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**TITLE:** *The Efficacy of Second-intention Healing in the Management of Defects on the Dorsal Surface of the Hands and Fingers after Mohs Micrographic Surgery*

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**PURPOSE:** The purpose of the study is to evaluate the efficacy of second-intention healing in the management of defects on the dorsal surface of the hands and fingers after Mohs micrographic surgery. In addition, the study will attempt to define optimal parameters such as diameter, location, and depth of the wound for choosing second-intention healing for the management of defects in these areas.

**DESIGN:** The authors contacted by telephone and retrospectively reviewed photographic and medical records of 59 patients who underwent second intention healing after Mohs micrographic surgery for the treatment of non-melanoma skin cancer involving the dorsal surface of the hands and fingers between July 23rd, 2008 and June 15th, 2010. Eight of the patients either were lost to follow-up or refused to participate, one patient's wound had not completely healed, and two patients died of unrelated causes. The remaining 48 patients were interviewed to evaluate healing by second-intention based on four outcome variables including functional ability (overall function, ability to make a fist, and ability to open the hand), durability (presence or absence of skin break down or bleeding of the scar after healing), sensation, and cosmetic result. Patient satisfaction was documented and rated on a Likert scale of 1 to 4 (1= Poor, 2= Fair, 3= Good, 4= Excellent). The mean duration of follow-up for patient self-evaluation was 10 months (range, 1-23 months). In addition to telephone follow up with the patient, the medical records and photographs (preoperative and postoperative) of all 48 patients were reviewed. All 48 patients had been evaluated at least twice postoperatively until the wound had completely healed. The follow up visits in the medical records were evaluated for documentation of problems with function, durability, sensation, cosmesis, and wound infection.

**SUMMARY:** Thirty-seven patients had defects on the dorsal hand, 10 patients had defects on the dorsal finger, and 1 patient's defect was located on the dorsal web space of the hand. None of the defects crossed joints, and only one defect extended below subcutaneous fat (exposed tendon with intact paratenon was present in the center of this defect). The defects ranged in size between 0.8 cm to 6.0 cm in diameter. All thirty-seven patients with defects of the dorsal hand reported excellent or good functional results, normal sensation within the scar, and excellent or good scar durability. Thirty-four of 37 patients reported excellent or good cosmetic results, while three patients reported fair cosmetic results.

Ten patients with Mohs defects of the dorsal finger also underwent second-intention healing. All 10 patients reported excellent or good functional results. Nine patients reported excellent or good durability, and only one patient had a fair response. Nine patients also reported excellent or good cosmetic results, and only one patient reported fair cosmetic results. All 10 patients reported excellent or good sensation.

One patient with a defect of the dorsal web space underwent second-intention healing. This patient reported no functional impairment and excellent durability, sensation and cosmetic results.

Review of the follow up visits and photographs in the medical records of all 48 patients revealed no documented problems with function, durability, sensation, cosmesis, or wound infection.

**CONCLUSION:** The hand is a unique and intricate part of the human anatomy that is important both aesthetically and functionally. It is imperative to consider function and aesthetic appearance when deciding which repair is appropriate for defects on the dorsal surface of the hand and fingers. Preservation of normal function should take precedence over a favorable cosmetic appearance.

The decision to use second-intention healing should include consideration of the location and depth of the defect. In general, defects may be allowed to heal by second intention if they do not traverse joints and if they do not extend below the subcutaneous fat to exposed tendon. Based on the excellent result in one patient, it is possible to allow a defect with exposed tendon to heal secondarily as long as the paratenon is intact. In our study, we did not find that size was a limiting factor in choosing second intention healing, since several patients with large defects over 3 cm in diameter obtained excellent results.

Although limited by its retrospective design, this study indicates that second-intention healing in an excellent option for repair of selected defects on the dorsum of the hand and fingers because of its ability to preserve normal function, durability, sensation and cosmesis.

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**TITLE:** *Intralesional Methotrexate Treatment for Keratoacanthoma Tumors: A Retrospective Case Series*

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**PURPOSE:** We sought to determine the response rate and adverse events in keratoacanthomas (KA) treated with intralesional methotrexate. The main objective was to determine whether IL-MTX could ultimately prevent morbidity associated with surgical options.

**DESIGN:** All cases of KA treated with intralesional methotrexate (IL-MTX) at our institutions from 2001 to 2009

were systematically reviewed. The inclusion criteria for this study were a typical clinical presentation and rapid tumor evolution (less than 2 months). A thorough clinical discussion regarding treatment options (surgery versus IL-MTX) was the rule for all patients. MTX-IL was not offered to patients if there was any clinical suspicion of SCC. We deliberately chose to include cases in which a skin biopsy was not performed prior to treatment with IL-MTX, mainly because the biopsy is often equivocal, as previously mentioned. In order to minimize biases, we chose to apply the following exclusion criteria: prolonged course of evolution, atypical clinical presentation, immunosuppressed patients and tumors which were not well defined. The standard technique used was injection of MTX at a concentration of 25 mg/ml diluted with xylocaine 1% with epinephrine using a 25G. KA location was noted and tumoral diameter was measured. A single injection was performed if the tumor was smaller than 0.5 cm; 5 injections per session were performed if the tumor exceeded 0.5 cm (one injection in each quarter of the tumor and one injection in the center). The goal was the objectification of a uniform tumor blanching. The procedure was repeated on an as-needed basis during the follow-up visits. The variables we chose to study were: age and sex of patients, tumor size and location, cumulative MTX dose, number of treatments needed to achieve clinical healing, treatment outcome and total patient follow-up time.

**SUMMARY:** In all, 45 cases of KA treated with IL-MTX were identified at our institutions. The average age at diagnosis was 68 years and the average tumor diameter was 1.3 cm. Tumors were located on the face in 76% of patients. Patients were treated with 1 to 4 total injection sessions (mean 1.8 injection session). The mean cumulative dose of IL-MTX was 10.2 mg. A complete response rate was achieved in 71% (32/45) of the treated KA tumors. Therapeutic failure occurred in 29% of patients (13/45); these patients had to undergo Mohs surgery in order to cure the disease. The subsequent evolution of these non-responders was recorded. The follow-up period ranged from 1 to 17 months (mean duration 5.6 months). Histological confirmation of diagnosis before IL-MTX treatment was obtained in just one case, as the working diagnosis was clinically established for this study. Conversely, post-treatment histological confirmation of diagnosis was performed in one single patient and showed no remaining tumor after the procedure. Tumor resolution was determined by physical examination and clinical behavior in the vast majority of cases (44/45). The average tumor diameter in the unsuccessful cases was 2.8 cm, which is somewhat larger than the mean diameter of all treated lesions (1.3 cm). Tumors that failed to respond to IL-MTX were all located on the face except two which had different locations (hand and leg). No significant adverse effect was noted throughout the study.

**CONCLUSION:** Our study demonstrates a 71% success rate in treating KA with IL-MTX. This treatment modality is appealing because of its low cost, minimally invasive procedure, excellent safety profile and cosmetic outcome. It

seems that there is a dose-response relationship with IL-MTX, because using higher doses tend to result in better efficacy, less treatment sessions and no more side effects.

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**TITLE:** *Can Tumor Cells be Implanted by Surgical Instruments during Skin Cancer Surgery?*

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**PURPOSE:** Surgical implant of tumor is a significant concern during cancer surgery for non-cutaneous adenocarcinoma, sarcoma, urothelial carcinoma, and renal cell carcinoma. This concept has not been investigated in skin cancer surgery.

This study used a model of tumor cell implantation using basal cell carcinoma (BCC) curettage specimens to investigate if tumor cells could possibly be implanted by surgical techniques used during Mohs micrographic surgery (MMS).

**DESIGN:** BCC curettage specimens and residual redundant tissue from reconstruction were collected from patients undergoing MMS. The curetted carcinoma material were placed above the tissue in 5 different manners: 1) tumor bulk placed above intact epidermis, 2) tumor bulk placed above eroded epidermis, 3) saline suspended tumor cells placed above intact epidermis, 4) saline suspended tumor cells placed above eroded epidermis, 5) saline suspended tumor cells placed above eroded epidermis then wiped using a gauze. Saline suspended tumor cells were prepared from the tumor bulk, as it was cut into pieces ranging in sizes from 1 to 3 mm then scraped and crushed with a curette in saline. Then the saline was drained with filter paper and the cells were collected with a 15 blade to place over either intact or eroded epidermis. A 15 blade was used to cut through the tumor material and tissue to the level of reticular dermis simulating the niches during MMS. The tissue was frozen on the cryostat, cut at 6 micron thickness, and stained with hematoxylin and eosin stain. A total of 450 cuts were analyzed to determine if tumor cells or bulk was implanted by the blade. Statistical analysis was done using a p-value of 0.05 for significance.

**SUMMARY:** The implant rates were as follows in the 5 groups:

- 1) tumor bulk above intact epidermis: 2.2% (2/90)
- 2) tumor bulk above eroded epidermis: 7.8% (7/90)
- 3) suspended tumor cells above intact epidermis: 12.2% (11/90)
- 4) suspended tumor cells above eroded epidermis: 23.3% (21/90)

5) suspended tumor cells above eroded epidermis then wiped: 1.1% (1/90)

The implant rate was statistically significantly higher ( $p < 0.05$ ) than all the other groups when the suspended tumor cells were cut above the eroded epidermis.

**CONCLUSION:** We have demonstrated that basal cell carcinoma can be implanted during skin cancer surgery. It will be crucial to investigate whether if the implanted cancer cells will survive and develop into a tumor in vivo with animal experiments for basal cell carcinoma and other cutaneous carcinomas.

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**TITLE:** Pre-operative Expectations and Values of Patients Undergoing Mohs Micrographic Surgery\_Micrographic Surgery

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**PURPOSE:** Mohs micrographic surgery (MMS) has been championed by dermatologists because of its unsurpassed treatment success for skin cancers, safety profile, cost-effectiveness, and tissue-sparing quality. It is unclear whether these characteristics are also valued by patients undergoing MMS. This study aims to evaluate patients' pre-operative expectations of MMS and identify those factors which may influence such expectations.

**DESIGN:** The study prospectively recruited subjects who were newly diagnosed with skin cancers and referred for MMS. A questionnaire listing the characteristics of MMS was given to the subjects, asking them to score the importance of each characteristic on a 10-point scale. The subjects were also asked to provide information regarding their gender, age, subjective health status, education level, family annual income, and their referral source.

**SUMMARY:** The subjects, on average, placed the highest value, in descending order, on the following characteristics: a treatment which yielded the highest cure rate, reconstruction initiation only after complete tumor removal, and the surgeon being a skin cancer specialist. Overall, the subjects placed high values in characteristics of MMS that have long been esteemed by dermatologists.

**CONCLUSION:** Our data corroborate that MMS is a valuable procedure that meets the expectations of not just physicians, but also our population of patients.

Average assigned values (standard deviations) to the corresponding statements regarding Mohs micrographic surgery (0=not important at all, 10=extremely important)

It is important that my surgeon had one or more years of formal training (fellowship) beyond residency to specialize in skin cancer surgery and management.	9.3 (1.3)
It is important my surgeon is a skin-cancer specialist.	9.6 (1.0)
It is important that my surgeon is a member of the American College of Mohs Surgery.	8.7 (2.2)
It is important that my surgeon is a member of the American Society of Mohs Surgery.	8.5 (2.2)
It is important that my surgery takes the minimal amount of normal skin possible to remove the skin cancer.	9.2 (1.6)
It is important that my surgery may minimize scar size.	8.7 (1.9)
It is important that my surgery has highest cure rate of all treatment options	9.9 (0.5)
It is important that my surgery is done in an outpatient office (not in an operating room).	7.8 (2.4)
It is important that my surgery may be done without being "put to sleep" under general anesthesia.	8.2 (2.2)
It is important to me that pain is well controlled during my surgery.	9.3 (1.2)
It is important for me to have the pathology results confirming successful removal of skin cancer on the same day.	9.3 (1.5)
It is important that the reconstructive surgery is NOT done until the skin cancer is removed.	9.6 (1.1)
It is important for me that I may be accompanied by family and friends in between stages of the procedure.	7.2 (2.9)
It is important that I can eat/drink before and during the day of surgery.	7.3 (2.7)

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**TITLE:** Building Confidence in the Treatment of Extramammary Paget's Disease: the Cytokeratin-7 Immunostain

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**PURPOSE:** To report an immunostaining technique that can be easily incorporated into the MMS technique, which has elucidated H&E negative margins of EMPD and is corroborated by our clinical experience of lower recurrence rates.

**DESIGN:** Retrospective chart review of all patients with EMPD treated in our office with MMS using the CK-7 immunostain method. Demographic data, tumor data, treatment characteristics and follow-up data were tabulated. Data was compared to a series of EMPD patients treated in our office with MMS using H&E staining only.

**SUMMARY:** 23 tumors in 15 patients were treated with MMS using CK-7 technique. There were eighteen primary and 5 recurrent tumors. This represents every patient with EMPD treated in our office from 2004 to the present. The recurrence rate after treatment with MMS with CK-7 was 5.5% (1/18) for primary EMPD and 0% (0/5) for recurrent EMPD. The overall recurrence rate was therefore 4% (1/23). The mean number of MMS stages was 4.6 (range: 1-13 stages) and the mean margin to clear all tumors was 5.6 cm (range: 0.7-24.5 cm). The overall cure rate using MMS with CK-7 for cutaneous EMPD was 100%. The overall recurrence rate from a previously published series using MMS and H and E only was 26% (7/27). The mean number of MMS stages in this series was 3.1 (range: 1-9 stages) and the mean margin to clear all tumors was 2.5 cm (range: 0.6-11 cm). Literature search identified articles reporting local recurrence rates ranging from 33-60% for standard surgical treatments and 8-26% for MMS using H&E.

**CONCLUSION:** The preliminary data from the current series suggests that the CK-7 immunostain improves the efficacy of MMS in the treatment of this difficult tumor. Based on the experience of the authors, the use of CK-7 makes reading the slides much less time consuming and much more accurate. Anecdotally, CK-7 has identified areas of EMPD margin positivity invisible to the authors on H&E. This immunostain gives the Mohs surgeon a sense of confidence that can be so elusive in treating this disease.

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**TITLE:** *Mycobacterium Chelonae Infection Masquerading as Cutaneous Squamous Cell Carcinoma in a Lung Transplant Recipient*

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**PURPOSE:** Rapidly growing nontuberculous mycobacteria (NTM) species have emerged as important causes of localized soft-tissue infections particularly in immunocompromised hosts. Diagnosis is often delayed given the variable clinical presentations. The difficulty of diagnosis and the impact associated with infections due to NTM, particularly in immunosuppressed hosts, necessitates that to ensure prompt diagnosis and early initiation of therapy, a high level of suspicion for NTM be maintained. We report a case of *Mycobacterium Chelonae* masquerading as cutaneous squamous cell carcinoma in an immunosuppressed patient.

**DESIGN:** A 71 year-old gentleman with past medical history of lung transplant secondary to pulmonary fibrosis, idiopathic thrombocytopenic purpura, hypogammaglobulinemia, and multiple squamous cell carcinomas previously treated with Mohs presented for evaluation of three non-healing ulcers of the left leg. The patient reported history of trauma 3

months prior. He subsequently developed additional lesions at the medial ankle and medial calf. These areas started as slightly erythematous, tender nodules that ulcerated 10-14 days later. He denied systemic symptoms, swimming in fresh or salt-water, Jacuzzi bathing or prolonged immersion of the lower extremities. He had been on several immunosuppressive medications including prednisone, tacrolimus and mycophenolate mofetil. Examination revealed a well-appearing Caucasian man in no acute distress with bilateral pitting edema. Involving the left posterior calf, left medial calf and left ankle superior to the medial malleolus were three well-demarcated, dusky plaques with violaceous raised border and central ulcer. There was no significant lymphadenopathy.

Histopathology showed irregular epidermal hyperplasia with a superficial lymphocytic and neutrophilic infiltrate. Stain for an acid-fast bacillus was positive. Tissue culture grew *Mycobacterium Chelonae* susceptible to amikacin, clarythromycin and tobramycin.

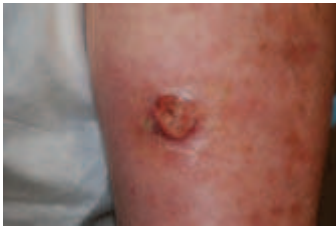
The patient was initially treated with clarithromycin and ciprofloxacin but these were subsequently discontinued because of drug interactions leading to toxic levels of tacrolimus. He was started on azithromycin monotherapy without further drug interactions. He completed a 6-month course of antibiotics and has complete resolution of the lesions.

**SUMMARY:** Our patient presented with multifocal, cutaneous *M. Chelonae* infection masquerading as cutaneous squamous cell carcinoma. The rapidly growing nontuberculous mycobacterium have emerged as important causes of localized soft-tissue infections in otherwise healthy persons and disseminated disease in patients with impaired immune function. The optimal treatment regimen for skin and soft tissue infection has not been well established. Current guidelines recommend susceptibility testing of all isolates, with use of empirical therapy until sensitivity and susceptibilities are known. Isolates are often sensitive to clarithromycin but azithromycin can be an acceptable alternative. Combination therapy with an aminoglycoside or a quinolone is recommended. The use of monotherapy has been recommended only in extenuating circumstances, as in this case. The optimal duration of antibiotic therapy is 6 or more months of treatment for skin and soft tissue infections in immunocompromised patients. Surgical excision is also an important adjunctive treatment for isolated lesions.

**CONCLUSION:** Cutaneous infections with *M. Chelonae* are frequently misdiagnosed because of the organism's polymorphic and nonspecific clinical presentations. The cutaneous manifestation depends on the stage of the disease and can present as cellulitis, vasculitis, abscesses, ulcerating nodules, or even display a squamous cell carcinoma-like clinical picture as described in this report. This case emphasizes the need to maintain high clinical suspicion for NTM, particularly in immunocompromised patients who present with chronic lower extremity ulcers.



Figure 1. At the left medial calf is a well-demarcated, dusky plaque with violaceous raised border and central ulcer.



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**TITLE:** Automated 15-minute Cytokeratin 7 Immunostaining Protocol for Extramammary Paget's Disease in Mohs Micrographic Surgery

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**PURPOSE:** Extramammary Paget's disease (EMPD) is a rare cutaneous neoplasm with propensity for wide local spread and indistinguishable clinical borders. Local excision with wide margins yields a recurrence rate of up to 60%. Mohs micrographic surgery (MMS) decreases recurrences to 16%. While better than conventional surgery, the MMS recurrence rate for EMPD is strikingly higher than for other skin cancers treated by MMS. Possible explanations include 1) non-contiguous nature of EMPD 2) difficulty in recognizing Paget's cells in H&E stained frozen sections, especially in the presence of freeze artifact.

Immunohistochemical (IHC) staining of frozen sections has been reported for treating EMPD. However, most MMS laboratories do not utilize this technique due to long incubation times, constant oversight and manual steps required of the histotechnician, and difficulty with antibody reagent consistency. However, recent advances in IHC systems now offer the Mohs surgeon rapid, automated IHC staining of frozen tissue specimens, thus freeing the histotechnician, dramatically improving consistency, and shortening incubation times.

We report a novel 15-minute immunostaining protocol for EMPD using cytokeratin 7 (CK7) antibody in a fully automated staining system. This system provides multiple advantages compared to traditional staining protocols: 1) pre-loaded reagent cartridges that eliminate human error in preparing the antibodies 2) mechanized dispensing, incubation, and rinsing steps that enhance accuracy and consistency 3) staining procedures that are human input free, allowing the technician to perform other tasks.

**DESIGN:** An 85 year-old man presented with a 6-month history of a 3.5X3.2 cm erythematous and non-pruritic groin plaque, proven to be EMPD by biopsy. MMS surgery was initiated excising the obvious cancer plus a 5 mm margin.

Mohs horizontal sectioning of frozen tissue, traditional fixation, and staining using H&E was performed on one set of slides, while a duplicate slide set was used for the following 15 minute CK7 immunostaining protocol.

Slide fixation: 1) Acetone fixation for 1 min 2) Air-dry for 1 min 3) Buffer soak for 1 min 4) Slide placement into staining instrument.

Staining protocol used by instrument: 1) Buffer rinse 2) CK7 primary antibody incubation for 4.56 min 3) Buffer rinse 4) HRP incubation for 2.3 min 5) Buffer rinse 6) Chromogen incubation of 2.04 min 7) Buffer rinse 8) Hematoxylin counterstain incubation for 6 sec 9) Buffer rinse.

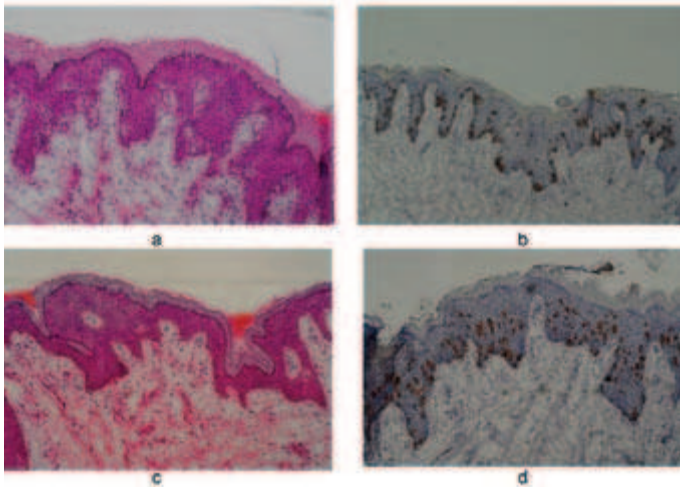
Final manual steps: 1) Slide removal and buffer soak for 3 min 2) Distill water soak for 1 min 3) Coverslip slides.

**SUMMARY:** The first Mohs layer contained 8 sections, all positive for EMPD: numerous Paget's cells were readily identifiable singly and in nests in the epidermis. IHC was therefore not run on the first layer. The second Mohs layer consisted of 10 sections. H&E staining showed 4 positive sections, 4 negative sections, and 2 equivocal sections. IHC was run on all sections of the second layer. IHC confirmed our 4 positive diagnoses and 4 negative diagnoses. The 2 equivocal sections were negative on IHC, thus preserving tissue that otherwise would be removed. Figure 1a and 1b are examples of EMPD on H&E and IHC, respectively. Interestingly, CK7 stained sections that were negative for EMPD did display CK7 staining of glandular structures. This physiologic staining pattern is a useful positive control.

Frozen tissue sections from all remaining layers were processed with H&E staining. We selectively used CK7 staining from this point onward for sections that were negative or equivocal on H&E. We also performed IHC on a few sections that were positive on H&E to determine whether the IHC stains altered our Mohs map on these sections. Overall CK7 staining enabled us to change 4 sections from equivocal to negative, and 1 section from equivocal to positive. Furthermore, IHC staining revealed additional regions of tumor on 2 sections that were focally positive on H&E. Figure 1c shows an area that was interpreted as negative for EMPD on H&E. Figure 1d is the same area stained with CK7, showing that there actually was EMPD present.

**CONCLUSION:** Adjunctive immunohistochemical staining using CK7 can reveal otherwise missed EMPD cells in frozen sections, thus hopefully decreasing the recurrence rate. By utilizing this rapid and fully automated staining protocol, Mohs laboratories will find that many of the traditional barriers to using immunohistochemistry can be removed.

Figure 1



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**TITLE:** Freehand Split-thickness Skin Grafts of the Chest for the Prevention of Hypertrophic Scars and Keloids in Wounds After Mohs Surgery: A Prospective Study

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**PURPOSE:** To assess clinical outcomes of freehand STSGs on the chest. The anterior chest is prone to hypertrophic scarring or keloid formation resulting in cosmetically displeasing outcomes. Freehand split-thickness skin grafts (STSG) are an excellent alternative for reconstruction of partial thickness dermal defects on the anterior chest.

**DESIGN:** 13 freehand STSGs on the anterior chest were performed after Mohs surgery. A flexible blade was used to harvest the grafts, which have a high take and very low necrosis rate. Clinical outcomes were evaluated based on live and photographic assessments.

**SUMMARY:** 13 grafts were evaluated at one or more follow-up visits up to 7 months following reconstruction of the defect with the graft. The average graft area was 3.3 cm<sup>2</sup> (range 0.9 cm<sup>2</sup> to 9.1 cm<sup>2</sup>). Erythema, telangiectasia, and swelling were present in all grafts at suture removal, but had completely resolved by the 4 month follow up visit. No other adverse effects for which these grafts were evaluated, such as infection, necrosis, dissimilar color match, uneven texture match, tenderness/pain, itching, and bleeding, were detected in any of the patients at any of the assessment times. No hypertrophic scarring and/or keloid formation were detected at short- or long-term follow-up.

**CONCLUSION:** The use of freehand STSGs for reconstruction of partial thickness dermal defects on the anterior chest is quick and easy to perform, safe and

efficient, resulting in excellent cosmesis, low complication rates, and high patient satisfaction.

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**TITLE:** Patient Perceptions of Non-melanoma Skin Cancer

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**PURPOSE:** There is a paucity of data regarding patient perceptions of non-melanoma skin cancers. Early self-identification of these tumors could decrease the morbidity associated with delayed diagnosis. Information about how patients conceptualize non-melanoma skin cancers prior to diagnosis could aid in formulating appropriate educational strategies and could theoretically lead to earlier detection of these skin cancers.

**DESIGN:** We are enrolling 300 consecutive patients undergoing treatment for non-melanoma skin cancers into this IRB-approved self-administered survey study. The survey is designed to assess: 1) what patients' impressions of their skin cancers were prior to diagnosis, 2) if patients sought medical attention for these cancers, and 3) what factors may play a role in the timing of skin cancer diagnosis. Patient charts are reviewed to identify type and subtype of skin cancer, treatment modality, tumor size and location.

**SUMMARY:** The primary endpoint is to define patients' concepts of what the malignancy represented (e.g. malignancy, acne lesion, wart, sore) prior to pathologic diagnosis. Secondary data points of interest include who first noted the lesion, if patients sought medical attention for this lesion, and what the reason for the medical visit was at the time of diagnosis. These data will be correlated with patient demographic features to help identify appropriately targeted strategies for patient education.

**CONCLUSION:** Understanding how patients perceive their skin cancers may aid in targeting educational strategies to patients, in order to increase their awareness of their skin cancer risk and encourage them to seek medical attention early for concerning skin lesions.

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**TITLE:** The Role of Cortical Bone Fenestration in the Management of Mohs Surgical Scalp Wounds Devoid of Periosteum

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**PURPOSE:** Mohs micrographic surgery may result in large, full-thickness scalp wounds (including periosteum) with resultant exposure of underlying bone. The inelasticity of scalp skin may preclude primary or flap closure. Grafts placed on exposed bone without a periosteal covering will not survive. Secondary intention healing is a well-recognized, simple, relatively pain-free wound management technique for scalp defects. However, wounds containing exposed bone devoid of periosteum heal slowly, or not at all, due to a lack of granulation. Fenestration of the exposed bone is a technique which can facilitate granulation in poorly healing bone-exposed wounds.

The bones of the skull are flat bones composed of an inner and outer table of compact bone and an intervening layer of spongy bone called the diploë. The diploë contains red bone marrow and is a reservoir of both differentiated and undifferentiated cells. Bone fenestration enables migratory fibroblasts to pass from the diploë to the base of the exposed bone wound via multiple shallow pits which are drilled into the outer table of the skull. These migratory diploëic fibroblasts can then lay down a matrix of granulation tissue on the exposed bone wound surface which facilitates re-epithelialisation<sup>1</sup>.

**DESIGN:** Fenestration can be performed in theatre as a local anesthetic day-care procedure. Aseptic technique is of paramount importance. Sedation is rarely required. We discuss usage of the Micro E hand-held electric bone drill (Hall)<sup>2</sup>. This is a widely used, compact, high-powered (90,000 cycles/minute) bone drill which enables precise fenestration. Multiple small shallow pits are drilled into the diploë via the outer bony table at 5-10 millimeter intervals. Sterile saline is trickled onto the bone during the fenestration procedure to prevent heating and thermal injury. Small bleeding points indicate that the correct depth has been attained. When sufficient pits are created, the wound is covered with a topical antibiotic ointment and a hydrocolloid occlusive dressing. An occlusive dressing maintains a clean, moist wound surface and is changed three times per week.

**SUMMARY:** We have discussed the relevant skull anatomy, patient selection, fenestration technique, and potential hazards.

**CONCLUSION:** We present fenestration technique to help in facilitating wound healing in exposed bone wounds.

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**TITLE:** A Novel Immunotherapeutic Adjuvant for the Treatment of Cutaneous Malignancies

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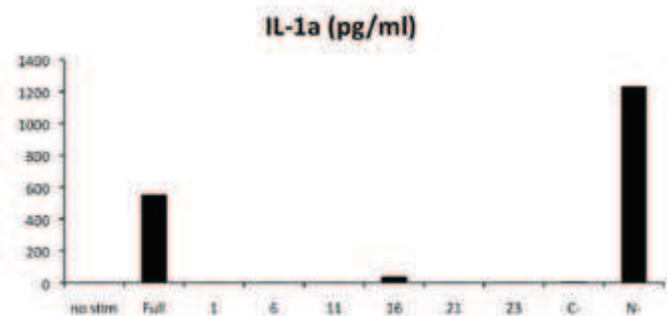
**PURPOSE:** Surgical excision, including Mohs surgery, is the treatment of choice for non-melanoma skin cancers. However,

medical treatment is sometimes indicated for patients who are poor surgical candidates or as adjuvant therapy when it is not possible to achieve complete removal. In addition, some have advocated treatment with immunotherapy prior to Mohs surgery to maximize tissue preservation. The only topical immunomodulator currently in clinical use is imiquimod, which acts on the toll-like receptor 7. This receptor is found in the skin only on the rare plasmacytoid dendritic cell population. There is a need for an immunomodulator that can act more broadly on resident skin cells to more potently immune responses to non-melanoma skin cancers. A modulator to act on keratinocytes, the cell population responsible for basal and squamous cell carcinomas, is particularly attractive. We have utilized an endogenous immunostimulatory peptide able to act on keratinocytes. In addition, we have made modifications that have increased its immunostimulatory ability.

**DESIGN:** Primary human keratinocytes were cultured in an adherent monolayer to 70-80% confluence. These cultures were then stimulated with synthetic peptides corresponding the native immunostimulatory peptide and numerous truncated peptides. The cultures were maintained for 24 hours before levels of cytokines were measured in culture supernatants.

**SUMMARY:** The native peptide induced production of immunomodulatory cytokines by keratinocytes. In particular, IL-1 alpha, a potent initiator of cell-mediated immunity, was strongly induced. Truncations at the C-terminus eliminated the stimulatory ability of the peptide, while truncation at the N-terminus yielded a peptide with a 2-fold increase in stimulatory ability. Shorter peptides were unable to stimulate keratinocytes.

**CONCLUSION:** An immunomodulator that targets keratinocytes would be a valuable tool in the treatment of non-melanoma skin cancers that are derived from these cells. We have developed a modified form of an endogenous peptide with potent immunostimulatory ability. Animal studies will be needed to assess the effectiveness of this approach to treating non-melanoma skin cancers.





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**TITLE:** *Burow's Grafts in Dermatologic Surgery: A Case Series*

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**PURPOSE:** While the concept of Burow's grafts is not new, most reports in the literature are limited to small case series. We aimed to further evaluate Burow's grafts as a viable closure method in defects on various anatomic locations by assessing for graft survival and overall complication rates.

**DESIGN:** A retrospective review of the Burow's graft undertaken in 2006 to 2010. Primary outcome included graft survival at follow-up wound checks and clinic visits and the presence or absence of graft necrosis. Secondary data was recorded including patient sex, type of primary lesion, how the defect was closed, and any post-operative complications.

**SUMMARY:** A total of 67 patients with 69 cutaneous malignancies and respective defects closed using a full thickness dog-ear graft were included. Nine of the grafts were on the extremities. 42 cases were uncomplicated with 100% graft survival. Four grafts had initial epidermolysis and sloughing which was resolved with general wound care and none resulted in graft failure or necrosis. There were no cases of complete necrosis with graft failure.

**CONCLUSION:** To our knowledge, this is the largest case series examining the use of Burow's grafts as modified full thickness skin grafts on a number of anatomic locations in the repair of large or complicated defects. In addition, this is the first report of Burow's graft used on the extremities. Our experience details the usefulness of these types of skin grafts in the closure of defects of varying sizes not only on the face, but arms, legs, hands, and feet.

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**TITLE:** *Mohs Micrographic Surgery or Wide Excision for the Treatment of Primary Dermatofibrosarcoma Protuberans*

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**PURPOSE:** Wide excision (WE) has been the standard of treatment for primary dermatofibrosarcoma protuberans (DFSP), but ideal margin width is poorly defined and Mohs

micrographic surgery (MMS) is considered a favorable alternative procedure. This large case series from a single institution examines the differences between recurrence rate, operative time, defect size, and closure technique in the treatment of primary DFSP by WE versus MMS.

**DESIGN:** A retrospective chart review was performed of 48 primary DFSP cases treated surgically from 1971 to 2006; 28 with WE and 20 with MMS. Choice of surgical resection technique was based on physician preference without standardized criteria for tumor size or location. WE consisted of circumferential resection margins of 2 to 3 cm surrounding the clinically visible tumor. For MMS, a layer of uninvolved tissue measuring 0.5 to 1.0 cm was taken around and under the tumor, processed via frozen sections and examined microscopically. Wound closure techniques were based on the extent of the surgical defect. Operative times were measured for each surgical modality.

**SUMMARY:** Local recurrence rate for patients treated with MMS was 0% at a median follow-up of 49.9 months (1.5-230.7) versus 3.6% (one patient) for WE at 40.4 months (0.6-147.0), *P* value = 1.0. Six patients (21.4%) treated by WE had positive resection margins. Two (33%) out of 6 positive resection margin patients were treated with repeat WE until negative margins were obtained, while the remaining 4 cases (67%) underwent MMS. Median maximal defect size was similar between the 2 groups (10 cm for WE vs. 9.4 cm for MMS, *P* value = 0.76). Closures with skin grafts or flaps were accomplished more frequently in the MMS group (65%) as compared with the WE group (18%). Median operative time was also significantly higher in the MMS group at 257 versus 77 minutes for WE, respectively (*P* value < 0.001). Operative features for DFSP patients treated with MMS and WE are summarized in Table 1.

**CONCLUSION:** Positive margin resection was more common with WE, but local control rate was not significantly different between WE or MMS. MMS had higher operative times and involved more complex closure techniques. The choice of WE versus MMS should be based on individualized patient/tumor characteristics and institutional expertise in these modalities.

Table 1. Operative features for DFSP patients treated with MMS versus WE

	MMS	WE	P
Median maximal defect size (cm)	9.4 (range, 3.5-20)	10 (range, 4-23)	0.48
Simple primary closure	7 (35%)	23 (82%)	0.001
Closure by flaps/grafts	13 (65%)	5 (18%)	0.001
Median operative time (min)	257 (range, 82-655)	77 (range, 82-655)	<0.001



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**TITLE:** *Intralesional Interferon  $\alpha$  2b for Refractory, Recurrent Squamous Cell Carcinoma of the Head and Neck*

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**PURPOSE:** Squamous cell carcinoma is the second most common cutaneous neoplasm with 200,000 new cases per year. The majority of cutaneous squamous cell carcinomas (SCC) are managed effectively with surgical treatments. A subset of SCC has an aggressive clinical course with recurrence or metastasis. The management of recurrent SCC is difficult due to the tumor's aggressiveness and the lack of randomized control trial data to guide care. Surgical re-excision is a possible therapeutic option; however, nonsurgical approaches may be needed for these refractory, complicated lesions.

Intralesional Interferon  $\alpha$  (IFN $\alpha$ ), a pro-inflammatory cytokine that induces immune mediated anti-tumor activity, has been described in the treatment of primary squamous cell carcinomas and basal cell carcinomas. Case series in stage III and IV head and neck SCC have shown combining subcutaneous IFN $\alpha$  2b with systemic 13 cis retinoic acid and vitamin E as an adjuvant therapy to surgery and radiation led to a decrease in tumor recurrence. IFN $\alpha$  may be beneficial in the treatment of aggressive, recurrent cutaneous SCC.

**DESIGN:** Retrospective chart review of patients with refractory SCC treated with adjuvant subcutaneous IFN $\alpha$  2b.

**SUMMARY:** We present two patients with aggressive, recurrent squamous cell carcinomas of the head and neck refractory to surgical and radiation therapies. RK is a 71 year old male with a SCC of the right cheek treated with wide local excision. The SCC recurred twice despite excision with clear surgical margins and adjuvant radiation. Following his third surgery, he received adjuvant intralesional IFN $\alpha$  2b 1.5 million units three times a week for 7 weeks and the epidermal growth factor receptor inhibitor cetuximab. He remains recurrence free at five years from treatment. MW is a 69 year old female with a recurrent, aggressive SCC of the right lower lip with perineural involvement of the mental nerve. Her previous treatments included surgical excision and radiation. After her sixth recurrence, she was treated with adjuvant intralesional IFN $\alpha$  2b 1.5 million units three times a week for three months. She remains recurrence free at eight years from IFN $\alpha$  treatment.

**CONCLUSION:** The management of recurrent SCC refractory to previous therapies is a challenge to the dermatologic surgeon. Adjuvant IFN $\alpha$  2b treatment showed long term benefit in the two patients described. Despite multiple previous recurrences, both patients remain recurrence free for over five years. Thus, intralesional IFN $\alpha$  2b should be included in the armamentarium of treatments for aggressive SCC.

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**TITLE:** *Use of the Bovine Collagen Xenograft for Post-Mohs Surgical Reconstruction*

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**PURPOSE:** Reconstructive options after Mohs surgery are numerous and include healing by secondary intention, primary closure, a local flap, and grafting. Collagen xenografts are widely used to promote healing of chronic wounds, but their use in post-surgical reconstruction is less prevalent. The purpose of this study is to review the use of the bovine collagen xenograft in post-Mohs reconstruction at a single institution.

**DESIGN:** Two-hundred and eighty-one consecutive patients reconstructed with a bovine collagen xenograft after Mohs surgery by a single surgeon between July 1, 2009 and June 30, 2010 were selected for inclusion in this study. Data collected included patient demographics, tumor characteristics, surgical details, and the incidence of further reconstruction after xenograft placement. Subjects were followed until complete re-epithelialization had occurred and patients were satisfied with the wound healing process. During follow-up, patients were given the option of continued monitoring, re-application of the collagen xenograft, or other reconstructive surgery.

**SUMMARY:** Patients selected for xenograft application had wounds located on the face (n=212), extremity (n=35), scalp (n=14), trunk (n=14), or neck (n=6). The size of the post-surgical defect ranged from 0.12 cm<sup>2</sup>-91.8 cm<sup>2</sup>, with a mean of 4.1 cm<sup>2</sup>. Defects extended to the level of dermis (n=21), fat (n=67), fascia (n=115), muscle (n=28), perichondrium/periosteum (n=26), cartilage (n=23), or bone (n=1).

Of the 281 patients initially treated with a bovine collagen xenograft, 263 (94%) required or desired no additional reconstruction. Re-application of the xenograft occurred during follow-up in three patients (1%). Twelve patients (4%) required further surgery with either a full-thickness skin graft (n=11, 4%) or a local tissue flap (n=1, 0.3%). Three patients underwent a scar revision procedure, one of whom subsequently required a delayed full-thickness skin graft in addition to the revision. One patient underwent postoperative dermabrasion to improve cosmesis.

Optimal outcomes were observed in patients with lesions in areas of natural concavities, such as the alar groove, medical canthus, conchal bowl, and temple. Use of the xenograft resulted in simplified wound care for the patient, and patient satisfaction was high. Complications were infrequent, but included hypergranulation tissue, easily treated with silver nitrate application or daily acetic acid soaks. Cost analysis revealed that xenograft application is less costly than other reconstructive options such as full-thickness skin grafts, flaps, and complex closures.

**CONCLUSION:** Bovine collagen xenografts offer patients acceptable cosmetic results with a minimally invasive application procedure, and should be considered alongside other reconstructive options. Ideal candidates have wounds located in favorable areas, as described above, and/or are unwilling or unable to undergo lengthy reconstructive procedures. Xenografts offer minimal risk and minimal morbidity to patients and have the added benefit of simplified wound care. Further study is necessary to better understand the role of bovine collagen xenografts in immediate post-Mohs surgical wound management.

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**TITLE:** *Use of Goulian Knife with a Weck Blade for Mohs Layers When Tumor Extends to the Perichondrium of the Ear*

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**PURPOSE:** We present a simple clinical pearl using the Goulian knife with a Weck blade to obtain a layer during Mohs surgery when the prior stage reveals tumor histologically deep to perichondrium. Excision of skin cancers on various locations on the ear is one of the most common challenges in Mohs surgery and the thinness of the auricular skin and the cartilaginous convolutions pose particular challenges. Ulcerated, aggressive, and neglected tumors often demonstrate cancer extending deep to the perichondrium. The surgeon then faces the challenge of obtaining a complete layer that achieves a tumor free plane while preserving subjacent cartilage. Use of a 15 blade to dissect the perichondrium off of the cartilage or to excise an ultrathin layer of cartilage can be difficult. Our technique is novel and overcomes this challenge.

**DESIGN:** When removing ulcerated, aggressive and neglected tumors, tumor is frequently noted at the deep margin of the initial or subsequent layers. The first stage of most Mohs layers performed on the anterior lamella of the ear is most commonly incised down to, but does not include, the perichondrium. Using the map made following our first stage, we use gentian violet on a cotton tipped applicator to delineate the portion of the remaining tissue in which tumor is still present at the deep margin. In order to preserve the maximal amount of underlying cartilage a layer encompassing the inked perichondrium as well as a thin piece of underlying cartilage is removed using a 0.010 inches Goulian guard (Figure 1). This method provides a clean specimen without jagged cartilage that our histotechnicians have found simple to process and produce consistent, complete slides for interpretation. Additionally, the underlying cartilage remains intact (Figure 2).

**CONCLUSION:** One of the main tenets of Mohs surgery is the preservation normal tissue while maintaining the highest possible cure rate. The surgeon described a technique using the scalpel blade on edge with a pushing, sweeping motion to dissect perichondrium from cartilage. This technique can be frustrating as well as destructive to the underlying tissue and often produces tissue that is challenging to process. Using our technique, we were able to maintain adequate intact underlying cartilage to support fairly complex transposition flaps. We have used this on the posterior ear and antihelix, and in select cases, from the conchal bowl.

Limitations of this method include the need to buy additional equipment if the Goulian knife set has not already been incorporated into the Mohs practice. Additionally, the use of the Goulian knife is less useful when taking stages on tumors that invade deeply into the cartilage. Familiarity with this tool in the harvesting of small split thickness skin grafts certainly facilitates learning its application as we have described. If the surgeon is inexperienced in its use however, then using the Goulian knife may pose a challenge initially but likely would be easily overcome with minimal experience. Otherwise we have found this to be a simple and useful tool.

Figure 1. Removal of inked cartilage and overlying involved perichondrium with tumor involvement using Goulian knife technique.



Figure 2. Intact underlying cartilage after layer removed.



**TITLE:** Prolonging the Primary Pivoting Point: Mathematical Effect of Prolonging the Primary Burow's Triangle on Bilobed Flap Rotation

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**PURPOSE:** To evaluate the lengthening of the primary Burow's triangle and its effects on the total angle of rotation for a bilobed transposition flap (BLTF).

**DESIGN:** Utilizing Zitelli's modified design of the BLTF and AutoCad (engineering design software); the length of the primary Burow's triangle was progressively lengthened. The effect of this lengthening on the total degree of rotation (from secondary lobe to primary lobe) was analyzed on two common variations of BLTF designs: 1) when both the primary and secondary lobe equals the defect diameter/size, 2) the primary lobe equals the defect size and the secondary lobe is 80% of the defect size.

**SUMMARY:** An inverse relationship exists between the length of a primary Burow's triangle and the total angle of rotation for a BLTF. As the Burow's triangle or pivot point of a BLTF is lengthened, the flap's total angle of rotation is decreased (Figure 1). Further, as the Burow's triangle and pivot point lengthens, the flap's pedicle increases. The formula of  $\text{Sin}(\text{angle of rotation}/4) = \text{radius of the defect}/(\text{radius of the defect} + \text{length of the Burow's triangle})$  can be used to calculate the Burow's triangle length for a given angle of rotation when using sizes for the primary and secondary lobes equal to the size of the defect. Table 1 describes the relationship of different lengths of the primary Burow's triangle and the total angle of rotation when the two common BLTF designs are considered.

**CONCLUSION:** The BLTF is an effective reconstructive option for defects on the lower third of the nose. Dzubow<sup>1</sup> described the concept of pivotal restraint and its effects on rotational movements. As the angle of rotation of a BLTF is increased, the pivotal restraint of the flap increases, which may lead to secondary anatomic distortion. This pivotal restraint may be mitigated by lengthening the Burow's triangle or pivot point, which inversely decreases the total angle of flap rotation and thus pivotal restraint. Zitelli<sup>2</sup> stressed that the Burow's triangle should be at least the length of the defect's diameter and even up to 1.5 times the diameter to overcome pivotal restraint. Varying the length of the Burow's triangle and pivot point can also be used to improve and modify the placement of the secondary lobe of the BLTF<sup>3</sup>. This inverse relationship is critical to consider when designing the BLTF.

As a result, lengthening the primary Burow's triangle in a BLTF design achieves three effects: 1) decreases the total angle

of flap rotation, 2) decreases pivotal restraint, and finally 3) increases the flap's pedicle.

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Figure 1. As the Burow's triangle or pivot point of the BLTF is lengthened, the flap's total angle of rotation is decreased.

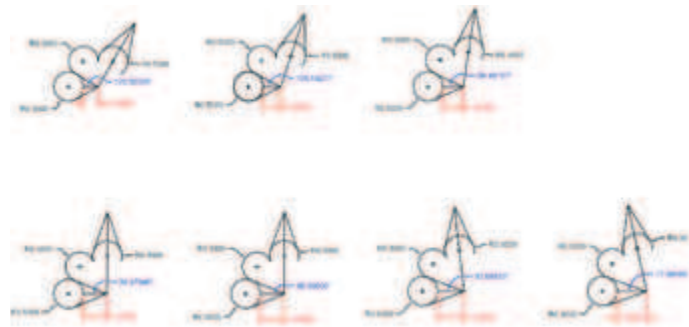


Table 1.

Burow's triangle length (pivot point) measured from defect edge	Total degree of rotation (primary lobe equal to defect size and secondary lobe 80% of defect size)	Total degree of rotation (primary and secondary lobe equal to defect size)
Radius	110.4788	120
60% diameter or 120% radius	99.887	108.14277
70% diameter or 140% radius	91.21053	98.49727
80% diameter or 160% radius	83.95903	90.47946
90% diameter or 180% radius	77.80023	83.69933
Diameter	72.49975	77.88488
1.6131259 radius		90

**TITLE:** Evaluating the Management of Malignant Fibrous Histiocytoma: Mohs Micrographic Surgery versus other Surgical Treatments

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**PURPOSE:** Malignant fibrous histiocytoma (MFH) is one of the most aggressive of the fibrohistiocytic tumors. In particular, the high recurrence rate and metastatic potential of MFH make proper diagnosis and management crucial

to a successful outcome. The primary aim of this study was to examine recurrence rates of MFH following Mohs micrographic surgery versus other popular treatment modalities at our institution.

**DESIGN:** We performed a retrospective chart review using our institutional electronic medical record and pathology databases to identify all patients diagnosed with MFH of the head and/or neck at our institution from January 1995 – December 2010.

**SUMMARY:** Thirty-nine total tumors of the head and neck were identified in 36 patients. Patient ages ranged from 6 – 87 years old at the time of initial diagnosis with an average age of 67. Most frequent sites of tumor involvement included the scalp (12), neck (7), cheek (5), calvarium/brain (4), forehead (4), ear (3), tongue (1), orbit (1), eyebrow (1), and nose (1). Mean follow-up after diagnosis was 32.7 months. Of the 36 patients, 16 (44.4%) developed recurrence of their tumor after initial treatment, and 7 patients (19.4%) developed metastatic disease. Average tumor diameter was 2.9 cm (range 0.6 – 10 cm). Recurrence was noted in 16 of 39 tumors (41.0%) after initial treatment.

Ten patients (11 tumors) were treated with Mohs surgery either at our institution or by referring physicians prior to subsequent management. Five of these patients had tumors that were initially diagnosed and treated as atypical fibrous xanthoma (AFX), with subsequent pathology specimens revealing MFH. Of the 10 patients treated with Mohs surgery, 7 developed recurrent disease. However, three of these patients also experienced recurrence after treatment with other modalities. In total, 7 of 11 tumors (63.6%) treated with Mohs surgery recurred after treatment. Three of the six patients treated at our institution were eventually cured. Three patients (30%) treated with Mohs surgery progressed to metastatic disease.

Alternative management included various combinations of wide local excision, chemotherapy, and radiation therapy (both post-operative and intra-operative), subtotal resection, or palliative care. The most commonly employed of these treatments included wide local excision (17 patients, 18 tumors) and wide local excision with post-operative radiation therapy (15 patients, 15 tumors). Ten of 17 patients (58.8%) treated with wide local excision developed recurrent disease following treatment, and 4 patients (23.5%) developed metastases. In comparison, 5 of 15 patients (33.3%) treated with wide local excision and post-operative radiation therapy developed recurrent disease following treatment. However, 5 of these 15 patients (33.3%) also developed metastatic disease after treatment.

**CONCLUSION:** We identified a large cohort of patients with MFH of the head and/or neck treated with a variety of modalities. Similar to published recurrence rates of 40-50%, the MFH recurrence rate at our institution (41.0%) remains high. Published data also suggests that prognosis typically correlates with depth of invasion of the MFH tumor. Estimates

place the rates of metastatic disease at less than 10% for superficial MFH and up to 40% to 45% with deeper tumors. The rate of distant metastatic disease in our cohort (19.4%) is consistent with this data.

Mohs micrographic surgery is often used as an alternative to wide local excision for the surgical management of MFH. When compared to either wide local excision or wide local excision with post-operative radiation therapy, the larger recurrence rate of MFH following treatment with Mohs surgery was not statistically significant in our cohort.

MFH can be challenging to treat with Mohs surgery because of in-transit skin metastases. The primary tumor may be cured but there can be “recurrences” in the same anatomic region. Therefore, if Mohs surgery is performed for MFH, close follow-up is important, and multiple surgeries may be necessary to eradicate the tumor. Given its aggressive nature, multidisciplinary management may be the most prudent strategy. Ultimately, patients with MFH or with a presumptive diagnosis of AFX require early diagnosis followed by prompt and comprehensive treatment.

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**TITLE:** Exenteration as an Outcome in Periocular Non-melanoma Skin Cancers

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**PURPOSE:** Non-melanoma skin cancers (NMSC) may invade the orbit as a result of an aggressive histological growth pattern, tumor recurrence or neglected disease. Orbital tumor invasion may result in disease not amenable to excision with loss of the eye, a devastating outcome in the pursuit of local disease control.

We analyze patients that had undergone orbital exenteration due to NMSC over a 10 year period.

**DESIGN:** Patients were identified retrospectively from a histopathology data-base at a tertiary referral centre in the Northeast of England serving a population of 4 million. All patients with orbital exenteration in treatment of NMSC were included. Exenteration resulting from cutaneous and choroidal melanoma was excluded. Patients’ demographics, presenting complaints, duration, size, site and histopathology of primary tumor, treatments and histopathology prior to exenteration were recorded. Data was obtained on date of exenteration, reconstruction, adjuvant treatment and outcome.

**SUMMARY:** Three men and 4 women, (one basal cell carcinoma (BCC), 3 squamous cell carcinoma and (SCC) and 3 sebaceous carcinoma underwent orbital exenteration (Table 1). Age at time of exenteration was 71 to 91 years (mean 81 years). Duration of tumor at time of presentation ranged from 3 months to 84 months (mean 24.8 months). Site of the primary



Detail of patients with exenteration

Case no	Age / sex	Tumor duration (months)	Site / size of primary tumor (mm)	Histology	PNI	Procedure before exenteration	Exenteration	Metastasis	Radio-therapy
1	80/M	8	Right eyebrow 15x14	Poorly diff SCC	yes	MMS	Right Orbit	no	no
2	87/F	3	Left supra-orbital area 15x12	Moderately diff SCC	yes	Excision	Left orbit	no	no
3	71/F	9	Right supra-orbital area 23x18	Moderately diff SCC	yes	MMS	Right Orbit	no	yes
4	90/M	6	Right lower lid / not recorded	Sebaceous Ca	no	MMS	Right Orbit	Right parotid gland	yes
5	91/F	24	Right upper lid 10x8	poorly diff Sebaceous Ca	no	no	Right Orbit	no	no
6	75/F	40	Left upper lid 30x20	Poorly diff Sebaceous Ca	no	no	Left orbit	no	yes
7	76/M	84	Left medial canthus 14x9	BCC micro-nodular	no	Wide local excision	Left orbit	no	no

skin tumor included: supraorbital area (3), upper eyelid (2), lower eyelid (1) and medial canthal area (1).

Treatment of the primary tumor included Mohs micrographic surgery (MMS) in 3 patients, wide local excision in 2 and 2 patients did not have any prior surgical procedure before exenteration. The 3 patients with SCC had perineural invasion (PNI) in the primary tumor. One patient had radiotherapy before exenteration.

Four patients underwent exenteration including excision of upper and lower eyelid. Two patients had exenteration with resection of lateral and medial bony orbital wall. Two patients had positive tumor margins on exenteration.

Reconstructive techniques included 6 patients who had myocutaneous flaps with split skin grafting and one patient had split skin grafting with secondary intention healing. One patient had metastasis of SCC to the right parotid gland (tumor margins positive on exenteration) and treated with adjuvant radiotherapy. Five patients are attending the clinic with 2 lost to follow up.

**CONCLUSION:** Exenteration may be performed for treatment of potentially life-threatening malignancies arising from the orbit, paranasal sinuses or periorcular skin. Periorcular skin malignancy can invade the orbit and may not be amenable to excision without loss of the eye. About 40–50% of exenterations are required for tumors originating in the eyelid or periorcular skin. 1

Nasab et al reported 32 patients with orbital exenteration (over a 20 year period) including 17 patients with BCC, 6 melanomas, 4 sebaceous carcinoma and 3 SCC. BCC was also the most common eyelid malignancy for which exenteration was performed in another series, the most commonly affected sites being the lower eyelid and medial canthus<sup>2</sup>. In our series, 3 patients had SCC, 3 sebaceous carcinoma and only one patient had BCC.

Complete excision of tumor at the initial treatment is likely to reduce the chances of orbital invasion. PNI is a marker of aggressive disease and in our series all 3 SCC had PNI.

The majority of periorcular NMSC has been treated by MMS at our centre for more than 10 years, which may explain the low numbers of exenteration for BCC in our case series compared to those reported elsewhere. It is likely that MMS resulting in tumor negative margins (where the tumor is not too advanced and sight is not threatened by Mohs excision) minimizes exenteration as an outcome.

We propose orbital exenteration for BCC as a surrogate marker for outcomes in periorcular BCC. Medial canthus and eyelid BCC should be treated by MMS.

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**TITLE:** An Analysis of Mohs Surgery Recurrences Referred to a Head and Neck Center

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**PURPOSE:** To examine those cases of non-melanoma skin cancer (NMSC) which had recurred following Mohs micrographic surgery (MMS) and been referred to a Head and Neck Center.

**DESIGN:** A retrospective chart review was performed of the Head and Neck surgery database and cases of recurrent NMSC following MMS treated between January 1, 1996 and January 1, 2009 were identified.

**SUMMARY:** Of the 23 eligible patients, 20 were males and 3 were females. The majority were white; one patient was Hispanic and another African American. Patient age at recurrence ranged from 15-91 years (mean 59 years).

Fourteen patients (61%) had squamous cell cancers (SCC); 9 (39%) had basal cell cancers (BCC). Approximately half (N=10) of the patients had had one or more prior excisions before MMS, and 3 had prior irradiation. In 8 cases the Mohs surgeon had performed a second Mohs surgery following the first recurrence and in 2 cases there was a third Mohs surgery.

Where the name of the Mohs surgeon had been recorded (N=12), it was possible to ascertain that 8 surgeons were trained by the American College of Mohs Surgery; 3 by the American Society for Mohs Surgery, and one was a dermatologist with no formal Mohs training.

Following MMS, approximately half of the patients developed clinical signs of neurologic involvement (anesthesia, palsy or facial pain) and five were noted clinically to have an enlarged lymph node or parotid mass. The approximate mean time from MMS until clinical recurrence was 29 months (range 1-164 months). In those cases where size of tumor recurrence was recorded, BCCs had a mean size of 2.1 cm (N=8) and SCCs 2.95 cm (N=8). A third of the tumors were located on the temple/forehead and of these, the majority were SCC (7/8). A further 4 cases (2 SCC; 2 BCC) were located in the orbital region.

Radiologic workup (CT, MRI, ultrasound, fusion PET/CT) performed at the time of Head and Neck assessment revealed a mass invading the orbital cavity and/or contents, or bone in 5 cases, involvement of a named cranial nerve in 5 cases and raised the possibility of perineural involvement in 3 other cases. A mass was identified in 4 cases, residual tumor in 2 cases and the possibility of residual tumor was raised in one case. An intraparotid lymph node was seen in one case and suspicious lymph nodes were noted in two more cases. A possible metastasis was seen on PET/CT. No tumor was seen in 2 cases and 2 patients did not have a radiologic workup.

Management by Head and neck surgery consisted of wide local excision for 21 patients with or without radiation therapy (XRT) for 18 patients (2 of which were treated with XRT alone) and 5 received chemotherapy, which was always as an adjunct to excision or XRT. Six patients underwent a neck dissection (selective or modified radical), 6 had a

parotidectomy (4 full, 1 superficial), 4 had orbitectomies, 10 nerve resection and 7 underwent bone resection.

Histologic exam of this tissue revealed tumor (SCC) in one of the 6 parotidectomies, and SCC was also found in 7 nodes from a total of 210 nodes submitted. In seven of ten cases where a specimen of a major cranial nerve was submitted, SCC was identified. All of the cases with neural involvement cleared with surgery save one case which underwent radiosurgery. Poorly differentiated SCC was found in 2 of the four orbitectomies. One of the bone specimens contained poorly differentiated SCC.

Cases were followed on average 45 months post head and neck surgery and a total of five cases, all of which were SCC, recurred. The only immunosuppressed patient, a 15 year old African American, died from metastatic SCC, while another 5 patients died from causes unrelated to their NMSC.

**CONCLUSION:** This case series demonstrates that Mohs surgeons should be particularly vigilant when presented with facial SCCs which have recurred following prior excision, irradiation or Mohs surgery and should monitor these patients very closely for the possible development of neurologic or nodal involvement post operatively. The importance of radiologic work up is emphasized.

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**TITLE:** Fenestration of Nasal Alar Cartilage Grafts: A Modification of a Technique, which Facilitates Rapid Coverage with Granulation Tissue and Aids in the Recreation of Alar Contour

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**PURPOSE:** Tumor extirpation of non-melanoma skin cancers located on the ala nasi may result in large or deep defects that may require structural support in the form of an auricular cartilage graft. These cartilage grafts may be required to prevent alar rim distortion or to prevent air inflow obstruction due to internal nasal valve compromise. Recent reports have described the successful reconstruction of alar defects with placement of free cartilage grafts and subsequent full thickness skin graft placement or secondary intention healing. We describe a modification of the technique whereby the free cartilage graft is fenestrated with a 2mm punch biopsy. This allows for faster coverage of the dorsal surface of the cartilage graft with healthy granulation tissue, thereby hastening healing by secondary intention or permitting earlier placement of a full thickness skin graft. Fenestration also enables the cartilage graft to be more pliable and this may aid in the recreation of the convex alar contour. Finally, we believe that fenestration of the cartilage graft facilitates fixing of the graft to the underlying nasal wound bed, thereby optimizing patency of the nasal airway. There is also less

likelihood that the cartilage graft will be traumatized from the anchoring sutures as these can be passed through the "fenestration ports" which minimizes trauma to the graft.

**DESIGN:** We describe the technique of fenestration of the cartilage graft and how the fenestrated graft is manipulated to recreate the convex alar contour. We describe how the cartilage graft is sutured to the underlying wound bed (nasal mucosa), making use of the "fenestration ports" to optimize the "bracing" effect of the cartilage graft which prevents alar rim retraction and internal nasal valve collapse. We illustrate this technique with several clinical examples including the placement of subsequent full thickness skin grafts as well as use of secondary intention healing.

**SUMMARY:** Eleven patients underwent Mohs micrographic surgery for non-melanoma skin cancers of the ala nasi. The resultant surgical defects were reconstructed with placement of fenestrated free auricular cartilage grafts and subsequent secondary intention healing or placement of a full thickness skin graft. When the surgical defect extended beyond the alar, local tissue rearrangement was utilized so that the residual alar defect was managed as a cosmetic subunit reconstruction. No patients had evidence of postoperative nasal airflow obstruction. A healthy granulation wound bed developed rapidly on the dorsal surface of the cartilage graft. Two patients had mild hypertrophy of the scar (secondary intention healing) whilst the third patient had mild scar hypertrophy as well as some loss of ala/alar crease/medial cheek junction definition. All three declined the offer of scar revision.

**CONCLUSION:** Surgical defects of the ala nasi may require complex local reconstruction. This may not be appropriate in all patients. Alar subunit reconstruction may be achieved through placement of free auricular cartilage grafts and subsequent granulation or placement of full thickness skin grafts. We propose that fenestration of the cartilage graft optimizes such reconstruction as it hastens the development of a healthy granulation bed on the dorsal surface of the graft. It also facilitates recreation of the convex alar contour and minimizes potential suture trauma to the cartilage graft.



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**PURPOSE:** Mohs micrographic surgery (MMS) plays an important role in tumors of the periorbital area due to both its tissue-sparing capability and the possibility for margin control. The characteristics of periorbital non-melanoma skin cancers (NMSC) including basal cell carcinoma (BCC) and squamous cell carcinoma (SCC) treated with MMS have been previously described in studies involving tertiary centers. However, the majority of Mohs surgeons operate in the private practice setting. Therefore characteristics of periorbital skin cancers treated with Mohs in the private practice setting are important but not described.

The purpose of this study was to describe the characteristics of periorbital skin cancers treated with MMS in the private practice setting. These include patient demographics, tumor site, histological subtype, preoperative tumor size, postoperative defect size, number of Mohs stages, mucosal involvement, and type of surgical repair.

**DESIGN:** A one-center retrospective study of patients who underwent MMS for periorbital skin cancers over an 8 year period (January 2001 to August 2009). All surgeries were performed by a single Mohs surgeon in a suburban private practice. Medical records of 1078 consecutive cases (996 patients) were reviewed. The collected data includes patient age and sex, patient immunologic status, tumor site, preoperative tumor size, postoperative surgical defect, histologic subtype, presence of mucosal involvement, number of Mohs stages, reconstruction status, and referring physician specialty.

**SUMMARY:** The patient population consisted of 996 patients, all Caucasian. The average age of patients studied was  $70.28 \pm 13.8$  years. For patients with BCC the average age was  $69.4 \pm 14.1$  and for SCC it was slightly higher at  $75.1 \pm 10.6$ . The female to male ratio of patients with BCC was 1.4:1, while the ratio was reversed for SCC with a male to female ratio of 1.3:1. Of 1078 individual tumors, 921 (85.4%) were BCC, 143 (13.3%) were SCC, 11 (1%) were sebaceous carcinomas, and 1 each of microcystic adnexal carcinoma, Merkel cell carcinoma, and melanoma in situ were treated. Left-sided lesions predominated for both BCC and SCC, accounting for 474 (51.5%) of BCC and 83 (58%) of SCC.

Table 1. identifies lesion site distribution of BCC and SCC tumors.

Table 2. describes the average values for measured parameters of BCC and SCC tumor.

**CONCLUSION:** The burden of NMSC in the periorbital region is well-known, as is the importance of Mohs surgery as a treatment modality for these tumors. The majority of these tumors are treated in the private practice setting, yet the characteristics of periorbital NMSC treated with MMS have only previously been described in tertiary treatment centers.

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**TITLE:** Characteristics of Periorbital Cancers Treated with Mohs Surgery in the Private Practice Setting: A Series of 1078 Cases

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Our data describes these tumors and their characteristics in a single center private practice setting.

Table 1. Distribution of Periocular BCC and SCC by Location

	LL	UL	MC	LC	Total
BCC	488 (53%)	143 (15.5%)	216 (23.5%)	74 (8%)	921
SCC	60 (41.9%)	40 (28%)	22 (15.4%)	21 (14.7%)	143

SCC = squamous cell carcinoma, BCC = basal cell carcinoma, LL = lower lid, UL = upper lid, MC = medial canthus, LC = lateral canthus

Table 2. Characteristics of Periocular BCC and SCC tumors

	BCC (n=921)	SCC (n=143)
Preoperative size	6.54±5mm	6.19±4.25mm
Postoperative defect	12±7.5mm	11.3±6.8mm
Number of Mohs stages	2.19±1.1	1.89±0.99
Mucosal involvement	343 cases (37.2%)	31 cases (21.7%)
Underwent reconstruction	571 (62%)	64 (44.8%)
Immunosuppressed host	18 cases (1.95%)	10 cases (6.99%)

SCC = squamous cell carcinoma, BCC = basal cell carcinoma

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**TITLE: A Multi-site Prospective Study of the Adverse Events and Complications Associated with Mohs Surgery for the Treatment of Skin Cancer**

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**PURPOSE:** Mohs surgery is a proven method for the removal of skin cancer and well-designed, single-center studies have demonstrated the safety and low complication rate of the technique. Well-designed, multi-center studies provide a higher order of clinical evidence and will further establish the rate of adverse events and complications associated with the treatment of skin cancer using Mohs surgery.

The purpose of this study was to prospectively track serious adverse events and acute complications associated with Mohs surgery in a cooperative, multi-center investigation including 13 ACMS Mohs surgeons in 12 practices.

**DESIGN:** IRB approval was obtained for each of the 13 surgeons. Over the course of 4 weeks at each treatment site, patients were consented to allow treatment related data to be collected and analyzed. Data collected included demographic information, medication history, and past medical history. Additional information recorded included

tumor location, type, size before and after treatment, number of stages, method of reconstructive surgery, if any, and the use of preoperative/intraoperative/post-operative antibiotics, anxiolytics or post-operative analgesics. Serious adverse events occurring during the procedure day were recorded.

The second portion of the study involved collecting post-operative data. Patients who followed-up in the office within 14 days of treatment had episodes of post-operative bleeding, hematoma formation, infection, wound dehiscence, flap/graft/wound edge necrosis, as well as serious adverse medical events and post-operative pain recorded.

Patients not following-up in the office were given a written questionnaire to complete, and were asked to mail this back to the primary research center in a pre-addressed, postage paid envelope. Patients who did not return the questionnaire were contacted by phone to complete the follow-up survey.

**SUMMARY:** A total of 1777 treatment events were recorded during the study. At this time, 1589 treatment events have follow-up (89%). There were no serious adverse events intraoperatively for 1777 of 1777 events. Of the 1589 treatment events with follow-up, only one patient experienced a serious adverse event after surgery, consisting of syncope leading to an ER visit. Of the 1589 treatment events with follow-up, 1511 experienced no complication (95%). There were 25 episodes of active bleeding that required physician intervention (1.5%), 10 hematomas (0.6%), 17 infections (1%), 10 cases of at least partial dehiscence (0.6%) and 15 cases of at least partial flap/graft/wound edge necrosis (0.9%). More detailed data analysis is underway.

**CONCLUSION:** In this multi-center, prospective 4 week study of serious adverse events and acute complications associated with Mohs surgery for the treatment of skin cancer, Mohs surgery is proven to be a very safe outpatient procedure. The rate of minor complications is low, at 5%. Active bleeding is the most commonly experienced complication, occurring in 1.5% of patients. Hematoma formation, infection, dehiscence, and flap/graft/wound edge necrosis occur at a rate of less than 1% each.

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**TITLE: Histological and Biological Parameters of Melanoma in African American Patients**

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**PURPOSE:** To define the histological and biological parameters of melanoma in African American patients.



Melanoma occurrence in African American patients is relatively rare. Clinical diagnosis is frequently delayed, contributing to an advanced clinical stage at presentation and a decreased median overall survival of patients.

**DESIGN:** We analyzed histopathologically the biopsy specimens from seventy African American patients with cutaneous melanoma. All slides were read by an experienced pathologist (LCK) using multiple morphological criteria for melanoma, including the current ADA criteria.

**SUMMARY:** The mean Breslow dept of invasion was 3.4 mm, and 72% of lesions presented a vertical growth phase. Histological factors predicting survival with statistical significance are: presence of ulceration (log rank 6.7,  $p=0.01$ ), Breslow dept (log rank 3.9,  $p=0.04$ ), Clark level (log rank 8.5,  $p=0.03$ ), number of mitoses (log rank 13.2,  $p=0.0003$ ), neurotropism (log rank 5.0,  $p=0.02$ ), and microvascular density (8.7,  $p=0.03$ ), and lymph node involvement by tumor (log rank 9.0,  $p=0.003$ ). In a multivariate model, the factors most closely associated with survival are, in the order of importance, Clark level, microvascular density under the tumor, presence of residual melanoma, number of mitoses, Breslow depth, and presence of neurotropism. The overall survival of African American patients was significantly decreased compared to a general melanoma population seen in a Pigmented Lesions Clinic (OS 47.0 mo vs. 80.0 mo, AA=46mo, log rank 23,  $p<0.0001$ ). A progressively diminished average survival was correlated with advancement in the Breslow depth (129.30 mo vs. 80.00 mo vs. 69 mo vs. 48 mo for depths of 0-1, 1.01-2.00, 2.01-4.00, and >4.01 mm, respectively [log rank 4.0,  $p=0.04$ ]).

**CONCLUSION:** Some of the classical histological predictors of survival in melanoma confirm their prognostic value in African American patients. However, few histological features behave differently from the known standard, pointing towards a possibly different biological behavior of melanoma occurring in pigmented skin.

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**TITLE:** Basosquamous Carcinoma and Metatypical Basal Cell Carcinoma: A Review of Treatment with Mohs Micrographic Surgery

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**PURPOSE:** The purpose of this study was to analyze the efficacy of Mohs micrographic surgery (MMS) as a treatment for basosquamous carcinoma (BSC) and metatypical basal cell carcinoma (MBCC).

**DESIGN:** A retrospective review of medical records and histologic tissue samples was conducted for 288 patients

with 293 biopsy-proven BSCs or MBCCs treated with MMS between the years 1996 and 2004. Prior to inclusion in the study, the histologic samples were reviewed by the primary author and a dermatopathologist to confirm the diagnoses, which resulted in a total of 32 BSCs and 129 MBCCs. The other 132 cases were reclassified as tumors including other subtypes of basal cell carcinomas (BCC) and squamous cell carcinomas (SCC). Surgical and follow up data was then collected for analysis.

**SUMMARY:** The K-M estimates of recurrence-free survival (95% CI) following MMS was 100% for the first year for both tumors and 95.5% for BSC and 93.8% for MBCC at 5 years. The median number of required Mohs layers was 1 for both tumor subtypes with initial mean sizes of 1.5cm for BSC and 1.3cm for MBCC. Approximately 7% (6.9% for BSC and 7.3% for MBCC) represented recurrent tumors at the time of presentation for MMS. Of the 8 patients who experienced recurrences, none of them developed known metastatic disease in the median 85 months of follow up.

**CONCLUSION:** Previously published studies report a recurrence rate for BSC/MBCC of 12 to 45% with wide local excision. In comparison, recurrence rates with MMS have been estimated to be 4.1% in a recent published study. Our study showed a similar recurrence-free survival, thus helping to confirm MMS as the standard of care for these BCC subtypes.

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**TITLE:** High-Risk Squamous Cell Carcinoma of the Scalp: Predictive Factors of Aggressive Behavior and an Approach to Management

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**INSTITUTION:** 1. Dermatology, UMass Memorial Medical Center, Worcester, MA, United States

**PURPOSE:** The scalp has recently been recognized as a special site for squamous cell carcinoma (SCC), with increased risk of deep local invasion, recurrence, and metastasis. Not surprisingly, we have encountered several such tumors at our institution which have proven difficult to treat and manage long-term. The purpose of this study was to contribute our experience to this difficult topic, by examining risk factors for the development of high-risk SCCs of the scalp, reviewing patient outcomes, and proposing an approach to the management of these challenging tumors.

**DESIGN:** In this retrospective analysis, all SCCs and SCC in situ (SCCISs) on the scalp treated at our academic institution between 2003 and 2010 were reviewed. Inclusion criteria for tumors considered "high-risk" were as follows: tumors greater than 2cm in diameter (post-operative size), recurrent tumors, tumors exhibiting perineural invasion or poor differentiation, and/or tumors in immunosuppressed patients. For each case, data regarding patient demographics (age,

sex), degree of scalp alopecia, tumor location, post-operative size, number of stages, clinical node status, imaging results, sentinel lymph node biopsy status, post-operative radiation, eventual course, and follow-up time was obtained and tabulated. Additionally, histopathology slides from corresponding Mohs layers were reviewed to document final tumor histology, depth of involvement, and scalp thickness.

**SUMMARY:** Of the 192 SCCs on the scalp identified, 110 (58.5%) met criteria for being considered "high-risk." The majority of these tumors were treated successfully with Mohs micrographic surgery (MMS). Four cases, however, (2.1% of all SCCs on the scalp, and 3.6% of high-risk SCCs of the scalp), proved to be extraordinarily aggressive, with affected patients developing multiple recurrences and local metastases. All patients with aggressive tumors were Caucasian; three of the patients were male (75%) and 1 was female (25%). All four aggressive tumors were located on the parietal/vertex scalp, and all affected male patients had stage 7 androgenic alopecia. In contrast, only 62.7% of the other high-risk tumors were located on the parietal/vertex scalp, and the average stage of alopecia in these male patients was 5.4. One of the four patients with aggressive tumors was immunosuppressed (25%), while 12.5% of total patients were immunosuppressed.

Two of the four aggressive tumors were well-differentiated (50%), one was moderately differentiated (25%), and one was poorly differentiated (25%). Of the other high-risk tumors, 47.3% were well-differentiated, 29.1% were moderately differentiated, and 5.5% were poorly differentiated; the remaining tumors were SCCISs. These findings highlighted the fact that well-differentiated tumors can be aggressive, and furthermore, not all poorly differentiated tumors indicate a bad prognosis. The average post-operative area of the aggressive tumors was 29.17cm<sup>2</sup>; meanwhile, the average area of all other high-risk tumors was 6.41cm<sup>2</sup>. Additionally, all four aggressive tumors extended down to periosteum, involving galea, suggesting that tumor depth and volume may also be important in identifying aggressive tumors. Perineural invasion was found in only two of the high-risk tumors (1.0%), both of which went on to behave aggressively, suggesting that when present, PNI can herald aggressive behavior, but is not necessary for poor outcomes.

**CONCLUSION:** With this review, we confirm that SCCs of the scalp should be considered a special subset of tumors, and even well-differentiated SCCs can demonstrate high-risk behavior. A more aggressive approach to diagnosis and treatment should be considered in the following cases: patients with extended field cancerization secondary to alopecia, relatively immunosuppressed patients, tumors greater than 20cm<sup>2</sup>, and tumors involving galea or periosteum. Future prospective studies are needed to determine whether changes in management (such as cytokeratin staining of final Mohs layers to confirm clear margins, preemptive bone burring or resection for tumors extending to periosteum, and/or post-operative radiation) affect patient outcomes and overall morbidity and mortality.

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**TITLE:** *Current Trends in the Treatment of Melanoma in situ/Lentigo Maligna and Melanoma with Mohs Micrographic Surgery*

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**PURPOSE:** Surgical excision is the standard of care for melanoma and melanoma in-situ. The optimal surgical method employed is a subject of much debate in the medical literature even among those of the same specialty. Dermatologists and dermatologic surgeons are trained in the diagnosis and management of cutaneous melanocytic tumors and are usually the first physicians to diagnose melanoma. The American College of Mohs Surgery (ACMS) is an organization whose members are comprised of those physicians who have completed a 1 to 2 year fellowship in surgical dermatology including Mohs micrographic surgery. No consensus guidelines have been written regarding the optimal surgical modality for the treatment of melanoma. Given the discrepancy over the optimal surgical treatment method and the negative implications of suboptimal staging and treatment for this potentially lethal malignancy, investigation into the current practices of members of the American College of Mohs Surgery has become relevant to improving outcomes and moving towards meaningful comparative trials that could drive a consensus statement supporting the optimal surgical method for treating melanoma. We present the results of a web-based survey of the members of the ACMS covering current practice trends in the treatment of melanoma and melanoma in-situ.

**DESIGN:** We used an Internet-based web survey service to obtain a perspective on current practices of ACMS surgeons with regard to treatment of melanoma.

**SUMMARY:** There was an almost even split among ACMS members that do and do not (51.1% vs. 48.9%) perform Mohs surgery for melanocytic lesions. All of those surgeons who perform Mohs for melanocytic lesions do so for melanoma in-situ and fewer do so for thicker melanomas. As expected, the percentage of surgeons performing Mohs surgery declined as the thickness of melanoma increased: 40.5% (64/158) use Mohs for invasive melanoma < 1 mm., 19.6% (31/158) for invasive melanoma 1-2 mm in thickness, and 14.6% (23/158) for invasive melanoma > 2 mm in thickness. Of those that do perform Mohs for melanocytic lesions, the mean number of annual cases was 45.1.

**CONCLUSION:** Complete surgical excision is accepted as the standard of care for the treatment of localized cutaneous melanoma. No randomized, controlled studies exist to directly compare locoregional recurrence or disease free survival rates for Mohs surgery with any of its modifications or with conventional surgical excision. The more recent literature has cast doubts on the adequacy of current recommended surgical margins, particularly for melanoma in situ.

There is general agreement among Mohs surgeons that Mohs surgery is appropriate and effective for melanoma in-situ. However, this survey evoked strong opinions from both sides of the table on using Mohs surgery for invasive melanoma. Many College members hold the belief that Mohs surgery has not been established as an effective treatment modality for melanoma; others believe it has based on previously published studies. When scrupulous surgical and pathological technique is applied, Mohs surgery may be successful in treating localized melanoma while sparing normal tissue.

Given the discrepancy in the medical literature over the optimal surgical treatment method for and the potentially negative implications of suboptimal treatment in melanoma, exploring what Mohs surgeons decide on a daily basis gives us a start in identifying treatments for comparison in long-term randomized controlled trials. Information gleaned from this survey may help to narrow the practice variability among those treating melanoma. As this discrepancy narrows, general agreement on the best way to treat these lesions may emerge. Then perhaps we will be better prepared in designing high-powered, multicenter long-term randomized controlled clinical research comparing methods of treating cutaneous melanocytic tumors.

Table 2: What margin do you typically take for the debulking layer?

	1 mm	2 mm	3 mm	4 mm	5 mm	Greater than 5 mm	Response Count
LM/MIS	58 (46.4%)	24 (19.2%)	30 (24.0%)	2 (1.6%)	9 (7.2%)	2 (1.6%)	125
Melanoma < 1 mm	24 (40.7%)	11 (18.6%)	15 (25.4%)	0 (0.0%)	4 (6.8%)	5 (8.5%)	59
Melanoma 1-2 mm	13 (14.9%)	3 (9.7%)	10 (32.3%)	0 (0.0%)	2 (6.5%)	3 (9.7%)	31
Melanoma > 2 mm	8 (34.8%)	3 (13.0%)	7 (30.4%)	0 (0.0%)	2 (8.7%)	3 (13.0%)	23

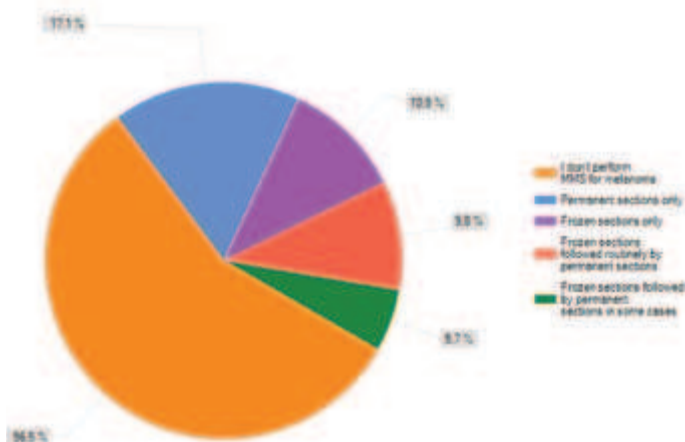
Table 3: What margin do you typically take for stage 1 of MMS?

	1 mm	2 mm	3 mm	4 mm	5 mm	Greater than 5 mm	Response Count
LM/MIS	3 (1.9%)	44 (27.6%)	43 (27.2%)	11 (7.0%)	51 (32.3%)	6 (3.8%)	158
Melanoma < 1 mm	2 (2.7%)	12 (16.4%)	18 (24.7%)	2 (2.7%)	22 (30.1%)	17 (23.3%)	73
Melanoma 1-2 mm	1 (2.5%)	5 (12.5%)	11 (27.5%)	1 (2.5%)	7 (17.5%)	15 (37.5%)	40
Melanoma > 2 mm	1 (3.3%)	5 (16.7%)	9 (30.0%)	1 (3.3%)	5 (16.7%)	9 (30.0%)	30

Table 4: What margin do you typically take for the subsequent MMS stages?

	1 mm	2 mm	3 mm	4 mm	5 mm	Greater than 5 mm	Response Count
LM/MIS	6 (3.8%)	58 (36.7%)	62 (39.2%)	11 (7.0%)	21 (13.3%)	0 (0.0%)	158
Melanoma < 1 mm	1 (1.4%)	19 (26.0%)	31 (42.5%)	3 (4.1%)	16 (21.9%)	3 (4.1%)	73
Melanoma 1-2 mm	1 (2.5%)	8 (20.0%)	20 (50.0%)	1 (2.5%)	7 (17.5%)	3 (7.5%)	40
Melanoma > 2 mm	1 (3.3%)	5 (16.7%)	17 (56.7%)	0 (0.0%)	6 (20.0%)	1 (3.3%)	30

When performing MMS for melanoma, do you utilize:



Tables: A debulking layer is taken by the majority of the survey respondents. Trends in the width of typical margins taken for it and subsequent layers are displayed here.

Table 1: Do you perform a debulking layer for permanent sections?

	Yes	No	Totals
LM/MIS	125 (79.1%)	33 (20.9%)	158
Melanoma < 1 mm	59 (80.1%)	14 (19.1%)	73
Melanoma 1-2 mm	31 (77.5%)	9 (22.5%)	40
Melanoma > 2 mm	23 (76.6%)	7 (23.5%)	30

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**TITLE:** A Standardized Assessment of Cosmetic Outcomes of Different Repair Techniques for Defects on the Nose after Mohs Micrographic Surgery

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**PURPOSE:** The decision between repair options for post-surgical defects on the nose is complicated and subject to defect characteristics including size, depth, location, patient anatomy, and surgeon preference and/or bias. A systematic analysis comparing the cosmetic appearance of post-surgical scars after different repair techniques on the nose would be helpful for surgeons when planning reconstruction of post surgical defects.

**OBJECTIVE:** To objectively evaluate the cosmetic appearance of post-surgical scars of the nose in patients after Mohs surgery. The inclusion criterion was any patient who presented for follow-up photographs after MMS of the nose between September 2008 and April 2009.

**DESIGN:** Three dermatologists independently rated standardized photographs for cosmesis using the Vancouver Scar Scale (VSS). Repair types, cosmetic subunit of the nose, size of the post-operative defect, and length of time after surgery were used in the assessment.

**SUMMARY:** 104 patients were photographed post-operatively when seen in follow-up. Surgical characteristics are presented in Table 2. Linear closures and healing by second intention had lower mean scar scores than flaps or grafts, and this was statistically significant ( $F(3, 100)=12.001, p=0.000$ .) Post-hoc analysis after one-way Analysis of Variance (ANOVA) revealed that the difference between scar scores at zero to three months verses greater than twelve months was statistically significant (mean difference 2.5,  $p=0.005$ ). The total scar scores of the 29 patients who followed up more than once after Mohs surgery were also analyzed over time. A paired samples t-test showed that the average scar scores were statistically significantly lower over time for the same patient (mean difference 0.95,  $p=0.004$ ). Location on the nose was not significantly associated with higher or lower scar scores, ( $F(4, 99)=1.968, p=.105$ ). Age at the time of surgery and gender were also not statistically significantly associated with total scar score. A linear regression was performed to predict the total scar score from post-operative defect size in square centimeters, and follow-up time in weeks. Both relationships were statistically significant. As length of follow-up increased, the total scar score decreased, or improved significantly. As defect size increased, the total scar score increased, or worsened significantly.

**CONCLUSION:** Scar scores improved significantly over time with the best cosmesis at twelve months or greater. Patients who were evaluated more than once over time had statistically significant improvement in scar scores over time. Lowest scar scores (best cosmesis) were associated with complex linear closures and healing by second intention, while higher scores (poor cosmesis) were associated with flaps and grafts. Age, gender, and location on the nose were not associated with cosmesis. Smaller post-operative defects were associated with improved cosmesis, and higher length to width ratios of the post-operative defect was associated with complex linear closures. Alar defects were most often associated with graft closures, whereas nasal sidewall and bridge defects were most often associated with linear closures.

Table 1. Vancouver scar scale

Pigmentation	Pliability	Height	Vascularity
Normal 0	Normal 0	Normal 0	Normal 0
Pink 1	Supple 1	<2 mm 1	Hypopigmentation 1
Red 2	Yielding 2	2-5 mm 2	Hyperpigmentation 2
Purple 3	Firm 3	>5 mm 3	Mixed 3
	Ropes 4		
	Contracture 5		

Table 2. Patient and surgical characteristics

	Frequency	Percent
Nasal tip & Supratip	30	4.8
		1.0
		1.0
Nasal ala	26	25.0
Nasal sidewall	25	24.0
Nasal bridge	15	14.4
Alar groove	8	7.7
Basal cell carcinoma	83	79.8
Squamous cell carcinoma	21	28.8
Male	44	42.3
Female	60	57.7
Complex Linear	37	35.6
Skin graft	30	28.8
Second intention	15	14.4
Advancement	10	9.6
Transposition	5	4.8
Combination	5	4.8
Island Pedicle	1	1
Rotation	1	1



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**TITLE:** A Comparison of Mohs Micrographic Surgery Aided by MART-1 Immunostain for Melanoma and Melanoma In Situ on the Head and Neck vs. Trunk and Extremities: Retrospective Review of 274 Patients

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**PURPOSE:** The purpose of this study was to analyze the elements involved in the management of invasive melanomas and melanomas in situ of the head and neck compared with that of the trunk and extremities when treated with Mohs micrographic surgery aided by MART-1 immunostaining.

**DESIGN:** A retrospective chart review was performed of 274 patients treated with Mohs micrographic surgery for biopsy-proven invasive melanomas and melanomas in situ. All cases were aided by MART-1 immunostaining and performed between March 2006 and November 2010. All patients were treated with a similar protocol. Data points for invasive melanomas and melanomas in situ on the head and neck were compared to that of the trunk and extremities.

**SUMMARY:** A total of 274 cases (comprised of 213 melanomas in situ and 61 invasive melanomas) treated by Mohs surgery aided by MART-1 immunostains were reviewed. 230/274 (83.9%) cases were located on the head and neck and 44/274 (16.1%) were located on the trunk and extremities.

Preoperative biopsies were diagnosed as melanoma in situ in 213/274 (77.7%) cases, invasive melanoma in 54/274 (19.7%) cases, and atypical melanocytic lesions in 7/274 (2.6%) cases. Pathologic examination of the debulk specimens showed melanoma in situ in 167/274 (60.9%) cases, invasive melanoma in 15/274 (5.5%) cases, and atypical melanocytic lesions in 18/274 (6.6%). Examination of 74/274 (27%) of the debulk excision showed scar without any residual melanocytic lesion.

The likelihood of detecting residual tumor on the debulking excision was higher for tumors on the head and neck vs. trunk and extremities. Of all tumors on the head and neck, 166/230 (72.2%) showed residual melanoma. 30/50 (60%) of invasive melanomas on the head and neck had residual disease and 136/180 (75.6%) of melanomas in situ on the head and neck had residual disease. By comparison, 16/44 (36.4%) of all tumors from the trunk and extremities had pathologic evidence of tumor on the debulk excision. 5/11 (45.5%) invasive melanomas on the trunk and extremities had residual disease and 11/33 (33.3%) of melanomas in situ on the trunk and extremities had residual disease.

The average number of stages to clear the tumors was greater for both invasive melanoma (1.52 stages) and

melanoma in situ (1.49 stages) located on the head and neck compared to the average number of stages for tumors on the trunk and extremities (1.18 stages for both invasive melanoma and melanomas in situ on the trunk and extremities). The number of stages required to clear the tumor did not differ between in situ and invasive disease (average of 1.46 stages for invasive melanoma versus 1.45 stages for melanoma in situ). 65% of tumors on the head and neck were cleared with 1 stage compared to an 82% clearance rate for those on the trunk and extremities.

Complexity of reconstruction was greater for tumors located on the head and neck versus the trunk and extremities. For tumors located on the head and neck, 92/230 (40%) were repaired with complex closure, 85/230 (37.0%) with flaps, and 31/230 (13.5%) were referred. For lesions on the trunk and extremities, 35/44 (79.5%) were repaired with complex closure, 3/44 (6.82%) were closed with a flap, 3/44 (6.82%) were allowed to heal by secondary intention, and 3/44 (6.82%) were referred. Reconstruction method did not vary for melanoma in situ vs. invasive melanoma.

**CONCLUSION:** Melanoma in situ and invasive melanoma of the head and neck provide multiple challenges compared to similar lesions on the trunk and extremities.

First, since lesions on the head and neck are more likely to have residual tumor detected in the debulking excision there is an increased likelihood of upstaging at the time of Mohs surgery compared to lesions on the trunk and extremities. While only 4 (1.88%) of the cases in this series upstaged, previous authors have published upstaging in the range of 21-26%. Mohs surgeons must be aware of the possibility of upstaging, because the discovery can change prognosis and may influence timing of the reconstruction, if sentinel lymph node biopsy is desired.

Second, determination of surgical margins by examination of clinically visible lesions is less reliable on the head and neck vs. trunk and extremities, as evidenced by the greater number of stages required for melanomas and melanomas in situ of the head and neck.

Third, reconstruction after excision of melanomas in situ and invasive melanoma of the head and neck is more complex and requires a higher frequency of flaps, compared to lesions on the trunk and extremities.

These important differences between head and neck melanomas versus melanomas of the trunk and extremities were present for both melanomas in situ and invasive melanoma.

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**TITLE:** Fascial Flaps for Auricular Reconstruction When the Postauricular Skin is Not a Viable Option

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**PURPOSE:** The postauricular interpolation flap is commonly employed to reconstruct large helical rim defects after Mohs micrographic surgery (MMS). Occasionally, the glabrous postauricular skin is not a viable option; too photodamaged or sacrificed in tumor extirpation. The use of a random pedicled fascial flap in this circumstance is a strong alternative. The superficial temporoparietal fascia (STPF) flap has been described as an axial flap, however, due to the robust nature of the blood supply, a random fascial flap either from the STPF or the postauricular fascia (PAF) can successfully be employed to reconstruct extensive auricular MMS defects.

**DESIGN:** Case 1) An 85 year old male presented missing the superior third of the left helix after resection of a basal cell carcinoma by a rural dermatologist with intraoperative frozen sections positive for additional tumor. (Figure 1a) After MMS, the defect was extensive, (Figure 1b) with a remnant of exposed cartilage for the superior half of the helix and revealing the STPF around the helix. Reconstruction involved a preauricular transposition flap to the anterosuperior aspect of the helix and a STPF flap to the posterosuperior aspect of the helix covered with a full thickness skin graft. The STPF flap was created with an arcuate incision through the STPF at the outer edge of the MMS defect. The flap was dissected carefully off the muscle from posterior to anterior, leaving a broad pedicle anteriorly and sutured to the posterior aspect of the helix covering the exposed cartilage and recreating the superior aspect of the helix. Needing visibility for hemostasis, a linear incision posterosuperiorly from the edge of the MMS defect toward the vertex approximately 5cm in length, hemostasis was achieved and the scalp skin was sutured closed, and a xenograft of purified collagen (Puracol Plus, Medline) was used to cover the remaining scalp defect. (Figure 1c) Postoperatively, the patient's course was uncomplicated. He healed very well with a nearly normal appearing ear. (Figure 1d)

Case 2) An 81 year old male presented with a basal cell carcinoma on the left helical rim. MMS resulted in a cartilaginous defect of the rim. (Figure 2a) It was determined that due to severe photo damage and limited glabrous postauricular skin that a random PAF would best restore the normal contour of the helix. The PAF flap was created by incising along the postauricular sulcus apx 5 cm to fascia and then posteriorly apx 7cm followed by a perpendicular incision creating a "T". The scalp was undermined broadly between the fat and PAF. (Figure 2b) An arcuate incision of the PAF was made posteriorly and dissected off the muscular base leaving a broad pedicle anteriorly. The PAF was draped over the helical rim defect and sutured into place.

(Figure 2c) Pedicle division occurred after three weeks. This reconstruction resulted in a normal appearance to the ear, restoring the normal contour of the helical rim. (Figure 2d)

**CONCLUSION:** Fascial flaps have a robust blood supply and can provide an excellent alternative to the postauricular skin interpolation flap in auricular reconstruction when the skin flap is not a viable option.

Figure 1. Superficial temporoparietal facial flap

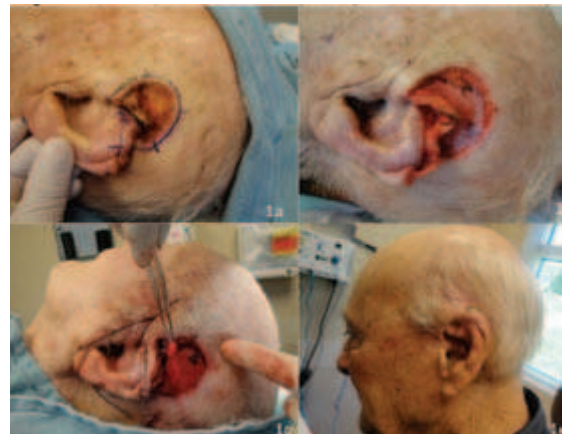


Figure 2. Postauricular fascial flap



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**TITLE:** The Presence of Inflammation May Predict Carcinoma in Mohs Sections

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**PURPOSE:** The histopathologic evaluation of tissue obtained from Mohs micrographic surgery is important in obtaining complete tumor removal. Areas of dense inflammation are commonly removed during Mohs surgery because of the concern that they may mask or predict areas of tumor. As the goals of Mohs surgery are trifold: tumor clearance, maintaining functionality through margin minimalization and providing an aesthetically acceptable scar, it is important to

delineate surgical techniques that provide tumor clearance while optimizing the two secondary objectives.

**OBJECTIVE:** We sought to evaluate whether inflammation predicted carcinoma Mohs sections in order to determine if surgical margins should always include all inflammation

**DESIGN:** Serial sections and immunohistochemical technique with anticytokeratin antibodies (AE1/AE3 and CK8/18) were performed on Mohs frozen sections found to have moderate inflammation on histology.

**SUMMARY:** A total of 31 Mohs cases were examined. 19 (61%) showed evidence of moderate inflammatory infiltrate and were chosen for further evaluation. Tumor was found in 7 of the 19 cases (39%). This included 4 squamous cell carcinoma, 2 basal cell carcinoma, and 1 keratoacanthoma. 2 of 7 cases (29%) detected tumor on serial sections not detected on routine histology. 12 (39%) showed none or mild inflammatory infiltrate.

**CONCLUSION:** Areas of inflammation may predict carcinoma during Mohs surgery. Step sections and immunohistochemistry may provide additional information that can aid in definitive therapy. Further studies are warranted.

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**TITLE:** HPV Types in Transplant-Associated Squamous Cell Carcinomas

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**PURPOSE:** Solid organ transplant recipients are among the most challenging patients in Mohs surgery practice. Immunosuppression dramatically increases patients' risk of developing non-melanoma skin cancer. Skin cancers ultimately affect over 50% of transplant recipients. In particular, the risk of squamous cell carcinoma is increased 65-250 fold in transplant recipients. While some patients have numerous and frequent skin cancers, others go many years without any lesions. There is not yet a way to predict whether a patient will be in a high- or low- risk group. Immunosuppression leads to increased infection with human papillomavirus (HPV), and these infections may play a role in promoting cutaneous malignancies. The goal of this study is to detect HPV types in transplant-associated SCCs. We hope to discover specific HPV types that may identify transplant patients who are at highest risk for developing squamous cell carcinomas.

**DESIGN:** Biopsy specimens were collected from patients in the university transplant dermatology clinic undergoing Mohs surgery for squamous cell carcinoma. Lesions were limited to sun-exposed skin, including head and neck, forearms and hands. DNA was isolated from paraffin-embedded specimens and subjected to general-primer-PCR reverse-line blotting to specifically detect cutaneous HPVs.

**SUMMARY:** HPV typing was performed on SCCs from solid organ transplant patients presenting for Mohs excision. We detected between 0 and 6 HPV types per lesion, including 11 unique HPV species. The most prevalent HPV types were HPV20 (6/11), HPV9 (3/11) and HPV4 (2/11). The mean number of HPV types identified was  $1.2 \pm 0.3$  in renal transplant patients versus  $3.4 \pm 0.8$  for cardiac transplant patients.

**CONCLUSION:** The majority of squamous cell carcinomas from transplant patients had detectable HPV DNA. SCCs from cardiac transplant patients had, on average, more HPV types than those from renal cell transplant patients. This is particularly interesting given the clinical observation that cardiac transplant patients appear to be at greater risk for developing SCCs than renal transplant patients. The most frequently detected species, HPV20, has been associated with malignant transformation in animal studies and in human cells in vitro. However, a role for HPV20 has yet to be demonstrated in humans. It will require a larger patient cohort to assess the association and possible causative role of specific HPV types in transplant-associated SCCs. In the future it may be possible to treat with vaccination or HPV-directed immunotherapy to prevent the development of SCCs in immunosuppressed patients.

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**TITLE:** Influence of Pre-Operative Viewing of Educational Videos about Mohs Micrographic Surgery on Patients' Perceptions

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**PURPOSE:** The purpose of this study is to determine if showing patients pre-operative educational videos about Mohs micrographic surgery will enhance their satisfaction and preparedness.

**DESIGN:** In our clinic, patients are contacted by a pre-operative phone call to discuss the Mohs procedure. All patients are given access to two videos via internet intended to educate them about Mohs surgery. One video is the "Patient Education Video" accessed through the web site for the American College of Mohs Surgery. The other video is a wound care video developed by the Melanoma and Cutaneous Oncology Program at the Huntsman Cancer Institute. During post-operative nurse calls all new patients were asked if they watched the educational videos. Additional questions explored how well the patient felt they were prepared for the procedure and their overall satisfaction.

**SUMMARY:** A total of 22 patients who had never had Mohs surgery were contacted following their Mohs procedure. Of



the 22 patients, 11 (50%) patients viewed both the Mohs educational video and the post-operative wound care video. The average preparedness of patients who watched both videos was 9.27 out of 10. The average preparedness for the 11 patients who watched neither of the videos was 8.72 out of 10. Of those patients who felt most prepared for their procedure (10 out of 10) 70% watched both educational videos.

**CONCLUSION:** Patient preparation is key to the patient experience during their Mohs procedure. It seems patients benefit from viewing pre-operative educational videos that discuss the procedure, timing expectations, and post-operative wound care instructions. As a result we feel patients who watch these videos pre-operatively are more prepared, understand the possible outcomes, and feel empowered going into their Mohs procedure.

Further data is being gathered and will be available at the time of presentation to the Mohs College.

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**TITLE:** Locally Aggressive Atypical Fibroxanthoma – Case Series

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**PURPOSE:** Atypical fibroxanthoma (AFX) is a low-grade tumor that is typically characterized by its relatively small size and confinement to the dermis. We present three cases of AFX that are unique due to their size and the depth of invasion.

**DESIGN:** Atypical fibroxanthoma (AFX) is a malignancy that usually occurs on sun-damaged skin of the head and neck in elderly patients. Despite marked cellular atypia, the lesion is considered a low-grade sarcoma and is known to follow a benign clinical course. The largest case series of AFXs reports a median size of 10 mm, with tumor cells confined predominantly to the dermis. Smaller case series by Mohs surgeons document larger tumors, with a median size of 13 mm in one study. Mohs surgeons also report that almost all AFXs are cleared within 2 stages of Mohs, with an average margin of 4 mm in one study.

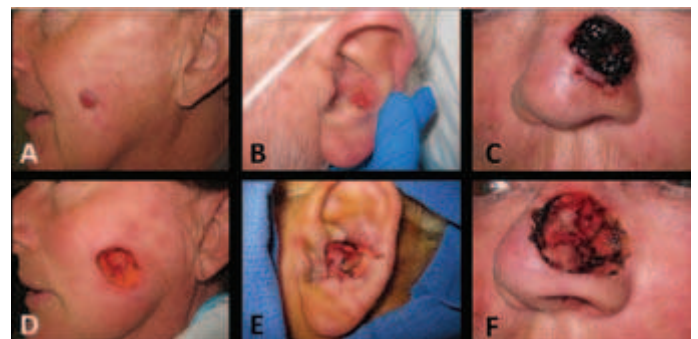
We present three cases of locally aggressive AFX of the head and neck, treated with MMS. Patient #1 is a 65 year-old male who presented with a fast growing nodule on the left cheek. The initial lesion measured 1.1 x 1.2 cm (Figure 1A) and tumor-free plane was achieved after 2 stages. The final defect measured 2.6 x 2.7 cm (Figure 1D), with tumor extension into the subcutis. Patient #2 is a 69 year-old male who presented with a new bleeding nodule on his left conchal bowl, measuring 2 x 1.5 cm preoperatively (Figure 1B). During MMS, extensive tumor invasion into the cartilage was found and a tumor-free plane was achieved after 2 stages. The final surgical defect measured 3.1 x 3 cm (Figure

1E). Patient #3 is a 64 year-old woman who presented with a rapidly growing lesion on the nose, complicated by constant bleeding. The initial size of the lesion was 2.5 x 2.0 cm (Figure 1C). Seven stages of MMS were required to clear the tumor, including removal of cartilage, and the final defect measured 5.1 x 4.3 cm (Figure 1F).

All three patients continue to be followed closely, and there has been no evidence of recurrence or metastatic disease after an average of 7 months of follow-up. Of note, prior to MMS, the diagnosis of AFX was achieved after histological examination of the tumor with special stains, including negative S100, negative pan-cytokeratin, and positive pro-collagen 1.

**CONCLUSION:** Our three cases highlight the potential for AFX to demonstrate locally aggressive behavior. These tumors were typical in their location (sun-exposed areas) and the age of the patients, but were characterized by a larger size and larger margins to clear the tumors than is typically seen in AFX. These cases also demonstrated much deeper tumor invasion, with penetration into the cartilage and subcutis, than is reported in the literature and that we normally see in our practice. In such cases, MMS is the preferred treatment modality, as it would be difficult to clear margins, particularly the deep margin, with standard excision. In addition, these cases illustrate the importance of special stains in diagnosing AFX, as these tumors could clinically and histologically be mistaken for amelanotic melanoma or spindle cell squamous cell carcinoma.

Figure 1: Pre-operative appearance of the lesions from patient #1 (A), patient #2 (B) and patient #3 (C) and final defect after tumor free plane was achieved of patient #1 (D), patient #2 (E) and patient #3 (F)



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**TITLE:** The Role of PET/CT Imaging in the Evaluation and Management of Merkel Cell Carcinoma

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**PURPOSE:** Merkel cell carcinoma (MCC) is among the deadliest of cutaneous malignancies with a mortality rate twice that of malignant melanoma. Management of this disease has been hindered by a lack of consensus evaluation and treatment guidelines. The utility of simultaneous positron emission tomography and computed tomography (PET/CT) scanning has been demonstrated for a variety of tumors. The purpose of this study was to report the contribution of PET/CT imaging in the initial workup and ongoing care of MCC patients, and to determine if any patient and/or tumor characteristics may predict when PET/CT is more likely to have greater impact.

**DESIGN:** A single institution, retrospective chart review was conducted of all patients diagnosed with MCC that underwent PET/CT scanning between 2007 – 2010. The outcome of each of these studies was evaluated as to the influence on patient staging and management. Patient information as well as gross and histologic tumor characteristics were collected and analyzed.

**SUMMARY:** Twenty-one patients (9 men, 12 women; median age 60, range 34 – 80 years) underwent a total of 40 PET/CT scans, comprising the largest reported cohort to date. Patient age, size and location of primary tumor, stage at presentation, history of immunosuppression, disease treatment history, maximum standardized uptake values (SUV), the presence of tumor infiltrating lymphocytes, depth of tumor invasion, and histologic growth index were noted for each patient when possible. Seven patients (33 %) had known metastatic disease at time of initial PET/CT. Of the 40 studies, 19 were performed for initial staging, 9 for longitudinal surveillance, and 12 to monitor the response to specific therapy. PET/CT resulted in changes in staging in 3 (7.5 %) instances, however, had PET/CT been performed earlier in the workup of patients, this number may have increased to as many as 8 (20 %). Of these 8 cases, 3 were in patients who originally presented with local disease that progressed to metastatic disease. There were no cases where PET/CT findings contradicted those of pathologic nodal staging and no cases of recurrence in the setting of negative PET/CT. Two patients were noted to have incidental second primary malignancies.

**CONCLUSION:** PET/CT is a valuable tool in the management of patients with MCC in 3 settings: (1) initial staging; (2) serial monitoring; (3) to gauge response to therapy. When performed as part of an initial workup it is a sensitive method for the detection of metastatic disease. Furthermore, because 90 % of all recurrences of MCC occur within 2 years of presentation, close monitoring of these patients within this time frame is critical. Lastly, in this study, PET/CT scans were a useful method to monitor response to treatment. Ultimately, a positive effect on survival would need to be demonstrated to confer the impact of serial PET/CT scanning with sensitivity and cost effectiveness greater than that of other imaging modalities.

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**TITLE:** Partial Subunit Island Pedicle Flap (IPF) for Small Defects Isolated to the Alar Subunit

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**PURPOSE:** To present a novel modification of the island pedicle flap, termed “partial subunit” repair, which allows reliable reconstruction of small defects isolated to the alar subunit.

**DESIGN:** In a series of 9 consecutive patients, we present indications, flap design, flap undermining, suturing technique and immediate and long-term follow-up. This flap is indicated for defects <5 mm in width and isolated to the anterior ½ of the alar subunit. A column extending from the superior aspect of the defect to the alar groove and from the inferior aspect of the defect to the free margin of the ala is excised to the depth of the alar mucosa. Superiorly, an incision is made through the dermis but above the levator labii superioris alaque nasi and alar portion of the nasalis muscle from the superior aspect of the newly excised column to the base of the alar groove at the hairless triangle. Inferiorly, an incision is made along the alar rim from the inferior aspect of the newly excised column to the base of the alar groove. The inferior incision is made at the junction of the alar mucosa and the alar portion of the nasalis muscle.

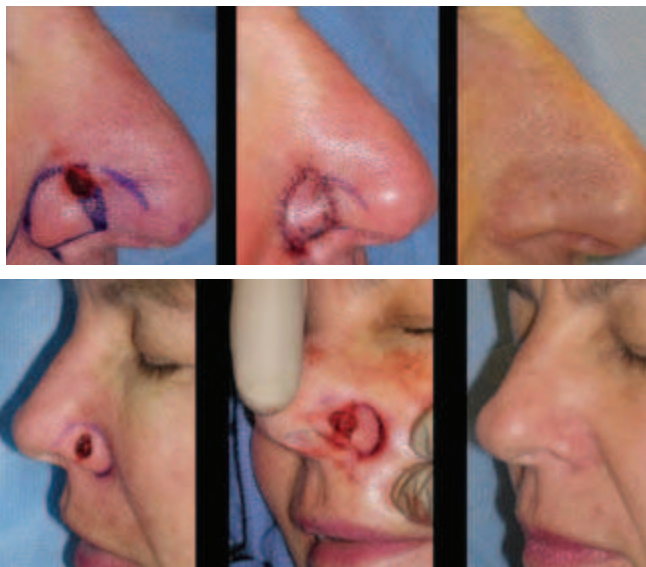
Undermining occurs in 2 planes. Superiorly and laterally, the nasal sidewall, cheek, and apical triangle of the lip are undermined immediately under the dermis, taking care to preserve the branches from the angular artery. At the incision along the alar rim, the flap is undermined in below the alar portion of the nasalis muscle, immediately superior to the hair bulbs of the alar mucosa.

The key suture is placed at the leading edge of the flap to close the vertical columnar defect. The cheek and apical lip are advanced medially to close the secondary defect using a horizontal tension vector to avoid alar lift. Finally, the mucosa at the alar rim is sutured to the inferior margin of the flap. The excess volume of the alar mucosa can usually be distributed by a rule of halves; if not, the excess tissue should be distributed toward the base of the ala near apical triangle of the lip, and excised as necessary.

**SUMMARY:** 9 patients underwent Mohs micrographic surgery for tumors of the ala. All patients had small defects (<5 mm in width), which were successfully repaired with a partial subunit island pedicle flap. All patients had excellent cosmetic and functional outcomes with preservation of the normal position and contour of the ala. Function of the external nasal valve was preserved.

**CONCLUSION:** Previous authors have described the island pedicle flap for repair of alar defects with either the inferior limb of the flap located in the middle of the alar subunit

or a nasal sidewall donor site requiring bridging the alar groove. We present a novel modification, termed a "partial subunit" IPF which allows reliable reconstruction of small defects isolated to the anterior one half of the alar subunit. Compared to previously described IPFs, this flap optimizes placement of scars within cosmetic subunit junction lines and the free margin of the ala, and it avoids borrowing any tissue from outside of the alar subunit. By moving the flap on a muscle sling, the flap advances medially with minimal to no buckling of the alar margin. The position of the free margin of the ala and the function of the external nasal valve are preserved. Additionally, skin color, texture, and volume are optimized.



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**TITLE:** The Impact of Cutaneous Squamous Cell Carcinoma Thickness on Mohs-assisted Excisions: A Pilot Study

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**PURPOSE:** In 2010, the College of American Pathologists (CAP) revised the criteria for aggressive squamous cell carcinomas (SCCs) of the skin to include tumors greater than 2 mm. Prior to 2010, tumors greater than 4mm in thickness were classified as aggressive. This study seeks to examine the relationship between SCC thickness and the number of Mohs micrographic surgery (MMS) stages required for complete tumor extirpation.

**DESIGN:** This study is a retrospective chart review of SCCs with histologically-documented tumor thickness that underwent Mohs-assisted excisions between July 1, 2009 to December 31, 2010.

**SUMMARY:** A total of 87 histologically-measured SCCs subsequently underwent MMS. Fifty-six tumors measured less than 2 mm in thickness and required an average of 1.32 MMS stages for complete clearance. The remaining thirty-one

tumors measuring 2mm or greater in thickness required an average of 1.33 stages for complete tumor extirpation.

**CONCLUSION:** At this time, the thickness of SCC is not correlated with the number of MMS stages required for complete tumor clearance.

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**TITLE:** Increasing Rates of Non-melanoma Skin Cancer in the US, 1995-2007

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**PURPOSE:** We previously reported overall demographic patterns of NMSC in the US over the last 10 years. This subset analysis aims to better elucidate the overall trends in incidence and treatment patterns of NMSC over the last decade.

**DESIGN:** This is a cross sectional analysis of the National Ambulatory Medical Care Survey (NAMCS) between 1995 and 2007. NAMCS is an annual federal survey conducted by the National Center for Health Statistics of office visits made by ambulatory patients to a sample of approximately 1,500 non-federally employed physicians selected from the American Medical Association database. A weighted sampling technique allows for calculation of nationally representative estimates of the number of patient visits and patient characteristics. Data are obtained on patients' symptoms, physicians' diagnoses, medications, demographic characteristics, diagnostic procedures, and treatment. Our analysis was restricted to Non-Hispanic white patients over 18 years of age who had NMSC recorded as a reason for their physician visit (ICD9 codes 173, 232). Benign skin conditions including seborrheic keratoses, corns, scars as well as actinic keratoses and malignant melanoma were excluded. All analyses were weighted to account for survey sampling in order to make results applicable to the entire US population. Population adjusted rates of NMSC were calculated and linear regression models determined the annual percent change (APC). In addition, multivariate logistic regression was used to evaluate the effects of age, gender, provider type, insurance, and region of the country on treatment patterns.

**SUMMARY:** Overall population adjusted prevalence of NMSC increased in 1995 to 2007 from 9.1/1000 to 16.6/1000 (Figure 1). The rates were significantly increased in men (APC = +5.23, p=0.02), particularly those over age 65 (APC: +4.80, p=0.01) (Figure 2). In addition, an increase was noted in all individuals over the age of 65 compared to those under 65 years (APC: +3.49, p=0.04). Among all individuals less than 65, a trend was noted toward increased rates in women (from 6.6/1000 to

9.1/1000) while rates in men less than 65 remained stable. Despite these increases in rates of NMSC, the number of procedures has not been increasing over time in terms of total number, percentage of those with NMSC, and in multivariate models. The most important predictors of receiving a procedure for NMSC using multivariate logistic regression (including destruction by freezing, ED&C, local excision, and Mohs) included male sex (OR 1.3,  $p=0.01$ ), being seen by a dermatologist (OR 5.13,  $p<0.0001$ ), and having private pay insurance (OR 1.9,  $p=0.0003$ ). In addition, there was a trend toward increased procedures in urban environments, though not statistically significant.

**CONCLUSION:** Non-melanoma skin cancer rates are increasing and the rate of increase appears to be climbing faster in men than women, particularly over the age of 65. This study also suggests that patients who have access to a dermatologist may receive more prompt definitive treatment, and that there is a discrepancy in treatment for NMSC based on insurance type and gender. NMSC poses a significant and increasing burden to our healthcare system and providers.

Figure 1.

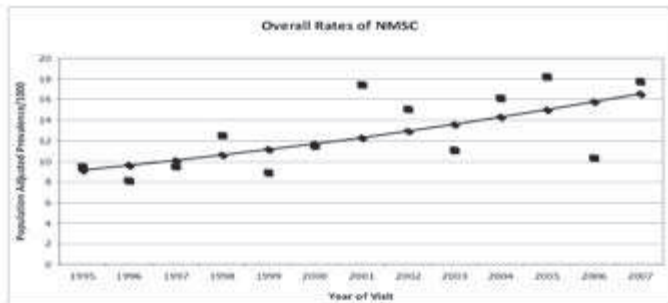
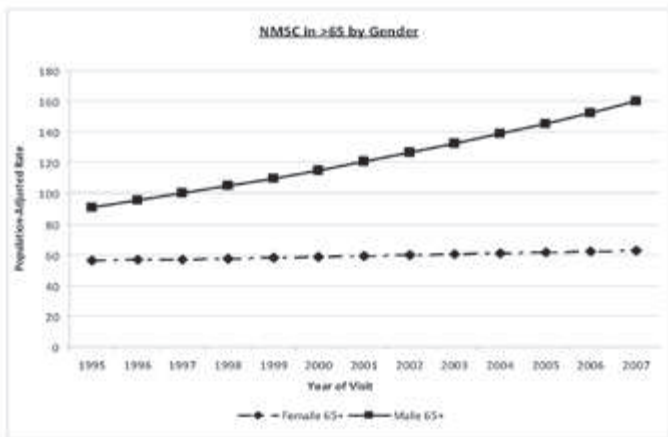


Figure 2.



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**TITLE:** The Off Label Use of Imiquimod 5% Cream as an Adjuvant Treatment to Staged Surgical Excisions in Lentigo Maligna: A Retrospective Review of 311 Patients

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**PURPOSE:** The current standard of care for the treatment of lentigo maligna (LM) is to perform staged surgical excisions in an attempt to verify clear perimeter margins before surgical repair. This approach has reduced, but not eliminated, perimeter recurrences. Although staged excisions have reduced recurrence rates for LM, they result in significant morbidity due to the relative large sizes of the defects compared to other melanoma subtypes. We report on the off label use of imiquimod 5% cream as an adjuvant treatment for LM to allow for more conservative staged excisions.

In this study, we retrospectively reviewed 311 patients with a histological diagnosis of LM who had been pretreated with imiquimod 5% cream with or without tazarotene 0.1% gel followed by conservative staged excisions with two millimeter margins. We sought to evaluate whether the level of inflammation achieved or the length of treatment might predict complete tumor clearance rates.

**DESIGN:** A total of 311 patients who were treated for an average of two months with imiquimod 5% cream five days a week (Monday thru Friday). All patients were evaluated after the first four weeks of treatment to assess inflammation. If no appreciable inflammation was clinically present, tazarotene 0.1% gel was added twice a week (Saturday thru Sunday) in hopes of decreasing the stratum corneal lipid barrier to penetration of the topical agent. In all cases, the patients underwent a staged surgical excision two months after stopping the topical therapy to assess for residual tumor and perimeter margin control. Outcomes were sorted by the histologic absence of disease at the time of surgery, residual histologic disease not requiring additional surgery, and residual disease requiring an additional stage of surgery.

**SUMMARY:** 209(67.2%) patients received imiquimod alone. 102(32.7%) patient received imiquimod and tazarotene. 223(72.1%) patients were male and 88(27.9%) patients were female. Further descriptive statistics are pending.

**CONCLUSION:** Pending.



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**TITLE:** *Perception versus Reality in Academic Dermatologic Surgery: A Study of Motivation, Retention, and Loss*

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**PURPOSE:** Published studies have looked at academic dermatology as a whole regarding issues of recruitment and retention, but very little has focused on the subspecialty of academic dermatologic surgery. Our goal was to survey fellowship trained Mohs surgeons to review factors that motivated a career in academics and factors that influenced some surgeons to leave. We also wanted to compare the actual influences for leaving academia versus the reasons perceived by current academic surgeons.

**DESIGN:** An online survey was sent in December 2010 to members of the American College of Mohs Surgery whose email address was available on the ACMS website. The survey was designed so that based on answers to an initial set of questions, respondents were separated into three groups: 1) currently an academic dermatologic surgeon, 2) formerly an academic dermatologic surgeon, and 3) never practiced in academics. Questions were asked using a combination of five-point Likert scales, multiple choice, and open response sections.

**SUMMARY:** Preliminary data from 67 respondents (36 current academic dermatologic surgeons, 12 previously in academics, and 19 who never practiced in academics) was analyzed. It suggests that initial motivating factors to work in academia are similar between current and former academic surgeons: 75% of both groups stated a desire to teach. Additionally, 67% of current and 83% of former academic surgeons stated the opportunity for collaboration as a motivating factor. It also reveals differences between the surgeons' perception of why their colleagues left academics and the actual factors: 92% of current versus 55% of former academic surgeons 'agreed' or 'strongly agreed' that they leave for higher financial reimbursement. In contrast, the strongest factor influencing the decision to leave academia was for greater control over staff (92%). Other significant factors included too much bureaucracy (82%) and family or lifestyle reasons (50%).

The preliminary data also revealed that half of former academic dermatologic surgeons were directors of their programs at the time they left, and the majority of respondents indicated that they would return to a full time academic position if the reason(s) they left were rectified.

**CONCLUSION:** Retention of fellowship trained Mohs surgeons in academia is critical for the future of our subspecialty. Unfortunately many dermatologic surgeons who have been leaders in academics have left. The early responses of our survey have illustrated some of these

factors and how they vary with the perceived influences. It is important for the departmental, medical school and hospital leadership to understand these actual motivations in order to retain current and future academic dermatologic surgeons.

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**TITLE:** *Surgeon, Sex, Age, Location, and Orientation; Do They Affect The Closure Length to Wound Diameter Ratio For Primary Repairs Following Mohs Surgery?*

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**PURPOSE:** When planning a skin excision, most authorities state that the length of the wound needs to be approximately 3-4 times as long as it is wide in order to avoid cutaneous redundancies. However, there appears to be little data other than one small study and the results of mathematical models to support this notion. Previous studies have shown that skin varies considerably in nature depending on anatomic location, patients' age, and the distribution and magnitude of the surrounding tension field. Our study hopes to determine whether a patient's age, sex, orientation of closure, location of closure, surgeon, and presence of resident or fellow during the procedure will affect closure length. Additionally we hope to determine whether the actual closure length adheres to the 3:1 length to width ratio guidelines. Knowing the likely length of the planned repair can help in patient education and wound closure planning.

**DESIGN:** In this retrospective chart review study, data previously accumulated within two University affiliated outpatient surgery facilities was used to identify a cohort of patients who underwent Mohs surgery with repair by primary closure within a ten-year span. Our databases collectively contained information on 3211 patients with primary repairs following Mohs surgery by three different dermatologic surgeons. Data regarding the patients' age, sex, length and width of Mohs defect, location of closure, orientation of closure, surgeon and presence of resident or fellow during procedure were collected. Location of closure was limited to ten groups: temple, cheek, forehead, nasal tip, scalp, upper lip, lower eyelid, neck, nose sidewall, and chin. Digital images taken following the procedure were used to determine the orientation of closure compared to relaxed skin tension lines at the body site involved. Closure ratios were determined by dividing the length of the wound closure by the mean of its length and width. Statistical analysis will be performed to determine the effects of age, sex, location, orientation and presence of residents/fellows affect the overall length of the closure.

**SUMMARY:** An interim analysis indicates the median closure length ratio is 2.53:1. Nasal tip closures had the largest average closure length ratio. The average closure length



ratio at each of the ten different locations is summarized in Table 1. Moreover, our preliminary data revealed that the average closure length ratio at each of the ten sites varied by dermatologic surgeon (Table 1). Interestingly, closure length ratios appeared similar even with different closure orientations relative to the relaxed skin tension lines (Table 2). Statistical analysis of the effects of the patients' age, sex, closure orientation, surgeon, location of closure, and presence of resident/fellow during the procedure is underway and will be completed prior to the meeting.

**CONCLUSION:** Preliminary data suggests that closure length, with the exception of the nasal tip, appears to vary little based upon location. Conversely, considerable variability appears to exist among different surgeons. Definitive conclusions await full completion of data collection and final statistical analysis to be complete prior to the annual meeting.

Table 1. Average closure length ratio for all three surgeons combined and separately at each of the ten sites.

Location	Average Closure Length Ratio- All Surgeons	Average Closure Length Ratio (Surgeon 1)	Average Closure Length Ratio (Surgeon 2)	Average Closure Length Ratio (Surgeon 3)
Cheek	2.55	2.57	2.81	2.47
Chin	2.22	-	2.73	2.14
Forehead	2.50	3.04	2.68	2.31
Lower Eyelid	2.53	2.47	2.97	1.82
Neck	2.32	2.45	2.59	2.16
Nose Sidewall	2.61	1.20	2.89	2.18
Nose Tip	3.43	1.0	2.30	3.12
Scalp	2.35	2.46	2.95	2.19
Temple	2.54	-	3.10	2.21
Upper Lip	2.54	2.72	2.55	2.38

Table 2. Closure length ratios for wounds closed at different orientations relative to relaxed skin tension lines.

Orientation Relative to Relaxed Skin Tension Lines	Closure Length to Mean Wound Diameter Ratio
0'	2.47
45'	2.69
90'	2.57

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**TITLE:** Novel Use of MOC-31 Antibody to Distinguish Basal Cell Carcinoma Cells from Normal Epidermal and Hair Follicle Cells and Its Possible Applications in Mohs Surgery

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**PURPOSE:** To describe the characteristics of a novel monoclonal mouse anti-human Epithelial Related Antigen (ERA) antibody, also known as MOC-31 and its utility in differentiating basal cell carcinoma cells from normal epidermal and hair follicle cells, as well as possible applications in Mohs surgery.

**DESIGN:** MOC-31, also known as Epithelial Related Antigen, is a monoclonal mouse anti-human antibody that targets the epithelial cell adhesion molecule (Ep-CAM, TACSTD1) expressed in epithelial cells (Pai RK and West RB, 2009). During the past twenty years, it has been found to be useful in distinguishing between reactive mesothelial cells and metastatic adenocarcinoma. In addition, studies have shown it to have excellent specificity in distinguishing invasive ductal and lobular carcinomas of the breast from mesothelial cells (Pai RK and West RB 2009) as well as differentiating metastatic carcinoma from hepatocellular carcinoma (Saleh et al. 2009). In our institution, MOC-31 is used frequently as part of a panel to determine the possible origin of poorly differentiated carcinomas. While evaluating some of these poorly differentiated carcinomas, it became apparent that MOC-31 has excellent staining qualities for basal cell carcinomas whether they are infiltrative, nodular or superficial. Even more interesting, MOC-31 is quite specific for basal cell carcinoma cells while not staining normal epidermal cells or hair follicle cells, as can be the case with the different epithelial keratins such as CKAE1 and CKAE3. MOC-31 specifically highlights the tumor, creating an obvious map of the tumor.

Because of these qualities, we wanted to test MOC-31 and see if these characteristics were consistent. We first collected all skin pathology specimens stained with MOC-31 in the past three years, analyzed them and graded the intensity of MOC-31 staining (grade 0 = no staining, grade 1 = mild staining, grade 2 = moderate staining, and grade 3 = strong staining). We then selected fifteen specimens of infiltrative basal cell carcinoma and had them stained with MOC-31 and analyzed the results. Because MOC-31 also stains eccrine ducts we also stained three microcystic adnexal carcinomas to see if MOC-31 could be useful during Mohs

surgery for evaluating margins when treating microcystic adnexal carcinomas.

**SUMMARY:** Out of the fifteen specimens of infiltrative basal cell carcinoma that we tested, all fifteen (100%) stained with MOC-31. Out of the three microcystic adnexal carcinomas, 2 of the tumors showed no staining with MOC-31 (grade 0), and one tumor showed very mild focal staining with MOC-31 (grade 1). Interestingly, the only trichoepithelioma stained with MOC-31 also showed no staining (grade 0), a characteristic that may be useful when trying to differentiate between a trichoepithelioma and a basal cell carcinoma.

Upon reviewing all cases stained with MOC-31 in the past 3 years at our institution, we were able to find the following: 4/4 basal cell carcinomas (100%), 7/15 squamous cell carcinomas (47%), and 1/2 Merkel cell carcinomas (50%) stained with MOC-31. One sebaceous carcinoma and one porocarcinoma stained focally (grade 1) with MOC-31. One eccrine carcinoma (0%), one trichoepithelioma (0%) and one malignant melanoma (0%) did not stain with MOC-31.

**CONCLUSION:** MOC-31 is a useful immunohistochemical marker for highlighting basal cell carcinomas and differentiating them from normal adjacent epidermal and follicular cells. This could be a useful characteristic during Mohs surgery when differentiating normal hair follicles, follicular proliferations, or isolated atypical cells from residual basal cell carcinoma. In addition, we were able to show that although MOC-31 stains normal eccrine ducts, it is not useful in highlighting microcystic adnexal carcinomas.

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**TITLE:** Acceleration of Mouse and Human Wound Healing Using Systemic GCSF: A Novel Approach to Healing of Wounds and Potential Application to Mohs Surgery

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**PURPOSE:** Stem cells can accelerate wound healing with reduced scarring, but their use in human diseases is still in the investigational stages. We have previously reported a method whereby mesenchymal stem cells were aspirated from the bone marrow, amplified in vitro, and then placed back on human wounds, including Mohs surgery wounds as an accelerant to wound healing. In this study, we sought to develop a method of stem cell therapy that circumvents the need for bone marrow aspiration and in vitro amplification. Granulocyte colony stimulating factor (GCSF) is used in hematology to mobilize stem cells out of the bone marrow to be collected for stem cell transplantation in the treatment

of lymphomas and leukemias. In a similar approach, we used GCSF to mobilize stem cells out of the bone marrow; however, rather than collect the stem cells, we allowed the cells to circulate and to home directly to a cutaneous wound via the bloodstream. We studied the effect of systemic GCSF in improving the healing of experimental wounds in mice and also, preliminarily, of a chronic wound in a human subject. Our objective was to begin to optimize conditions for stem cell therapy using GCSF.

**DESIGN:** We measured how well GCSF mobilized the stem cells out of the bone marrow and into the peripheral circulation by measuring stem cell concentrations in two ways: We used colony forming assays that selected for stem cells and we performed flow-cytometry using the stem cell antibodies Sca-1 and c-Kit. For our experimental mouse wounds, we created full thickness skin wounds on the tail. We measured wound healing in 3 ways at different time points: clinical appearance of the wound, proportion of wound epithelialization, and collagen content in polyvinyl alcohol sponges. We monitored stem cell homing from the bone marrow to the wound site using live imaging of chimeric mice to follow green fluorescent protein labeled bone marrow cells as the fluorescent signal moved to the wound. In addition, we treated one human subject with a chronic wound (refractory to standard treatments) using systemic GCSF.

**SUMMARY:** In the experimental mice, peripheral blood stem cells rose between three and five days after GCSF treatment. GCSF also resulted in cleaner, less crusted wound beds in wild type mouse wounds. GCSF treated mice exhibited a small increase in connective tissue formation, suggesting improved granulation. Live imaging showed a gradually increasing accumulation of bone marrow-derived cells in the tail wound for at least eight days after wounding. The wound of the human subject treated with GCSF showed an increase in granulation tissue followed by nearly a 50% decrease in the ulcer area.

**CONCLUSION:** We conclude that stem cell therapy using GCSF shows promise in stimulating wound healing. Furthermore, this approach circumvents the need for bone marrow aspiration and in vitro amplification of the cells.

In this presentation, we will introduce the principles of stem cell therapy, present our results above, and then discuss potential uses of this approach for treating chronic wounds or acute wounds of Mohs surgery.

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