

## **2009 Accepted Posters**

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Posters will be displayed in the Austin Grand Ballroom Lobby, outside the Exhibit Hall and session rooms. Posters will be displayed from 12:00 pm Thursday through 2:00 pm Saturday.

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**116 Inexpensive Alternative to Surgical Markers that Remains Effective after Contact with Moisture: Gentian Violet, Toothpick, Microcentrifuge Tube**

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*Daniel Michael, MD, PhD; Daniel B. Eisen, MD*

### Poster Presentations

102

**PRESENTER:** David Geist, MD

**TITLE:** **Single Cell Cutaneous Squamous Cell Carcinoma (CSCC): A Clinical Case Review**

**AUTHORS:** *David E. Geist, MD; Dori Goldberg, MD; Mary E. Maloney, MD*

**Purpose:** To assess the classification and clinical implications of single cell CSCC.

**Design:** Several cases of CSCC with predominately single cell features and of poorly differentiated CSCC with single cell features are reviewed for histology, clinical course and management implications.

**Summary:** CSCC consisting of predominately single cells or with single cells lying free from the tumor mass is a rare variant with uncertain biologic potential. Prior reports discuss single cell tumors as variants of spindle cell or desmoplastic CSCC (1, 2). A more recent report identified non-desmoplastic single cell tumors and emphasized the difficulty in recognizing these tumors histologically. Special staining with CK MNF11 and p63 aided in identification (3). In the scant prior literature, it remains unclear whether single cell tumors should be classified as a separate histologic subtype, and whether their biologic potential makes them a variant of poorly differentiated CSCC. The data presented here illustrate that these tumors tend to recur and that curative procedures are difficult. In one case, the tumor recurred after Mohs micrographic surgery (MMS). MMS with permanent staining of an additional peripheral margin then reveal persistent positive margins. Sequential overnight permanent en face sectioning ("slow Mohs") was required to achieve clear margins.

**Conclusion:** Single cell CSCCs are difficult to interpret on both frozen and permanent sections. Our cases series suggests that these tumors have a similar or greater risk of recurrence and metastasis than poorly differentiated CSCCs. Aggressive clinical management may be considered including wider margins, adjunctive radiotherapy or sentinel lymph node biopsy. Larger prospective series are needed to further define the biologic potential of these tumors.

(1) Cassarino DS et al. Cutaneous squamous cell carcinoma: a comprehensive clinicopathologic classification, part one. *J Cutan Pathol* 2006;33:191–206.

(2) Cassarino DS et al. Cutaneous squamous cell carcinoma: a comprehensive clinicopathologic classification, part two. *J Cutan Pathol* 2006;33:261–279.

(3) Ko CJ et al. Squamous cell carcinomas with single cell infiltration: a potential diagnostic pitfall and the utility of MNF116 and p63. *J Cutan Pathol.* 2008;35:353–357.

103

**PRESENTER:** Edward Upjohn, MD

**TITLE:** **Solid Organ Transplant Recipients Undergoing Mohs Micrographic Surgery: A Review of Patient Characteristics and Case Load**

**AUTHORS:** *Edward Upjohn, MD; R. Stan Taylor, III, MD; Sarah B. Weitzul, MD; Jenifer B. Perone, MD; Erin Welch, MD*

**Purpose:** Mohs micrographic surgery is recommended for organ transplant recipients who are immunosuppressed. Whilst the increased incidence of non-melanoma skin cancer in transplant recipients is well documented the characteristics of these patients and their tumors when treated by Mohs surgery has received less attention.

**Design:** A retrospective review of solid organ transplant recipients presenting to a university dermatologic surgery clinic for Mohs micrographic surgery was undertaken. Data relating to

patient age, sex, tumor type, size (pre and postoperatively) and frequency of representation for further Mohs surgery was gathered and analyzed.

**Summary:** 27 transplant patients (25 males, 2 females) underwent Mohs surgery for 148 tumors over the course of 34 months (7 Nov 2005 to 30 Sep 2008). The mean duration of attendance of Mohs patients was 15 months (for those attending over a time span of more than 1 month) and the mean number of tumors treated per transplant patient over that time was 5.5. The ratio of SCC to BCC was 3.5:1.

There was one atypical fibrous xanthoma and one Merkel cell tumor treated. There were 13 patients with cardiac transplants, 6 with renal, 5 lung and 3 hepatic.

**Conclusions:** Solid organ transplant patients produce a significant and recurrent case load for a Mohs surgery unit. The most common transplant patient encountered were those with cardiac transplants, perhaps reflecting a higher level of immunosuppression usually required by these patients as compared to other organ transplant recipients. The ratio of SCC to BCC is consistent with previous studies showing a reversal in the usual ratio of BCC to SCC.

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**PRESENTER:** Jason Givan, MD

**TITLE:** A Blinded Comparison of Nylon vs. Braided Polyglactin-910 Suture for Epidermal Wound Closure following Mohs Micrographic Surgery

**AUTHORS:** Jason Givan, MD; Scott W. Fosko, MD; Summer R. Youker, MD

**Purpose:** The use of absorbable suture for closure of epidermal wound edges is fraught with controversy. Opponents cite concerns of wound infection and suboptimal cosmetic outcomes. Proponents of absorbable suture consider these risks to be overstated, especially when sutures are removed in a timely fashion. Advocates acclaim cost reduction by maximizing the use of previously opened suture and patient preference for un-dyed suture material.

The purpose of this prospective, side-by-side, evaluator-blinded study was to compare the wound healing process and aesthetic outcome of surgical wounds repaired with monofilament nylon verses those repaired with absorbable braided polyglactin-910 for epidermal closure.

**Design:** Patients with surgical wounds of at least one centimeter in final length were evaluated. Wounds requiring flap closure were excluded. The deep portion of each wound was closed in usual fashion using polyglactin-910 dermal sutures. Each wound was then subjectively divided into two equal portions. One half of the epidermal wound was randomly closed with monofilament nylon suture. The remaining half was closed with braided polyglactin-910 of equal caliber. Wound care instructions were not altered by study participation.

Patients returned for suture removal at post-operative day five to seven and completed a questionnaire rating each half of the wound regarding suture appearance and wound symptomatology. Following removal of all epidermal suture material, a blinded evaluating physician rated each half of the wound with respect to erythema, edema, and evidence of dehiscence.

Patients returned at post-operative week six to eight to complete a second questionnaire rating each half of the scar regarding overall cosmetic appearance. A single blinded evaluating physician rated each portion of the scar with respect to overall cosmesis as well.

The primary outcome of the study was to determine if an increased risk of wound infection/complication was associated with braided polyglactin-910 suture for epidermal closure. Secondary outcomes included patient preference with regard to suture appearance and cosmetic result, as well as physician evaluation regarding cosmetic result.

**Summary:** Thirty-one patients with thirty-five wound repairs were enrolled. The majority of wounds were closed in complex linear fashion and all sites were located on the head or neck.

We found no increased risk of wound infection associated with braided polyglactin-910 suture for epidermal closure as there were no documented wound infections of either portion of any of the surgical sites.

Contrary to our hypothesis, we found no difference ( $p=0.454$ ) between suture types with regard to patient perceived appearance. As expected, we found no difference with regard to patient perception of "Pain/Tenderness/Itching" ( $p=0.873$ ) or "Redness/Swelling" ( $p=0.124$ ). There was no difference with regard to dehiscence ( $p=0.317$ ). In contrast to conventional dogma, we found a statistically significant reduction in peri-operative site edema ( $p=0.007$ ) and a trend of reduced erythema ( $p=0.059$ ) with polyglactin-910 suture closure.

Fourteen of sixteen (87.5%) subjects with at least six weeks post-operative follow-up returned for evaluation and questionnaire completion. As anticipated, we found no difference between groups with regard to patient-assessed scar cosmesis ( $p=0.564$ ) and a single blinded evaluating physician ( $p=1.00$ ).

**Conclusions:** We found no increased risk of wound infection/complication with the use of braided polyglactin-910 suture for epidermal wound closure.

Interestingly, our results show a significant reduction in peri-operative site edema with superficial closure utilizing braided polyglactin-910 suture. Reduced erythema with polyglactin-910 suture closely approached significance. Subjects failed to report a preference regarding suture material. There was no difference regarding scar cosmesis at six to eight week post-operative follow-up. Although our numbers are small, results indicate that polyglactin-910 may be used with confidence in-lieu of nylon suture for epidermal wound closure.



*Surgical wound; edema/erythema of the nylon suture portion.*

**105**

**PRESENTER:** Adam Ingraffea, MD

**TITLE:** Ezrin Expression in Basal Cell and Squamous Cell Carcinoma

**AUTHORS:** Adam Ingraffea, MD; Todd Vinovrski, MD; Vincent Falanga, MD; Satori Iwamoto, MD, PhD

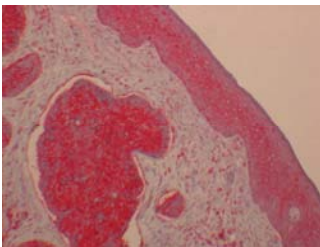
**Purpose:** Ezrin is a member of the Merlin-Ezrin-Radixin-Moesin group of proteins that link the cytoplasmic membrane to the actin cytoskeleton. Ezrin binds to the cell membrane through interactions with a variety of proteins, including CD 44 and ICAM-1 and -2. Through its interactions with the cell membrane and f-actin cytoskeleton, ezrin is believed to help regulate cell to cell adhesion and migration. Ezrin also has an important role in several signaling pathways involved in cell survival and proliferation, including the Rho-GTPase and PI-3/Akt pathways. Several recent studies have indicated that increased ezrin expression is associated with aggressive behavior and metastatic spread in a variety of human cancers, including breast

carcinomas, osteosarcomas, malignant fibrous histiocytomas, and malignant melanomas. Little is known about the function of ezrin in the skin and in non-melanoma skin cancers. In this study we investigated ezrin immunoreactivity in cases of cutaneous basal cell carcinoma and squamous cell carcinoma.

**Design:** Surgical specimens from a total of eight patients with non-melanoma skin cancers, which included five basal cell and three squamous cell carcinomas, were evaluated for ezrin expression. All examples were from surgical excisions and included margins of uninvolved skin, which served as internal controls. The tissues were analyzed by immunostaining after standard processing and paraffin embedding. Four micron sections were baked overnight at 37 degrees Celsius and then deparaffinized and re-hydrated. They were then blocked for peroxidase activity with 1% hydrogen peroxide in methanol for thirty minutes and washed under running water for five minutes. After antigen retrieval, the sections were incubated with purified ezrin rabbit anti-human antibody overnight at 4 degrees Celsius. The secondary antibody was goat anti-rabbit. All incubations were carried out in a humid chamber at room temperature. The slides were then developed using permanent red as a substrate and counter stained with Mayer's hematoxylin. The slides were then reviewed for ezrin expression.

**Summary:** Ezrin was expressed in the normal human epidermis, and was most prominent in the stratum basale and spinosum. As expected from its reported functions, ezrin is expressed strongly around the cytoplasmic membrane of human keratinocytes. It is also strongly expressed in sebaceous glands, hair follicles, eccrine glands and the endothelial lining of vessels. It was also strongly expressed by inflammatory cells around blood vessels and tumors but not in dermal fibroblasts. Ezrin immunoreactivity was dramatically prominent in basal cell and squamous cell carcinomas. In basal cell carcinomas ezrin immunoreactivity spared the peripherally palisading cells of tumor islands and was increased in the cells forming the bulk of the tumor.

**Conclusions:** Ezrin is a component of the normal human epidermis and appendageal structures. Ezrin immunoreactivity is increased in basal cell and squamous cell carcinomas. This early report suggests that ezrin expression may help in delineating the extent and margins of basal cell carcinoma and may be a useful marker for cutaneous carcinomas. More work is needed to determine whether this molecule plays a role in the pathogenesis of these tumors.



*Increased ezrin immunoreactivity in basal cell carcinoma.*

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**PRESENTER:** Ravi S. Krishnan, MD

**TITLE:** *Is 45-Degree Angle Beveling Necessary for Mohs Micrographic Surgery?*

**AUTHORS:** *Ravi S. Krishnan, MD; Jenna Gross; Morgan Vanderhorst*

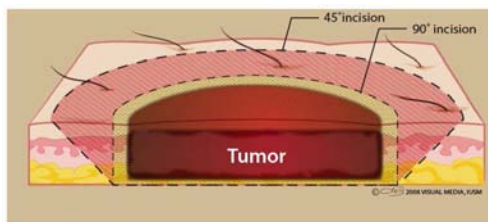
**Purpose:** Traditionally, when taking a Mohs layer, the surgeon excises the tumor with a 45-degree bevel instead of the 90-degree angle which is employed when performing an ordinary surgical excision. The 45-degree angle is used in order to make tissue mounting and slide preparation easier for the histotechnician, so that the entire margin of the specimen can be examined microscopically. However, the 45-degree angle carries with it one great disadvantage: in order to be able to excise the tumor with a 45-degree bevel, the surgeon must take the layer slightly further from the clinically apparent margin of the tumor than he would with a 90-degree

excision to avoid cutting into the tumor (Figure 1). This can potentially result in the unnecessary excision of unaffected tissue.

**Design:** In 50 consecutive patients, we took Mohs layers in such a way that one half of the layer was excised with a 45-degree bevel and the other half was excised without beveling (i.e., at 90-degrees). Slides were prepared by blinded, novice (< 2 months experience) histotechnicians. We then evaluated the slides that were produced, paying specific attention to the number of sections necessary for the entire margin to be fully visualized for each type of beveling.

**Summary:** There was no statistically significant difference in the mean number of sections needed to visualize the entire margin of the excised specimen (entirety of the epidermis and deep tissue) for each technique. The mean number of sections needed at a 90-degree cut was 3.4 (SD=1.8), and the mean number of sections needed at a 45-degree cut was 3.2 (SD=1.7). Based on the paired t-test, there was no significant difference in the mean number of sections needed between the two angles ( $p=0.29$ ). When subgroup analyses were performed, we also found no difference between the techniques related to body site, tumor type, thickness of specimen, or size of specimen.

**Conclusions:** High quality slides, which will allow the Mohs surgeon to examine the entire margin, can be easily produced without beveling. Avoiding beveling will allow the Mohs surgeon to preserve healthy tissue without sacrificing slide quality.



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**PRESENTER:** Susan Butler, MD

**TITLE:** Interpreting Discordances Between Frozen and Permanent Sections in Mohs Surgery

**AUTHORS:** Susan Butler, MD; Scott W. Fosko, MD

**Purpose:** When performing Mohs surgery, it is common practice for some surgeons to submit a case for permanent sections for various reasons, such as confirming clear margins or perineural invasion seen on frozen sections. Occasionally, the permanent sections and frozen sections obtained during the Mohs case are discordant. The etiology of this discordance and how often it occurs is not clear. A possible explanation is that the frozen section was not of sufficient quality for the tumor to be recognized. Alternatively, the tumor may not have been present on the frozen section but appeared only on the permanent sections which were cut from deeper into the block.

Previous studies in the pathology literature have shown frozen/permanent concordance rates as high as 98.6% with regards to diagnosis, though these studies often excluded cases in which the intent was to examine the margin, because the permanents may not represent the true margin as they are obtained from deeper into the block. Considering this limitation of permanent sections, it is difficult to determine the significance of this discordance in Mohs surgery where the primary focus is to obtain clear margins. It is unclear whether the tumor seen on permanent sections in these situations should be treated as a false positive or clinically relevant.

This same phenomenon can be involved when obtaining additional frozen sections during Mohs cases to adequately assess the margin. If that one additional section cuts into tumor in an area that was clearly tumor-free on previous sections, the clinical relevance of that "positive margin" is

in question. Exploring current practices of fellowship-trained Mohs surgeons in the scenarios outlined above may be helpful when faced with these difficult situations.

**Design:** An e-mail was sent to all of the members of the American College of Mohs Surgery with an e-mail address published in the ACMS 2007 membership list, inviting them to participate in an electronic survey. All data collected was de-identified, encrypted and transmitted over a secure network. The survey collected information regarding demographic data, frequency and experience obtaining permanent sections, and concordance rates between frozen and permanent sections.

**Summary:** A total of 791 e-mails were sent. Approximately 137 of those e-mails did not reach the intended participant due to an invalid address or full mailbox. At the time of submission of this abstract, 100 participants had responded to the survey. Seventy percent were in private practice. Most (55%) surgeons submit for permanent sections 1-3 times/year, though 31% submit at least once/month. The most common reason to submit at case for permanent sections was confirming negative margins after clear on frozens (73%), followed by confirming a new separate diagnosis seen on frozens, obtaining special stains, and finally evaluating for perineural/intravascular involvement.

Nearly half (47%) had submitted a case to confirm negative margins and had permanent sections show tumor. When respondents went back to review the frozen sections in that scenario, tumor was still not appreciated on the frozen sections always (51%) or most often (36%). Just over half (52%) conclude that tumor seen on permanent sections but not frozens is a result of cutting further into the block and not clinically significant, though just over half still remove more tissue (51%).

Regarding the technical aspect of their practice, 68% of surgeons report orienting the tissue in the Mohs fashion when submitting for permanents. Most often (64%), the histotech inks and grosses the specimens while other lab personnel embed it in cassettes, cut sections, and stain the tissue.

When examining multiple slides for a Mohs stage, most (67%) report that they would not take another stage if only one slide shows tumor and it clears by the slide most representative of the margin. Those in an academic setting were significantly more likely to take another stage than those in private practice ( $p=.02$ ). Most (65%) obtain an additional section off the block to further evaluate the margin on a stage at least once/week. While 94% have had the additional re-cut slide show tumor where it had been negative on previous slides, most (57%) do not take another stage because the tumor was clear on previous slides.

**Conclusions:** A large percentage of Mohs surgeons frequently submit cases for permanent sections, and most have experienced discordant results. Frequently they believe tumor seen on permanent sections may not have clinical significance, however most still take additional tissue based on that information.

Though a similar situation is experienced by most surgeons who see tumor show up in additional slides obtained to evaluate the margin during Mohs cases, most surgeons do not remove more tissue based on these frozen sections. Exploring practices of Mohs surgeons can offer insight into the relevance of positive margins obtained on permanent and frozen sections.

**108**

**PRESENTER:** J. Suzanne Mosher, MD

**TITLE:** Clinical Accuracy of Mohs Surgeons as Compared with Dermatopathologists on Frozen Section Diagnoses at an Academic Center

**AUTHORS:** J. Suzanne Mosher, MD; Suzanne Olbricht, MD

**Purpose:** The purpose of this study is to assess the agreement between frozen section diagnoses by Mohs surgeons and dermatopathologists at an academic center.



**Design:** We performed a retrospective chart review of 2000+ cases of frozen sections performed in our Mohs surgery practice from January, 2003 through October, 2008. For each section, comparison was made between the frozen section diagnoses by the Mohs surgeon who performed the case, along with the permanent section evaluated by the dermatopathologist. During this period of time, 7 Mohs surgeons and 4 dermatopathologists were employed by our clinic. Our primary outcome measures included the correlation between diagnoses of "benign" versus "malignant" lesions and the correlation between diagnoses of actinic keratoses versus squamous cell carcinoma in-situ. Both endpoints were selected for their relevance to clinical practice, in that increased accuracy determines the appropriate implementation of the Mohs procedure, and the latter specifically highlighting the importance of distinguishing this subtle spectrum as it relates to that decision. For any discrepancies in the data, or conflicting reports (e.g. tumor found on frozen section but not permanent section or vice-versa), we will pull the old slides and compare the two in a blinded fashion with 2 board certified Mohs surgeons. Finally, we will evaluate for any significant or recurrent discrepancies between the diagnoses of Mohs surgeons and dermatopathologists and determine whether any relevant conclusions can be drawn that might impact clinical practice.

**Summary:** Preliminary results show that Mohs surgeons and dermatopathologists agreed in approximately 80% of cases in distinguishing benign versus malignant lesions (e.g., there was upwards of a 20% false positive rate for the Mohs surgeons, with considerable variability across individual Mohs surgeons (range 6-30% false positive rate). In addition, Mohs surgeons agreed with dermatopathologists in approximately 80% of diagnoses of AK versus SCCIS, with Mohs surgeons overcalling these lesions in 15% of cases and under calling them in approx 5% of cases. These numbers may change with final review, as we have not yet removed conflicting data (e.g. where tumor was only found on frozen section and not permanent section, leading to a temporary discord that we can resolve only after pulling the slides for a blind review). Our current data includes these discrepancies as counting against the Mohs surgeons.

**Conclusions:** We will need to continue to analyze our data before drawing more specific conclusions.

**109**

**PRESENTER:** James O. Barlow, MD

**TITLE:** The Tissue Efficiency of Common Reconstructive Design and Modification

**AUTHOR:** James O. Barlow, MD

**Purpose:** To analyze the quantity and potential variability of redundant tissue loss, i.e. burrows triangles, encountered during the use of conventional reconstructive techniques through the calculation of tissue efficiency.

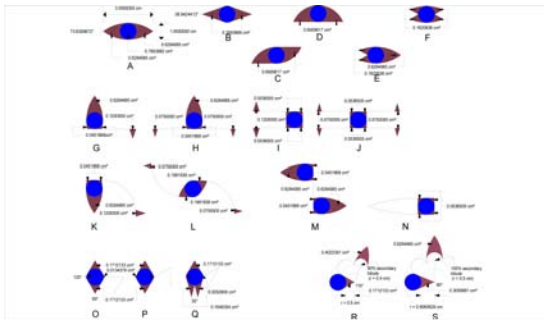
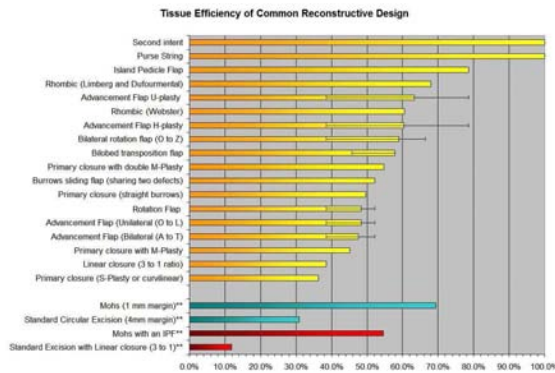
**Design:** Conventional reconstructive designs were applied to a standard circular defect using computer aided drafting (CAD) software to determine the surface area of each closure design. Tissue efficiency was defined as the surface area of the defect divided by the total surface area of tissue loss after reconstruction.

Tissue Efficiency = (SAdefect) / (SAdefect + SABurrows)

**Summary:** The CAD designs of the reconstructive techniques demonstrate that the island pedicle flap (78.5%) and rhombic flap (68.0%) are the two most tissue efficient reconstructive designs commonly used to reconstruct wounds following skin cancer removal. Many of the traditional reconstructive designs and novel design modifications improve both tissue recruitment and tissue efficiency when compared with the simple linear closure.

**Conclusions:** Reconstructive techniques consume a highly variable amount of additional normal tissue when used to reconstruct surgical wounds following skin cancer removal. The classical elliptical linear closure actually removes a greater amount of normal tissue than the size of the

original surgical defect. Tissue efficiency is a significant advantage that most flaps have in repairing wounds in critical anatomic locations. Many modifications of classical reconstructive designs can further improve tissue efficiency through additional tissue recruitment and the elimination of secondary burrows triangles. Tissue conservation, applied to the choice and design of reconstructive techniques, can further reduce the morbidity of cutaneous tumors.



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**PRESENTER:** Murad Alam, MD

**TITLE:** Resistance to Microbial Penetration by Acellular Dermal Matrices

**AUTHORS:** Murad Alam, MD; Elizabeth Fahrenbach; John Y. Kim; Chao Qi, MD

**Purpose:** Acellular dermal matrices are skin and subcutaneous substitutes that are used for skin repair and surgical reconstruction. Compared to autologous grafts, acellular materials do not require creation of a donor site defect and enable the coverage of large defects. Since such acellular dermal substitutes may be implanted permanently, their susceptibility to infection is a relevant feature. The purpose of this study is to investigate how commercially available dermal matrices compare to one another in their ability to act as barriers to microbial penetration in vitro.

**Design:** A pilot study was performed to determine the appropriate microbial concentrations for an in vitro comparison of the ability to serve as a barrier to microbial penetration of 4 commercially available dermal matrices: Alloderm (LifeCell), FelxHD (MTF), Neoforn (Mentor Corp), and Stratice (LifeCell).

Twenty 1 x 2 cm pieces of each dermal substitute were placed on top of blood agar culture medium, yielding 80 plates. As our pilot study identified 106 CFU/ml as the appropriate bacterial dose, four solutions of this concentration were created for *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Streptococcus pyogenes*, and *Candida albicans*. For each of the 4 acellular dermal materials, 5 plates were inoculated with 1 microliter of 106 CFU/ml each for each of the 4 bacterial solutions; thus 20 plates were prepared for each acellular dermal material.

The 80 plates were then incubated for 3 days in air at 37 degrees C. After the incubation period, the patches were carefully peeled away from the blood agar plate, and a 3 mm punch biopsy was obtained of the culture medium below the piece of acellular dermal material. The punch specimens were placed in separate tubes with 5 ml of BHI broth and shaken for 2 hours at 37 C. For each sample of broth a blood agar plate was inoculated with a 0.001 ml calibrated loop in the way that is done for quantitative urine culture. One colony from 0.001 loop streaking represents 1000 CFU/ml. These plates were incubated overnight and a colony count was performed the following day.

**Summary:** Alloderm acted as the best barrier to bacterial penetration. *S. aureus* and *S. pyogenes* were unable to penetrate Alloderm, and *P. aeruginosa* penetrated two out of five pieces of Alloderm. Flex HD followed Alloderm, functioning as a good barrier to penetration by *S. aureus* and *S. pyogenes*. However Flex HD was not able to prevent penetration of *P. aeruginosa*. Strattice performed well against the gram positive organisms, preventing penetration of *S. pyogenes*, and allowing penetration of relatively few organisms of *S. aureus* (185 colonies counted on Strattice plate #1 and 208 counted on plate #5). However, unlike Alloderm, Strattice was not able to prevent penetration of *P. aeruginosa*. Neoforn exhibited the least ability to act as a barrier to bacterial penetration as uncountable numbers of bacterial colonies were obtained for *S. aureus*, *P. aeruginosa*, and *S. pyogenes*. That *P. aeruginosa* was able to penetrate the most pieces of acellular material may be due to its motility as a flagellated organism. As for the ability of acellular dermal substitutes to act as a barrier to *Candida* penetration, the results of this study are inconclusive. The cultures showed no evidence of *Candida* penetration for any of the dermal substitutes studied, with this outcome possibly secondary to an inappropriately low concentration of *Candida* in the inoculum.

**Conclusions:** There appear to be differences among commercially available acellular dermal matrices regarding their microbial barrier function. While the structural and performance characteristics of a given acellular material may impact its relevance for a specific clinical use, microbial resistance information may be one factor taken into account by practitioners selecting appropriate materials. Further studies are needed to assess the fungal resistance of these materials.

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**PRESENTER:** Satori Iwamoto, MD, PhD

**TITLE:** Optimizing the Conditions for Bone Marrow Stem Cell Mobilization during Wound Healing

**AUTHORS:** Satori Iwamoto, MD, PhD; Kendra Kobrin; Tatyana Yufit; Ina Zak; Jisun Cha, MD; Nicola Kouttab, PhD; Polly Carson; Vincent Falanga, MD

**Purpose:** Wound healing is a process common to each of the reconstructive options following Mohs micrographic surgery, whether the reconstruction is by secondary intention, linear closure, flap closure, skin graft or composite graft. There are data showing that stem cells can accelerate wound healing and diminish scarring. We have recently shown that stem cells accelerate healing both in animal models and in human acute (post-Mohs surgery) and chronic wounds. The purpose of this study was to optimize conditions that stimulate stem cells, using granulocyte colony stimulating factor (G-CSF) to mobilize stem cells from the bone marrow to the peripheral blood. Such mobilization would facilitate the use of stem cells in wound healing.

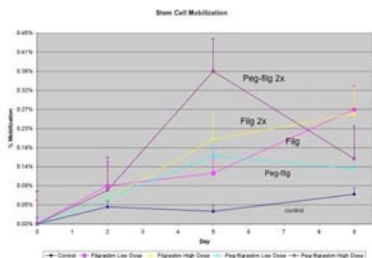
**Design:** There are two main approaches to deploy bone marrow-derived stem cells in order to accelerate wound healing. The first approach, which our group recently reported (Falanga, Iwamoto, et al, Tissue Engineering, 2007, 13:1299-1312) is to aspirate stem cells from the bone marrow, expand them in vitro, and then physically transfer them to the wound site using a fibrin spray. We found this approach to be very feasible after Mohs surgery and when secondary intention healing is desirable or necessary. However, this approach is not possible in the healing of post-Mohs surgical defects or reconstructions that are no longer open---i.e., those wounds closed by linear closures, flap closures, skin grafts, or composite grafts. For those closed

wounds, a second approach involving coaxing stem cells out of the bone marrow into the peripheral blood, using approved cytokines such as GCSF, to be recruited to the wound site may be a better option. Moreover, identifying ways to make this approach feasible in Mohs surgery would have potential benefits in situations where healing is likely to be a problem. Previous work from our group has also shown that the topical application of stem cells to the wound can decrease scarring. Hence, stem cell mobilization may have this additional and desirable benefit in Mohs surgery or other surgical procedures.

However, as we began to investigate bone marrow stem cell mobilization, we realized that surprisingly little has been reported about the optimal conditions and parameters for mobilizing stem cells from the bone marrow, either in humans or animal models. To fill this deficiency, we now report our results using bone marrow stem cell mobilization by GCSF in mice. It is our intent to ultimately determine the best conditions that can work in humans and adopt them for use in wound healing. To this end, C57BL/6 mice were injected with filgrastim (recombinant human GCSF) at daily doses of either 250 mcg/kg or at 500 mcg/kg, or peg-filgrastim (a long lasting GCSF formulation) injected with a single dose of either 250 mcg/kg or 500 mcg/kg, at various time points. Five mice were used in each group, and the results were compared to five control mice injected with phosphate buffered saline. Stem cell mobilization was monitored by flow cytometric measurements of cells expressing the standard stem cell markers sca-1 and c-kit, as well as by the measurement of total white blood count.

**Summary:** Our results showed maximal and statistically significant stem cell mobilization from the bone marrow into the peripheral blood by day 5 of the cytokine treatment, with either filgrastim or peg-filgrastim showing a convincing dose response (see graph).

**Conclusions:** These data indicate that there are optimal conditions to achieve bone marrow stem cell mobilization. Once further optimized and tested in a wound healing situation, these parameters could be used to accelerate the healing of human acute wounds after Mohs surgery and, possibly, to reduce scarring.



*Time course and dose response of GCSF-mediated stem cell mobilization.*

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**PRESENTER:** Hillary Johnson-Jahangir, MD, PhD

**TITLE:** Predetermining the Surgical Margin of High Risk Basal Cell Carcinomas through the Use of Clinical Predictors and Mohs Micrographic Surgery: A Validated, Model-Based Approach

**AUTHORS:** Hillary Johnson-Jahangir, MD, PhD; David A. Lee, MD; Manisha Desai; Désirée Ratner, MD

**Purpose:** A standard surgical margin for removal of basal cell carcinoma (BCC) has never been firmly established. Our goal was to develop a simple model that accurately predicts the number of millimeters required for clearance of high risk BCC.

**Design:** We prospectively evaluated 513 patients with biopsy-proven BCCs who underwent Mohs micrographic surgery over a 26 month period. We measured the preoperative and final defect sizes and the amount of tissue stretch occurring after specimen removal. Potential

predictors were age, gender, race, tumor site, and primary versus recurrent status. Additionally, a subset of the patients with BCCs was further studied to assess the role of histologic subtype as a predictor. Biopsy specimens of BCCs from 217 patients were characterized for histologic subtype including superficial, nodular, micronodular, morpheaform, infiltrative, or combinations thereof. We used standard linear regression and cross-validation tools to develop and validate a predictive model. The number of millimeters required for tumor clearance was defined as the difference between the final defect size, after accounting for tissue stretch, and preoperative tumor size.

**Summary:** When evaluating the predictors simultaneously, race, age, tumor size, and tumor site demonstrated strong predictive ability. Validation tools indicated our model predicts the number of millimeters required for clearance with a median absolute prediction error of 1.75 mm for BCCs regardless of histologic subtype. Evaluation of histologic subtype as a predictor and its role in our model is underway.

**Conclusions:** Using race, age, tumor size and location as predictors, we have developed a model that predicts the number of millimeters required for clearance of high risk BCCs. Despite being a practical tool, this model should not circumvent the need for Mohs surgery, as BCCs may grow asymmetrically and therefore require careful examination of all margins to achieve maximal cure rates and tissue conservation.

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**PRESENTER:** Ellen S. Marmur, MD

**TITLE:** *The Use of High Frequency High Resolution Ultrasound Prior to Mohs Surgery*

**AUTHORS:** *Ellen S. Marmur, MD; Eric Z. Berkowitz, MD; Brian S. Fuchs, MPH; Giselle K. Singer, BS; Jane Y. Yoo, MPP*

**Purpose:** The objective of the study was to explore the clinical application and use of high frequency, high resolution ultrasound (HRUS) in Mohs micrographic surgery; to evaluate its ability to determine lesion borders; to determine if HRUS provides a clinical advantage when planning a Mohs procedure with regard to determining the width and length of lesions; and to evaluate whether the use of an ultrasound can reduce the number of Mohs stages necessary to be clear of tumor.

**Design:** This was an IRB approved single-center study of twenty six patients scheduled for Mohs surgery with lesions on flat surfaces (chest, back, extremities and face). The investigator demarcated and documented clinical estimation of the first stage. Ultrasound images were then taken and length and width were documented. Extirpation of tumor and histological analysis was performed using standard Mohs technique. Statistical analysis was performed with Stata 8 (Stata Corp, College Station, Tex).

**Summary:** A paired-samples t-test revealed no significant difference between clinical and US widths ( $t=-1.324$ ,  $p=0.201$ ). Similarly, there was no significant difference between the lengths found from clinical assessment vs. ultrasound ( $t=-1.093$ ,  $p=0.289$ ). Among different tumor types, there was no significant difference between clinical and US widths or lengths for BCC ( $t=-1.307$ ,  $p=0.228$ ;  $t=-1.389$ ,  $p=0.202$ ) or SCC ( $t=-0.342$ ,  $p=0.734$ ;  $t=0.427$ ,  $p=0.679$ ), respectively.

**Conclusions:** There is a diagnostic role for high resolution ultrasound in Mohs surgery, especially regarding the delineation of surgical margins. This feature may assist in the preoperative evaluation of skin tumors particularly in areas where there is a need to preserve normal skin. However, the limitations of this technology preclude its practical adoption at this time.

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**PRESENTER:** Kristin Herring, BS

**TITLE:** *One-Stage Earlobe and Cartilage Defect Flap Reconstruction*

**AUTHORS:** *Kristin Herring, BS; Rachael Moore; Anna A. Bar, MD*

**Purpose:** Many surgical earlobe repair techniques require complicated flap designs and multiple-stage reconstructions. In this poster presentation, we present a one-stage flap repair of a large earlobe defect that extends into the surrounding cartilage which provides a donor site that is well-matched to earlobe skin in texture, hair growth, and color.

**Design:** A 60-year-old man presented with a left earlobe basal cell carcinoma measuring 1.0 x 1.0 cm. Mohs micrographic surgery was indicated based on the location and poorly-defined margins. A six-stage procedure achieved tumor free margins, resulting in a 2.6 x 2.0 cm full thickness earlobe defect (Fig 1). Portions of the inferior helical and anti-helical cartilage were also removed.

**Summary:** A tunneled island pedical flap to repair earlobe defects involves a two-stage repair and may leave the earlobe with an anterior pull requiring a third corrective procedure. Also, it has not been described for defects extending beyond the lobule. Similarly, Limberg and bilobar postauricular transposition flaps are two-stage procedures and have only been described for the reconstruction of defects confined to the lobule. A bilayered banner transposition flap from the preauricular and mandibular skin is a one-stage procedure used to reconstruct lobule defects involving portions of the auricular cartilage. However, the donor sites are often hair-bearing. Earlobe reconstruction with double-crossed skin flaps is a single-stage repair, but can require a future corrective procedure to deepen the pre-lobular notching and requires incisions in the pre-auricular and the infra-auricular skin.

**Conclusions:** When considering how to repair our patient's particular defect, we considered several factors: it was full-thickness involving earlobe and cartilage, the patient requested a one-stage repair, and we wanted the best cosmetic outcome. The primary defect was repaired using a one-stage V-shaped infra-auricular transposition flap (Fig 1). It was a good match for the earlobe in color and consistency. The width of the flap equaled the width of the primary defect, and the length was estimated based on the need to cover both the anterior and posterior portions of the defect, with the addition of a few millimeters to compensate for the length lost in flap rotation. Final flap dimensions were 5.3 x 2.0 cm. The donor flap was excised and the secondary defect was closed. Donor tissue was overlapped on itself, thinned in areas to form the helical and anti-helical contours, and sutured into place. Redundant tissue was removed behind the ear. At two weeks follow-up, the wound was healing well without evidence of flap necrosis. At seven months follow-up, the earlobe was healed and the patient was satisfied with the cosmetic appearance (Fig 2). The helical rim had slightly less bulk due to scar contracture. Designing the flap slightly larger would have reduced this asymmetry.



*Fig 1. Primary defect following Mohs surgery with the donor site outlined.*



*Fig 2. Surgical site seven months post-operatively.*

**115**

**PRESENTER:** Rupert Barry, MB, BCh, BAO

**TITLE:** Mucosal Advancement without Undermining in the Repair of Vermilionectomy Defects of the Lower Lip

**AUTHORS:** Rupert Barry, MB, BCh, BAO; James Langtry, MD

**Purpose:** We present a case series of nine patients who underwent labial mucosal advancement, post-vermilionectomy, without undermining of either the labial mucosa or the cutaneous lip.

**Design:** Previous reports of the operative technique of labial mucosal advancement have described undermining of the labial mucosa at a level deep to the minor salivary glands as well as undermining of the cutaneous lip so that irritating beard hairs may be removed. We present a series of nine patients with mucosal advancement without undermining. We discuss the surgical technique, outcomes and discuss the literature.

**Summary:** Nine patients underwent vermilionectomy of the lower lip between 2006-2008 in a university hospital based Mohs unit. All operations were performed by the same surgeon. The indication for treatment was squamous cell carcinoma in six patients and severe actinic cheilitis in three. Five patients were male. The age range was between thirty-one and eighty-one. Two were cigarette smokers. All patients were reconstructed with labial mucosal advancement. Undermining was not performed on the mucosal or cutaneous wound margins. The labial mucosa was sutured directly to the cutaneous lower lip with either absorbable or non-absorbable sutures. Postoperatively, wound margin crusting was seen in five cases and transient lip tenderness in one patient. Six months on, one patient reported a band of numbness below the vermilionectomy scar and another patient gave a history of intermittent paraesthesiae of the lower lip and mild labial scar tension. A good cosmetic outcome was obtained and full lower lip function was preserved in all cases.

**Conclusions:** A follow-up study of fifty-two vermilionectomy patients reported that ninety per cent had postoperative symptoms which included paraesthesiae, pruritus and tenderness as well as anaesthesia of the cutaneous lip below the scar-line<sup>1</sup>. These symptoms persisted in one-third of cases for up to one year postoperatively and in this series, up to one-third of patients reported significant labial scar tension three months after surgery though this had improved by six months. Although our series is smaller, postoperative symptoms were relatively few. We propose that this may be due to the lack of undermining in our technique.

1 Sanchez-Conejo-Mir J, Perez Bernal A.M., Moreno-Gimenez J.C., Camacho-Martinez F. Follow-up of vermilionectomies: Evaluation of technique. *J Dermatol Surg Oncol* 1986;12(2):180-184.



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**PRESENTER:** Teris M. Chen, MD

**TITLE:** **Inexpensive Alternative to Surgical Markers that Remains Effective after Contact with Moisture: Gentian Violet, Toothpick, Microcentrifuge Tube**

**AUTHORS:** *Teris M. Chen, MD; Rungsima Waniphakdeedecha, MD; Tri H. Nguyen, MD*

**Purpose:** Surgical site infections have been caused by gentian violet (GV) marking solutions that were contaminated with *Mycobacterium chelonae*. GV solution is commercially available as a solution that may not have been prepared under sterile conditions. The authors describe a skin marking method that is sterile, effective, and economical.

**Design:** GV solution, microcentrifuge tubes, and round, wood toothpicks are used as an alternative to the standard surgical marker. GV (4 drops) is dispensed into a microcentrifuge tube. After capping, the tube is autoclaved. The toothpick is used as the writing instrument and dipped into the gentian violet as needed for intraoperative skin marking. Unlike commercially available skin markers, skin moisture will not cause the writing implement (toothpick) to become ineffective; merely dry the skin before skin marking.

**Summary:** Autoclaving the commercially available shelved GV solution ensures sterility. The cost of the gentian violet, toothpicks, and microcentrifuge tubes is approximately \$0.07 to \$0.10 per operation. In contrast, commercially available surgical markers range in cost from \$0.79 to \$3.89 per pen (MSRP), a 7- to 55- fold difference.

**Conclusions:** Infectious precautions should be taken with surgical site marking. Marking solutions should be prepared under sterile conditions in a pharmacy. Alternatively, commercially available non-sterile solutions can be autoclaved to ensure sterility.



*Fig 1. Gentian violet marking system. Labeled microcentrifuge tube and two round, wood toothpicks. Cotton tip applicators with wood end shaved to a fine point may also be used (A). Microcentrifuge tube rack may be used to facilitate preparation of multiple tubes for autoclaving (B). The cap should be pressed firmly to ensure a tight seal (C). The tube may be packaged separately (D). for autoclaving in case a spill does occur.*

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**PRESENTER:** Quenby L. Erickson, DO

**TITLE:** **The Novel Use of a Bovine Triple Helix Collagen Micro-scaffold Wound Dressing in the Guided, Second Intention Healing of a Large and Deep Lower Extremity Mohs Defect**

**AUTHORS:** *Quenby L. Erickson, DO; Tri H. Nguyen, MD*

**Purpose:** Defects on the lower extremities routinely present wound-healing challenges. Prolonged healing time and unsightly scars with contour abnormalities are common. Our novel use of a bovine collagen micro scaffold wound dressing in the guided, second intention healing of a large lower extremity defect resulted in a relatively short healing time and an excellent overall result without contour abnormalities. Infection and venous stasis were prevented by the use of



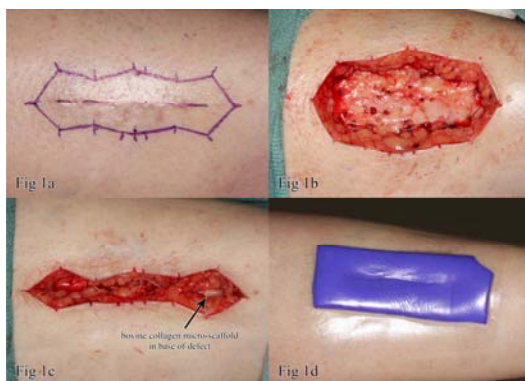
gentian violet- and methylene blue-impregnated dressing, cephalexin 2mg preoperatively and 500mg four times daily for 10 days postoperatively and a compression garment. This case highlights multimodal approach required for the management of large lower extremity tumors.

**Design:** A 40-year-old woman presented for Mohs micrographic surgery with an incompletely-excised, 6.2cm indeterminate fibrohistiocytic tumor of unclear classification on the left anterior lower extremity. The tumor was cleared using the Angulated Mohs technique in one stage of 8 sections (Fig 1a). The final defect size was 8.0 cm x 4.8 cm and extended to the fascia (Fig 1b). The wound was partially narrowed with buried pulley sutures, resulting in a 8.0 cm x 1.5 cm defect (Fig 1c). A purified, bovine triple helix collagen micro scaffold biodegradable dressing was placed over the fascia in the base of the wound to act as a protective, absorptive dermal scaffold which facilitated fibroblasts migration (Fig 1c). The wound was then dressed with gentian violet and methylene blue impregnated polyvinyl alcohol foam sponge and covered with a transparent semipermeable adhesive film (Fig 1d), and a compression stocking providing 20-30mmhg of pressure. The collagen microscaffold was left in the base of the wound while the gentian violet and methylene blue dressing was changed every third day. Greater than 90% of the wound had healed via secondary intent by post-operative day 14 with minimal erythema, purulence, and fibrinous exudate (Fig 2a). By the fifth post-operative week, the wound had only a 7mm distal erosion and had regained its normal, pre-operative contour (Fig 2b).

**Summary:** We observed more rapid healing and better contour restoration when compared to similar wounds on the lower extremity.

**Conclusions:** This case highlights a highly effective, multimodal approach of the management of a large lower extremity tumor which employed purified bovine collagen micro scaffold as a filler agent and the use of an antibacterial dressing with compression. These measures resulted in healing and cosmesis that in our experience with lower extremity wounds, was unusually rapid with minimal morbidity.

This result demonstrates the need for further investigation in the use of collagen micro scaffold in large deep defects where delayed healing is common. Further study is also needed to compare efficacy of the wide variety of post surgical dressings currently available.



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**PRESENTER:** Margaret A. Collins, MD

**TITLE:** Localized Phaeohyphomycosis Caused by Exophiala Treated with Mohs Micrographic Surgery

**AUTHORS:** Margaret A. Collins, MD; Juliet L. Gunkel, MD; Molly Hinshaw, MD

**Purpose:** We present a case of a renal transplant patient with a keratoacanthoma-like presentation of phaeohyphomycosis caused by *Exophiala* which failed to respond to systemic therapy and subsequently underwent Mohs micrographic surgery for definitive treatment of the lesion.

**Design:** The patient initially presented with a rapidly growing, tender, clinically exophytic, keratotic lesion on the medial aspect of the hand (Fig 1). The clinical differential diagnosis included squamous cell carcinoma, specifically keratoacanthoma. Biopsy revealed pseudoepitheliomatous hyperplasia with a suppurative and granulomatous infiltrate as well as pigmented spores and septate hyphae (Fig 2). Phaeohyphomycosis is a rare opportunistic infection caused by dematiaceous fungi which include *Exophiala*, *Alternaria*, and *Phialophora* species. Infection may manifest as primary cutaneous lesions, typically cystic, and rarely as systemic infection with secondary cutaneous involvement particularly in the immunocompromised, although evaluation for systemic involvement was negative in our patient. Tissue culture revealed *Exophiala* which was sensitive to posaconazole and itraconazole. The patient was started on oral posaconazole 400mg twice daily by another provider, but after over three months of continuous treatment, there was no improvement in the lesion; in fact, the lesion expanded in size. Surgical intervention was considered. A review of the literature found a report by Bogle et al. (Ref. 1), and the decision was made to proceed with Mohs surgery with the goal of clearing the infection. At the time of surgery, a biopsy was obtained that again revealed pigmented hyphae consistent with *Exophiala* thus proving persistent infection despite 3 months of antifungal therapy. The surgery was completed in two stages, and final permanent processing of the tissue confirmed clearance of the fungus. The wound was allowed to heal by secondary intention, and the patient continues to do well without evidence of recurrence at one month post procedure.

**Conclusions:** This case not only displays an atypical presentation of an unusual infection in a transplant patient, it also illustrates the critical role of surgical intervention in cases of phaeohyphomycosis.

(Ref. 1. Bogle MA, Rabkin MS, Joseph AK. Mohs micrographic surgery for the eradication of phaeohyphomycosis of the hand. *Dermatol Surg* 2004 Feb;30(2 Pt 1):231-3.)



Fig 1. Clinical presentation resembling keratoacanthoma.

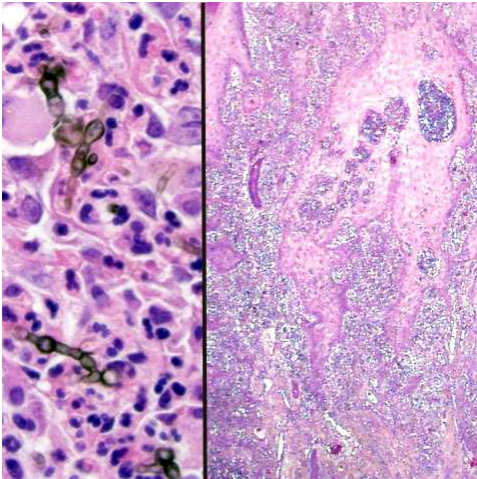


Fig 2. Pseudoepitheliomatous hyperplasia with pigmented spores and septate hyphae.

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**PRESENTER:** Monika Srivastava, MD

**TITLE:** The Management of Parotid Fistulas after Mohs Surgery

**AUTHORS:** Monika Srivastava, MD; Divya Srivastava, MD; Gangaram Ragi, MD

**Purpose:** Parotid fistulas are a rare complication following routine Mohs surgery. We report two cases of parotid fistulas which developed 2-4 weeks postoperatively following Mohs surgery for basal cell carcinomas. These case reports highlight several important pearls: 1) Aggressive basal cell carcinomas can involve the parotid gland. 2) It is necessary to understand the normal anatomy of the parotid gland, as well as recognize aberrant parotid tissue in atypical locations. 3) The development of small parotid fistulas after Mohs surgery for basal cell carcinomas involving the parotid gland can complicate postoperative courses. 4) These small parotid fistulas can be noninvasively managed and treated with daily pressure dressings for 2-3 weeks.

**Design:** Parotid fistulas are a rare complication following routine Mohs surgery. We report two cases of parotid fistulas which developed 2-4 weeks postoperatively following Mohs surgery for basal cell carcinomas. The first case occurred in a 74 year old man who presented with a basal cell carcinoma in the right postauricular area. Mohs surgery was completed in 4 stages. The deep margins revealed aberrant parotid gland tissue. The defect was repaired with an advancement

flap. Approximately 3 weeks after surgery the patient complained of saliva draining from the wound. Examination revealed a 2 mm fistula. The patient was treated with daily pressure dressings for 3 weeks. At follow-up, the fistula had closed and the patient had no further complications. The second case occurred in an 80 year old woman with a basal cell carcinoma involving the right preauricular area. Mohs surgery was completed in 2 stages. The deep margins involved the parotid gland. The defect was repaired with an A-T advancement flap. Sutures were removed 2 weeks after surgery without complication. Approximately 4 weeks after surgery, the patient complained of saliva draining from the surgery site. On exam, there was a 1 mm fistula. Saliva was produced with gentle compression. The patient was treated with daily pressure dressings for 2 weeks. At follow-up, the fistula had healed with no further complications.

**Conclusions:** In conclusion, parotid fistulas can complicate the postoperative course of Mohs surgery for basal cell carcinomas involving the parotid gland. These small fistulas can be managed with daily pressure dressings for 2-3 weeks.

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**PRESENTER:** Erica Lee, MD

**TITLE:** **The First Report of Transient Peroneal Nerve Palsy in Dermatologic Surgery**

**AUTHORS:** *Erica Lee, MD; Robin Ashinoff, MD; Vicki J. Levine, MD*

**Purpose:** Dermatologic surgeons commonly perform procedures on the lower extremity with minimal adverse effects. We present two cases of transient peroneal nerve paresis, a rare but potentially serious complication after dermatologic surgery.

**Design:** Case #1 is a healthy 55 year old male referred to Mohs surgery for a nodular basal cell carcinoma on the left calf, several centimeters below the popliteal fossa. After infiltrative anesthesia with 4ml of 1% lidocaine and epinephrine (1:200,000), one stage of Mohs surgery and a layered closure were performed. Shortly thereafter, the patient stated his entire left leg was paralyzed. Clinical exam showed loss of sensation from the left knee to dorsal foot and a left foot drop. After 5 hours, full function and sensation returned.

Case #2 is a 51 year old healthy female referred for removal of a severely dysplastic nevus on the lateral right leg. The lesion was anesthetized with 6ml of 1% lidocaine and epinephrine (1:200,000), excised to the mid subcutaneous fat and closed in layers. The patient was able to ambulate a short distance to a chair, however when attempting to put on pants while wearing shoes, she fell to the floor. On exam, decreased sensation from the right lateral knee to dorsal foot and incomplete foot eversion were appreciated. This resolved following 7 hours.

**Summary:** The common peroneal nerve courses close to the skin surface on the outer, lower portion of the knee to supply the tibialis anterior, foot everter muscles and the extensors of the toes. It also provides sensation to the skin over the anterolateral aspect of the lower leg and the dorsal foot. Infiltration of local anesthesia in the vicinity of the peroneal nerve and its branches, notably the superficial peroneal nerve can in rare instances, lead to temporary peroneal nerve paralysis manifesting as a foot drop, anesthesia or decreased foot eversion. While this is an uncommon adverse effect of local anesthetics, when it occurs, is alarming to the patient and surgeon.

**Conclusions:** To our knowledge, transient peroneal nerve palsy after cutaneous surgery has not been reported. Dermatologic surgeons should be aware of this phenomenon to appropriately inform, assess and manage patients.

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**PRESENTER:** Parrish Sadeghi, MD

**TITLE:** **Trichoblastic Carcinoma: Case Report of a Rare Entity**

**AUTHORS:** *Parrish Sadeghi, MD; Allison T. Vidimos, MD; Michael Fritz, MD*

**Purpose:** Trichoblastic carcinoma is a rare malignant adnexal tumor, capable of metastasis. To our knowledge, only 9 cases have been reported in the literature.

**Design:** This is a case of a 32 year-old Caucasian man with a 6 year history of an enlarging asymptomatic pink nodule on the left nasal sidewall. An incisional biopsy was consistent with a trichoblastic carcinoma.

Work up included a CT scan showing a soft tissue mass measuring 7x16x18 mm on the left side of the nose, involving the pre-septal region of the medial left orbit without extension to the orbital septum. PET scan was negative for metastatic disease.

Mohs micrographic surgery was performed and negative margins were achieved after 6 stages. Reconstruction was performed with excellent cosmesis.

**Conclusions:** Trichoblastic carcinoma is a malignant epithelial adnexal neoplasm arising from the external root sheath of the hair follicles. It is a rare entity; however, misdiagnosis and inadequate treatment can lead to metastasis. To our knowledge, only 9 cases have been reported in the literature. Of these, three involved the lip, one on the nose and ear, and the rest on the trunk and extremities. In two of the cases (trunk and upper extremity), the patients expired secondary to metastasis.

Microscopically, many irregularly shaped confluent plump cell nests, often in a ribbon-like or cribriform arrangement are visualized. Mid-size to large pleomorphic epithelial cells, often with atypical mitoses, are present. The stroma is often cell poor and sclerotic. Necrosis, calcification and bone formation may be seen.

Treatment includes adequate surgical removal by Mohs surgery or wide excision. Role of radiation therapy has not been established. Metastatic work-up and close post-operative follow-up is essential.



*Original lesion.*



*Defect after Mohs micrographic surgery.*

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**PRESENTER:** Murad Alam, MD

**TITLE:** Treatment of Primary Mucinous Carcinoma of the Skin: Meta-Analysis of 189 Cases

**AUTHORS:** Murad Alam, MD; Renata Trela; Natalie Kim; Simon S. Yoo, MD; Alfred Rademaker

**Purpose:** Primary mucinous carcinoma is an uncommon sweat gland tumor with varied clinical presentation. While generally considered an indolent lesion, the prognosis after treatment is poorly understood. The purpose of this study was to estimate the likelihood of recurrence and metastasis after treatment of primary mucinous carcinoma by various methods. A secondary objective was to provide demographic data regarding incident cases.

**Design:** Meta-analysis of case reports and case series from MEDline, 1950-2008. Uniform fields, including demographic information (patient age, sex, race), tumor characteristics (anatomic location, apparent clinical surface area), and treatment-specific variables (months prior to treatment when lesion was first noticed, treatment type, duration of post-treatment follow-up, recurrence, metastasis) were extracted from published reports. Means and variation of descriptive variables were recorded. Association of demographic and tumor characteristics with likelihood of recurrence and metastasis was assessed.

**Summary:** Average patient (mean) was 64 years old, female (51.6%) and white (53.2%; 22.1% black, 23.4% Asian). Lesions were first noticed 37.2 months (mean) before presentation for treatment, and occurred most frequently on the eyelid/eyebrow (44.4%), and also often on the scalp (21.2%), and face/ear/neck (20.1%). Most lesions were treated by excision (94%), with a minority by Mohs (5%), or other methods (1%: eye exenteration, radiation, chemotherapy, liquid nitrogen). Mean size prior to treatment was 5.1 sq. cm., and after treatment was 9.8 sq. cm. (medians, 1.6, and 4.7, respectively). Mean follow-up after treatment was 39.6 months, during which time 19.6% of lesions recurred, and 5.8% metastasized. At the end of follow-up, 80.3% of patients were alive without disease, 1.5% were alive with disease, 2.9% were dead of disease, and 15.3% were dead of other causes. Anatomic site was associated with risk of metastasis ( $p=0.002$ ), with 40% of axillary lesions, 18% of trunk and extremity lesions, and fewer than 5% of lesions at all other locations developing metastases. The association between treatment type and risk of recurrence approached significance ( $p=0.06$ ) with recurrence after Mohs or excision (3.4%) being nominally much less than recurrence after non-surgical modalities (33%). Similarly, the association between lesion size and risk of metastasis was near-significant ( $p=0.08$ ), with lesions that did not metastasize having a mean surface area of 3.88 sq. cm, and lesions that did of 18.87 sq. cm.

**Conclusions:** Primary mucinous carcinoma is amenable to surgical resection, which provides a good outcome, with approximately 20% risk of recurrence and 5% risk of metastasis during 3 years of follow-up. Axillary tumors account for a small proportion (5.3%) but are much more liable (40%) to metastasize than tumors at other locations. Most lesions are relatively small, but the distribution is skewed, with some very large lesions that are associated with higher risk of metastasis. Non-surgical therapy for primary mucinous carcinoma is rarely undertaken and is contraindicated given the poor response.

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**PRESENTER:** Dori Goldberg, MD

**TITLE:** Sandwich Graft in the Repair of a Small Through and Through Defect on the Nose

**AUTHORS:** Dori Goldberg, MD; Gary Fudem; Jeremy S. Bordeaux, MD, MPH; Mary E. Maloney, MD

**Purpose:** We describe the case of a 76 year-old man with a persistent 1 mm through and through defect of the nasal tip resulting after Mohs surgery that was successfully repaired with a sandwich graft from the scaphoid fossa of the ear. There is one report of using a sandwich graft from the earlobe for repair of a full-thickness defect of the nose in the plastic surgery literature; however, this has not been reported in the dermatologic literature to our knowledge.

**Design:** A 76 year-old man presented to the Mohs surgery clinic with a nodular and infiltrative basal cell carcinoma on the nasal tip. The lesion was cleared in three stages resulting in a 2.1 x 1.9 cm wound that was repaired with an island pedicle flap. At one week follow-up, the patient had superficial epidermal necrosis of the flap. The area was debrided and the wound gradually

granulated in. At 5 week follow-up the wound was healing well but there was now a 1 mm through and through defect at the inferior margin. The wound edges were freshened and the edges re-sutured with 5-0 prolene cutaneous suture. At 2 week follow-up the defect persisted. Despite subcutaneous hinge flap repair on 2 separate occasions, the through and through defect remained. The wound was successfully repaired eleven months after his Mohs surgery using a 3-layer composite graft from the left ear (skin-cartilage-skin) harvested using a 4 mm punch biopsy. The donor site was closed primarily. A 4 mm punch biopsy was used to freshen the edges of the re-epithelialized defect on the nasal tip. The sandwich graft was then sutured in place at the epidermal and mucosal aspects using 4-0 chromic suture in an interrupted fashion.

**Summary:** The defect has not recurred after 5 months of follow-up.

**Conclusions:** A 3-layer sandwich graft can easily be harvested from the ear and provides an effective option for repair of small, persistent through and through defects on the nasal tip.



*Through and through defect of the nasal tip.*



*Healed defect 1 month following sandwich graft.*

**124**

**PRESENTER:** Antonio P. Cruz, MD

**TITLE:** Surgical Pearl: Percutaneous Suspension Suture

**AUTHORS:** Antonio P. Cruz, MD; Ross Campbell, MD; Raymond G. Dufresne, Jr., MD

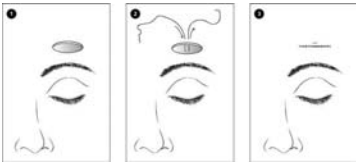
**Purpose:** The suspension suture can be beneficial in a primary linear closure by fixing the closure line at the junction of cosmetic units, and preventing distortion of free margins this technique of utilizing a buried suture can be limited by access from underlying subcutaneous structures of the advancing tissue and security of the suture placement.

**Design:** Materials: One tissue hook, one pair of undermining scissors, absorbable 3.0 or 4.0 polyglactic suture material, and one needle driver.



**Summary:** We describe a technique of placing the first segment or advancing arm of the suture in a percutaneous manner thus allowing added support, distant position and less risk of tissue tearing for this tension-bearing suture.

**Conclusions:** The percutaneous technique gives greater support to the classic suspension suture, relieves tension on the repair preventing tissue ischemia, and decreases spreading of the scar. Over time, patients heal well with no dimpling effect. This is a simple, highly effective technique to allow primary linear closures, fix defects at the junction of cosmetic units, and prevent distortion of facial features.



*The percutaneous suspensions suture.*



1. Note the dimpling created immediately upon placement of the percutaneous suture.
2. After 1-2 weeks at suture removal, the dimpling has faded.

**125**

**PRESENTER:** Deborah J. Yang, MD

**TITLE:** Closure Pearls for Defects Under Tension

**AUTHORS:** Deborah J. Yang, MD; Ida F. Orengo, MD

**Purpose:** There are often defects that can be closed but are under tension. We present three clinical pearls to aid in closure of such defects.

**Design:** We present the following clinical pearls to aid in closing defects under high tension: the far-near-near-far pulley suture, the tension-dispersed horizontal mattress suture, and the tug-of-war technique.

**Summary:** 1. Placing several far-near-near-far pulley sutures in a defect under tension allows placement of buried dermal sutures to appose the defect margins. After the defect is closed the pulley sutures can be left in place or removed depending on skin tension observed after placement of remaining sutures.

2. The tension-dispersed horizontal mattress suture is a modification of the horizontal mattress suture with the free end of the suture placed within the horizontal suture on the opposite side to help displace the tension.

3. Placement of the first buried dermal suture within a site of tension often leads to difficulty in apposition without breaking the suture. If one applies a tug-of-war type technique in which the suture ends in each hand are alternately pulled, suture breakage is minimized.

**Conclusions:** These three clinical pearls provide ideas for closure of defects under tension.

**126**

**PRESENTER:** Theresa L. Ray, MD

**TITLE:** Closure of Large Surgical Defects on the Cutaneous Upper Lip Using an Island Pedicle Flap

**AUTHORS:** Theresa L. Ray, MD; Christine H. Weinberger, MD; Peter K. Lee, MD, PhD



**Purpose:** Closure of large defects on the cutaneous upper lip is quite challenging. While small defects may be closed within the cosmetic subunit of the lip, large defects often require flaps that distort the melolabial fold or move glabrous skin into the defect. We report our experience using an island pedicle flap for closure of large defects on the cutaneous upper lip in 20 patients.

**Design:** All defects were the result of Mohs micrographic surgery. The defects were sometimes extended to the full height of the lip for closure along cosmetic boundaries. The primary defect was frequently reshaped to allow appropriate match to the square shape of the flap. The island pedicle flap was harvested from the mandible in the area of the marionette lines, extending past the jaw line if necessary. This provided a well vascularized flap consisting of hair-bearing skin similar to that of the cutaneous upper lip. Because island pedicle flaps are advancement flaps, the direction of hair growth was preserved. The area around the secondary defect was extensively undermined in the plane of the deep subcutaneous fat to give the flap appropriate mobility.

**Summary:** All 20 patients had successful reconstruction with good cosmetic results. We experienced no cases of trapdoor deformity and no flaps required secondary debulking procedures. Complications experienced include paresthesias and one case of minimal alopecia at the flap's leading edge. If transected, the orbicularis oris muscle was repaired prior to closure; therefore, we experienced very little asymmetry of facial movement or smile.

**Conclusions:** In our experience, the island pedicle flap is an excellent option for closure of large defects on the cutaneous upper lip. Enough tissue can be mobilized to cover large defects using similar, hair-bearing skin. Undermining in the deep subcutaneous fat allows good flap mobility while maintaining the flap's blood supply and follicular units.



*Original Mohs surgical defect before reshaping.*



*Finished island pedicle flap on the day of surgery.*

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**PRESENTER:** Christina Wahlgren, MD

**TITLE:** The Use of Imatinib Mesylate as an Adjuvant Therapy to Mohs Surgery in a Child with Dermatofibrosarcoma Protuberans

**AUTHORS:** Christina Wahlgren, MD; Peter Shaw; Shao Jiang; Doug Kress; Robin Gehriss; Drazen Jukic; Hakeem Sam, MD, PhD

**Purpose:** The purpose of this case report is to describe successful treatment of a child with a pigmented dermatofibrosarcoma protuberans (DFSP) with imatinib mesylate. To our knowledge,

this is only the second report of a child treated with imatinib mesylate for a DFSP in the literature to date.

**Design:** DFSP is a rare soft tissue tumor that infrequently metastasizes, but has a high rate of local recurrence due to infiltration of the subcutaneous tissue. As a result, excision via Mohs micrographic surgery has become the standard of care. Treatment of DFSPs in the pediatric population has not been well studied and guidelines are based upon studies in the adult population. DFSPs are characterized by chromosomal abnormalities involving the platelet derived growth factor beta chain locus (PDGFB). Imatinib mesylate is a tyrosine kinase inhibitor with activity against the PDGFB receptor and has been reported to be effective in treating adult patients and one child with DFSP.

Herein we describe a three year-old African American female with a pigmented DFSP measuring 9 cm by 9 cm on the right shoulder. Given the extent of the tumor, its proximity to the spinal accessory nerve and the possibility of a poor functional or cosmetic outcome, Mohs micrographic surgery was not considered the optimal first-line therapy. She was consequently treated with imatinib mesylate in an attempt to make the tumor more amenable to resection. After 3 months of daily oral imatinib mesylate at a dose of 13mg/kg, we noted a dramatic clinical response with a significant reduction in the tumor size. The patient's only toxicity was intermittent leg pain managed with acetaminophen.

**Conclusions:** Treatment of DFSPs in the pediatric population is challenging. Surgical excision of the lesion is the gold standard; however, this is not always feasible as in the case presented here. Our case report in conjunction with the current body of published evidence suggests that imatinib mesylate should be considered as an adjuvant therapy to those children with DFSPs who are not good candidates for Mohs micrographic surgery at diagnosis. Ideally a prospective clinical trial could test the efficacy of this therapy but is hindered by the rarity of this tumor in the pediatric population.



*DFSP prior to treatment with imatinib mesylate.*



*DFSP after 3 months of imatinib mesylate therapy.*

**128**

**PRESENTER:** Jeremy S. Bordeaux, MD, MPH

**TITLE:** Defining Prognosis for Transected Melanomas

**AUTHORS:** *Jeremy S. Bordeaux, MD, MPH; Kathryn J. Martires; Ashok Panneerselvam*

**Purpose:** The prognosis and therapy of melanoma is directly related to depth of cutaneous invasion at initial removal. This is referred to as “Breslow’s depth” and is measured in millimeters (mm). When melanomas are transected at diagnosis, true Breslow’s depth is difficult to ascertain. If residual melanoma is present on re-excision, the Breslow’s depth of the residual tumor is added to that of the original transected tumor. If no residual melanoma is present on re-excision, only the depth of the transected tumor (original Breslow’s depth) is available to guide prognosis and therapy. The purpose of this study is to determine the frequency of melanoma transection at diagnosis, to describe risk factors associated with poorer survival, and to compare survival rates of patients with transected melanomas that have no additional tumor on re-excision with that of melanomas of the same Breslow’s depth that are not transected.

**Design:** This is a cohort study of patients diagnosed with melanoma at the University Medical Center between 1996 and 2007 who had corresponding survival data available from the University Medical Center Tumor Registry. The study was conducted at an academic medical center with a multidisciplinary melanoma clinic that draws patients from the academic setting and the surrounding community. A total of 625 patients were included for analysis. The study examined the number of transected melanomas, the proportion of transected melanomas without residual tumor, risk factors for poor survival, and relative survival rates of transected tumors found to have no residual tumor compared with non-transected tumors of similar Breslow’s depth.

**Summary:** The study found that 178 of 625 (28.5%) melanomas were transected at diagnosis. Of the transected melanomas, 59.0% revealed no residual tumor on re-excision. In the multivariate analysis, advanced age ( $p=0.0011$ ), higher Breslow’s thickness ( $p=0.0032$ ), and presence of ulceration ( $p=0.0112$ ) each independently predicted poorer survival, while male sex (0.0981) and positive sentinel node (SN) status (0.0666) trended toward poorer survival. Univariate analysis demonstrated that patients with transected melanomas with no residual tumor

had poorer survival than patients with no transection ( $p=0.0479$ ). The multivariate analysis trended toward this result as well ( $p=0.0887$ ).

**Conclusions:** A high number of melanomas are transected at diagnosis, making appropriate staging and therapy difficult. In agreement with other studies in the literature, factors found to predict poorer survival include advanced age, thicker Breslow's thickness, presence of ulceration, male sex, and positive SN status. Patients with transected melanomas with no residual tumor on re-excision may have poorer survival, and as a result, more aggressive diagnostic and therapeutic procedures may be appropriate for them.

**129**

**PRESENTER:** William Lear, MD

**TITLE:** A Comparison of Four Mohs Tissue Processing Methods Using Porcine Skin

**AUTHORS:** William Lear, MD; Daniel Berg, MD; Norma Andersen

**Purpose:** To evaluate, in a randomized and standardized manner, the time and depth into the block required to get a complete en face section of epidermis, dermis and fat for the following four Mohs tissue processing methods: cryoEMBEDDER®, slide, float and heat sink methods. We also evaluated, for each method, a one-piece versus two-piece approach to processing standardized samples of tissue.

**Design:** We used pig bellies as the source of tissue to give us a large surface with relatively uniform physical properties. We coordinated our study with other University researchers who were using pigs to study spinal anesthesia. The fresh pig bellies were excised as one large specimen and kept on ice during our experiment. Circular samples of 1.0 cm diameter and a depth to the fat were excised from the pig belly in a standard Mohs fashion (i.e. beveled) and randomly allocated to one of the four methods and to either one- or two-piece approach to processing. Three samples were processed for each method and approach, thus having us excise a total of 24 circular discs of 1.0 cm diameter. One-piece samples were processed whole, while two-piece samples were divided along the diameter of the circular disc and processed as two separate pieces.

The time required to get the initial section of tissue was measured from the time the inked specimen was given to the technician until the first section of tissue was obtained from the block. Sections were then obtained every 60 microns into the block. These sections were processed and stained using H&E. The sections were examined microscopically to determine the lowest depth into the block at which a complete section of epidermis, dermis and fat was present.

**Summary:** For all methods, the one-piece approach to process the specimen usually required more depth into the block to get a complete section and more time to get the initial section. (Fig. 1 and 2).

The slide and cryoEMBEDDER® methods required the least amount of depth into the block to get a complete section (Fig. 1). In addition to required more depth to get a complete section, the heat sink and float methods also suffered from a high variability in depth required. This tendency could be inopportune for very thin specimens.

The slide and cryoEMBEDDER® methods required more time to get complete sections. For one-piece processing, the time required to get the initial section for the slide method was 698 +/- 64 seconds versus 364 +/- 312 seconds for the heat sink method (Fig. 2), which would amount to over five minutes less time required using the heat sink method. The heat sink and float methods did not have significant differences in processing times. There was a trend to the cryoEMBEDDER® being slightly faster than the slide method for one-piece samples.

**Conclusions:** Each method and approach has its own set of unique advantages and disadvantages, as outlined in Fig. 1 and 2. We did not evaluate the fidelity (i.e. ability to detect tumor) of the methods/approaches in our study.

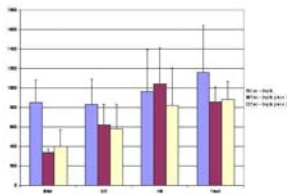


Fig. 1 Depth in microns required to cut into block to get complete section.

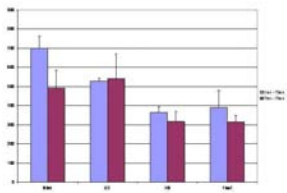


Fig. 2 Processing time in seconds required to get initial section.

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**PRESENTER:** Aleksandar L.J. Kronic, MD, PhD

**TITLE:** Refractory Aggressive Keratoacanthoma Centrifugum Marginatum of the Scalp Controlled with Epidermal Growth Factor Receptor Inhibitor Erlotinib

**AUTHORS:** Aleksandar L.J. Kronic, MD, PhD; John Villano; Aaron Cetner, MD; Tanya K. Bulj

**Purpose:** To evaluate the efficacy of Epidermal Growth Factor Receptor inhibitor (EGFRi) erlotinib (Tarceva) in the treatment of recalcitrant, aggressive Keratoacanthoma Centrifugum Marginatum (KCM) of the scalp.

**Design:** A case presentation.

**Summary:** This is a 74 year old Caucasian female with a five year history of refractory KCM. Prior to presentation in 2006 she had undergone unsuccessful surgical excision, Mohs surgery, chemotherapy, radiation, systemic retinoids, and full-thickness debridement of the scalp and bilateral helices. Despite aggressive surgical therapy new nodules continued to develop at the edges of the scalp contributing to further destruction of the skin and subjacent structures. She received a 6 month course of oral methotrexate (15mg weekly) which led to partial plaque resolution until systemic methotrexate was stopped due to concerns about toxicity. Intralesional methotrexate failed to produce significant control of the new appearing tumors. Even with her extensive skin involvement, on multiple occasions she failed to demonstrate metastatic disease on positron emission tomography, computed tomography or magnetic resonance imaging. Keratoacanthomas are squamous cell neoplasms known to be abundant in EGF receptors. Special stains of typical crater-like neoplastic architecture of her lesions confirmed diffuse presence of EGF receptors in the tumor. The patient was placed on oral erlotinib 150 mg daily. This therapy produced efficient control of the development of the new lesions and almost complete regression of the pre-existing ones after 2 months. Upon initiation of therapy patient experienced typical EGFRi-associated papulopustular rash on the trunk and upper extremities which resolved in the due course.

**Conclusions:** EGF regulates growth and development of several cell lines including keratinocytes. EGFRi are tyrosine kinase inhibitors which were shown to control the growth of different internal neoplasms, including metastatic squamous cell carcinoma of the skin. The

expansion of the use of EGFRi to control other very well differentiated EGF dependent squamous neoplasms of the skin may open a new field for therapy in cutaneous oncology especially when dealing with recalcitrant, multiple or surgically non-resectable lesions.

131

**PRESENTER:** Daniel Michael, MD, PhD

**TITLE:** Algorithm for Approaching a Patient with a Newly Diagnosed Sebaceous Neoplasm

**AUTHORS:** Daniel Michael, MD, PhD; Daniel B. Eisen, MD

**Purpose:** To provide a comprehensive algorithm to identify patients with sebaceous neoplasms who will benefit from germline testing and intensive cancer screening.

**Design:** A literature search was conducted using keywords including: Muir-torre, Lynch syndrome, immunohistochemistry, microsatellite, and sebaceous. Previous algorithms for patients with Muir-Torre and Lynch syndrome were identified and their short comings assessed. Few comprehensive algorithms were identified in the literature regarding Muir-Torre syndrome, so a new algorithm was created using information primarily regarding Lynch syndrome.

**Summary:** Muir-Torre syndrome (MTS) is an autosomal dominant phenotypic subset of hereditary nonpolyposis colorectal cancer syndrome (Lynch syndrome). It is manifested by the development of sebaceous neoplasms or keratoacanthomas in conjunction with visceral malignancies, most often colorectal carcinoma. Sebaceous neoplasms are rare, but many dermatologic surgeons will encounter them. Up to 42% of these lesions are associated with MTS. Who and how to screen patients for MTS has been a source of confusion. We provide an algorithm that should simplify the approach to these complex lesions.

**Conclusions:** Intensive cancer screening of patients at risk for this syndrome has been found to decrease mortality in patients with Lynch syndrome. Early identification of these patients and screening of their first degree relatives can improve outcomes.

