:** On RCM, the margins of the scar were free of atypical roundish and/or dendritic cells and of dermoepidermal junction architectural disarray, ruling out melanocytic atypia. Based on these results, the patient was spared unnecessary re-excision, and advised to return for routine annual follow-up to monitor the post-excision scar with repeat imaging.

**Summary:** Our case demonstrates the potential of RCM in augmenting diagnosis, management, and longitudinal surveillance of atypical melanocytic proliferations with ill-defined borders, particularly when there is a background of sun-damaged skin.

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## Utilizing the Nasal Tip Subunit En Bloc as a Flap Template: A Modified Approach to the Paramedian Forehead Flap

**Author:** Daniel Bax, MD, Resident, University of Vermont, Burlington, VT

**Co-Authors:** Corey Dewitt, MD; Glenn Goldman, MD

**Purpose:** Design and execution of the paramedian forehead flap is usually accomplished with an external template. We present a case utilizing the distal nasal subunit as a template for reconstruction.

**Design:** A 59 year old female underwent Mohs micrographic surgery for a nodular basal cell carcinoma of the right nasal tip. Negative margins were achieved after 5 stages. The resultant skeletonized defect measured 3.0 x 2.8 cm and encompassed much of the distal nasal subunit.

A paramedian forehead flap pedicle was delineated. The distal nasal subunit was then excised en bloc, rotated 180 degrees, and placed on the superior forehead. FIGURE 1 The borders were outlined with a surgical marking pen. FIGURE 2 after local anesthesia was administered, the flap was actuated in the usual fashion. FIGURE 3 Suture removal was performed one week postoperatively. FIGURE 4 Flap division and inset proceeded uneventfully at three weeks. FIGURE 5 Long term follow up reveals a suitable result. FIGURE 6

**Findings:** The paramedian forehead flap offers good skin color and texture match, adequate thickness, and adequate blood supply to repair nasal wounds. Forehead flap design must include a robust pedicle of adequate length, and a design that incorporates the shape, size, and curvature of the operative wound. Non-stick gauze and foil suture packets are commonly used to create a template for the distal nose. Care must be taken in creating a 3-dimensional flap, as the two-dimensional diameter of the operative wound will prove inadequate for aesthetic repair. In this case, since the nasal tip subunit skin was going to be enlarged for cosmesis, we elected to use the native skin as the template. Utilization of the defect tissue ensures exact sizing in three dimensions, and ultimately simplifies a key step in flap design. When the entire distal nasal subunit will be removed we consider this a reasonable approach.

**Summary:** En bloc excision of the nasal tip subunit provides a useful template in the design of a paramedian forehead flap for nasal tip reconstruction following Mohs surgery.

## Vitamin d3 Injection- A New Armamentarium in the Treatment of Cutaneous Warts

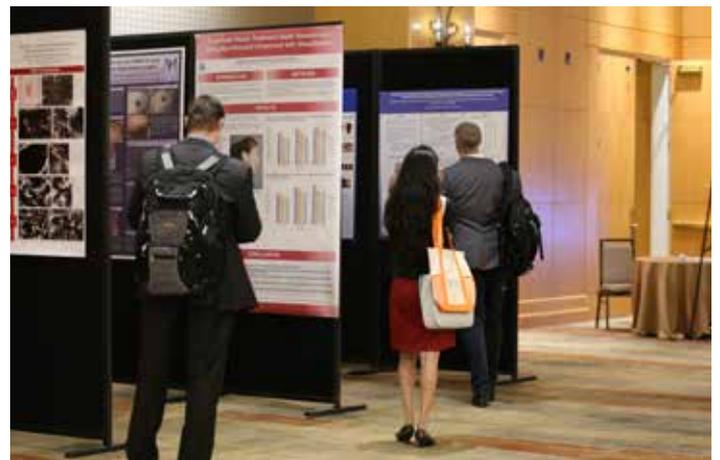
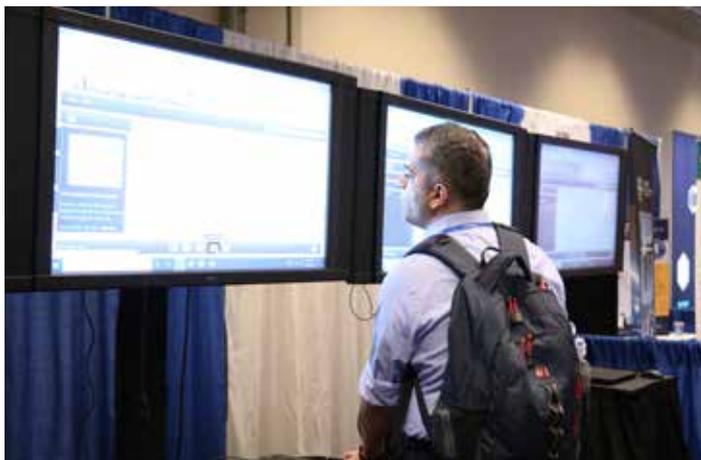
**Author:** Kinnera Boina, MD, Senior Resident, Rangaraya Medical College, Kakinada, Andhra Pradesh, India

**Purpose:** To study the role of intralesional vitamin D3 therapy in the treatment of cutaneous warts.

**Design:** 40 Patients presenting with cutaneous warts who gave consent for the procedure were treated with intralesional vitamin D3 injection. About 0.2 to 0.5mL vitamin D3 solution (600,000 IU, 15 mg/mL) was injected to the base of the wart after giving local anaesthesia. The injections were repeated at 3-weekly intervals for a maximum of 4 treatments or till the response whichever was earlier. No clearance of warts by 9 weeks was considered as failure. Erythema and swelling were noted in few cases. Patients were followed for 2 months after the last injection to detect any relapse. Clinical photos before and after treatment were taken.

**Findings:** Out of 40 patients 37(92.5%) patients came for regular follow ups, complete resolution was seen at 3weeks in 12(32.4%), 6 weeks in 13(35.1%), 9 weeks in 10(27.5%) and 2 (5%) did not respond by 9 weeks.

**Summary:** Intralesional vitamin D3 injections are safe and effective in treatment of cutaneous warts. It is an effective option in those with keloidal tendency and those with multiple warts.



# Industry e-Poster Abstracts 2020 ASDS Virtual Annual Meeting

## Submitting Company: Colgate-Palmolive

**Title:** In Vitro Release Tests (IVRT) of Retinol Formulations

**Author:** Aaron Cohen

**Co-author:** Junhong Mao

**Objective / Purpose:** In Vitro Release Tests (IVRT) of retinol were conducted for PCA Skin's Intensive Age Refining Treatment (IART), containing 0.5% retinol encapsulated in the OmniSome delivery system, and compared with two competing products from SkinCeuticals containing 0.5% and 1.0% retinol in a Poly-Pore delivery system.

**Design:** IVRT's were conducted on a standard six-cell, dry-heat Franz diffusion system. To optimize the method, we explored different choices of receiver medium that were both compatible with the instrument and allowed for high levels of retinol solubilization. Additionally, we explored a variety of surface membranes to provide accurate and reproducible results. Membranes had to withstand the conditions of the IVRT without degrading. Additionally, the pore size of the membranes had to be small enough such that only free, released retinol would pass through, rather than an intact encapsulation system. Receiver fluid was withdrawn at pre-determined time intervals during the course of the experiment and replaced with fresh fluid; the withdrawn fluid was analyzed by HPLC to determine the overall retinol concentration.

**Results / Summary:** When designing a topical retinol formulation, it is critical to optimize the active release rate, achieving a strong level of product efficiency without causing high levels of visible irritation to the consumer. In this study, we compared the retinol release rate from PCA Skin's Intensive Age Refining Treatment (IART), which uses the OmniSome delivery system, to two competing retinol products from SkinCeuticals that both contain the Poly-Pore delivery system. The rate of retinol release from PCA Skin's IART was about 2.5 times greater than both of the SkinCeuticals' products over a 24 hour experimental period. We believe that this increase in the retinol release rate from PCA Skin's IART allows the product to optimize both product efficiency and user tolerability by delivering high levels of retinol into the skin while still minimizing levels of visible skin irritation.

**Conclusion:** In vitro release tests (IVRT) were performed for three topically applied retinol products. IVRT conditions were optimized to provide accurate and reproducible results. PCA Skin's Intensive Age Refining Treatment (IART), containing 0.5% retinol in the OmniSome delivery system, had a release rate about 2.5 times greater than two SkinCeuticals' products that contain retinol in a Poly-Pore delivery system.

## Submitting Company: Endo Aesthetics LLC

**Title:** Patient Retention Strategies for Long-Term Extension Aesthetic Studies: Collagenase Clostridium Histolyticum-aaes (QWO™) Phase 3 Clinical Study Experience

**Authors:** James Clark; Joely Kaufman-Janette, MD; Kappa Peddy, MD

**Co-authors:** Alex Cazzaniga; Davina Cupo; Rosalie Filling; Robert Yon

**Objective / Purpose:** Patient retention can be challenging in long-term extension (LTE) studies, particularly LTE aesthetics studies. We present a case study of sponsor and investigator strategies used to improve patient retention rates in an LTE study of collagenase clostridium histolyticum-aaes (QWO™, Endo Aesthetics LLC, Malvern, PA).

**Design:** QWO was approved by the Food and Drug Administration in July 2020 as injectable treatment for moderate-to-severe cellulite in the buttocks of adult women. This case study highlights patient retention outcomes in the ongoing QWO EN3835-304 LTE study that is associated with identical pivotal studies EN3835-302 and -303.

**Results / Summary:** In contrast to the contract research organization (CRO) model used in early QWO LTE studies, more recent studies use a Functional Service Provider (FSP) model. Unlike a CRO model in which study operations are fully outsourced (with limited or no contact between sponsor and study sites), an FSP model outsources certain functions of study conduct. In the Endo FSP model, Clinical Operations

personnel are engaged in study management / oversight, with vendor personnel operating as a fully-integrated team under Endo Clinical Operations' oversight. This model has enhanced Clinical Operations team consistency and expertise, increased quality, and provided more control, active involvement, cost savings, and greater flexibility / scalability than the previous CRO model. This FSP model has also facilitated frequent / direct communication between Endo and study sites. Such communication allows for rapid / flexible problem resolution and keeps study sites up-to-date and motivated throughout LTE studies – all ultimately contributing to improved patient experience and retention outcomes. Study sites have also employed their own strategies to further optimize LTE study patient retention. Appropriate selection and education of patients by study site personnel is critical for ensuring that patients can understand / commit to the requirements of an LTE study. Study site personnel also endeavor to build / maintain positive, long-term relationships with patients through communication both during visits (e.g., reinforcement to patients throughout about the importance of the research and their continued individual contribution) and between visits (e.g., multiple pre-visit reminders, check-in calls / contacts). The collective implementation of these sponsor / study site strategies fosters a "ONE Team" mentality amongst all LTE study stakeholders, and has resulted in a high (55%) patient retention rate (as of August 2020) in the EN3835-304 QWO LTE study.

**Conclusion:** Case study results suggest that use of an FSP clinical study operations model in combination with strong study site-patient relationships/support can create a "ONE Team" atmosphere that can foster improved patient retention rates in LTE aesthetic studies.

## Submitting Company: Endo Aesthetics LLC

**Title:** A Survey of Dermatology Healthcare Professional Knowledge, Perception and Experience Regarding Cellulite and Its Treatment

**Author:** Jill Edgecombe, BS

**Co-authors:** Sherry Chen, MS; Daniel Connolly, BBA; Stephanie Wenstrup, MBA

**Objective / Purpose:** To identify unmet needs in dermatologist knowledge, perceptions / attitudes, and experience regarding cellulite and its treatment.

**Design:** On-line Endo market research survey conducted March 3-12, 2020.

**Results / Summary:** Eighty self-identified dermatologists (79 licensed dermatologists, one nurse practitioner specializing in dermatology) completed the survey, at which time the majority worked in a group or solo private practice setting (68% and 30%, respectively). An average of 1,382 patients were treated / month / practice; dermatologists completing the survey personally treated an average of 583 patients / month. Fifty-nine percent of dermatologists' practices offered cellulite treatment. Most dermatologists (81%) indicated that cellulite could be attributed to multiple causes, the most frequent being skin tethered by fibrous band (75%), thickening of fibrous septae (69%), and increasing fat lobules and herniation of fat (65%). Only 45% of dermatologists selected all three as causes of cellulite, and only 19% selected these and dermal thinning as causing cellulite. Although 29% agreed with the statement, "Cellulite will never go completely away with treatment, so it isn't worth trying to improve in patients," 71% agreed that, "If a treatment targets the cause of cellulite, it can greatly improve the appearance of cellulite and is worth offering to my patients." For the 47 dermatologists currently offering cellulite treatment in their practice, the most frequently offered treatments were non-invasive energy-based treatment (70%; most commonly CoolSculpting®), dermal fillers (49%), surgical subcision (38%), minimally invasive radiofrequency (28%), minimally invasive laser-based treatment (21%), surgical fat reduction (19%), mesotherapy (17%), Cellfina® (13%), and Cellulaze® (13%); however, only half of the 47 dermatologists reported being somewhat (49%) or very / extremely (2%) satisfied with the effectiveness of currently available cellulite treatments. While 65% of all dermatologists indicated that their female patients sometimes/often ask about cellulite treatment options, only 36% felt very/extremely comfortable discussing cellulite treatment options with their patients. Furthermore, 90% of

dermatologists identified  $\geq 1$  reason (i.e., barrier) that could make them hesitate to bring up cellulite during appointments with female patients, the most frequent being that current treatments require expensive equipment (41%), do not target the root cause of cellulite (31%), are too expensive for patients (28%), and/or do not have long-term effects (25%).

**Conclusion:** This survey of dermatologists identified unmet needs in cellulite education, currently available/utilized cellulite treatments, and dermatologist-patient communication on cellulite treatment options.

## Submitting Company: Endo Aesthetics LLC

**Title:** Long-Term Durability of Collagenase Clostridium Histolyticum-aaes Treatment Effectiveness for Cellulite in Women

**Authors:** Joely Kaufman-Janette, MD; Saji Vijayan, MBBS; V. Leroy Young, MD; Matthew Zook, MD, PhD

**Co-authors:** Lawrence S. Bass, MD; Karen A. Chajko, RPh; Michael P. McLane, PhD; Qinfang Xiang, PhD

**Objective / Purpose:** Collagenase clostridium histolyticum-aaes (CCH [Qwo™], Endo Aesthetics LLC, Malvern, PA) was approved in July 2020 by the US Food and Drug Administration for the treatment of moderate-to-severe cellulite in the buttocks of adult women. Once injected into the treatment area, CCH enzymatically releases fibrous septae by specifically targeting Type I/III collagen to improve skin smoothness. We report results of a phase 2b, open-label extension (OLE) study (NCT04381117) that evaluated the durability of response and safety of CCH in women 4 years after initial treatment of buttock or posterolateral thigh cellulite during a randomized, placebo-controlled, phase 2 trial (RCT; Sadick NS, et al. *Dermatol Surg.* 2019;45(8):1047-1056).

**Design:** During the previous RCT, buttock or posterolateral thigh cellulite was treated with subcutaneous CCH 0.84 mg (12 injections per treatment area; buttock or thigh treatment area) on Days 1, 22, and 43. Women identified as CCH responders during the RCT ( $\geq 2$ -level improvement from baseline in both Clinician Reported Photonumeric Cellulite Severity Scale [CR-PCSS] and Patient Reported Photonumeric Cellulite Severity Scale [PR-PCSS] at Day 71) could enroll in annual, single-visit, OLE studies. The present OLE study had a single-day evaluation at  $48 \pm 1$  months (ie, 4 years after Day 1 of the RCT). A durable CCH response was defined as the absence of a complete loss of response (i.e. both CR-PCSS and PR-PCSS scores returning to the respective RCT baseline score). A decrease in CR-PCSS and/or PR-PCSS score indicated improved skin appearance.

**Results / Summary:** Seven women who were RCT CCH responders ( $n=5$  and  $n=2$  treated for buttock and thigh cellulite, respectively) and completed previous OLE studies were participants in the current OLE study (mean [SD] patient age, 43.1 [11.2] years; mean [SD] body mass index, 29.2 [5.8] kg/m<sup>2</sup>; all women had Fitzpatrick skin type III or IV). All 7 women (100%) demonstrated durable response to CCH treatment 4 years after initial RCT CCH dosing. During the previous RCT, mean (SD) change from baseline in CR-PCSS and PR-PCSS scores at Day 71 was -2.3 (0.49) for both. In the present OLE study, mean (SD) change from RCT baseline in CR-PCSS and PR-PCSS at 4 years was -1.7 (0.76) and -1.4 (0.79), respectively. No adverse events reported.

**Conclusion:** CCH treatment of the buttocks and thighs provided durable improvement in cellulite appearance up to 4 years after initial dosing and was generally well tolerated.

## Submitting Company: Krystal Biotech, Inc.

**Title:** In Vitro and In Vivo Pharmacology of KB301, an HSV-1-Based Gene Therapy for the Treatment of Superficial Skin Depressions

**Authors:** Agarwal, P.; Collin de l'Hortet, A.; Freedman, J.; Krishnan, S.; Majumdar, A.; Parry, T.; Zhang, P.

**Objective / Purpose:** Due to the essential role collagen plays in the process of skin biorejuvenation, and the diminution of dermal collagen being a significant contributor to the aged phenotype, direct and indirect collagen stimulation / supplementation / replacement has been a focus

of cosmetic product development. However, directed supplementation of functional full-length human type III collagen (COL3), produced by and secreted from the subject's own dermal cells, has not been explored clinically. To this end, we engineered KB301, a replication-defective HSV-1 gene therapy vector, for the targeted delivery of human COL3.

**Design:** Our preclinical program explored KB301's ability to transduce clinically relevant skin cells and express and secrete mature human COL3 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 (HDFs) harvested from aged patients (65- to 75-years-old) in vitro and 12- to 13-month-old mice (equivalent to 38- to 49-year-old humans) in vivo as representative models for studying COL3 supplementation.

**Results / Summary:** In vitro, KB301 readily transduced primary aged male and female HDFs, and capably induced full-length COL3 expression, proper maturation, and subsequent secretion. Moreover, high concentrations of KB301 were non-cytotoxic to the cells, supporting safety of the vector. In vivo, young and aged immunocompetent mice were intradermally injected with low or high dose KB301. Successful vector transduction and subsequent COL3 expression was observed in a dose-dependent manner at both the transcript and protein levels. Immunofluorescence data revealed that the exogenously expressed human protein localized to the mouse dermis, signifying proper delivery to the targeted skin layer. Biodistribution was also examined 4-, 24- and 168-hours after a single intradermal injection of the vector to aged mice. It was shown that vector genomes were retained exclusively in the treated skin, with no detectable dissemination into blood or any other tested tissues, suggesting that KB301 was unable to enter systemic circulation or infect highly perfused organs after intradermal injection. Within all KB301-positive tissues, exogenous human COL3A1 transcripts were expressed as early as 4-hours post-dose and detectable at the 168-hour time point.

**Conclusion:** Results from these in vitro and in vivo proof-of-concept studies and safety assessments support the application of KB301 for the treatment of shallow-to-moderately deep wrinkles and other superficial skin depressions. A Phase I clinical trial of repeat dose KB301 is underway.

## Submitting Company: Nutrafol

**Title:** Evaluation of Standardized Nutraceuticals to Improve Hair Growth in Men and Women of Various Ethnicities: A Six Month Subjective Single Blinded Prospective Study

**Author:** Tess Marshall

**Co-authors:** Sheryl Berkowitz MS; Sophia Kogan MD; Isabelle Raymond PhD

**Objective / Purpose:** Hair loss and thinning can occur in both men and women of all ethnic backgrounds. Self-perceived improvements in hair is an important treatment outcome to ensure patient satisfaction and wellbeing. This single blinded prospective study assessed the perceived efficacy of standardized nutraceuticals (Nutrafol® Men and Women featuring Synergen Complex™) that target multiple root causes of thinning hair to improve hair growth and quality in both women and men of various ethnicities with mild to moderate self-perceived hair thinning.

**Design:** Men (20-55y) and women (20-45y) with mild to moderate self-perceived hair thinning meeting the eligibility requirements were included in this 24 week study. Clinical evaluations were conducted at baseline, week 12 and week 24. Perceived efficacy was assessed through self-assessment questionnaires (e.g., hair attributes, mood, confidence) at baseline and weeks 4, 8, 12, and 24. The investigator rated overall perception of treatment benefit via standardized global photograph at 12 and 24 weeks compared to baseline using a 7-point Likert scale. Overall perception of treatment benefit included the changes in overall growth, coverage, density, and volume combined. Additionally, an area of interest (AOI) from male subjects' photographs was for hair growth, overall volume/thickness/fullness, and appearance of coverage. Adverse events (AEs) were monitored throughout the course of the study.

**Results / Summary:** A total of 87 subjects (44 women, 43 men) completed the study. Subjects were African American (N=16), Asian (N=24), Hispanic Caucasian (N=24) and Non-Hispanic Caucasian (N=23). Both men and women reported statistically significant improvements from baseline for: overall appearance / quality, volume / fullness, coverage of scalp, thickness, and lack of shedding at weeks 4, 8, 12, and 24. Photo grading mean scores at weeks 12 and 24 were statistically significant indicating investigator overall perception of treatment benefit for all groups of subjects (women, men, African American, Asian, Hispanic Caucasian and non-Hispanic Caucasian subjects). Analysis on men's AOI showed a statistically significant improvement in hair attributes, including hair growth, overall volume / thickness / fullness, and appearance of coverage for all ethnicities with the exception of the Hispanic Caucasian (all  $P < 0.05$ ). No treatment related AEs were reported.

**Conclusion:** The daily intake of a standardized nutraceutical was effective in improving visible hair growth, volume / thickness / fullness, and coverage with less notable shedding based on subjects' and investigator's overall perception of treatment benefit for women and men of various ethnic backgrounds.

## Submitting Company: Nutrafol

**Title:** Evaluating the Efficacy of a Standardized Nutraceutical to Improve Hair Growth and Quality in Menopausal Women: A Nine Month Subjective Single-Blind Prospective Study.

**Author:** Sheryl Berkowitz, MS

**Co-authors:** Sophia Kogan, MD; Tess Marshall; Isabelle Raymond, PhD

**Objective / Purpose:** Generalized hair loss and thinning increases with advancing age and is most common among menopausal women. Hormonal changes are often cited as the cause of hair loss among older women although growing evidence indicates the cause is often multifactorial. Hair loss and thinning can have a significant psychological impact, leading to low self-esteem and diminished quality of life. The purpose of this study was to assess the perception of the efficacy of a standardized nutraceutical (Nutrafol® Synergen Plus Complex™) that targets multiple root causes of thinning hair to improve hair growth and quality in women throughout and beyond the menopause transition.

**Design:** Nine-month single-blinded prospective study with 41 women who self-reported as either pre-, peri- or post-menopausal with self-perceived hair thinning were included. Assessments were conducted at baseline, 3, 6 and 9 months and included subject questionnaires (hair attributes, quality of life and overall well-being), professional photography and expert grading of hair attributes. Hair growth, along with change for overall volume, shine, texture, degree of coverage was evaluated on a 0-9 scale by an expert grader. The percentage of participants who received a category rating of 2-3 or greater at each respective evaluation point from baseline, 3, 6, and 9 months was calculated.

**Results / Summary:** Thirty women (mean age = 55 + 7.2 y) completed the study. Subjects reported improvements in hair growth, growth rate, thickness, texture, strength and shedding. Progressive improvements were seen throughout the duration of the study. Additionally, study subjects reported improvements in quality of life; increased confidence, feelings of attractiveness and overall health during menopausal transition. All subjects were rated by the expert grader as having attained growth at 9 months relative to baseline evaluation. Expert grader reported statistically significant changes in hair attributes for overall volume ( $p < 0.01$ ), shine ( $p < 0.005$ ), texture ( $p < 0.001$ ) at 6-months and continuous improvement at 9 months. Degree of coverage progressively improved over the course of the study with a significant trend at 9 months. No reported adverse events.

**Conclusion:** This study showed subjective improvement of hair growth and quality in menopausal women following daily intake of a nutraceutical supplement containing standardized botanical extracts specifically addressing multiple root causes of hair thinning. Both subjects and expert graders reported hair growth and quality and saw further improvements throughout the duration of the study in addition to overall well-being parameters.

## Submitting Company: Revance Therapeutics

**Title:** Rheological Evaluation of the Dynamic Properties of Hyaluronic Acid-based Dermal Fillers

**Author:** Vince Bertucci, MD, FRCPC

**Co-authors:** François Bourdon; Jimmy Faivre; Conor Gallagher; Mélanie Gallet; Kevin Legent; Elodie Tremblais

**Objective / Purpose:** Facial movement and expression convey emotional and additional nonverbal information. The preservation of expressiveness is one of the most important considerations when addressing facial volume loss or deep wrinkles and folds with hyaluronic acid (HA)-based dermal fillers. Therefore, dermal fillers must have properties that allow them to move and adapt seamlessly with facial motion while lifting and supporting the tissue. Quantification and comparison of the physical properties of HA-based dermal fillers have typically involved evaluation of static properties of the gels through such measurements as  $G'$  and compression force. There is a need to develop methods that evaluate the ability of HA gels to retain their mechanical properties across a range of facial stresses experienced during facial animation. Here we introduce two novel physical gel assessments aimed at more accurately reflecting the performance of an HA gel in a dynamic environment. The Dynamic Strength (Strength) score integrates the conventionally measured  $G'$  value across the full range of force through which it can maintain a stable  $G'$  value without degrading. The Stretch score evaluates the ability of an HA gel to deform without disruption when subjected to continuous pressure.

**Design:** A broad range of HA fillers marketed in the US were evaluated. Strength scores were determined through progressive oscillatory strain application to the gels on a rheometer. The Strength score, calculated as the product of  $G'$  and the observed Linear Viscoelastic Range (LVER), was reported in Pa<sup>2</sup>. The Stretch score was determined by measuring the deformation of the gel over time with a constant applied force.

**Results / Summary:** The evaluated HA-based products exhibited a wide range of Strength and Stretch properties. HA products intended for deep compartment placement demonstrated comparatively higher Strength scores than products designed for more superficial placement. In contrast, Stretch scores were comparatively higher in products intended for more superficial placement compared with products intended for deep compartment placement. Within "use categories," marked differences in Strength and Stretch scores were observed between products. HA products with balanced Strength and Stretch characteristics are those generally considered the most versatile products, being suitable for placement in a variety of tissue layers.

**Conclusion:** Dynamic Strength and Stretch are novel parameters that may be useful in selecting HA fillers adapted to the dynamic facial environment. HA products designed for deeper placement demonstrated higher Strength scores and lower Stretch scores, while products designed for superficial placement had lower Strength scores yet higher Stretch scores, presumably for adaptation to repetitive motion in the superficial planes of the face. Considering Strength and Stretch parameters when characterizing an HA filler may help predict filler behavior in vivo and may aid physicians in selecting the appropriate product(s) to achieve a natural-looking aesthetic outcome for the face.

## Submitting Company: Revance Therapeutics

**Title:** Evaluation of the Impact of Hyaluronic Acid (HA) Filler Manufacturing Technologies on HA Chain Degradation

**Author:** Jay H. Mashburn PhD, RPh, PMP, CMPP

**Co-authors:** Jimmy Faivre; François Bourdon

**Objective / Purpose:** Hyaluronic Acid (HA) polysaccharide chains are readily degraded under crosslinking conditions employed in the stabilization of HA with BDDE for aesthetic use.<sup>1</sup> The crosslinking reaction occurs in a high pH solution, typically with elevated temperatures of 40°C or greater.<sup>2,3</sup> Different manufacturing technologies result in fillers that significantly vary in physical characteristics, including HA chain integrity, which may impact the biophysical characteristics, clinical performance, and safety of products in situ. HA fragments that

are generated during the manufacturing process are extractable as soluble HA (sHA) fragments and can be evaluated for molecular weight (MW). The aim of this study was to examine the sHA chain length and distribution in commercial filler products to understand the impact of filler manufacturing technologies on HA chain degradation.

**Design:** A broad sample of US-marketed HA fillers across 5 technologies (Vycross, Hylacross, NASHA, XpresHAn, and Preserved Network Technology [PNT]) was evaluated. After filtration, the sHA fraction extracted from HA gels was analyzed using Size Exclusion Chromatography (SEC). The mean MW in kilodaltons (kDa) of sHA released from the final formulation per syringe are reported. Furthermore, the proportion of sHA that fell under fragment sizes of < 30 kDa, < 100 kDa, and < 250 kDa are identified for each product.

**Results / Summary:** A total of 13 gels from 5 manufacturing technologies were analyzed. Fillers manufactured by PNT released the longest sHA fragment chains (~500-600 kDa), followed by Hylacross (~300 kDa), XpresHAn (~100-275 kDa), NASHA (~200 kDa), and Vycross (~100-165 kDa). PNT released the lowest cumulative amount of sHA compared to other technologies for all 3 low MW fragment size categories (0% for < 30 kDa fragment sizes; 4-5% for < 100 kDa fragment sizes; 8-9% for < 250 kDa fragment sizes). In contrast, Vycross released more of the shortest sHA fragment chains (2-7% for < 30 kDa fragment sizes; 15-20% for < 100 kDa fragment sizes; 21-26% for < 250 kDa fragment sizes). This is consistent with the predominant use of lower MW HA during the Vycross manufacturing process, and differences in the manufacturing process between PNT and other technologies.

**Conclusion:** This analysis demonstrates the differential impact of manufacturing technologies on the HA chain length released in finished products. Most products initially using high MW HA undergo significant HA chain degradation in the manufacturing process, however, PNT products exhibit the longest sHA chains. Vycross products uniquely contain a substantial amount of very low MW HA. Low MW HA has been reported to potentially have proinflammatory properties.<sup>4-6</sup> References: 1. Baek J, et al. Carbohydrate Polymers. 2018;202:545-553. 2. Allergan Patent US 7741476 B2. June 22, 2010. 3. Q Med AB Patent US 5827937. October 27, 1998. 4. Cavallieri F, et al. Surg Cosmet Dermatol. 2017;9:218-222. 5. Mikkilineni R, et al. Dermatol Surg. 2020 Mar 17. DOI: 10.1097/dss.0000000000002385. 6. Belezny K, et al. Dermatol Surg. 2015;41:929-939.

## Submitting Company: skinbetter science

**Title:** A Single-center, Open-label Clinical Trial Evaluated the Efficacy and Tolerability of a Comprehensive, Hydrating Topical Antioxidant Developed Specifically for Men.

**Author:** Brooke C. Sikora, MD

**Co-authors:** Jeffrey S. Dover, MD; Diane B. Nelson; Mitchell Wortzman

**Objective / Purpose:** There is growing interest among men for skincare products designed specifically to address their unique facial skin characteristics. Reliance on social media and video conferencing for work and recreation has increased men's awareness of the importance of healthy skin and the need for effective skincare that complements their shaving regimen. The study described herein evaluated the efficacy and tolerability of a comprehensive antioxidant product (SHD-M) in men with photo damaged skin.

**Design:** This 12-week open-label study evaluated improvements from baseline in erythema, lines/wrinkles, skin tone, texture and brightness, dryness/flaking, and pore size using a 6-point grading scale following daily (AM) application of SHD-M in males with mild to moderate photo damaged skin. Digital images and skin surface sebum levels were assessed at baseline, 4-, 8- and 12 weeks. Subjects completed self-assessments at 4-, 8- and 12 weeks, and Adverse Events (AEs) were captured throughout the study period.

**Results / Summary:** Twenty-two men completed the study. Early mean percent improvements from baseline were demonstrated in all categories at week 4 with visible improvements occurring in skin tone (29%;  $P = .0001$ ) and pores (28%;  $P < .0001$ ). At 12 weeks, once-daily use of SHD-M resulted in significant improvements from baseline in the appearance of erythema (24%;  $P = .01$ ), lines/wrinkles (22%;  $P < .0005$ ), skin tone (34%;  $P < .0001$ ) and dryness/flaking (30%;  $P < .01$ ). Reductions in skin surface sebum levels from baseline were demonstrated at 8 ( $P < .0001$ ) and 12 ( $P < .0003$ ) weeks. Ninety-six percent of subjects reported overall improvement in the appearance of their skin after 4 weeks of use, and that the study product calmed and soothed their skin, reducing redness and irritation following shaving. One subject reported mild dryness.

**Conclusion:** Once daily application of a comprehensive, hydrating topical antioxidant developed for men led to significant improvements in skin appearance, substantial reductions in skin surface sebum levels, and was well tolerated with a high level of subject satisfaction over 12 weeks.

## Submitting Company: Soliton, Inc.

**Title:** Improvement in the Appearance of Cellulite Depressions and Skin Laxity Resulting from a Single Treatment with Acoustic Subcision: Findings from a Multi-Center Pivotal Trial

**Authors:** Elizabeth L. Tanzi, MD, Capital Laser & Skin Care; Christopher C. Capelli, MD, Soliton, Inc.; David W. Robertson, MS, Soliton, Inc.; Brenda LaTowsky, MD, Clear Dermatology and Aesthetic Center; Carolyn Jacob, MD, Chicago Cosmetic Surgery and Dermatology; Omer Ibrahim, MD, Chicago Cosmetic Surgery and Dermatology; Michael S. Kaminer, MD, SkinCare Physicians of Chestnut Hill

**Objective / Purpose:** The appearance of cellulite depressions can be improved through disruption of the subcutaneous fibrous structures. Current approaches accomplish this invasively requiring anesthesia and potential down time. Skin laxity worsens the appearance of cellulite depressions, however, current invasive approaches do little to improve the skin laxity. The objective of this study was to evaluate a non-invasive approach to improving both cellulite depressions and skin laxity through fibrous septa disruption using rapid acoustic pulses (acoustic subcision). Safety, efficacy, tolerability and participant satisfaction results were measured.

**Design:** Women (n=67) with moderate to severe cellulite were treated in a single acoustic subcision treatment without anesthesia. Post-treatment adverse events and tolerability were recorded. At 12-weeks, cellulite outcomes using a 6-point simplified cellulite severity scale (CSS), Global Aesthetic Improvement Scale (GAIS), and participant satisfaction were obtained. Additionally, laxity improvement was measured using a 3-point Hexsel Laxity Score (LS) and GAIS.

**Results / Summary:** Improvement in cellulite appearance measured at 12-weeks showed that participants (n=62) had a mean CSS reduction of 1.16 (a 32.5% reduction from baseline). Cellulite was graded as improved, much improved or very much improved using the GAIS at 84.9% of treated locations. The post-treatment photograph was correctly identified from randomized pairs of pre/post-treatment photograph pairs for 84.4% of participants. Finally, 91.9% of participants reported positive satisfaction responses. Scoring for improvement in skin laxity appearance at 12-weeks showed a mean LS reduction of 0.52 (a 25.6% reduction from baseline). GAIS for laxity was graded as improved, much improved or very much improved in 61.8% of treated areas. No adverse events were noted other than mild erythema at treatment sites. Overall pain score during treatment was 2.4 (0-10 pain scale) and 0.3 post-treatment.

**Conclusion:** A single non-invasive acoustic subcision session can safely provide meaningful improvement in the appearance of cellulite in terms of depressions, as well as skin laxity, with minimal treatment pain or post-treatment down time. Further improvement in appearance is expected with multiple treatments over time. Additional trials to verify this are planned.