Abstract, Poster & CME Information

47th Annual Meeting

THURSDAY, APRIL 30 - SUNDAY, MAY 3, 2015
MARRIOTT RIVERCENTER • SAN ANTONIO, TX

ACMS American College of Mohs Surgery

47TH ANNUAL MEETING

APRIL 30 - MAY 3, 2015
MARRIOTT RIVERCENTER

Abstract, Poster & CME Information

ACMS American College of Mohs Surgery

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Tromovitch Award Abstract Session – Thursday, April 30: 10:00 – 11:00 am

April 30, 10:00 - 10:07 AM

Presenter: Emily Ruiz, MD

Title: Multiple Mohs Micrographic Surgery is the Most Common Reason for Divergence from Appropriate Use Criteria

Authors: *Emily Ruiz, MD[1]; Pritesh Karia, MPH[1]; Juanita Duran Rincon, MD[1]; Christine Liang, MD[1]; Chrysalyne Schmults, MD, MSCE[1]*

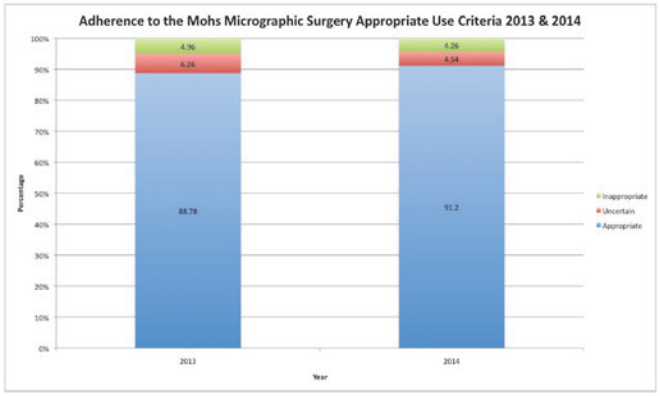
Institutions: *1. Brigham and Women's Faulkner Hospital, Jamaica Plain, MA*

Purpose: In 2012, appropriate use criteria (AUC) for Mohs micrographic surgery (MMS) were implemented; however, to our knowledge, no studies have evaluated adherence to the new criteria since their publication. This study evaluates institutional adherence to the AUC after implementation and identifies reasons for MMS in cases classified as being inappropriate or uncertain.

Summary: A total of 3,036 cases of MMS were performed in 2013 and 2014 at Brigham & Women's Hospital (BWH). Of these cases, 18 were excluded, as the diagnosis was not defined in the AUC. The remainder of cases were classified as appropriate (2013: 89%, 2014: 91.5%), uncertain (2013: 6%, 2014: 4.5%), and inappropriate (2013: 5%, 2014: 4%). Multiple MMS on the same day was the most common reason for performing MMS if the AUC was inappropriate or uncertain (2013: 53%, 2014: 63%). Other reasons included ill-defined margins and history of difficult skin cancers. In addition, in 2013 and 2014, 55% and 47% of inappropriate and uncertain cases, respectively, were allowed to heal by secondary intention. The cost of surgical excision and same day second MMS are estimated to be $293.75 for the excision alone and $727.17 with closure versus $226.30 for MMS alone and $494.36 with closure, respectively (based on reimbursements from Medicare as well as 5 private insurers).

Design: All MMS cases performed at BWH in 2013 and 2014 were included in our study. Cases were classified as appropriate, uncertain, and inappropriate based on the AUC. Uncertain and inappropriate cases were subjected to chart review to determine the reason for MMS. The cost of surgical excision and a same day second MMS was tabulated based on claims reimbursement data at BWH.

Conclusion: Institutional adherence to the AUC for MMS exceeded 89% at our institution during the study period. The majority of inappropriate and uncertain cases were performed as second site same day MMS. Based on BWH Medicare and private insurer reimbursement data, the cost of a second site same day MMS was less than surgical excision. In addition, the second site MMS was even more cost effective as roughly 50% of inappropriate and uncertain cases were allowed to heal by secondary intention. These cases would likely have required closure due to the increase size of surgical defects with standard surgical excision compared to MMS. In addition to being as cost effective as surgical excision, multiple site same day MMS reduces the patient's burden of treating their disease. Our practice is evolving toward a higher percentage of patients with multiple tumors so treatment of multiple lesions on the same day streamlines patient care. Further analyses that evaluate cases classified as uncertain or inappropriate would identify limitations to the AUC and help to improve MMS guidelines in the future.



Reason for performing MMS if AUC classification was inappropriate or uncertain	2013 n of divergent cases (% of divergent cases)	2014 n of divergent cases (% of divergent cases)
Multiple MMS Same Day	86 (53)	84 (63)
Ill-Defined Margins	37 (23)	28 (21)
History of Difficult Skin Cancers	24 (15)	10 (7)

Professional reimbursements for same day second site MMS and surgical excision	Average Professional Fees*
Same Day Second MMS**	
MMS Only (CPT 17313)	$226.30
MMS+Closure (CPT 17313+13101/13121)***	$494.36
Surgical Excision (including pathology CPT 88305)	
Excision Only (CPT 11602/11603)	$293.75
Excision+Closure (CPT 11602/11603+13101/13121)	$727.17

*Professional fees at our institution are lower than professional fees in a private practice/outpatient based setting since BWH bills a facility fee as well. Facility reimbursement data were unavailable but are proportional to professional fees so should not change overall results of the comparison.
**For same day second MMS, CPT codes 17313 and the average of 13101/13121 were used because nearly all (97.6%) of uncertain and inappropriate cases were in these locations.
***To generate the average cost of a same day second MMS with closure, 50% of the complex primary closure codes (13101/13121) and 50% of the simple closure (second intention) codes (12002) were applied as half the wounds healed by second intention.

April 30, 10:07 - 10:14 AM

Presenter: Christie Regula, MD

Title: Functionality of Patients 75 Years and Older Undergoing Mohs Surgery: A Multi-Center Study

Authors: *Christie Regula, MD[1]; Murad Alam, MD, MSCI[2]; Ramona Behshad, MD[3]; Marc Glashofer, MD[4]; William Hanke, MD, MPH[5]; Christopher Harmon, M.D.[6]; Ryan Johnson, MD[7]; David Kent, M.D.[8,9]; Patrick Lee, MD[10]; Naomi Lawrence, MD[11]*

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11. Center for Dermasurgery, Cooper University Hospital, Marlton, NJ

Purpose: Recent discussions in our medical community have centered on the use of Mohs surgery in patients with nonmelenoma skin cancers and limited life expectancy. In most cases the Charlson Comorbidity Index (CCI) has been used to identify such patients. The CCI, however, only takes into account the presence of a comorbid condition, not the severity of the condition or impact on the patient's quality of life. Further, it is best suited to predict outcomes of acute complex medical conditions and major surgeries. The purpose of this study is to categorize the functional status of patients 75 years and older undergoing Mohs surgery of a nonmelanoma skin cancer using the Karnofsky Performance Status (KPS) scale. This scale provides a functional assessment of the patient and may be a more useful tool when making the decision to perform Mohs surgery in this population. In addition, we aim to identify any distinguishing characteristics of lower functioning patients undergoing Mohs surgery.

Summary: A total of 291 patients completed the study. The average KPS score was 90.1. 93.1% of our subjects had a KPS score of 70 or greater. Subjects with a KPS score less than 70 were significantly more likely to be older (p=0.003) and to have larger tumors (p=0.033). Those with a KPS score less than 70 were also more likely to answer yes to questions 1a, 1b, 2, 4b, and 5 (p<0.001, p=0.002, 0.013, 0.013, 0.032).

Design: A cohort of consecutive patients 75 years and older who underwent Mohs surgery for nonmelanoma skin cancer at eight separate and geographically diverse sites were included in this study. Patient and tumor characteristics (age, gender, tumor type, tumor location, and tumor size) were recorded. Physicians scored each patient on the KPS Scale (Table 1). Five questions were also asked of each subject to categorize the symptoms and impact of their skin cancer (Table 2).

Conclusion: The vast majority of patients 75 years and older who undergo Mohs micrographic surgery are highly functioning. Lower functioning patients are likely to be older, but they are also more likely to have larger, symptomatic tumors that negatively impact their lives.

KPS Score	Description
100	Normal, no complaints, no evidence of disease.
90	Able to carry on normal activity, minor signs or symptoms of disease.
80	Normal activity with effort, some signs or symptoms of disease.
70	Cares for self, unable to carry on normal activity or do active work.
60	Requires occasional assistance, but is able to care for most of his needs.
50	Requires considerable assistance and frequent medical care.
40	Disabled, requires special care and assistance
30	Severely disabled, hospitalization is indicated although death is not imminent.
20	Hospitalization necessary, very sick, active supportive treatment necessary.
10	Moribund, fatal processes progressing rapidly.
0	Dead.

Table 1. Karnofsky Performance Status Scale.

1. Are you having discomfort at the site of your lesion? Is it hurting, throbbing, stinging, or sensitive in some other way?
2. Is your lesion making you unhappy, depressed, or worried?
3. Is your lesion making it hard for you to do daily activities? ie. Wearing glasses, combing your hair, or wearing clothes?
4. Has you lesion bled or is it messy in some other way? Is it difficult to keep clean?
5. Does your lesion make you avoid others or socializing because you think others find it unattractive?

Table 2. Patient Questionnaire.

April 30, 10:14 - 10:21 AM

Presenter: Andrew Breithaupt, MD

Title: Determining Human and Viral Gene Signatures in Cutaneous Squamous Cell Carcinomas Using RNA Sequencing

Authors: *Andrew Breithaupt, MD[1]; Philip Scumpia, MD, PhD[1]; Christina Choung, MD[1]; Gary Lask, MD[1]; Scott Binder, MD[1]; Teresa Soriano, MD[1]*

Institutions: *1. University of California, Los Angeles, Los Angeles, CA*

Purpose: Our understanding of the molecular pathogenesis of high-risk cutaneous squamous cell carcinomas (SCCs) in immunosuppressed patients is limited but is thought to be driven by multiple endogenous and exogenous factors including UV radiation, loss of immune surveillance, and possible exposure to viruses including papilloma viruses. Whether viruses can activate human proto-oncogenes or inactivate tumor suppressor within high-risk SCCs genes is currently unknown. RNA Sequencing (RNASeq) is a new high-throughput technique that may quantify viral and host gene expression simultaneously and the purpose of this study was to evaluate whether this is possible and to quantify these gene expression changes difference between normal skin, low-risk, and high-risk SCCs.

Summary: Our study included a total of 23 tissue samples: 10 high-risk SCCs, 10 low-risk SCCs (as defined below), and 3 samples of normal skin. We identified over 250 genes that vary at least two-fold in expression between the groups. Additionally, we identified several viral genes significantly overexpressed in the SCC groups compared to normal skin. The expression of certain viral genes correlated with the overexpression of certain proto-oncogenes in the SCCs.

Design: This was a prospective study analyzing gene expression in three groups: normal skin, low-risk SCCs, and high-risk SCCs. Low and high-risk SCCs were based on the following criteria: A. Histological features: thickness>2mm, poor differentiation, certain histologic subtypes (desmoplastic or adenosquamous carcinoma, invasive Bowen disease), perineural invasion, lymphovascular invasion. B. Patient features: Size > 2cm, SCC arising in areas of chronic burn/inflammation, immunosuppression, high-risk anatomic location (pinna of the ear, labial mucosa). If a patient had a tumor that met two of these features, they were included in this study as high-risk. To be characterized as a low-risk SCC,

a patient's tumor must not have demonstrated any of the features listed above. Using RNA-Seq, cDNA libraries were generated to quantify the expression of all mRNA in tissue samples. This sequencing data was then analyzed against known human and viral genome libraries.

Conclusion: We find that several viral genomes can be detected in human skin, including the SCC samples, indicating the presence of viruses in cutaneous SCCs. Interestingly, a type I interferon mediated antiviral signature was detected more strongly in the SCCs from otherwise healthy patients when compared to those SCCs from patients on chronic immunosuppression. Several signaling pathways were increased in low-risk and high-risk SCCs including Notch, p53, and mitogen activated protein kinase (MAPK pathways) compared to normal skin. While further studies are warranted to more clearly elucidate the relationship between the viral genome and oncogenesis, this study highlights the potential application of RNASeq to determine how viruses may influence cutaneous oncogenesis in patients with high-risk SCCs.

April 30, 10:21 - 10:28 AM

Presenter: Karen Connolly, MD

Title: Intraoperative Pain During Mohs Surgery: An Opportunity for Improved Patient Care

Authors: *Karen Connolly, MD[1]; Kishwer Nehal, MD[1]; Anthony Rossi, MD[1]; Erica Lee, MD[1]*

Institutions: *1. Memorial Sloan-Kettering Skin Cancer Center, New York, NY*

Purpose: Mohs micrographic surgery is unique as patients are treated under local anesthesia until disease clearance is achieved. This can necessitate prolonged waiting periods and multiple procedures in a day. Patients can undergo extensive resections and reconstruction in sensitive areas all in the outpatient setting. Postoperative pain following Mohs surgery has been well described, however intraoperative pain during Mohs surgery has not been characterized. The aim of this study was to determine if patients experience pain during their office visit for Mohs surgery. Secondary goals were to determine if certain tumor characteristics such as location, duration of time spent in the office, number of Mohs stages, or defect size correlated with the degree of pain experienced.

Summary: A total of 137 patients (150 sites) undergoing Mohs surgery were included. Eighty five (57%) men and 64 (43%) women with a mean age of 70.5 years were treated. The most frequent location was the head and neck (74.5%) followed by the trunk/extremities (25.5%). The majority of patients required 2 stages for tumor clearance (46.6%). Overall, 26.2% of patients reported pain during their Mohs surgery day, with an average pain number of 3.8 out of a maximum of 10. Cross classification of surgical anatomic location and pain showed an increase in patient-reported pain for the nose, forehead, and periorbital area. Logistic regression estimates of the association between pain and elapsed time in the office, number of stages, and final defect size showed an increase in pain for patients who spent a longer time in the office (406-570 minutes), 3 or more Mohs stages, and a final defect size greater than 1.9 cm.

Design: Patients were asked to report pain level using the verbal numerical rating scale (0-10) by the doctor or nurse prior to leaving the office. Information recorded for each patient included demographic information, surgery site, preoperative and postoperative size, number of sites, number of Mohs stages, total duration of time spent in the office, pain number, and whether oral analgesics were given.

Conclusion: Patient-reported pain was noted in a quarter of patients during Mohs surgery. However, the majority of patients did not report pain to the medical staff unless asked. Additional preventative pain control measures could be considered in locations at higher risk. Assessing pain during Mohs surgery may improve the patient's treatment experience and increase overall satisfaction.

Cross classification of surgical anatomic location and patient reported pain.

	Pain	
	No	Yes
cheek	24 (21.82)	4 (10.26)
chin	2 (1.82)	1 (2.56)
ear	5 (4.55)	2 (5.13)
forehead	13 (11.82)	6 (15.38)
lip	3 (2.73)	3 (7.69)
neck	2 (1.82)	0 (0)
nose	19 (17.27)	11 (28.21)
periorbital	2 (1.82)	5 (12.82)
scalp	6 (5.45)	3 (7.69)
trunk_ext	34 (30.91)	4 (10.26)
P = 0.022		

Logistic regression estimates of the association between pain and elapsed time, stages and final defect size. Each logistic model controlled for age and sex.

	Odds Ratio	[95% Conf.	Interval]	P>z
Elapsed time				
75-193 (referent)	1.0	--	--	--
194-260	0.75	0.19	2.90	0.68
261-320	1.68	0.47	6.00	0.42
321-405	1.66	0.45	6.11	0.445
406-570	3.49	1.02	12.01	0.047
Stages				
1 (referent)	1.0	--	--	--
2	2.19	0.88	5.47	0.094
3+	3.99	1.30	12.30	0.016
Final defect size				
0.4-1.1 (referent)	1.0	--	--	--
1.2-1.8	0.97	0.37	2.55	0.958
1.9-5.0	2.27	0.88	5.82	0.089

April 30, 10:28 - 10:35 AM

Presenter: Benvon Moran, MB BCh BAO

Title: Rapidly Absorbable vs. Non-Absorbable Sutures for Mohs Surgery Repair on the Face: A Randomized Controlled Split-Scar Study

Authors: *Benvon Moran, MB BCh BAO[1]; Shannon Humphrey, MD[1]; Alex Seal, MD[1]; David Zloty, MD, Dermatology[1]*

Institutions: *1. University of British Columbia, Vancouver, BC*

Purpose: This study was carried out to assess equivalence of scar outcomes between two suture materials (rapidly absorbable irradiated polyglactin 910 and non-absorbable nylon monofilament) commonly used for wound closure on the face in dermatologic and Mohs micrographic surgery (MMS).

Summary: 105 participants were recruited (54 male, 51 female). The mean age was 70.6 years (range 43 – 92). Fifty-three patients had reconstruction with a flap, and 52 with a side-to-side closure. The average scar length was 72.3 mm. The mean Stony Brook Scar Evaluation Scale (SBSES), Visual Analogue Scale (VAS) and Wound Evaluation Scale (WES) results at one week, two months and six months are shown in Tables 1-3.

Design: This was a prospective randomized controlled split-scar observer-blinded study. 105 consecutive patients attending for MMS, with scar lengths of at least 40mm on the face, were included. Each wound half (superior/medial or inferior/lateral) was randomly assigned for repair with running cutaneous rapidly absorbable polyglactin 910 or non-absorbable nylon monofilament. Scar analysis was performed by the principal investigator (DZ) at one-week, two-month and six-month intervals using validated scar assessment tools (the Stony Brook Scar Evaluation Scale, Visual Analogue Scale, and Wound Evaluation Scale). Clinical photographs were taken, and the final six-month photographs were assessed by two blinded, independent observers (SH and AS) using the same scar scales.

Conclusion: Non-absorbable sutures are traditionally used for skin closure after dermatologic surgery on the face. In the present study there was no statistically significant difference in scar outcome between the rapidly absorbable and non-absorbable materials. Rapidly absorbable polyglactin 910 falls out after 14 - 21 days, without the need for an additional office visit for suture removal. The potential discomfort associated with suture removal is also avoided if this material is used. This is the first study, to our knowledge, demonstrating equivalence of cosmetic outcome of these two materials when used for repair of facial defects post Mohs micrographic surgery.

Table 1: One-week assessment

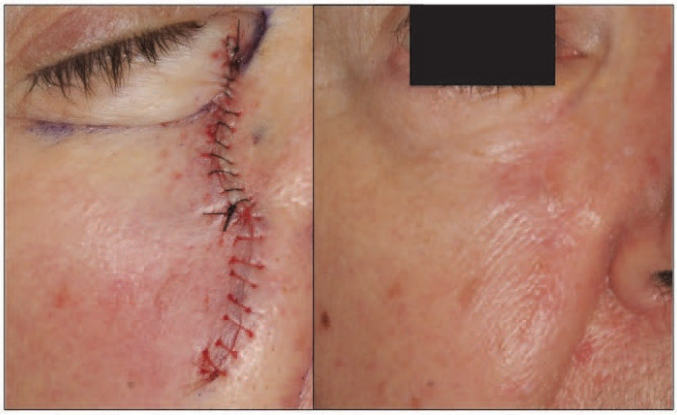
Suture type	SBSES	VAS	WES
Rapidly absorbable polyglactin 910	3.0	79.7	5.0
Non-absorbable nylon monofilament	3.0	78.5	4.6

Table 2: Two-month assessment

Suture type	SBSES	VAS	WES
Rapidly absorbable polyglactin 910	3.9	82.1	4.9
Non-absorbable nylon monofilament	3.9	82.2	4.9

Table 3: Six-month assessment

Suture type	SBSES	VAS	WES
Rapidly absorbable polyglactin 910	4.1	87.3	5.4
Non-absorbable nylon monofilament	4.2	87.8	5.4



Immediate and six-month post-operative photographs showing the superior wound half sutured with nylon monofilament and the inferior half with rapidly absorbable polyglactin 910

April 30, 10:35 - 10:42 AM

Presenter: Rachel Schleichert, MD

Title: Ultraviolet-Fluorescent Tattoos Facilitate Accurate Identification of Biopsy Sites

Authors: *Rachel Schleichert, MD[1]; Kathryn Russell, MD[1]; Eli Saleeby, MD[1]; Eduardo Weiss, MD[2]*

Institutions: *1. The Skin Institute of South Florida, Coral Springs, FL*
2. Hollywood Dermatology, Hollywood, FL

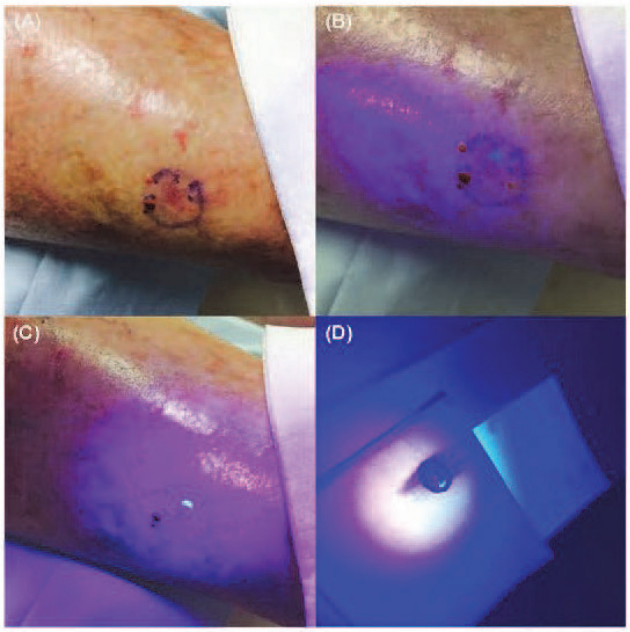
Purpose: The inability to correctly identify a patient's biopsy site is a common problem encountered among dermatologic surgeons. Healing biopsy wounds can be difficult to find in patients with diffuse actinic damage, prior surgical scars, or multiple biopsy sites. Past studies have

established that patients misidentify their biopsy sites with considerably high frequency. This frustrating situation can lead to delays in treatment and wrong site surgeries. Current methods for identifying surgical sites such as photography, diagrams, measurements to anatomical landmarks, and gauze dermabrasion are not perfect. Having a system to accurately identify biopsy sites is imperative. Tattoos are regularly used in the fields of surgery and radiation oncology to correctly identify tumor locations. Ultraviolet tattoos, also known as invisible tattoos, are composed of ink that is invisible in natural light but fluoresces when exposed to ultraviolet light. The purpose of this study was to determine the efficacy of ultraviolet-fluorescent tattoos in facilitating correct identification of biopsy sites in patients suspected of having nonmelanoma skin cancer.

Summary: 51 shave biopsy sites (Figure 1A) were tattooed with ultraviolet-fluorescent ink (Figure 1B) in a series of 31 patients. All but 3 biopsy specimens revealed nonmelanoma skin cancer; 39 squamous cell carcinomas, nine basal cell carcinomas, two actinic keratoses, and one case of acroangiodermatitis were diagnosed by histopathologic examination. Follow up visits for treatment occurred 7 to 161 days after tattoo application. In 35% of cases, patients could not identify their biopsy site at the time of treatment without the aid of ultraviolet light. In 7% of cases, physicians could not confidently identify the site until illuminating the tattoo. Older patients (age > 74) were less likely to correctly identify their biopsy sites than younger patients (p=0.013). Physicians were less likely to correctly locate the site when it was located on the patient's arm compared to other sites (p=0.045). At follow up, all tattoos were detectable with Wood's lamp illumination (Figure 1C,D) but were imperceptible in visible light. All patients who underwent surgical treatment were left with no residual tattoo. No adverse events occurred.

Design: After Institutional Review Board approval was obtained, 51 shave biopsy sites were tattooed with a small amount of ultraviolet-fluorescent ink in 31 patients suspected of having a cutaneous malignancy. At the time of follow up for treatment, the ability of the patient and the physician to identify the correct site with and without ultraviolet illumination of the tattoo was recorded. The intensity of fluorescence of the tattoo was graded on a scale of 0-3 before and after treatment. In cases where treatment was not performed, patients were offered the option of tattoo removal by excision. Patients were monitored for any adverse reactions.

Conclusion: Ultraviolet-fluorescent tattoos offer a reliable, discreet, and effective means of accurately marking cutaneous biopsy sites.



April 30, 10:42 - 10:49 AM

Presenter: Mac Machan, MD

Title: Penile Squamous Cell Carcinoma: Penis-Preserving Treatment with Mohs Micrographic Surgery

Authors: *Mac Machan, MD[1]; David Brodland, MD[2]; John Zitelli, MD[2]*

Institutions: *1. Surgical Dermatology & Laser Center, Las Vegas, NV*
2. Zitelli & Brodland PC, Clairton, PA

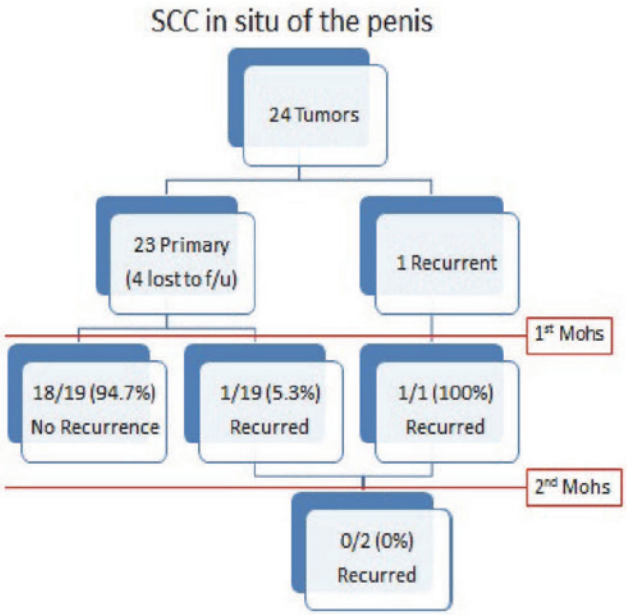
Purpose: Squamous cell carcinoma (SCC) of the penis is an uncommon malignancy accounting for 0.4-0.6% of malignant tumors among men in the United States and Europe. The standard therapy for invasive carcinoma of the penis is either amputation (partial or complete penectomy) or radiation therapy. There are few published case series documenting the use of Mohs micrographic surgery (MMS) for the management of penile SCC. The reported recurrence rates for these series are 26-32%. This study reviews 30 years of experience removing penile SCC with MMS.

Summary: A total of 48 (44 initial tumors + 4 recurrences) cases of MMS were performed on 23 primary SCC in situ, three recurrent SCC in situ, 14 primary SCC, and eight recurrent SCC. 41% were located on the shaft, 39% on the glans penis, 14% at the base of the penis, and 4.5% on the prepuce. The mean pre-operative size of all lesions was 1.9 cm (range: 0.2-6.0 cm). The mean number of MMS stages was 2.0 (range: 1-7 stages). The mean margin required for tumor clearance was 0.83 cm (range: 0.2-5.0 cm). There was one recurrence among the 19 primary SCCs in situ, resulting in a cure rate of 94.7%. The lone recurrence occurred after 9 months and was treated with a 2nd MMS procedure. (Figure 1) There were four patients with SCC in

situ of the glans with extension down the urethra. In each case a ventral meatotomy and urethrotomy was performed to provide exposure, and allow for removal of a complete circumferential tissue layer. While all four patients required urethral dilation post-operatively secondary to urethral stricture, none of these tumors recurred and normal function was restored in each case. There were no recurrences among the 10 primary invasive SCC. Of the six recurrent invasive SCCs, four were previously treated with standard excision, one with CO2 laser ablation, and one with topical imiquimod therapy. Two tumors recurred, resulting in an initial cure rate of 66.7%. The median time to recurrence was 57.5 months. The two recurrences were re-treated with MMS and there were no recurrences in this group. (Figure 2) 14/42 patients had passed away at the time of writing. None died from penile carcinoma or complications of the treatment. No patients developed nodal metastasis. Function was preserved in all patients.

Design: Retrospective record review in a private practice setting from 1983-2013 of 42 patients with 44 penile SCCs. Detailed review of each patient's medical record was conducted and all relevant data collected (Table 1). Follow up visits and telephone surveys were conducted for all patients.

Conclusion: MMS may be preferred for patients with penile carcinoma by providing a tissue conservative alternative to partial or total penectomy, and does not need to be limited to low grade, small, superficial tumors.



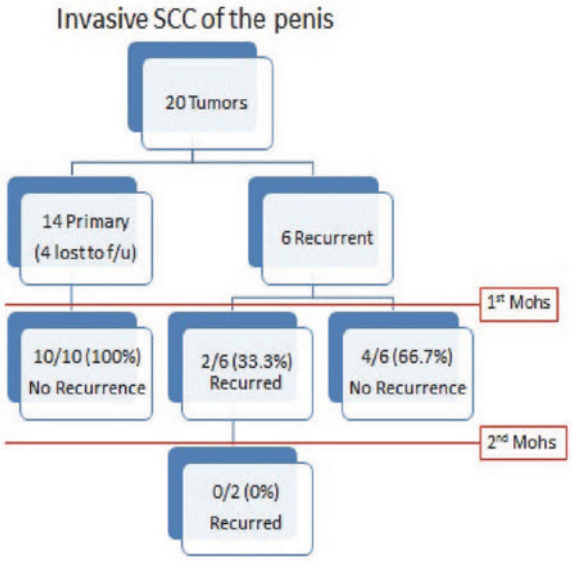


TABLE 1

Case no.	Patient	Age	Location	Urethral Involvement	Prior Tx	Pre-operative Size (cm)	Stages	Follow up (mos)	Recurrence	MTR
Squamous Cell Carinoma In-situ										
1	A	67	Glans/urethra	Yes (3 cm)		1.3	5	20	No	
2	B	61	Shaft			1.5	1	255	No	
3	C	88	Glans/urethra	Yes (5 cm)		2	5	4*	No	
4	D	72	Distal shaft/glans			2.2 x 1.7	2	26	No	
5	E	74	Dorsal Penis/Pubis			3.9 x 3.0	2	35	No	
6	F	29	Mid shaft			0.2	1	46	No	
7	G	49	Proximal shaft			1.6	1	155	No	
8	H	61	Dorsal shaft			1.1	1	128	No	
9	I	50	Dorsal shaft/glans			2.3x1.5	1	142*	No	
10	J	82	Mid shaft			1.5	2	269	No	
11	K	32	Distal shaft			0.8	1	198	No	
12	L	76	Glans/Urethra	Yes (1 cm)		2.5	4	56	No	
13	M	83	Distal shaft/glans			5	2	104*	No	
14	N	40	Base of penis			1.2	1	43	No	
15	O	70	Glans/Urethra	Yes (2 cm)		2	3	91	No	
16	P	70	Distal shaft			0.6	1	125*	No	
17	P	70	Proximal shaft			0.6	4	29*	No	
18	Q	62	Shaft			2.2x1.3	2	27	No	
19	R	56	Cornoa			2.1x1.3	2	Lost	n/a	
20	S	71	Shaft			1.1	2	Lost	n/a	
21	T	82	Shaft			2.3x2.9	1	Lost	n/a	
22	U	41	Base of penis			2	2	Lost	n/a	
23	V	71	Glans			1	1	n/a	Yes	9
Recurrent Squamous Cell Carcinoma In-situ										
24	V	72	Glans		Mohs	0.8	1	1	No	
25	W	45	Ventral shaft		Excision	1.3	2	n/a	Yes	15
26	W	47	Ventral shaft		Mohs	0.5	1	144	No	
Squamous Cell Carincoma										
27	X	65	Penis			1.5 x 1.5	3	182*	No	
28	Y	68	Glans			1.5	1	149*	No	
29	Z	54	Ventral shaft			2	1	177*	No	
30	AA	52	Glans			1	2	315	No	
31	BB	47	Glans			3	n/a	252*	No	
32	CC	92	Distal foreskin/Glans			3.4	1	88*	No	
33	DD	73	Shaft			2.5	1	93	No	
34	EE	85	Distal shaft/foreskin			5	2	11	No	
35	FF	57	Glans			n/a	1	Lost	n/a	
36	GG	82	Glans			1.4	1	Lost	n/a	
37	HH	60	Coronal sulcus			1.4	2	Lost	n/a	
38	II	42	Base of penis			1.3	2	Lost	n/a	
39	JJ[A]	47	Distal shaft			1	1	183	No	
40	JJ[A]	52	Corona			1.8	2	66	No	
Recurrent Squamous Cell Carcinoma										
41	KK[B]	71	Urethral meatus	Yes (3 cm)	Excision	1	4	113*	No	
42	LL	79	Glans		Excision	2	3		Yes	6
43	LL[C]	80	Coronal sulcus		Mohs	1	3	190*	No	
44	MM	78	Scrotum/prox shaft		imiquimod	6x4	7	41*	No	
45	NN	73	Base of penis		Laser (CO2)	1.2	2	25	No	
46	OO	51	Base of penis		Excision	2.7x2.2	1	193	No	
47	PP	77	Shaft/glans		Excision	[D]large[D]	2		Yes	109
48	PP	85	Shaft/glans		Mohs	2.5	1	45*	No	

MTR = months to recurrence, Tx = treatment
*Patient died of unrelated cause
[A]Patient has balantis xerotica obliterans
[B]Tumor invaded the corpus spongiosum
[C]Tumor invaded the corpus cavernosum

April 30, 10:49 - 10:56 AM

Presenter: Ashley Rubin, MD

Title: A Diagnostic Challenge: Changes in Histopathologic Tumor Diagnosis of Atypical Squamous Proliferations and Keratoacanthomas Following Surgical Removal

Authors: *Ashley Rubin, MD[1]; Shang Jiang, MD[1]*

Institution: 1. *University of California, San Diego, San Diego, CA*

Purpose: Difficulty arises in attempts to definitively diagnose various cutaneous lesions microscopically due to partial sampling, lack of complete criteria for a definitive diagnosis, or the overlap of histopathological features with other neoplasms. Biopsy-proven "atypical squamous proliferations" and keratoacanthomas are entities that may prove difficult to diagnose histologically for the above stated reasons. Although the phrase "atypical squamous proliferation" (ASP) is not uncommonly encountered on histopathologic reports, this entity is not well defined in the dermatologic literature. Furthermore, there are not established guidelines concerning the management of ASPs. While keratoacanthomas (KAs) share marked histologic similarities to squamous cell carcinomas (SCCs), much controversy surrounds this diagnosis, as well, as these lesions have been classified as benign neoplasms, pseudomalignancies, regressing malignancies, and as variants of SCCs. The purpose of this study is to retrospectively clarify the diagnosis of biopsy-proven ASPs and KAs following surgical removal. Specifically, the goal is to ascertain what fraction of these proliferations represent malignant tumors.

Summary: Of the 71 biopsy-proven ASPs, which were treated by surgical removal in the five-year span of our study, 39 (54.9%) exhibited resultant pathologic diagnosis of squamous cell in situ or SCC. The average age of patients with biopsy-proven ASPs was 72.6 years, and there was a slight male predominance at 59% (42). Most commonly, these biopsies were obtained by Dermatology residents. Time between biopsy and surgical removal was 44 days. The most common lesion location was the head and neck (45.1%). Twenty-five biopsy-proven KAs were treated with surgical removal during our study period, and 40% (10) of those lesions revealed non-melanoma skin cancers upon histopathologic examination following surgical removal. The average age at KA diagnosis was 72.5 years, and 56% (14) of these patients were male. These lesions were most commonly located on the extremities. The average time between biopsy and surgical removal was 34.8 days, and the most common biopsy performer was a Dermatology attending.

Design: This study is a retrospective chart review. Medical records of patients who underwent surgical removal of biopsy-proven ASPs and KAs in an academic dermatologic surgical unit from June 2008 to July 2013 were examined. In addition to basic demographic data, information was obtained concerning biopsy type (shave, punch, excisional), biopsy performer (dermatology attending, dermatology resident, non-dermatology physician), tumor location, time between biopsy and surgical removal, and most importantly, histopathologic diagnosis following surgical removal.

Conclusion: Biopsy-proven ASPs and KAs present a therapeutic challenge. Our data illustrate the importance of subsequent tissue sampling as often times these lesions represent non-melanoma skin cancers. The findings of this study allow for better guidance and management recommendations of these challenging lesions.

April 30, 11:00 - 11:07 AM

Presenter: Agnieszka Thompson, MD

Title: Risk Factors of Cutaneous Squamous Cell Carcinoma Outcomes: A Systematic Review and Meta-Analysis

Authors: *Agnieszka Thompson, MD[1]; Benjamin Kelley, MD[1]; Larry Prokop, MLS[1]; Mohammad Murad, MD, MPH[1]; Christian Baum, MD[1]*

Institutions: *1. Mayo Clinic, Rochester, MN*

Purpose: While the rates of metastasis, recurrence, and disease-specific death for cutaneous squamous cell carcinoma (cSCC) are relatively low, studies have indicated that certain clinical and pathologic tumor characteristics are associated with a more aggressive disease course. The degree to which each risk factor influences outcomes has not been completely characterized. The purpose of this systematic review and meta-analysis was to comprehensively analyze all published data and determine the magnitude of association and quality of supporting evidence for each risk factor related to recurrence, metastasis, and disease-specific death.

Summary: The search yielded 1,041 citations; 29 studies (20,282 patients) met inclusion criteria (5 prospective; 24 retrospective). Results are summarized in Table 1. Several factors, listed below in order of magnitude (RR), demonstrated statistically significant association ($p<0.05$) with each outcome. The factors for recurrence were: invasion beyond subcutaneous fat (RR 7.09), presence of perineural invasion (PNI) (RR 4.23), Breslow depth > 6mm (RR 4.10), diameter >20mm (RR 3.22), location on the temple (RR 3.20), and poor differentiation (RR 2.24). The factors for metastasis were: invasion beyond subcutaneous fat (RR 6.30), poor differentiation (RR 5.40), Breslow depth > 6mm (RR 4.92), diameter >20mm (RR 4.87), presence of PNI (RR 2.96), location on the temple (RR 2.82), lip (RR 2.57) and ear (RR 2.55). The factors for cSCC-specific death were: diameter >20 mm (RR 19.10), poor differentiation (RR 4.54), location on the ear (RR 4.67) and lip (RR 4.55), presence of PNI (RR 4.06), and invasion beyond subcutaneous fat (RR 3.22). Immunosuppression was not significantly associated with the outcomes of interest. Overall, the quality of evidence is considered low to moderate due to heterogeneity, confounding (mostly univariate analyses) and increased risk of bias in mostly retrospective data.

Design: A comprehensive search of several databases from each database's earliest inception to June 2014 was conducted by an experienced librarian with input from the study's principle investigator. The databases included Ovid Medline In-Process & Other Non-Indexed Citations, Ovid MEDLINE, Ovid EMBASE, Ovid Cochrane Central Register of Controlled Trials, Ovid Cochrane Database of Systematic Reviews, and Scopus. Two reviewers independently selected studies and extracted data regarding known risk factors in cSCC. Meta-analysis was performed using the random effects model reporting risk ratios (RR) and 95% confidence intervals (CI).

Conclusion: We performed a comprehensive evaluation of cSCC risk factors and provided the magnitude of association for previously described clinical and pathologic risk factors. Tumor diameter greater than 20 mm is associated with the highest relative risk of disease-specific death while invasion beyond subcutaneous fat imparts the highest relative risk for recurrence and metastasis. Future large prospective studies that perform multivariate analysis of risk factors are needed to provide better predictive prognostic information for risk stratification of cSCC.

Table 1. Risk Factors and Outcomes in cSCC

Outcome	Risk Factor	Statistics for each association			
		Risk Ratio (RR)	Lower Limit of 95% CI	Upper Limit of 95% CI	P-value
Recurrence	**Invasion beyond subcutaneous fat**	**7.09**	**3.56**	**14.11**	**<0.01**
	Presence of PNI	**4.23**	**2.60**	**6.89**	**<0.01**
	Breslow depth > 6mm	**4.10**	**1.63**	**10.32**	**<0.01**
	Diameter > 20mm	**3.22**	**1.91**	**5.45**	**<0.01**
	Temple	**3.20**	**1.12**	**9.15**	**0.03**
	Poor differentiation	**2.24**	**1.48**	**3.40**	**<0.01**
	Immunosuppression	2.07	0.58	7.36	0.26
	Lip	1.32	0.30	5.89	0.72
	Ear	1.31	0.46	3.73	0.62
Metastasis	**Invasion beyond subcutaneous fat**	**6.30**	**2.16**	**18.32**	**<0.01**
	Poor differentiation	**5.40**	**3.37**	**8.65**	**<0.01**
	Breslow depth > 6mm	**4.92**	**2.17**	**11.16**	**<0.01**
	Diameter > 20mm	**4.87**	**2.27**	**10.46**	**<0.01**
	Presence of PNI	**2.96**	**2.28**	**3.85**	**<0.01**
	Temple	**2.82**	**1.72**	**4.63**	**<0.01**
	Lip	**2.57**	**1.70**	**3.89**	**<0.01**
	Ear	**2.55**	**1.65**	**3.94**	**<0.01**
	Immunosuppression	1.75	0.48	6.35	0.40
	Cheek	1.30	0.61	2.77	0.50
Disease-specific death	**Diameter > 20mm**	**19.10**	**5.80**	**62.95**	**<0.01**
	Poor differentiation	**4.54**	**1.24**	**16.62**	**0.02**
	Ear	**4.67**	**1.28**	**17.08**	**0.02**
	Lip	**4.55**	**1.41**	**14.69**	**0.01**
	Presence of PNI	**4.06**	**3.10**	**5.32**	**<0.01**
	Invasion beyond subcutaneous fat	**3.22**	**1.67**	**6.21**	**<0.01**
	Immunosuppression	1.80	0.22	14.79	0.58

**Bolded risk factors indicate statistical significance.*

April 30, 11:07 - 11:14 AM

Presenter: Erica Lee, MD

Title: Cancer Worry in Patients with Facial Skin Cancers: The Impact of Surgical Treatment

Authors: *Erica Lee, MD[1]; Anne Klassen, DPhil[2]; Danielle Kehn, BS[1]; Susan Oliveria, ScD[1]; Andrea Pusic, MD, MHS[1]*

Institutions: *1. Memorial Sloan-Kettering Skin Cancer Center, New York, NY*
2. McMaster University, Hamilton, ON

Purpose: Patients with skin cancer may report significant levels of distress. The level of worry may vary throughout the diagnostic and treatment process and is also impacted with time. Therefore, skin cancer may significantly influence the patient's quality of life. Health-related quality of life (HR-QOL) is a multidimensional concept, which in the skin cancer population includes scarring/disfigurement, anxiety and fears of future skin cancers. HR-QOL is increasingly being recognized as an integral component of dermatologic surgery outcomes. The FACE-Q Skin Cancer Module is a new patient-reported outcome instrument under development. A preliminary scale was developed to assess skin cancer worry.

Summary: All skin cancers treated were located on facial skin. Thirty-one pre-operative and 50 post-operative patients were included. There were 45 females and 36 males; the median age was 61 years of age (range: 25-84). Sixty-nine patients were treated with Mohs surgery and 12 with excision

for early stage melanoma. The scale consists of 15 questions with response categories: Strongly disagree=1, Disagree=2, Agree=3 and Strongly agree=4. For each patient, we created an index by summing the responses for each item and then dividing the total by 15. The range and distribution of scores for the pre-operative group was 1.3 to 3.1 (percentiles: 25%=2.2, 50%=2.5, 75%=2.7). The range and distribution of scores for the post-operative group was 1.0 to 3.5 (percentiles: 25%=1.4, 50%=2.2, 75%=2.4). We analyzed a single question, "I worry I may die of my skin cancer" and observed mean scores of 1.74 and 1.58, for the pre-operative and post-operative groups, respectively.

Design: The FACE-Q Skin Cancer Module is a new patient-reported outcome instrument for individuals with facial skin cancers. Based on previous qualitative work, over 10 independently functioning scales were developed. The instrument is in the 2nd of 3 phases (i.e. field-testing) of the development and validation process. The instrument was administered to pre-operative and post-operative patients undergoing Mohs surgery or excision for melanoma. Descriptive analyses were conducted to characterize patient responses for the Cancer Worry Scale.

Conclusion: We present preliminary descriptive results for cancer worry in skin cancer patients. After surgical treatment of a skin cancer, there was less worry compared with pre-surgery. Overall, respondents disagreed with the statement that skin cancer affected their mortality. This scale explores different domains of worry that may guide clinicians to refine patient counseling and mitigate skin cancer-related anxiety. Acknowledgement of patients' concerns can also contribute to an increase in patient satisfaction and improve patient care.

April 30, 11:14 - 11:21 AM

Presenter: Karen Connolly, MD

Title: Long Term Outcomes of Melanoma of the Lentigo Maligna Type Treated with Staged Excision

Authors: *Kishwer Nehal, MD[1]; Karen Connolly, MD[1]; Rajiv Nijhawan, MD[2]; Klaus Busam, MD[1]*

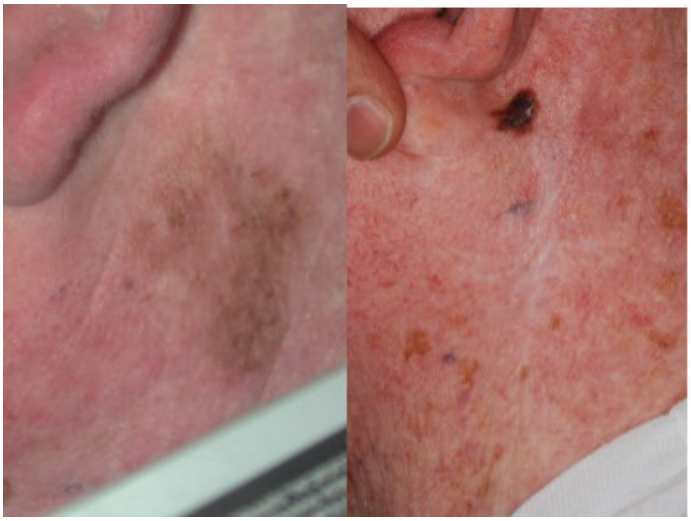
Institutions: *1. Memorial Sloan-Kettering Skin Cancer Center, New York, NY*
2. University of Texas, Dallas, TX

Purpose: Most studies evaluating recurrence rates following surgical and nonsurgical treatment options for melanoma of the lentigo maligna type are limited by follow up data of two to three years. This study provides long term follow up and outcomes for patients treated with the staged excision with radial sectioning technique.

Summary: One hundred seventeen patients with lentigo maligna were followed for a median of 6.6 years (range 0 to 13.6 years) after staged excision of their tumors. 95% of the tumors were on the head and neck location, and the mean lesion size was 11.3mm for lentigo maligna and 14.8mm for lentigo maligna melanoma. The average number of stages required for tumor clearance was 1.67, with a total excised margin of 7.1 mm for lentigo maligna and 10.3 mm for lentigo maligna melanoma. A total of five local recurrences were identified (6/117; 5.1%), with an average time to recurrence of 5 years. Of locally recurrent lesions, one lesion had been previously treated with cryotherapy, and one with incomplete excision by an outside facility prior to staged excision. A third case on the helical rim involved extensive follicular involvement, and recurred twice until removal of the underlying cartilage. Two additional patients developed subsequent lentigo maligna in close proximity to the initial surgery, but within an area of extensive field damage. One patient was upstaged at the time of staged excision to a 2.2 mm melanoma and subsequently developed metastatic disease and death. One patient had preceding melanoma in situ and later developed metastatic melanoma of unknown primary.

Design: The study was a retrospective review of all patients with a biopsy diagnosis of stage 0 or IA lentigo maligna treated with staged excision from 1999 to 2006 at a cancer center. An institutional cancer database was searched to assess patient status and last date of follow up within our institution. Additionally, each medical record was reviewed to assess for evidence of recurrence. For patients who were identified as having a possible recurrence or subsequent metastatic disease, surgical notes, preoperative and postoperative photographs, as well as initial and subsequent pathology slides were reviewed by two dermatologic surgeons and a dermatopathologist to determine recurrence status.

Conclusion: Local recurrence rates of lentigo maligna treated with staged excision are very low. However, the long time to recurrence in these cases emphasizes the importance of prolonged follow up for patients treated for lentigo maligna, as well as close attention to follow up time when critically evaluating studies examining efficacy of treatments for lentigo maligna.



April 30, 11:21 - 11:28 AM

Presenter: Michael Migden, MD

Title: Randomized, Double-Blind Study of Sonidegib (LDE225) in Patients (pts) with Advanced Basal Cell Carcinoma (BCC)

Authors: *Michael Migden, MD[1]; Reinhard Dummer, MD[2]; Alexander Guminski, MD[3]; Ralf Gutzmer, MD[4]; Luc Dirix, MD[5]; Karl Lewis, MD[6]; Patrick Combemale, MD[7]; Robert Herd, MD[8]; Martin Kaatz, MD[9]; Carmen Loquai, MD[10]; Alex Stratigos, MD[11]; Hans-Joachim Schulze, MD[12]; Ruth Plummer, MD[13]; Frank Cornélis, MD[14]; Ragini Kudchadkar, MD[15]*

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8. Glasgow Royal Infirmary, Glasgow, UK
9. University Hospital Jena, Freiburg, Germany
10. Johannes Gutenberg-Universität Mainz, Mainz, Germany
11. University of Athens, Athens, Greece
12. Fachklinik Hornheide, Münster, Germany
13. Freeman Hospital, Newcastle Upon Tyne, UK
14. Cliniques Universitaires Saint-Luc, Bruxelles, Belgium
15. Moffitt Cancer Center, Tampa, FL

Purpose: The BOLT phase 2 study, comparing 2 doses of sonidegib, a hedgehog pathway inhibitor (HhPI), in pts with advanced BCC (aBCC; NCT01327053), met its primary endpoint of objective response rate ≥ 30% in both arms in analyses of data collected up to 6 mo after randomization of the last pt (June 28, 2013, cutoff; median follow-up [f/u], 13.9 mo; Migden, ASCO 2014). Associations of GLI1 (marker of Hh pathway activation) with clinical outcome (as of June 28, 2013) and updated 12-mo efficacy and safety data (Dec 31, 2013, cutoff; median f/u, 20.0 mo) are presented.

Summary: GLI1 levels decreased from BL with both doses at wk 9 and 17 (median % changes [200 mg], −91.07 and −93.75; P < .0001 vs BL) and in pts with disease control (CR, PR, SD). Median % changes (200 mg) at wk 17 by response were CR, −99.47; PR, −90.79; SD, −96.58; PD, +10.19; unknown, −94.24. With an additional 6-mo f/u, median exposure duration was 11.0 (200 mg) and 6.6 mo (800 mg). More than half of pts with LaBCC in the 200-mg arm responded, and tumor responses in both arms were durable (Table). The safety profile of sonidegib was typical of HhPIs; the most common adverse events (200/800 mg) were muscle spasms (52%/69%), alopecia (49%/57%), and dysgeusia (41%/60%).

Design: Pts with locally advanced BCC (LaBCC; n = 194) not amenable to curative surgery or radiation or metastatic BCC (mBCC; n = 36) were randomized 1:2 to receive sonidegib 200 or 800 mg daily. Clinical response was assessed by central review using modified RECIST (LaBCC) or RECIST 1.1 (mBCC). Exploratory analyses in a subset of pts (LaBCC, n = 137; mBCC, n = 13) assessed GLI1 levels by qRT-PCR in tumor tissue collected at baseline (BL), wk 9, and wk 17.

Conclusion: Reduced GLI1 levels vs BL were seen in pts with disease control. With longer f/u, sonidegib continued to demonstrate clinically meaningful tumor shrinkage, sustained responses, and prolonged progression-free survival in pts with aBCC. The 200-mg dose had a better benefit-risk profile.

Table. Clinical Response[a] With Sonidegib in Pts With Advanced BCC in the Full Analysis Set[b] by Central Review

Parameter	LaBCC		mBCC	
	Sonidegib 200 mg n = 66	Sonidegib 800 mg n = 128	Sonidegib 200 mg n = 13	Sonidegib 800 mg n = 23
ORR (CR + PR; 95% CI), %	57.6 (44.8-69.7)	43.8 (35.0-52.8)	7.7 (0.2-36.0)	17.4 (5.0-38.8)
CR, %	4.5	1.6	0	0
PR, %	53.0	42.2	7.7	17.4
Disease control (CR+PR+SD), %	90.9	81.3	92.3	91.3
TTR, median (95% CI), mo	4.0 (3.8-5.6)	3.8 (3.7-5.5)	1.8 (NE)	1.0 (1.0-2.1)
DOR				
Events (PD or death)/responders, n	7/38	11/56	0/1	1/4
Median (95% CI), mo	NE	15.7 (NE)	NE	NE
12-mo event-free probability (95% CI), %	82.3 (33.0-81.7)	71.5 (49.7-83.1)	100 (NE)	NE
PFS				
PFS events, n	11	22	6	11
Median (95% CI), mo	22.1 (NE)	21.5 (NE)	13.1 (5.6-16.9)	11.1 (NE)
12-mo event-free probability (95% CI), %	82.1 (66.9-90.8)	80.4 (67.4-88.6)	58.9 (23.4-82.5)	42.0 (17.6-64.9)

CR, complete response; DOR, duration of response, NE, not estimable; ORR, overall response rate; PD, progressive disease; PFS, progression-free survival; PR, partial response; SD, stable disease; TTR, time to tumor response.
[a] Data cutoff: December 31, 2013.
[b] Intent-to-treat population.

April 30, 11:28 - 11:35 AM

Presenter: Erik Cabral, MD

Title: Endoneural Invasion by Squamous Cell Carcinoma in Molecular Detail Demonstrated by Adapting CLARITY for Human Skin

Authors: *Erik Cabral, MD[1]; Richard Bennett, MD[2,3]; Rajan Kulkarni, MD, PhD[4]*

Institutions: *1. Center for Dermatology, Laser, and Cosmetic Surgery, Milpitas, CA*
2. University of Southern California, Santa Monica, CA
3. Medicine (Dermatology), David Geffen School of Medicine at UCLA, Los Angeles, CA
4. University of California, Los Angeles, Los Angeles, CA

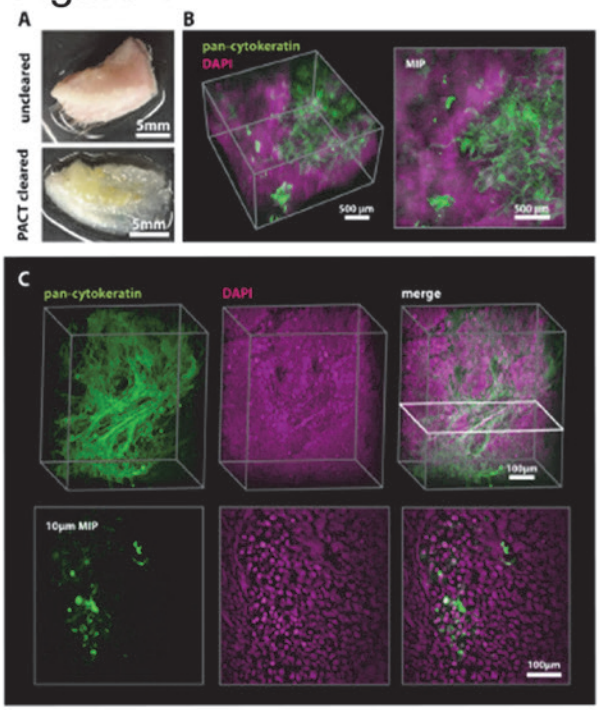
Purpose: Perineural invasion (PNI) is an important feature in establishing the prognosis, morbidity, and mortality associated with cutaneous squamous cell carcinoma (cSCC). The prognosis for cSCC is good overall; however there is a subset with a predilection for recurrence, metastases, and death (Weinberg et al., 2007). Detection of PNI is a high risk factor that up-stages cSCC in commonly used tumor classification systems such as the 2010 AJCC staging system (Edge SB et al., 2010) and the NCCN guidelines. Even recent proposed alternative staging systems are predicated on PNI, of any caliber, as a predictor of poor patient outcomes (Jambusaria-Pahlajani et al., 2013). Despite its clinical importance, there is no consensus of its definition, let alone how to accurately and reliably diagnose PNI on frozen section tissue and with immunohistochemistry (Shimizu & Thomas, 2014). Given that most large, aggressive cSCCs are treated with Mohs surgery, it is of utmost importance for Mohs surgeons to accurately diagnose PNI.

Summary: Using the novel CLARITY system, we were able to significantly reduce opacity to visualize non-melanoma skin cancers in 3-D (Figures 1&2). Quantitative co-localization analysis for SCC in red fluorescent staining surrounds a solitary nerve highlighted by S100 in green (Figure 3A-C). Initial H&E sections highlighted putative SCC perineural spread, but SCC could not be definitely detected within the nerve (Figure 3A). A 3-D flip book animation demonstrates that SCC tracks toward the nerve, invades the perineurium as well as the epineurium with SCC finally being highlighted within the nerve as illustrative of endoneural spread (Figure 3B).

Design: CLARITY disrupts traditional cutaneous tissue processing methods. It generates optically clear tissue hydrogels. Fresh tissue is fixed in paraformaldehyde 1% solution to enable cross-linking of proteins, nucleic acids, and subcellular structures, and then an acrylamide monomer is infused. The monomer is then polymerized to create a hydrogel surrounding neoplastic cells. The lipids are not cross-linked and can be extracted using sodium dodecyl sulfate detergent. This processing enables imaging of the entire intact cutaneous compartment at the molecular level.

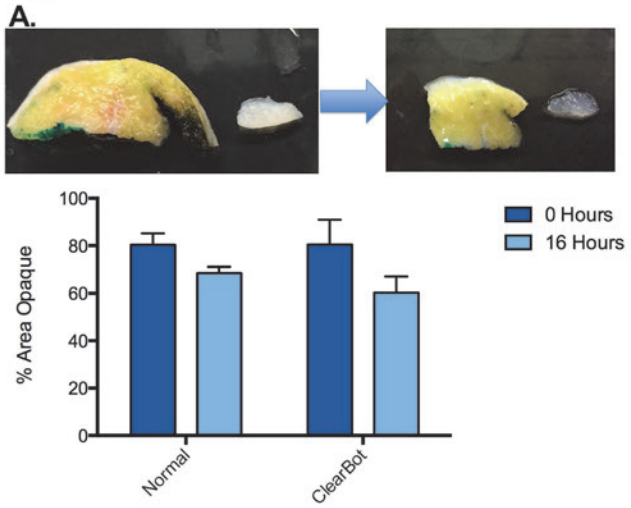
Conclusion: We have developed a new and unique approach for generating 3-D images to map PNI by SCC as a pathway of skin cancer invasion. Novel tissue processing methods for preserving skin neoplasia in 3-D can be utilized for heightened understanding of tumor invasion and for identifying cells with increased malignant potential for further IHC analysis. Significant reduction in skin tissue opacity was achieved. Furthermore, we found that non-apparent SCC on 2-D H&E slides was demonstrated within nerve by modifying CLARITY for human skin to leverage immunolabeling. Perineural spread may involve endoneural spread. SCC invasion along and within nerve may be non-contiguous which has been postulated (Bouzari & Olbricht, 2011), but never before shown in 3-D confocal microscopy detail.

Figure 1



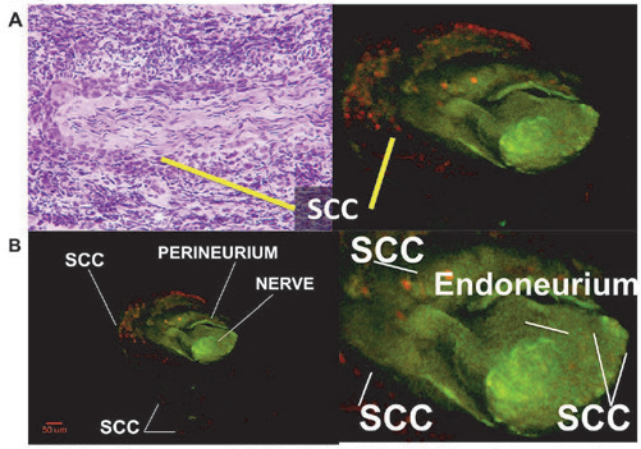
A 3-mm-thick section of a human basal cell carcinoma (BCC) tissue biopsy was cleared with PACT, immunolabeled with anti-pan-cytokeratin (AE1/AE3) antibody, and counter-stained with DAPI. (A) Photographs of uncleared (top) and cleared 3-mm-thick section (bottom) of human basal cell carcinoma (BCC) tissue biopsy (scale bars, 5 mm). (B) Low-magnification (5x) (z = 1.5 mm) and (C) High-magnification (25x) (z = 0.5 mm) 3D rendering and maximum intensity projections showing locations of AE1/AE3 positive cells and keratin filaments (green) of apoptotic tissue with respect to all cells (magenta) of the region. (scale bars, 500 µm and 100 µm).

Figure 2A-B



A. CLARITY and ClearBot successfully make human skin transparent. **B.** Similar reduction in opacity between both processing methods.

Figure 3



A. 2-D H&E with inapparent SCC with 3-D CLARITY rendering showing **B.** invasion of the perineurium and the endoneurium.

April 30, 11:35 - 11:42 AM

Presenter: Silke Heinisch, MD, PhD

Title: Patients' Perceptions Regarding Mohs Surgical Repair

Authors: *Silke Heinisch, MD, PhD[1]; Hakeem Sam, MD PhD[1]*

Institutions: *1. University of Pittsburgh, Pittsburgh, PA*

Purpose: Mohs surgeons manage multiple wounds and assess wound management in each case to serve patients' best interest. Yet, patients' perceptions about Mohs surgical repair are not well understood. A survey of patients treated for nonmelanoma skin cancers in a university-based setting was performed to characterize patients' concerns about Mohs surgical repair.

Summary: Seventy-one patients completed the study, the majority were male, 50-70 year-old, non-smokers and in excellent-good health. >90% patients could perform self-wound care and had support people for assistance. Current pain and life stress were rated low in >80% patients. 42% of patients lacked prior skin cancer. Basal cell carcinoma was the most frequent cancer treated. Most patients lacked a history of melanoma, organ transplantation, pain medication use, or easy bruising. Facial locations of the tumors where mostly in the M- and H-zones (93%). 43% of patients had prior Mohs surgery with 7% reporting complications from the surgery. 85% of patients had other surgery with undesirable scars (15%) and wound infections (13%). Regarding primary outcome measures of most concern to patients, the majority selected recurrence (44%) over infection (30%), scar appearance (13.6%), wound care (6.1%), pain (3%), bruising or function (each 1.5%). Regarding primary outcome measures of least concern to patients, the majority chose scar appearance (38%) over pain or wound care (each 14.5%), bruising (13%), function (11.6%), recurrence (5.8%) or infection (2.9%). Patients tended to perceive wound healing by second intention as associated with increased risk of infection over sutured repair (61% vs. 40%). In general, no difference was seen between patients' willing to undergo further surgery by a Mohs versus plastic surgeon. However, among patients wanting surgery to have the scar appear nicer, the majority tended not to prefer further surgery if there could be a greater infection risk (29% vs. 71%). Secondary endpoint analysis showed positive associations between patients "most" concerned about scars:excellent/very good health or history of scars ($p<0.05\%$).

Design: The prospective study was approved by the institutional review board. Patients who were informed of their tumor-free Mohs defect status, but who did not yet discuss the repair options with the Mohs surgeon, were selected to complete an anonymous survey. Our primary endpoint was to determine outcomes that were of most or least concern to patients: scar appearance, infection, pain, bruising, function preservation, wound care, time for reconstructive surgery, or tumor recurrence. Secondary endpoints (age, sex, location, health status, life stress or history of skin cancer, scarring or bruising from surgeries) were examined.

Conclusion: These results suggest important knowledge gaps regarding patients' concerns and should serve as a basis for further study and patient education regarding the safety and efficacy of Mohs surgery.

April 30, 11:42 - 11:49 AM

Presenter: Kevin Christensen, MD

Title: A Retrospective Review of Skin Biopsies with Discordant Frozen and Permanent Section Diagnoses

Authors: *Kevin Christensen, MD[1]; Oluwakemi Onajin, MD[1]; David Wetter, MD[1]; Nneka Comfere, MD[1]; Randall Roenigk, MD[1]*

Institutions: *1. Mayo Clinic, Rochester, MN*

Purpose: Frozen section (FS) biopsies are often implemented by dermatologic surgeons for rapid diagnosis of non-pigmented skin lesions. Previous studies have demonstrated a high concordance rate between FS diagnosis and permanent section (PS) diagnosis from biopsy samples, with rates approaching 90%. It has been hypothesized that the majority of discordant diagnoses are due to sampling error when the biopsy specimen is divided for separate processing. The purpose of this study is to review a consecutive series of skin biopsies with discordant FS and PS diagnoses to identify reasons for the discordance.

Summary: Of the 300 consecutive skin biopsies, 50 had discrepant diagnoses. 12 cases were excluded because the FS diagnosis was "await permanent section". The remaining 38 cases had definitive diagnoses on FS. Three of these cases were excluded for the following reasons: one case did not have slides available for review; one case was determined to not be discrepant; and one case did not have a permanent section sample. Excluding these cases, an overall concordance rate of 87.7% (250/285) was noted. Of the 35 discordant cases, 12 (34.3%) were deemed sampling errors as the tumor was clearly seen on one section but not the other. Of the remaining 23 cases, the limitations of frozen sections including freeze artifact causing significant nuclear pleomorphism, epidermal pallor, keratinocyte vacuolization, and epidermal folding contributed to the discordant diagnoses (Table 1, Figures 1a, 1b). Additionally, abnormal staining of superficial hair follicles and superficial inflammation contributed to misdiagnoses.

Design: A retrospective chart review was performed of 300 consecutive cases from our institution in which non-pigmented lesions were biopsied and examined using FS and PS. For each case, a board-certified dermatopathologist had rendered a final diagnosis independently for the FS and PS. Discordance was defined as a difference in diagnosis between FS and PS. Differences in qualifying details (for example superficial vs nodular) were not considered discordant. For all discordant cases, the original slides were reviewed by a board-certified dermatopathologist and possible reasons contributing to the discordant cases were recorded.

Conclusion: Overall there is a very high concordance between FS and PS diagnosis of non-pigmented skin biopsies in our practice. While sampling error does account for a significant portion of discrepant cases, the technical limitations of frozen section processing contribute to diagnostic error as well. Occasional overtreatment of benign lesions may occur if management decisions are made solely on frozen sections.

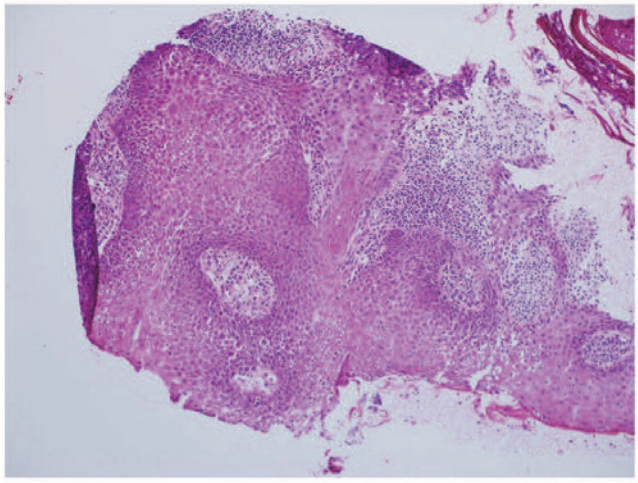


Figure 1a. Frozen section interpreted as squamous cell carcinoma (10x magnification).

Number of Cases	PS diagnosis	FS diagnosis	Comment
5	AK	SCC	Freeze artifact led to increased pleomorphism, vacuolization, and pale staining of keratinocytes; superficial pale staining hair follicles mimicked invasion
4	No tumor	BCC	Multiple small hair follicles and superficial inflammation mimicked BCC
4	Benign Keratosis	SCC	Freeze artifact led to increased pleomorphism, vacuolization, and pale staining of keratinocytes
4	Benign tumor	AK	Sebaceous adenoma, dermatofibroma, cicatrix, and dermal nevus were misinterpreted on FS
3	SCCIS	AK	Epidermal folding obscured full thickness atypia
1	SCC	BCC	Basaloid staining of SCC
1	BCC	SCC	Pale staining of BCC
1	BCC	Inflamed AK	Small BCC nests were obscured by dense inflammation

Table 1. Discrepant cases excluding cases of sampling error. FS frozen section; PS permanent section; BCC basal cell carcinoma; SCC squamous cell carcinoma; SCCIS squamous cell carcinoma in situ; AK actinic keratosis.

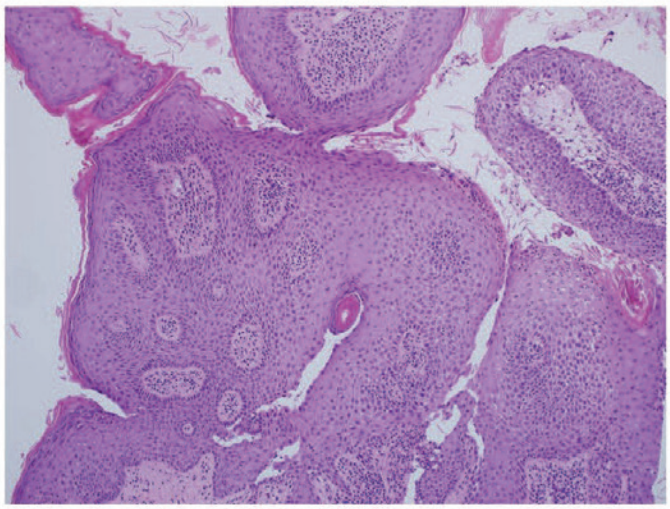


Figure 1b. Corresponding permanent section demonstrating an inflamed verrucal keratosis (10x magnification).

Design: This study employs US government administrative data including the Centers for Medicare and Medicaid Services Fee-for-Service Physicians Claims databases to calculate totals of skin cancer procedures performed for Medicare beneficiaries from 2006 to 2012 and related parameters. The population-based National Ambulatory Medical Care Survey database was used to estimate keratinocyte carcinoma related office visits. We combined these to estimate totals of new skin cancer diagnoses and affected individuals in the overall US population.

Conclusion: This study is the most complete nationwide estimate of the incidence of keratinocyte carcinoma and provides evidence of continued increases in skin cancer diagnoses and affected patients in the United States. This study also demonstrates equal incidence rates for basal cell carcinoma and squamous cell carcinoma in the Medicare population.

April 30, 11:49 - 11:56 AM

Presenter: Howard Rogers, MD, PhD

Title: Incidence Estimate of Keratinocyte Carcinoma in the United States Population, 2012

Authors: *Howard Rogers, MD, PhD[1]; Martin Weinstock, MD, PhD[2]; Steven Feldman, MD, PhD[3]; Brett Coldiron, MD[4]*

Institutions: *1. Advanced Dermatology, Norwich, CT*
2. Brown University, Providence, RI
3. Wake Forest University, Winston-Salem, NC
4. The Skin Cancer Center, Cincinnati, OH

Purpose: To estimate the incidence of keratinocyte carcinoma in the United States population in 2012 and the incidence of basal and squamous cell carcinoma in the Medicare Fee for Service population.

Summary: The total number of procedures for skin cancer in the Medicare fee-for-service population increased by 13% from 2,048,517 in 2006 to 2,321,058 in 2012. The age-adjusted skin cancer procedure rate per year per 100,000 beneficiaries increased from 6,075 in 2006 to 7,320 in 2012. The number of procedures in Medicare beneficiaries specific for keratinocyte carcinoma increased by 14% from 1,918,340 in 2006 to 2,191,100 in 2012. The number of persons with at least one procedure for keratinocyte carcinoma increased by 14% (1,177,618 to 1,336,800) from 2006 to 2012. In the 2012 Medicare fee for service population, the age adjusted procedure rate for basal cell carcinoma and squamous cell carcinoma were 3280 and 3278 per 100,000 beneficiaries respectively. The ratio of basal cell carcinoma to squamous cell carcinoma treated in Medicare beneficiaries was 1.0. We estimate the total number of keratinocyte carcinomas in the U.S. population in 2012 at 5,434,193, and the total number of persons in the U.S. treated for keratinocyte carcinoma at 3,315,554.

May 2, 3:15 - 3:22 PM

Presenter: Ashlynne Clark, MD

Title: The Mallet Finger and Nail Surgery: Pearls for the Mohs Surgeon

Authors: *Ashlynne Clark, MD[1]; Julia Katarincic, MD[2]; Susan Sweeney, MD[1,3]; Alyssa Findley, MD[1]; Nathaniel Jellinek, MD[1,3]*

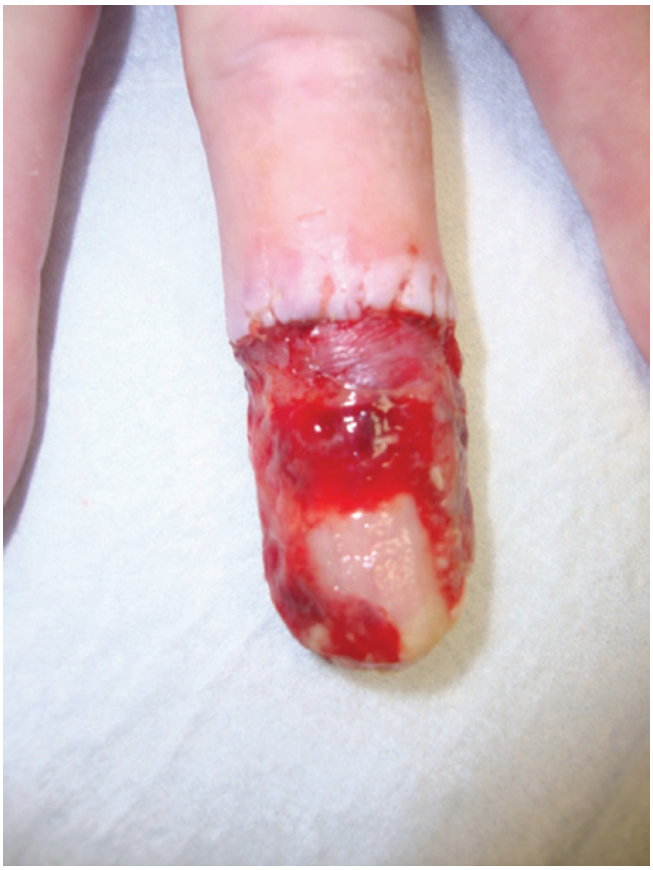
Institutions: *1. Dermatology Professionals, Inc, East Greenwich, RI*
2. Brown University, Providence, RI
3. University of Massachusetts Medical School, Division of Dermatology, Worcester, MA

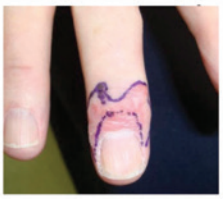
Purpose: Dermatologic surgeons operate with regularity in and around the nail apparatus, over the distal interphalangeal joint, in the path of the lateral bands of the extensor tendon and its insertion into the distal phalanx. During surgery or due to complications after surgery, patients may develop loss of continuity of the extensor tendon over the distal interphalangeal joint and develop a mallet finger. The literature regarding the anatomic basis of this condition, and the treatments applied to it, are missing in the dermatologic and dermatologic surgery literature. This study will present a case and review of this literature, and make recommendations to prevent and treat this complication.

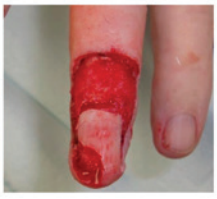
Summary: The patient had Mohs surgery for a nail fold squamous cell carcinoma, cleared with five stages, leaving a large ungual/periungual defect, involving the proximal matrix, proximal and lateral nail folds, and minimally, the tip and nail bed skin distally. This was partially repaired with a full thickness skin graft. One week postoperatively he was healing well and retained normal function of his finger. At three week follow-up, however, he had developed a Mallet finger, with loss of continuity of the extensor tendon. After consultation with and evaluation by hand surgery, he was treated with splinting. By two months postoperatively, he had regained extensor function of the digit. No further therapy was required for the tendon injury.

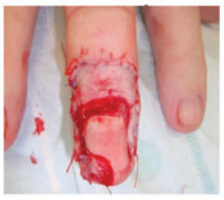
Design: This case illustrates the potential complication when operating around the extensor tendon. A detailed literature review was performed and recommendations for conservative management (splinting) and surgical options are presented.

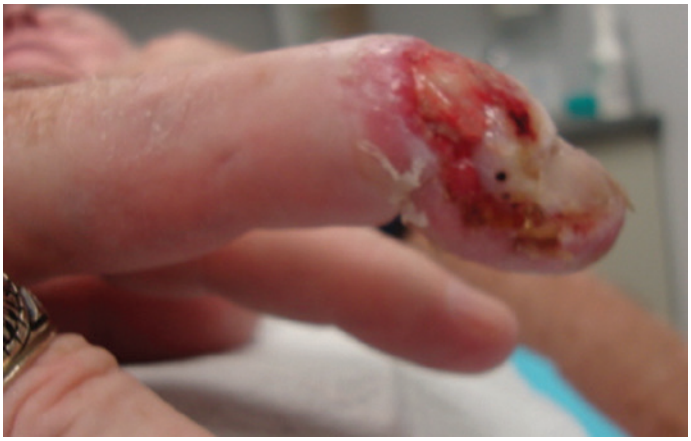
Conclusion: Extensor tendon injuries (and mallet fingers) are unusual complications for the dermatologist and Mohs surgeon. Nevertheless, as this case and review demonstrates, they can occur whenever surgery is performed in/around the base of the distal phalanx and DIPJ. While it is acknowledged that splinting is the treatment of choice for both acute and chronic mallet fingers, it seems prudent to apply these principles in a prophylactic fashion in select circumstances– splinting after surgeries where the tendon may be vulnerable, partially injured, or where patients are likely to use the digit without appropriate restrictions after surgery. Splinting is in particular recommended in surgical sites with areas left to granulate, in the setting of any skin breakdown during recovery, or with any loss of extensor function intra- or postoperatively. Coordination with hand surgery and prophylactic K-wire placement across the distal interphalangeal joint may be indicated if a significant amount of extensor tendon is excised and/or damaged.











May 2, 3:22 - 3:29 PM

Presenter: Amanda Lloyd, MD

Title: Conservative Treatment of Osteoradionecrosis of the Cranium after Treatment of Cutaneous Malignancy with Mohs Surgery and Postoperative Radiation

Authors: *Amanda Lloyd, MD[1]; Michael Graves, MD[1]; Hugh Greenway, MD[1]*

Institution: 1. *Scripps Clinic, La Jolla, CA*

Purpose: Osteoradionecrosis is a well-known late side effect of radiation with an increasing incidence as patients are surviving much longer; however, there are very few reports on osteoradionecrosis of the cranium. It is defined as exposed irradiated bone that fails to heal over a three month period and can occur anywhere from 2 months to 40 years post-radiation. After tissue is radiated, it becomes hypoxic, hypovascular and hypocellular which results in tissue break down as the metabolic demands cannot be met and cell death and collagen lysis exceeds collagen synthesis and cellular replication. The most common location for osteoradionecrosis is the jaw but it can occur in any bony area that is irradiated.

Summary: We report three cases of osteonecrosis of the cranium that have been treated successfully with local wound care and occasional antibiotics for nine or more years post-radiation (Figures 1-3). In all cases, the osteoradionecrosis occurred three or more years after treatment of a cutaneous malignancy with Mohs surgery and postoperative. Each patient underwent a multispecialty evaluation and declined definitive surgical reconstruction and hyperbaric oxygen therapy. Therefore, they were all treated with local wound care which consisted of daily washing with soap and water and application of petrolatum ointment. Additionally, each patient was seen in follow up at least every three months, at each visit the loose necrotic bone chips would be gently removed and wound culture was performed. The wound cultures were occasionally positive, for patient one with methicillin resistant staphylococcus aureus and pseudomonas, for patient two with methicillin sensitive staphylococcus aureus and for patient three with pseudomonas. If the cultures were moderate to high in growth, the patient would be treated according to the culture sensitivities with oral antibiotics and topical gentamicin 0.3% solution twice daily until repeat culture showed mild to rare bacterial growth.

Design: Clinical pearl

Conclusion: Treatment of osteoradionecrosis includes hyperbaric oxygen, surgical reconstruction using free flaps, and skin grafts and more recently tissue engineered skin substitutes. The one randomized controlled clinical trial showed no benefit from hyperbaric oxygenation, though there are reports of its help with wound healing as adjuvant therapy. Surgical reconstruction is difficult as the radiated tissue is fragile, heals poorly and many patients are elderly and do not wish to undergo or cannot medically tolerate a major operation. Tissue engineered skin substitutes have shown some benefit in wound healing. Though the risk of osteomyelitis, cranial abscess and meningitis is present and can possibly lead to patient death; frequent patient follow up with good local wound care, gentile debridement of necrotic bone, culturing of the wound and treating with oral antibiotics and topical gentamicin 0.3% solution when indicated can be considered as conservative therapy in patients that are not surgical candidates.

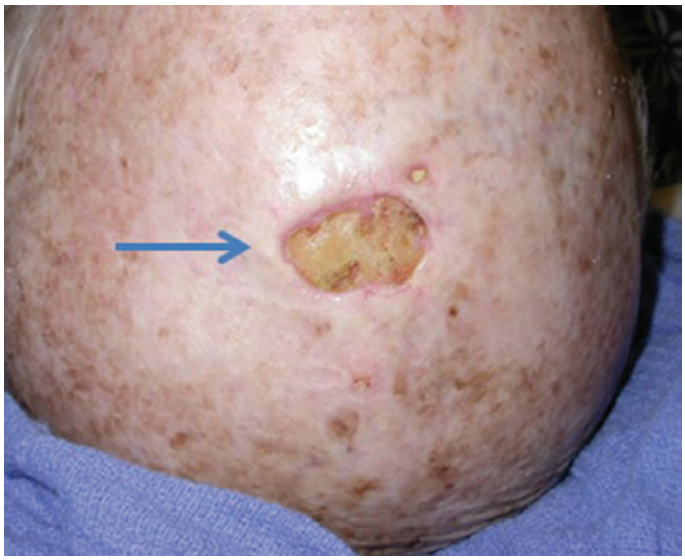


Figure 1: Patient one, ten years post-radiation.

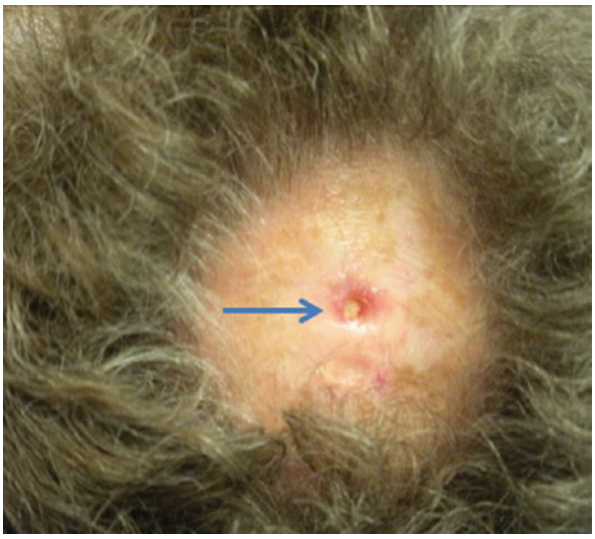


Figure 2: Patient two, eleven years post-radiation.

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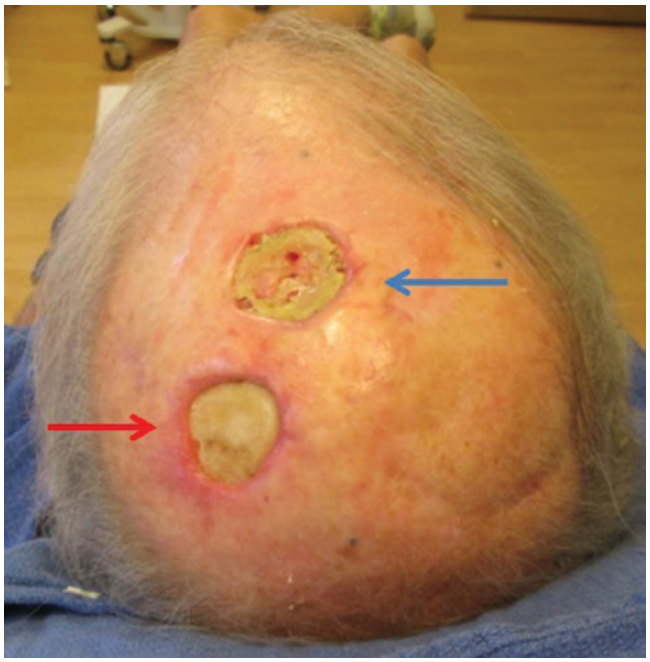


May 2, 3:29 - 3:36 PM

Presenter: Kristin Bibee, MD, PhD

Title: Successful Application of Hinge Flaps in Management and Prevention of Painful Chondritis Associated With Exposed Bare Cartilage, a Case Series

Authors: *Kristin Bibee, MD, PhD[1]; Hakeem Sam, MD PhD[1]*

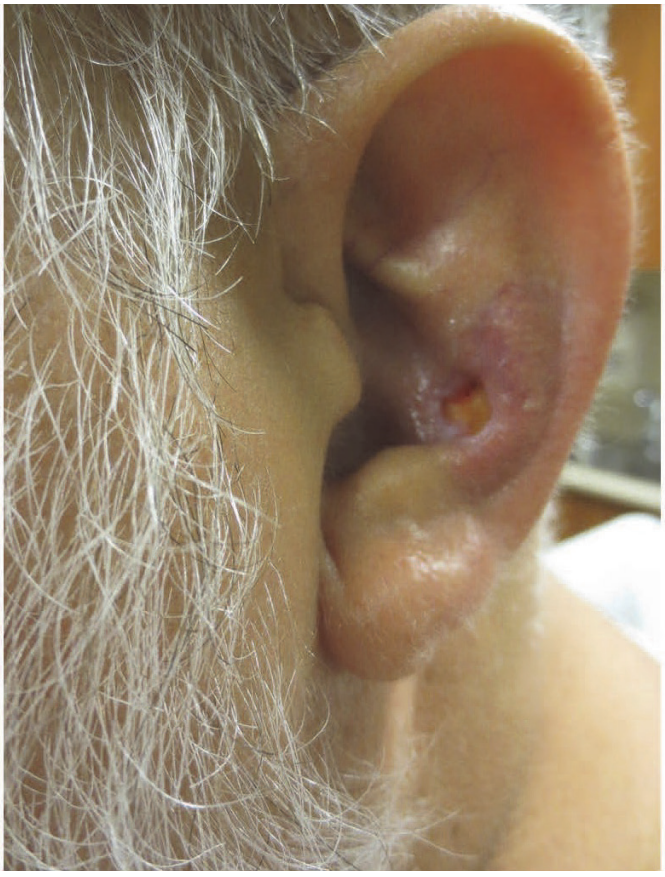
Institutions: *1. University of Pittsburgh Medical Center, Pittsburgh, PA*

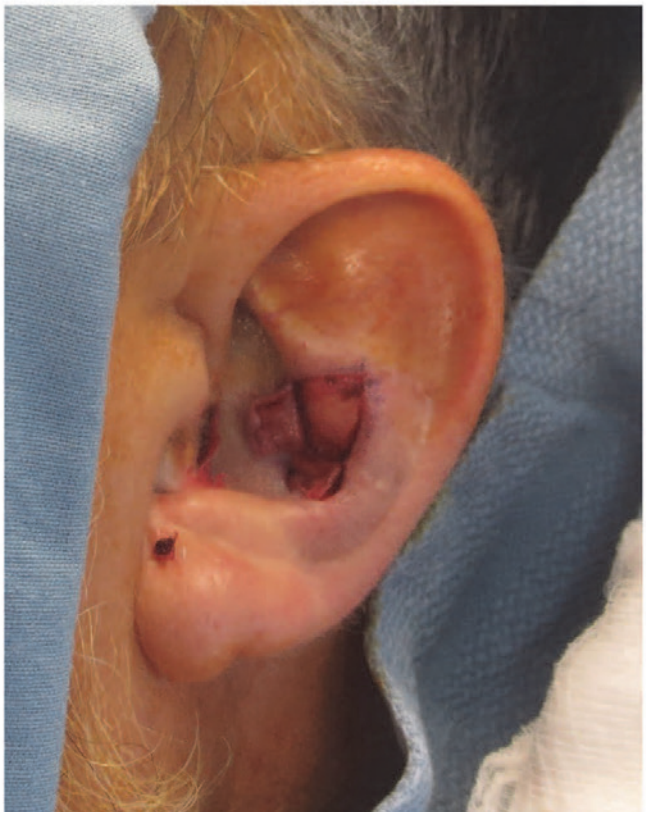
Purpose: Mohs defects of the ear with bare cartilage devoid of perichondrium may present unique management challenges to patient and surgeon alike. Left to heal by second intention, such defects may lead to slow granulating or non-healing wounds with significant patient morbidity due to cartilage desiccation and painful chondritis. A skin graft may be undesirable because of absent blood supply to the wound base from missing perichondrium. Flaps may be more favorable, yet tightly adherent skin on many sub anatomic locations of the ear limits the use of sliding flaps. We present our experience with the use of adjacent hinge flaps in managing these Mohs defects.

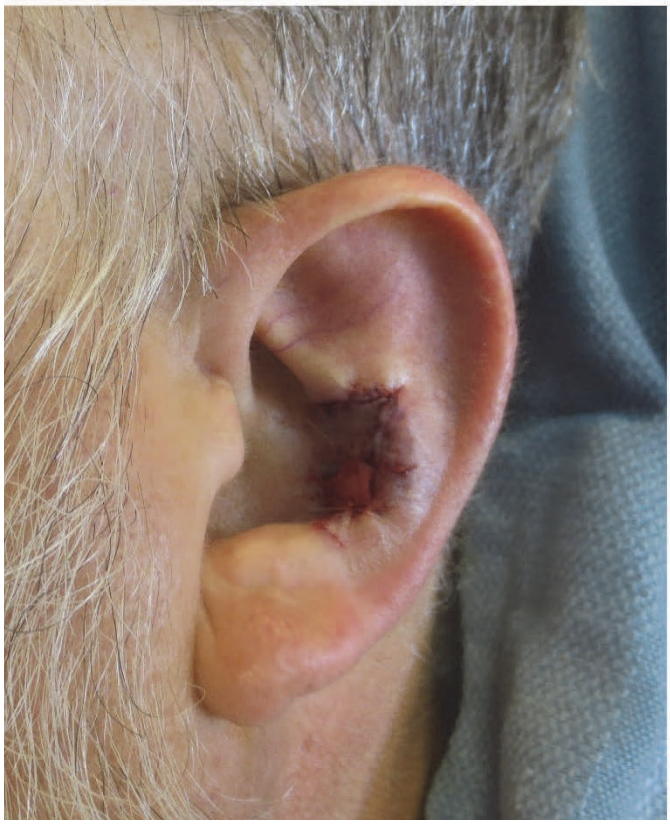
Summary: An adjacent hinge flap was used in one patient to treat post surgical painful chondritis and subsequently in five patients to prevent painful chondritis and cartilage desiccation.

Design: The lead case was that of a 67 year-old white man who presented with a SCCIS at least involving the conchal bowl. Mohs micrographic surgery was performed in 2 stages to obtain clear tumor margins. The final defect measured 1.4 cm by 1.3 cm but was deep and devoid of perichondrium. The wound was left to heal by second intention. Given the small size, a flip-flop island pedicle flap or skin graft was not considered to be necessary. Two months later, the patient complained of a painful non-healing defect (Figure1). An adjacent cutaneous flap was elevated, underneath of which a subcutaneous perichondrial hinge flap was elevated and folded over like a door hinge to cover the non-healing cartilage (Figure2). The cutaneous flap was then laid back down to cover the donor site (Figure3). Within a week post-operatively, the patient reported an immediate 60-80% reduction in pain and no pain or additional sequelae several weeks post-procedure. Three months after the revision, the patient reported minimal pain when pressure was applied. Next, we applied the hinge flap prophylactically to 5 other patients with Mohs defects of the ear with bare cartilage, ranging in size from 0.4cm x 0.4cm to 2.5cm x 2.7cm and distinct sub anatomic regions of the ear including helix, postauricular and tragus. All patients healed well without any painful chondritis or poorly healing wounds.

Conclusion: Adjacent hinge flaps are an option to prevent painful chondritis and cartilage desiccation after Mohs micrographic surgery of the ear requiring perichondrium removal.







May 2, 3:36 - 3:43 PM

Presenter: Kerri Robbins, MD

Title: A Review of Common Post-Operative Dressings and Tips for Challenging Anatomical Sites

Authors: *Connie Wang, MD[1]; Kerri Robbins, MD[1]; Mohsin Mir, MD[1]; Ida Orengo, MD[1]*

Institutions: *1. Baylor College of Medicine, Houston, TX*

Purpose: Proper post-operative dressings are an essential part of dermatologic surgery. Dressings serve as a barrier for the wound, decrease pain, absorb drainage, increase hemostasis and provide a moist environment to accelerate wound healing. The dressing should also be comfortable and aesthetically pleasing when possible. There are numerous types of products available, each with its own advantages and disadvantages. With an abundance of choices yet no clear guidelines for usage, selecting a dressing can be perplexing.

Summary: With a focus on acute wounds, we review commonly used dressings and adhesive agents in dermatologic surgery including select non-adherent fabrics (Xeroform, Telfa, Mepitel, Adaptic, gauze), occlusive dressings including films (Tegaderm), hydrocolloids (Duoderm), hydrogels, alginates and foams, tapes (silk, paper, silicone) and wraps (Coban, Unna boot). For sutured wounds a traditional three-layer dressing with a non-adherent contact layer, an absorptive layer and a securing layer is appropriate. Some studies show superiority of hydrocolloids over impregnated gauze for incisional healing while others do not. Mepitel proves to be useful as an atraumatic contact layer in split-skin graft sites, incision wounds, nail beds, and aging skin. In general, occlusive dressings seem to have greater utility in donor site and secondary intention healing although the data is varied. Foam seems to be superior to gauze with respect to pain and patient satisfaction. However Xeroform and Telfa are both widely used and effective in donor site healing. Tapes should also be carefully selected based on patient characteristics and wound type. Long term paper tape is equally as effective as silicone gel sheets in prevention hypertrophic scarring. Wraps are particularly beneficial for wounds on the extremities. In addition to finding the optimal dressing for a post-surgical wound, applying proper dressing to areas with complex anatomy such as the ear, nose and hand, or hair-bearing areas such as the scalp, may be challenging. Compressive head bandages after ear surgery lead to a higher incidence of bruising and erythema of the pinna with no benefit in prevention of hematoma or infection compared to bandages without compression. There are several proposed methods of a light-weight dressing after auricular surgery in surgical literature such as the “pocket sandwich” and “trapdoor” methods. Tie-over methods or tying the hair surrounding a wound to maintain pressure can be employed for dressings of the scalp. Mepitel, tubular dressings, and various splints can be used in bandaging the finger. We review several methods of bandaging for difficult regions frequently encountered by the dermatologic surgeon.

Continued on page 24

Conclusion: Choosing the ideal dressing and properly securing the bandage can be challenging but is an essential part of cutaneous surgery and helps to ensure proper healing and minimize complications.

May 2, 3:43 - 3:50 PM

Presenter: Jason DuPont, MD

Title: Drawing App in Mohs Fellowship Training: a Useful Tool in Learning Surgical Reconstruction

Authors: *Jason DuPont, MD[1]; Duane Whitaker, MD[1]; Nathalie Zeitouni, MD[1]*

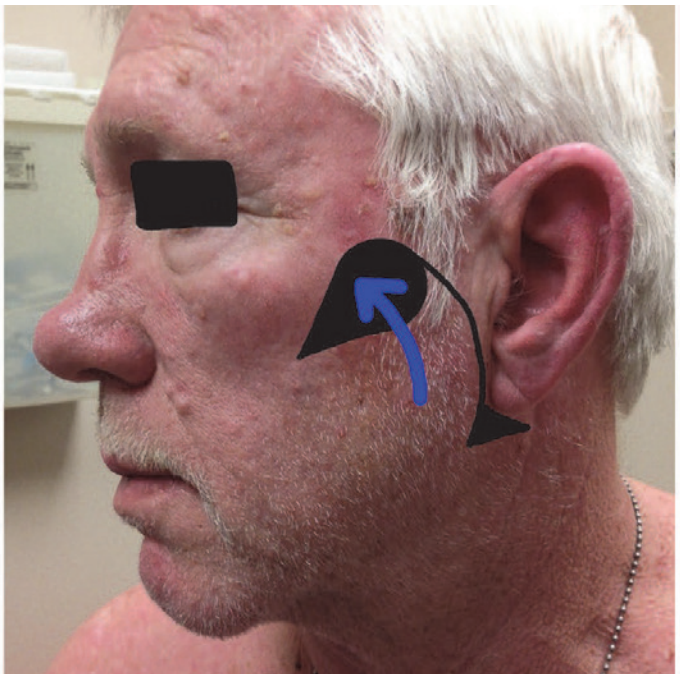
Institution: 1. *University of Arizona, Tucson, AZ*

Purpose: Choosing the right repair for a given surgical defect and properly executing its design is one of the more challenging skills acquired in fellowship. This process often requires considerable time and thought for the beginning reconstructive surgeon and can feel awkward and rushed when contemplated directly in front of the patient. We have found an iPad drawing app to be an effective teaching tool in this context in that it allows the surgeon the opportunity to draw out various reconstructive options and more easily conceptualize flap movement, tension vectors, and effect on free margins for any given design. It is especially useful when considering large complex defects involving more than one cosmetic unit or those in areas with aesthetic or functional importance.

Summary: Several sample cases demonstrating the utility of the app in the reconstruction of post-Mohs surgical defects will be shown.

Design: In our program we use an iPad2 to photograph Mohs cases. The high-quality 8 megapixel photos and large screen of the iPad provide the opportunity to study a surgical defect in more detail and with more time than what might be reasonable at the patient's table. With the app a photo can quickly be cropped, rotated, and zoomed as needed. Then, using a stylus, the surgeon can experiment with various repair options that might be appropriate for a given defect by drawing over the photo. This method allows our residents and fellow ample time and opportunity to experiment with different reconstructive designs and consider the pros and cons of each approach as they proceed through a logical progression of options including granulation, primary closure, flaps and grafts. This process creates a valuable teaching opportunity as they then review their sketches with the attending Mohs surgeon who ultimately assists in rendering a blueprint of the final closure. In this manner when we return to our patient we already have a good idea of which type of repair will be used and precisely how it will be drawn out. In most cases we have found that the repair as envisioned two-dimensionally via the app closely approximates the final three-dimensional closure drawn out in vivo with the skin marker. Besides being a valuable educational activity this method minimizes the fumbling and indecision that can accompany this process when deliberating over a repair in the presence of the patient.

Conclusion: A drawing app is a simple, inexpensive and useful tool in the education of residents and fellows with regard to surgical reconstruction. For large or complex defects even the experienced surgeon may find it helpful in planning a difficult repair.



May 2, 3:50 - 3:57 PM

Presenter: Kenny Omlin, MD

Title: Animation as a Powerful Tool to Advance the Field of Mohs Surgery

Authors: *Jayne Joo, MD[1]; Faranak Kamangar, MD[1]; Kenny Omlin, MD[1]*

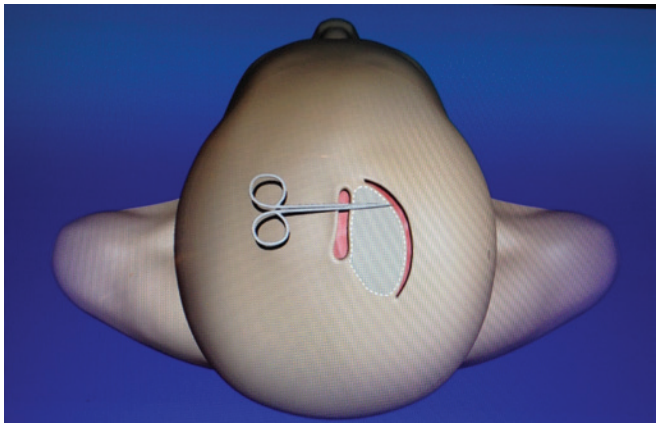
Institutions: *1. University of California, Davis, Davis, CA*

Purpose: The evolving healthcare environment poses many challenges for Mohs surgeons. The use of animation as a multimedia tool offers extraordinary utility to the practice of Mohs surgery at many levels. Resident and Fellow education, patient information videos and general public outreach are the main focus of the application. The purpose of this presentation is to demonstrate the usefulness of animation in the field of Mohs surgery to meet the challenges of an ever-changing health-care environment.

Summary: Over three years of experience has demonstrated that the addition of animation is an extremely useful tool for many aspects of a Mohs surgery practice.

Design: Several examples of the utility of animation in the field of Mohs surgery are presented. For teaching purposes, animation is used to teach basic surgical technique as well as complex reconstructions [Figure 1]. Examples of animation used in patient education are presented, highlighting critical operative steps as well as postoperative changes. Early detection and other public service messages utilizing animation are also presented.

Conclusion: The application of animation is a powerful tool for many aspects of the field of Mohs surgery. A competitive healthcare environment demands cutting edge multimedia to train Residents and Fellows, education patients and promote awareness of the skill and expertise of fellowship trained Mohs surgeons. We believe the incorporation of animation plays a valuable role at many levels in the future of Mohs surgery.



May 2, 3:57 - 4:04 PM

Presenter: Ryan Rogers, MD

Title: A Novel Intralesional Injection Technique of Keloids with an N-Tralig Periodontal Ligament Injector

Authors: *Ryan Rogers, MD[1]; David Kent, MD[1,2]*

Institutions: *1. Dermatologic Surgery Specialists, PC, Macon, GA*
2. Mercer Medical School, Macon, GA

Purpose: The management and treatment of keloids in clinical practice presents unique challenges to the practicing clinician. The mainstay of treatment for keloid management includes intralesional Kenalog injection (ILK). Historically, placement of adequate quantities of ILK has been challenging due to the density of some keloids. Various instruments for injection of ILK have been used and with mixed results. Keloids are composed of dense collections of type 3 collagen making placement of ILK difficult and often suboptimal with existing injection technique. We describe a novel injection technique utilizing an N-Tralig intraligmental dental syringe to deliver intralesional Kenalog allowing for improved placement of adequate volumes of ILK. The N-Tralig Intraligmental syringe is designed to deliver precise amounts of anesthetic within very dense dental ligaments prior to dental procedures. This presentation will illustrate all aspects of use including technical assembly of instrument, injection technique, as well as potential pitfalls of use and how to avoid them. Actual cases will be presented. We have used this device as part of successful management of keloids in our practice for over two decades. This is the first report of using this device for keloid injections in the dermatologic literature.

May 2, 4:04 - 4:11 PM

Presenter: Garrett Lowe, MD

Mohs Fellow in Training Slide Case Competition Winner

Authors: *Kevin Gardner, MD[1]; Garrett Lowe, MD[1]*

Institutions: 1. Mayo Clinic, Rochester, MN

Clinical Interest: To describe a case of tumor induced osteomalacia secondary to PMTMCT mimicking dermatofibrosarcoma protuberans treated successfully with Mohs micrographic surgery.

Clinical History: A 40-year old male presented with a 4-year history of progressive pain in his legs, lower back and ribs. The patient denied any family history of the heritable forms of osteomalacia. Laboratory tests revealed elevated total alkaline phosphatase, low phosphorous, and elevated fibroblast growth factor 23 (FGF 23). Imaging studies demonstrated multiple stress fractures involving the ribs and pelvis and a bone density scan with a Z-score in the osteoporosis range. An F-18 fluorodeoxyglucose positron emission tomography with computed tomography (FDG-PET/CT) test was unremarkable. A clinical diagnosis of acquired hypophosphatemic osteomalacia was rendered by his endocrinologist and he was referred to Dermatology for a 2.0 x 1.7 cm subcutaneous nodule on the left shoulder. An excision biopsy was performed and submitted with a clinical impression of an epidermal cyst. On scanning microscopy, the lesion demonstrated a predominantly dermal-based tumor invading into the subcutis. The tumor was composed of a dense population of spindle-shaped cells with dark but uniform nuclei arranged in a "honeycomb" growth pattern with the subcutaneous tissue, reminiscent of that seen in dermatofibrosarcoma protuberans. Frequent small deposits of acellular, partially calcified basophilic matrix and scattered osteoclast-type multinucleated giant cells were also identified. The lesional cells were strongly CD34-positive. Reverse-transcriptase polymerase chain reaction (RT-PCR) confirmed FG23 expression. Together, these features supported a diagnosis of a phosphaturic mesenchymal tumor, mixed connective tissue variant (PMTMCT). Given the infiltrating pattern of growth, anatomic location, and desire for combined tissue sparing and histologic margin control, Mohs micrographic surgery was recommended. On the day of the surgery, the patient ambulated to the surgical suite with the use of a cane due to his profound weakness and pain. The tumor was readily identifiable on frozen sections and a tumor-free plane extending into the superficial aspect of the trapezius muscle was obtained after three stages of Mohs surgery. The surgical defect measured 8.0 x 7.0 centimeters and was closed in a linear fashion. At a two-week follow-up for suture removal, the patient was able to ambulate without a cane and his pain was significantly improved. At a five-month follow-up, the patient's laboratory values were within normal limits, his bone scan was significantly improved, and his functional status was essentially normal.

Poster Presentation List

Posters will be displayed outside the Exhibit Hall from 11:00 am Thursday, April 30 through 2:00 pm Saturday, May 2.

Authors have been requested to stand by their poster to answer any questions during the following timeframes:

Even Number Posters (2 – 42):
Thursday, April 30 from 12:00 – 1:00 pm

Odd Number Posters (1 – 41):
Saturday, May 2 from 12:00 – 1:00 pm

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Comparison of SOX10 and Melan-A/MART-1 Immunostaining of Lentigo Maligna Treated with Mohs Micrographic Surgery

Hatem Hassanein, MS3[1]; Samer Al-Quran, MD[2]; Ashraf Hassanein, MD, PhD, FACMS[3]
1. University of South Florida, Tampa, FL
2. University of Florida College of Medicine, Gainesville, FL
3. Florida Dermatologic Surgery and Aesthetics Institute, The Villages, FL

2

The Annual Cost of Dermatologic Care for Solid Organ Transplant Recipients

Molly Moye, MD[1]; Nkanyezi Ferguson, MD[1]; Hillary Johnson-Jahangir, M.D., PhD[1]; Marta VanBeek, MD, MPH[1]
1. University of Iowa Hospitals & Clinics, Iowa City, IA

3

A Randomized Controlled Trial Comparing Preemptive Versus On-Demand Administration of Analgesics after Mohs Surgery and Cutaneous Reconstruction

Lauren Crow, MD/MPH Candidate 2016[1]; David Brodland, MD[2]
1. University of Arizona, Phoenix, AZ
2. Zitelli & Brodland PC, Clairton, PA

4

A Retrospective Study of Nail Squamous Cell Carcinoma at Two Institutions

Ashlynne Clark, MD[1]; Nikki Tang, MD[2]; Amanda Robinson, MD[3]; Mary Maloney, MD[3]; Nathaniel Jellinek, MD[1,4]
1. Dermatology Professionals, Inc., East Greenwich, RI
2. Mount Sinai Medical Center, New York, NY
3. University of Massachusetts, Worcester, MA
4. University of Massachusetts Medical School, Division of Dermatology, Worcester, MA

5

Patient Satisfaction by Treatment Modalities for Epidermal Superficial Non-Melanoma Skin Cancer

Benjamin Drew, BS[1]; Pritesh Karia, MPH[1]; Ariana Mora, BS Candidate[1]; Christine Liang, MD[1]; Chrysalyne Schmults, MD, MSCE[1]
1. Brigham & Women's Faulkner Hospital, Jamaica Plain, MA

6

Attesting for a Test: Our Procedures for Quality Assurance and Documentation of Immunohistochemistry Tests in a Mohs Lab

Carrie Kinas, BS[1]; Bryan T. Carroll, MD, PhD[1]
1. Eastern Virginia Medical School Dermatology, Norfolk, VA

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Treatment and Outcomes of Deep Penetrating Nevi

Benjamin Kelley, MD[1]; Christine Lohse, MS[1]; Christopher Arpey, MD[1]; Christian Baum, MD[1]; Clark Otley, MD[1]; Randall Roenigk, MD[1]; Carilyn Weiland, MD[1]; Jerry Brewer, MD[1]
1. Mayo Clinic, Rochester, MN

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Changing Trends of Keratinocyte Carcinoma Mortality Rates in the United States, 1999 through 2012

Wesley Wu, MD[1,2]; Ida Orengo, MD[2]; Martin Weinstock, MD, PhD[2]
1. Baylor College of Medicine, Houston, TX
2. Brown University, Providence, RI

9

The Effect of Viewing Mohs Micrographic Surgical Defect on Patient Perception and Satisfaction of Final Surgical Closure

Nkanyezi Ferguson, MD[1]; Margaret Moye, MD[1]; Nahid Vidal, MD[1]; Melissa Willis, MD[1]; Hillary Johnson-Jahangir, MD, PhD[1]; Marta VanBeek MD, MPH[1]
1. University of Iowa Hospitals & Clinics, Iowa City, IA

10

Squamoid Eccrine Ductal Carcinoma: A Case Report and Review

Sabrina Martin, M.D.[1]; Andrew Breithaupt, MD[1]; Vishad Nabili, M.D.[1]; Gary Lask, MD[1]
1. University of California, Los Angeles, Los Angeles, CA

Poster Presentation List

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Complete Ear Reconstruction with Two Interpolation Flaps and Anti-Helix Cartilage Graft

Irèn Kossintseva, MD, FRCPC, FAAD[1]
1. University of British Columbia, Vancouver, British Columbia

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A Potential Pitfall: Intravascular Basal Cell Carcinoma-Mimicker on Mohs Frozen Section

Min Deng, MD[1]; Adaobi Nwaneshiudu, MD PhD[1]; Duri Yun, MD[1]; Diana Bolotin, MD, PhD[1]; Vesna Petronic-Rosic, MD MSc[1]; Vivek Iyengar, MD[1]
1. University of Chicago, Chicago, IL

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Utility of the Quadrilobe Flap for Repairing Defects of the Nasal Tip

Suyin Ong, MBBChir, MRCP(UK), MSc[1]; Neil Mortimer, MBChB, MRCP(UK), FACMS[1]; Paul Salmon, MBChB, FRACP, FACMS[1]
1. Skin Cancer Institute, Tauranga, Bay of Plenty

14

Superior Cosmesis with Staples for Lower Leg Wound Closure After Mohs Micrographic Surgery

Annie R. Wang, MD[1]; Joanna L Walker, MD[1]; Antonio P. Cruz, MD[2]
1. Brown University, Providence, RI
2. Warren Alpert Medical School of Brown University, Department of Dermatology, Providence, RI

15

Whole-Exome Sequencing of an Aggressive Cutaneous Squamous Cell Carcinoma with In-Transit Metastases

Abigail Baird, MD[1]; Jonathan Levinsohn, B.A.[1]; David Leffell, MD[2]
1. Yale University, New Haven, CT
2. Yale University School of Medicine, New Haven, CT

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Squamous Cell Carcinoma with Perineural Invasion Mimicking Benign Perineurium: Highlighting the Role of Immunohistochemical Stains

Jane Yoo, MD, MPP[1]; Earl Glusac, MD[1]; David Leffell, MD[1]; Sean Christensen, MD, PhD[1]
1. Yale University, New Haven, CT

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Pemphigus Vegetans Mimicking Acantholytic Squamous Cell Carcinoma In Situ: A Potential Pitfall for Mohs Micrographic Surgery

Theresa Zaleski, DO[1]; Megan Morrison, DO[1]; Jenny Cotton, MD,PhD[1]; Kent Krach, MD[2]
1. St. Joseph Mercy Hospital, Ypsilanti, MI
2. St. Joseph Mercy Hospital, Clinton Township, MI

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High Frequency Electrosurgery for Partial Thickness Defects of the Distal Nose following Mohs Micrographic Surgery

Lara Butler, MD[1]; Suzanne Olbricht, MD[1]
1. Lahey Clinic/Harvard Medical School, Burlington, MA

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Aggressive Digital Papillary Carcinoma: A Wolf in Sheep's Clothing

Alyssa Findley, MD[1]; Nathaniel Jellinek, MD[1,2]; Nicole Velez, MD[1]; Ashlynne Clark, MD[1]
1. Dermatology Professionals, Inc., East Greenwich, RI
2. University of Massachusetts Medical School, Division of Dermatology, Worcester, MA

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Plaque-Type Syringomatous Proliferation Associated with an Infiltrating Basal Cell Carcinoma

Steven Peine, MD[1]
1. Geisinger Medical Center, Danville, PA

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Vismodegib Preceding Radiation Therapy May Be Associated with Exuberant Radiation Dermatitis

Michael Graves, MD[1]; Amanda Lloyd, MD[1]; Prabhakar Tripuraneni, MD[1]; Geva Mannor, MD[1]; Seaver Soon, MD[1]
1. Scripps Clinic, La Jolla, CA

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Surgical Repair of the Lower Extremity: Maximizing Healing and Minimizing Complications

Amanda Robinson, MD[1]; Dori Goldberg, MD[1]; Mary Maloney, MD[1]
1. University of Massachusetts, Worcester, MA

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Tumor Status at the Time of Excision of Squamous Cell Carcinoma In Situ (SCC-IS) in Immunocompetent and Immunosuppressed Patients

Eduardo Moioli, MD, PhD[1]; Diana Bolotin, MD, PhD[1]
1. University of Chicago, Chicago, IL

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Processing High Adipose Tissue Samples: A Comparative Study of Effectiveness of Pre-Treatment with Flash Freezing Spray or Liquid Nitrogen

Zachary Kozel, BS[1]; Cindy Krol, BS[1]; Jodi Speiser, MD[1]; Patricia Todd, MD[1]; Rebecca Tung, MD[1]
1. Loyola University, La Grange Park, IL

25

The Role of Teledermatology in the Diagnosis and Management of Non-Melanoma Skin Cancer

Maren Cotes, MD[1]; Carl Washington, MD[1,2]; Suephy Chen, MD[3]
1. Emory University School of Medicine, Atlanta, GA
2. Dermatology Associates of Georgia, Decatur, GA
3. Emory University, Department of Dermatology, Atlanta, GA

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Matrilin-2 Labeling Can be Used in Mohs Surgery to Distinguish Basal Cell Carcinoma from Benign Structures

Satori Iwamoto, MD, PhD[1]; Douglas Heiner, MD[1]; Fang Xiong, BA[1]; Ming Lu, MD[1]; Catherine Breen, MD, MPH[1]; Zhengke Wang, PhD[1]
1. Roger Williams Medical Center, Providence, RI

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Observation of Dog-Ear Regression by Anatomical Location

Thomas Jennings, MD, PhD[1]; Stephanie Walsh, MD[2]; James Keane, MD[3]; David Raimer, MD[4]; Vineet Mishra, MD[5]; Conway Huang, MD[1]
1. University of Alabama, Birmingham, Birmingham, AL
2. Private Practice, Northport, AL
3. Private Practice, Shreveport, LA
4. Private Practice, Galveston, TX
5. University of Texas, San Antonio, TX

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Long-Term Quality of Frozen Section Slides

David Weinstein, MD[1]; Brett Coldiron, MD[2]
1. The Good Samaritan Skin Cancer Center/TriHealth, Cincinnati, OH
2. The Skin Cancer Center, Cincinnati, OH

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Keratoacanthomas and Squamous Cell Carcinomas Treated by Mohs Micrographic Surgery: Anatomic Similarities But Invasive Differences

Patrick Mulvaney, BA[1]; Kachiu Lee, MD MPH[1]; Raymond G. Dufresne, MD[1]; Antonio Cruz, MD[1]; H. William Higgins, MD, MBE[1]
1. Warren Alpert Medical School of Brown University, Department of Dermatology, Providence, RI

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Rate of Surgical Site Infections with New Protocol of Prophylactic Antibiotic Use in Dermatologic Surgery

Jennifer Ranario, MD, MBA[1]; Ikue Shimizu, MD[2]
1. MD Anderson Cancer Center, Houston, TX
2. Texas Tech University Health Sciences Center, Lubbock, TX

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Superficial Liposarcoma: A Clinicohistopathologic Review of 13 Cases

Kevin Gardner, DO[1]; Daniel Winchester, MD[1]; Julia Lehman, MD[1]; Clark Otley, MD[1]
1. Mayo Clinic, Rochester, MN

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Trash Isn't Cheap: Cost of Inappropriate Disopsal of Regulated Medical Waste in an Academic Dermatologic Surgery Clinic

Sara Braswell, BS[1]; Brett Blake, MD[1]; Paul Hargarten, BS, BA[1]; Keith Zirkle, BS[1]; Algin Garrett, MD[1]
1. Virginia Commonwealth University, Richmond, VA

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The Use of RNs and Other Ancillary Staff in Mohs Micrographic Surgery: A Survey of Fellow Members of the ACMS.

Kaleena Noland, BSN OCN[1]; Mark Hyde, PA[1]; Glen Bowen, MD[1]; Stephanie Murphy, MA[1]; Brady Donaldson, EMT[1]
1. University of Utah Department of Dermatology, Salt Lake City, UT

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Utility of Gene Expression Profile (GEP) Signature for a Cohort of Patients with Head and Neck Melanoma

Brooke Middlebrook, BS[1]; Derek Maetzold, BS[1]; Robert Cook, PhD[1]
1. Castle Biosciences, Inc., Friendswood, TX

Poster Presentation List

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Non-Cultured Epidermal Suspension Transplantation as a Novel, Effective Treatment for Segmental Vitiligo: A Pilot Study

Lauren Rimoin, MD[1]; Sulochana Bhandarkar, MD[1]
1. Emory University School of Medicine, Atlanta, GA

36

Intralesional 5-Fluorouracil for the Treatment of Follicular Actinic Keratoses in the Setting of Patient Immunosuppression: A Case Series

Jessica Dietert, MD[1]; Hubert Chodkiewicz, MD[1]; Jennifer Ranario, MD, MBA[2]; Valencia Thomas, MD[2,3]
1. University of Texas, Houston, TX
2. MD Anderson Cancer Center, Houston, TX
3. University of Texas, Houston School of Medicine, Houston, TX

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A Case of Basal Cell Carcinoma with Vascular Invasion Treated with Postoperative Adjuvant Radiotherapy

Sean Mazloom, MD[1]; Douglas Grider, MD[1]; Rahul Chavan, MD, PhD[1]; Mariana Phillips, MD[1]
1. Virginia Tech-Carilion Clinic, Roanoke, VA

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A Large, Plaque-Like Variant of Atypical Fibroxanthoma

Ramin Fathi, MD[1]; Dominic Ricci, MD[1]; Theodore Alkousakis, MD[1]; Joshua Wisell, MD[1]; Mariah Brown, MD[1]
1. University of Colorado Health Center, Aurora, CO

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Vemurafenib Induced Multiple Keratoacanthomas Responsive to Intralesional 5-Fluorouracil: A Case Report and Review of the Literature

Megan Morrison, DO[1]; Pezhman Shoureshi, DO[1]; Kent Krach, MD[2]
1. St. Joseph Mercy Hospital, Ypsilanti, MI
2. St. Joseph Mercy Hospital, Clinton Township, MI

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Complications with Antiplatelet Agent Ticlopidine in Cutaneous Surgery

Timothy Chang, MD[1]; Christopher Arpey, MD[1]; Christian Baum, MD[1]; Jerry Brewer, MD[1]; Phillip Hochwalt, MD[1]; Thomas Hocker, MD[1]; Randall Roenigk, MD[1]; Clark Otley, MD[1]
1. Mayo Clinic, Rochester, MN

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Koebnerizing Squamous Cell Carcinoma

James Behan, MD[1]; Dominic Ricci, MD[2]; Joshua Wisell, MD[2]; Mariah Brown, MD[2]
1. University of Colorado, Aurora, CO
2. University of Colorado Health Center, Aurora, CO

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The Use of an Injectable Diphenhydramine Solution as the Local Anesthetic for Mohs Surgery

Eric Wilkerson, MD[1]; W. Love, DO[1]
1. Case Western Reserve University, Cleveland, OH

1

Presenter: Hatem Hassanein, MS3

Title: Comparison of SOX10 and Melan-A/MART-1 immunostaining of Lentigo Maligna treated with Mohs Micrographic Surgery

Authors: *Hatem Hassanein, MS3[1]; Samer Al-Quran, MD[2]; Ashraf Hassanein, MD, PhD, FACMS[3]*

Institutions: *1. University of South Florida, Tampa, FL 2. University of Florida College of Medicine, Gainesville, FL 3. Florida Dermatologic Surgery and Aesthetics Institute, The Villages, FL*

Purpose: Mohs Micrographic Surgery (MMS) is an effective treatment modality for Lentigo Maligna (LM), especially in cosmetically and functionally sensitive areas. However, interpretation of melanocytic lesions in frozen sections can be challenging. The low recurrence rate and tissue sparing benefits of MMS for LM requires accurate identification and interpretation of melanocytes in frozen sections. Melan-A/MART-1 (melanoma antigen recognized by T-cells 1 antigen) has been reported to be a useful cytoplasmic marker facilitating the identification of melanocytes in frozen sections of MMS for LM. The transcription factor SRY-related HMG-Box gene 10 (SOX10) plays an important role in neural crest, peripheral nervous system, and melanocyte development. It is expressed in 100% of melanocytic nevi and conventional melanomas, and in 97-100% of desmoplastic and spindle cell melanomas. To the best of our knowledge, the use of SOX10 for MMS for LM has not been studied. Most dermatopathology laboratories are now using SOX10 for melanocytic identification. The purpose of this study was to compare Melan-A (cytoplasmic) with SOX10 (nuclear) immunostaining and evaluate their specificity and sensitivity in identifying melanocytes in frozen sections of LM.

Summary: Concomitant evaluation of the Mohs regular H&E stained sections with Melan-A and SOX10 immunostains was performed in all 19 cases. Ten cases were cleared with only one stage, six cases needed 2 stages and three cases needed 3 stages to achieve a clear margin. Melan-A cytoplasmic staining clearly showed diffusion within the neighboring keratinocytes through melanocytic dendrites. This gave a false-positive result of melanocytic confluence in 8 cases (42%). SOX10 staining was limited only to melanocytic nuclei, negating against confluence in these areas.

Design: Nineteen patients (12 males and 7 females) with LM (face 15, ear 2, foot 1, leg 1) treated with MMS using both Melan-A and SOX10 immunostaining during the surgery. A one-hour immunostaining protocol was used in all cases. The H&E and immunostains were examined concomitantly. After achieving, clear margins with the MMS, all tissues were submitted for formalin-fixed, paraffin-embedded sections for comparison. All sections were reviewed by a board-certified dermatopathologist.

Conclusion: This prospective study shows that SOX10 immunostaining is highly specific and sensitive marker for melanocytic identification. SOX10 is more specific than Melan-A for melanocytic evaluation and could be used reliably as an adjunctive tool during MMS for LM.

2

Presenter: Molly Moye, MD

Title: The Annual Cost of Dermatologic Care for Solid Organ Transplant Recipients

Authors: *Molly Moye, MD[1]; Nkanyezi Ferguson, MD[1]; Hillary Johnson-Jahangir, MD, PhD[1]; Marta VanBeek, MD, MPH[1]*

Institutions: *1. University of Iowa Hospitals & Clinics, Iowa City, IA*

Purpose: Non-melanoma skin cancers (NMSC) in transplant patients occur at increased frequency and tend to have a more aggressive course than in the general population. As a result, dermatologic care for this population can be costly. Under the current fee-for-service model, dermatologists are compensated more for patients who require more frequent care. U.S. policymakers instead support a fixed, capitated payment model in which physicians are paid a lump sum for caring for a population of patients over a given time period. There is concern that in a capitated system, physicians may be unable to provide care to complicated and inherently expensive patients due to inadequate compensation, thereby limiting access to care for these high-risk populations. Consequently, it is imperative to have information on the cost of dermatologic care for SOTRs so dermatologists and regulatory agencies are aware of the large range of resources that these patients require.

Summary: In 2013, 185 patients with an average of 122 months since transplant had 406 outpatient dermatology encounters. The average study population age was 57 (± 14.4, range 10 – 84), and the majority of patients were Caucasian (Table I). 90 squamous cell carcinomas and 25 basal cell carcinomas were diagnosed and treated with 42 Mohs micrographic surgeries and 25 excisions. 66 in situ non-melanoma skin cancers were diagnosed and were treated with destructive procedures or topical therapy. The average cost of dermatologic care was $1,149.49 (± $1,867.76, range $97.67 - $12,450.35). The cost of dermatologic care increased proportionally with age and months since transplant (Figures 1 and 2). Patients with a history of skin cancer prior to transplant cost an average of $3,908.09 (± $3564.32) and developed an average of 3.8 (± 3.1; range 0 – 9) skin cancers in 2013.

Design: The goal of this study was to determine the cost of dermatologic care in 2013 for the University of Iowa SOTR population. Secondary objectives include determining whether certain demographic and health characteristics influence the cost of dermatologic care. A retrospective chart review was performed from January 1, 2013 to December 31, 2013 where CPT codes were obtained from all outpatient

dermatology encounters including pathology-related charges. The cost of care was estimated using Medicare reimbursement rates for each CPT code in 2013, applying all applicable reductions, for in-facility physician and hospital reimbursement.

Conclusion: If physician reimbursement in the United States were to transition to a capitated system, reimbursement for the care of SOTRs must differ from that of the general population in order for this high-risk patient group to continue receiving optimal care. Certain variables, such as age, time since transplantation and possibly the organ transplanted must be included in determining appropriate reimbursement.

Table I. Demographic and transplant-related data of solid organ transplant patients seen in the outpatient dermatology clinic at the University of Iowa in 2013 (n=185)

Male sex, N (%)	125 (67.6%)
Female sex, N (%)	60 (32.4%
Race, N (%)	
Caucasian	176 (95.1%)
African American	6 (3.2%)
Hispanic	3 (1.6%)
Current Age, years	
Mean (SD)	57 (14.4)
Age at Time of Transplant, years	
Mean (SD)	46.8 (15.4)
Organ Transplanted, N (%)	
Kidney	56 (30.3%)
Heart	52 (28.1%)
Lung	29 (15.7%)
Liver	35 (18.9%)
Multiple	13 (7.0%)
Time since Transplant, months	
Mean (SD)	122 (92)
Immunosuppressants, N (%)	
Prednisone	93 (50.3%)
Tacrolimus	142 (76.8%)
Mycophenolate mofetil	102 (55.1%)
Azathioprine	10 (5.4%)
Cyclosporine	26 (14.1%)
Sirolimus or Everolimus	22 (11.9%)
Systemic Retinoid, N (%)	3 (1.6%)
Deceased, N (%)	13 (7.0%)
Dermatology Visits	
Mean (SD)	2.2 (2.1)
Range	1-15
Skin Cancers in 2013	
Mean (SD)	0.98 (2.1)
Range	0-11
BCCs, N	25
SCCs, N	90
SCCIS or superficial BCC, N	65
Skin Cancer Treatment	
Mohs micrographic surgery, N	42
Excision, N	25
Destruction, N	50

Figure 1. Time since transplant (months) versus the average cost of dermatologic care in 2013.

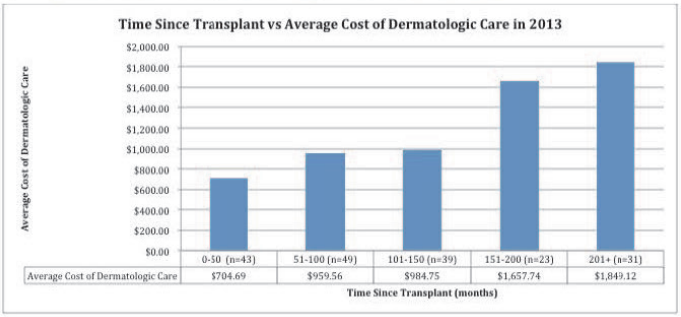
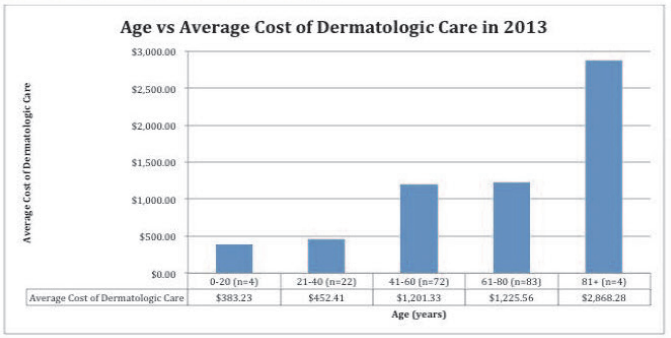


Figure 2. Age versus average cost of dermatologic care in 2013



3

Presenter: Lauren Crow, MD/MPH Candidate 2016

Title: A Randomized Controlled Trial Comparing Preemptive Versus On Demand Administration of Analgesics after Mohs Surgery and Cutaneous Reconstruction

Authors: *Lauren Crow, MD/MPH Candidate 2016[1]; David Brodland, MD[2]*

Institutions: *1. University of Arizona, Phoenix, AZ*
2. Zitelli & Brodland PC, Clairton, PA

Purpose: This study was designed to characterize the pain patients experience after Mohs surgery and reconstruction of the head and neck and to determine if preemptive dosing of analgesics was superior to patient-initiated dosing on an "as needed" basis.

Summary: Peak pain levels after surgery were surprisingly low and rated, on average, 2/10 using an analog pain scale. Peak pain occurred at four hours postoperatively for both subgroups and patients were satisfied with pain control 72.5% of the time. There was no significant difference in any of the parameters between the two dosing regimens.

Design: A randomized, controlled study of 200 subjects undergoing MMS and reconstruction of skin cancers on the head and neck were randomized to either receive acetaminophen at the time of discharge or to take it on an "as needed" basis. The two groups were evaluated for differences in peak pain levels, satisfaction with pain management and the need for narcotic analgesic "rescue" postoperatively. Patient follow-up was obtained in 87% of subjects.

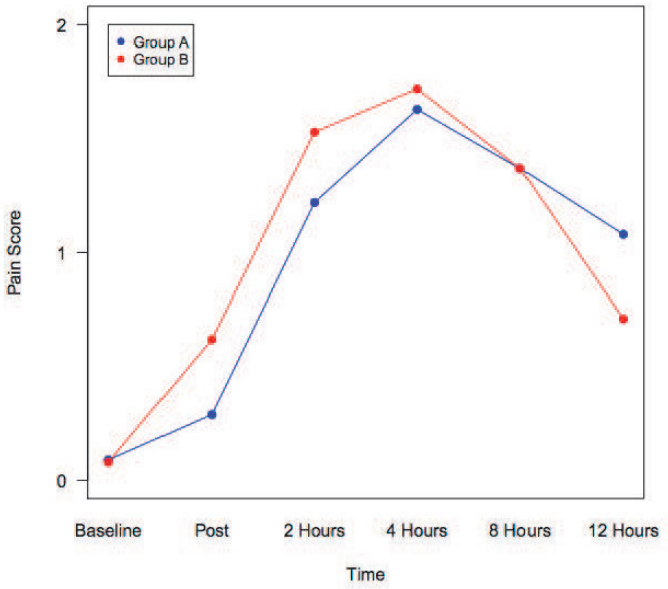
Conclusion: Mohs surgery is associated with surprisingly low levels of postoperative pain. Peak pain typically occurs four hours postoperatively. Patient satisfaction with pain management was high with acetaminophen regardless of the dosing regimen. Preemptive analgesia with acetaminophen does not appear to be superior to "as-needed" regimens as evidenced by insignificant differences between the two groups in peak pain, pain management satisfaction, and the need for narcotics to achieve satisfactory pain control.

Continued on page 32

Table 1. *Summary of patient metrics.*

Metric	Overall (n=174)	Group A (n=89)	Group B (n=85)	*p*-value
Mean score (SD)[a]				
Baseline	0.09 (0.45)	0.09 (0.45)	0.08 (0.45)	0.83
Post procedure	0.45 (1.28)	0.29 (0.69)	0.62 (1.67)	0.09
Two hours	1.37 (1.98)	1.22 (1.78)	1.53 (2.16)	0.31
Four hours	1.67 (2.09)	1.63 (2.02)	1.72 (2.19)	0.78
Eight hours	1.37 (1.86)	1.37 (1.86)	1.37 (1.87)	0.99
Twelve hours	0.90 (1.67)	1.08 (1.95)	0.71 (1.29)	0.15
Satisfied (%)[b]	72	72	73	0.99
Narcotics (%)[b]	7	9	6	0.62

[a]Independent-samples t-test. [b]Chi-square test.



4

Presenter: Ashlynne Clark, MD

Title: A Retrospective Study of Nail Squamous Cell Carcinoma at Two Institutions

Authors: *Ashlynne Clark, MD[1]; Nikki Tang, MD[2]; Amanda Robinson, MD[3]; Mary Maloney, MD[3]; Nathaniel Jellinek, MD[1,4]*

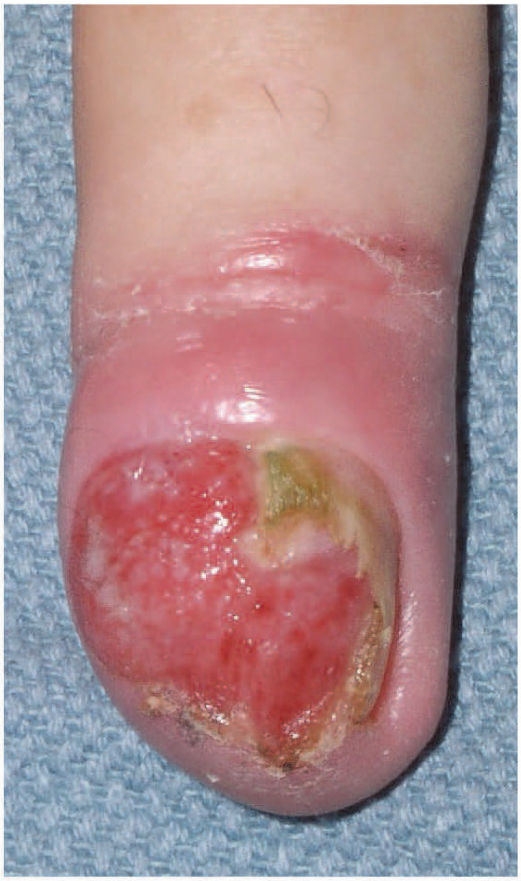
Institutions: *1. Dermatology Professionals, Inc., East Greenwich, RI*
2. Mount Sinai Medical Center, New York, NY
3. University of Massachusetts, Worcester, MA
4. University of Massachusetts Medical School, Division of Dermatology, Worcester, MA

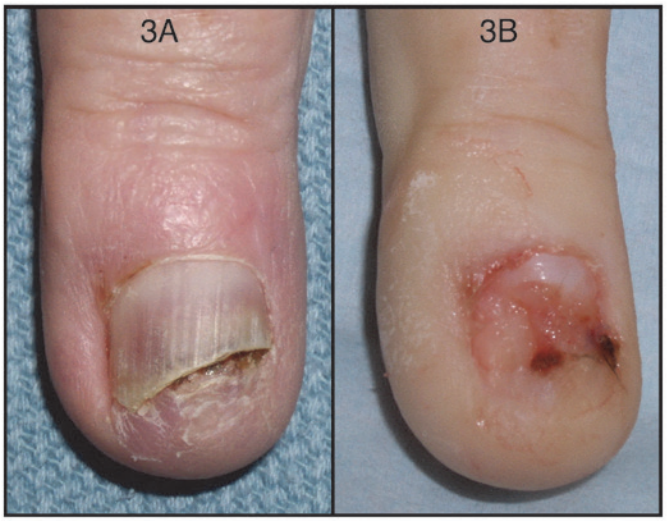
Purpose: Squamous cell carcinoma (SCC) of the nail is infrequently reported in medical literature and its causes are poorly understood. In addition, there is often a significant delay between onset of symptoms and diagnosis. Studies have shown strong associations of nail SCC with high-risk human papillomavirus, immunosuppression, tobacco use, toxin or radiation exposure, and trauma. Delays in diagnosis have been attributed to provider and patient hesitation to biopsy, as well as overlap with more common nail diseases such as verruca, onychomycosis, chronic paronychia, and onycholysis. The two most common treatments for nail SCC are Mohs surgery and digital amputation. We performed a retrospective review of nail SCC's treated at two institutions to evaluate patient demographics, risk factors, time to diagnosis, recurrence rates, and post-treatment disease progression.

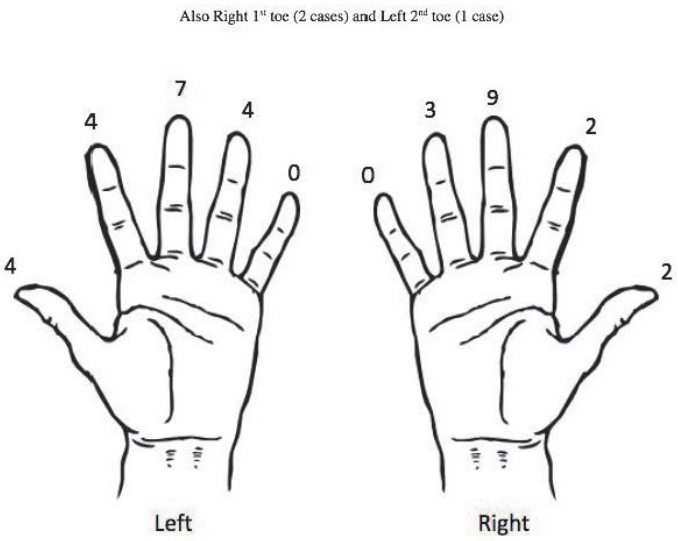
Summary: Between 2005 and 2008, 34 patients with 42 tumors were identified. 27 patients were male with a mean age of 63.2 at time of diagnosis. Diagnosis was often delayed with a mean of 3.2 years. Most tumors were located on fingernails (See Figure 1), specifically on the non-dominant hand (24/39, 62% C.I. 45-77%). The most common symptom reported was nail dystrophy (31/42, 74% C.I. 58-86%), followed by onycholysis (22/42, 52% C.I. 36-68%). The majority of tumors (35/42, 83% C.I. 69-93%) were treated with Mohs surgery. Tobacco was used at some point in time in 27/34 (79% C.I. 62-91%) of patients, including 13/34 (38% C.I. 22-56%) at the time of diagnosis. Recurrences were seen in three cases: one at the time of initial Mohs surgery and the others were large and/or draining at initial presentation (Figures 2 and 3). No metastases or deaths caused by nail SCCs were reported.

Design: A retrospective review of all patients with nail SCCs at both institutions between 2005 and 2008 was performed to determine involved digit, length of onset prior to diagnosis, symptom and signs, treatment, and rates of local recurrence and metastasis. Patient and tumor characteristics were also collected. Medical record review and phone call follow-up using a standardized questionnaire were used. This study was approved by Institutional Review Boards at participating institutions.

Conclusion: Nail SCC is found nearly exclusively in adults, predominantly in men, and favors the non-dominant hand. While diagnosis was often delayed, these tumors are slow growing and rarely metastasize. History of smoking may be a significant risk factor. Mohs surgery for nail tumors is well established, but cure rates remain below that for treatment of cutaneous SCC. Excising and processing the entire specimen with the plate intact - as well as utilizing a bone rongeur and/or dual action nail nipper to remove and process bone - may allow for better margin control and lower recurrence during Mohs surgery, limiting post-operative morbidity and disability.







5

Presenter: Chrysalyne Schmults, MD, MSCE

Title: Patient Satisfaction by Treatment Modalities for Epidermal Superficial Non Melanoma Skin Cancer

Authors: *Benjamin Drew, BS[1]; Pritesh Karia, MPH[1]; Ariana Mora, BS Candidate[1]; Christine Liang, MD[1]; Chrysalyne Schmults, MD, MSCE[1]*

Institutions: *1. Brigham & Women's Faulkner Hospital, Jamaica Plain, MA*

Purpose: Superficial basal cell carcinoma (BCC) and squamous cell carcinoma in-situ (SCCIS) are epidermally-limited skin cancers which can be cured by a variety of treatment modalities. With emerging research that links patient satisfaction to better health outcomes and the rising emphasis on patient-oriented health care delivery, further study is needed to assess patient satisfaction associated with superficial BCC and SCCIS care. The main objective of this study was to evaluate patient satisfaction with various treatment modalities for superficial BCC and SCCIS at an academic dermatologic surgery center.

Summary: A total of 329 tumors (49%) were treated with Mohs micrographic surgery (MMS), 292 tumors (43%) with topical medication (TM), and 57 tumors (8%) with cryotherapy (CT). Fluoruracil was the most commonly used TM (80%) followed by Ingenol mebutate (11%) and Imiquimod (9%). No difference in age (p=0.543), sex (p=0.181), immunosuppression (p=0.694) or Fitzpatrick skin type (p=0.762) was observed between the treatment groups. Of 200 patients randomly selected for the satisfaction survey, 142 (71%) participated. Characteristics between the survey and study cohort were comparable. About 97% of patients who received MMS were satisfied/very satisfied with their treatment versus 91% of patients who received non-MMS

treatment (p=0.092). In addition, 97% were willing to undergo MMS again versus 86% of the non-MMS treatment group (p=0.014). Approximately 34% of MMS and 38% of non-MMS patients were concerned about recurrence.

Design: A retrospective case series study of 550 patients diagnosed with 678 superficial BCCs and SCCIS treated from January 2008 to March 2014 by two physicians was conducted. Patient characteristics and outcomes were recorded and a 20% subset from each treatment group (MMS, TM, and CT) was randomly selected to participate in a telephone satisfaction survey that queried overall satisfaction, willingness to undergo treatment again, and concern for tumor recurrence. Chi-square analyses were used to compare MMS versus non-MMS treatments.

Conclusion: This study suggests that a large majority of patients are satisfied with their treatment. More MMS patients are willing to undergo treatment again. A larger randomized trial may offer additional insights into patient satisfaction, identify clinical opportunities to provide patient reassurance and education, and compare cost effectiveness of surgical versus non-surgical approaches incorporating patient satisfaction.

6

Presenter: Bryan T. Carroll, MD, PhD

Title: Attesting for a Test: Our Procedures for Quality Assurance and Documentation of Immunohistochemistry Tests in a Mohs Lab

Authors: *Carrie Kinas, BS[1]; Bryan Carroll, MD/PhD[1]*

Institutions: *1. Eastern Virginia Medical School Dermatology, Norfolk, VA*

Purpose: The use of immunohistochemistry (IHC) is increasing in Mohs labs. Unlike traditional stains such as hematoxylin and eosin, IHC reagents and protocols continue to evolve and transition from research labs into clinical labs. The adoption of recently created protocols introduces Mohs labs to Research Use Only (RUO) reagents that carry the FDA required label "for research use only, not for diagnostic use". The clinical application of an RUO reagent raises questions of legality, certification, and reimbursement. Here, we present our procedures for quality assurance and documentation of immunohistochemistry tests in a Mohs lab.

Summary: We describe the creation, development, and manufacturing of antibodies and define the limitations of different commercially available products. We review the history and recent changes for the three FDA classifications of IHC reagents and highlight the disclaimer elements that are unique to each IHC classification. There are many IHC reagents commercially available, however, there is still confusion surrounding the FDA regulations pertaining to the three marketed classes of IHC reagents: in vitro diagnostic (IVD) reagents, RUO reagents, and analyte specific reagents (ASRs). IVD reagents are FDA-approved assays whose manufacturers must use good manufacturing practices (GMP), as well as provide safety and diagnostic utility data along with instructions for the intended use. RUO reagents are not regulated by the FDA. They are not produced in compliance with GMP and therefore cannot be used for clinical purposes if there is an available ASR or IVD reagent. For instance, the availability of ASR-labeled Mart-1 antibodies obviates the use of the RUO reagents reported in recently published protocols. Unlike RUO reagents, ASRs must be manufactured with current GMPs. Manufacturers cannot include reagent performance characteristics with the ASR or assist in the optimization of the reagent. The burdens of test development fall solely onto the lab. We review elements needed to validate a clinical test, required controls for quality assurance (QA) purposes, and good practices for documentation of protocol validation and QA.

Design: This study is a literature review and presentation of the elements of our Mohs lab protocol for validation and quality assurance of IHC for Mohs.

Conclusion: Incorporating IHC validation and QA procedures will lead to reliable, accurate immunohistochemistry results.

7

Presenter: Benjamin Kelley, MD

Title: Treatment and Outcomes of Deep Penetrating Nevi

Authors: *Benjamin Kelley, MD[1]; Christine Lohse, MS[1]; Christopher Arpey, MD[1]; Christian Baum, MD[1]; Clark Otley, MD[1]; Randall Roenigk, MD[1]; Carilyn Weiland, MD[1]; Jerry Brewer, MD[1]*

Institutions: *1. Mayo Clinic, Rochester, MN*

Purpose: Objective 1: To describe the treatment modalities and outcomes of deep penetrating nevi and variants. Objective 2: To report other observations, including personal and family history of melanoma as well as subsequent melanoma development in patients diagnosed with deep penetrating nevi and variants.

Summary: A deep penetrating nevus (DPN) is a distinct melanocytic lesion that histologically shows an inverted, wedge-shaped architecture, with extension into the dermis and subcutis. Superficial variants include the clonal nevus and the inverted type A nevus. A DPN has clinical and histologic features that resemble melanoma and may demonstrate atypia. A growing body of evidence favors a benign course for this type of nevus, but few studies have looked at other findings, such as a personal history of melanoma or a family history of melanoma in addition to subsequent melanoma development.

Design: An IRB approved retrospective chart review was performed. Our search terms included "clonal nevus," "deep penetrating nevus," and "inverted type A nevus." Data extracted included demographics, nevus type, treatment modality (observation, wide local excision with or without sentinel lymph node biopsy), follow up and outcomes.

Associated risk factors included personal or family history of melanoma, Fitzpatrick skin type, indoor tanning history, and history of other atypical nevi. Patients with missing data points or insufficient follow up were contacted by telephone using a standard script. Results: Sixty-six patients with 69 DPN met our inclusion criteria. The median age was 30.5 years. The most common pattern was Inverted type A nevus with deep penetrating features (77%). Twenty-four lesions were treated by wide local excision, 45 were observed, and one sentinel lymph node was performed. There were no recurrences or metastases. The median follow up time was 2.5 years (range 0-18.3). Eleven patients (17%) had a family history of melanoma. Seven patients were diagnosed with melanoma at a median of 2.1 years prior to the index nevus. Two patients were diagnosed with melanoma at 2.7 and 3.3 years, respectively, following index; one of whom was also diagnosed with melanoma 2.1 years prior. Eight patients (12%) had a history of other atypical nevi.

Conclusion: This retrospective study adds to the growing body of evidence that DPN and superficial variants follow a benign course. Lesions demonstrating atypia may warrant precautionary wide local excision, but this does not appear to influence outcome. We also report the interesting observation that eight of our patients (12%) had a melanoma diagnosed either prior to the DPN or in subsequent follow up, and eleven patients (17%) had a first-degree family member with melanoma.

8

Presenter: Wesley Wu, MD

Title: Changing Trends of Keratinocyte Carcinoma Mortality Rates in the United States, 1999 through 2012

Authors: *Wesley Wu, MD[1,2]; Ida Orengo, MD[2]; Martin Weinstock, MD, PhD[2]*

Institutions: *1. Baylor College of Medicine, Houston, TX 2. Brown University, Providence, RI*

Purpose: Previous reports estimated a declining mortality trend of keratinocyte carcinoma (KC) in the last half of the twentieth century. However, the incidence of KC has risen at the turn of the twenty-first century, and current mortality trends are unknown. This study's objective was to characterize KC mortality trends from 1999 to 2012 in the United States, and to ascertain if differences due to factors such as sun exposure and urbanization existed.

Summary: Each year from 1999 through 2012, roughly 1,500 deaths in the United States were attributed to nongenital primary KC tumors, and greater than 1,000 deaths to genital carcinomas (Table 1). Highest nongenital KC mortality rates were seen in those over eighty-five years of age (Figure 1), men, Caucasians, and nonmetropolitan areas (P <0.001). Correlation between state UV exposure and nongenital KC mortality was found for men (P=.002), but not for women (P=0.46). Vulvar carcinoma deaths occurred more with increasing age (Figure 2) in Caucasian women in agricultural regions (P<0.001), although death rates were greater in African American women in urban areas. Penile and scrotal KC death rates were significantly greater in African American men (P<0.008). Overall, rates were stable at the turn of the century or increasing for Caucasian male nongenital carcinomas and vulvar carcinomas in Caucasians (P<0.001). Limitations include misclassification and potential underreporting of KC as the primary cause of death, particularly in elderly patients with many comorbidities.

Design: Descriptive and linear regression analysis was performed utilizing population-based death certificate data from the US National Center Health Statistics and National Oceanic Atmospheric Administration. In this report, KC refers to mortality from basal cell and cutaneous squamous cell carcinomas and is differentiated anatomically by genital and nongenital lesions.

Conclusion: In conclusion, KC poses a serious health burden, which may be underestimated by death certificate reporting. Changing mortality trends call for greater scrutiny and effective management of vulnerable populations with special concern for age and genital lesions. With an increasing average life expectancy, treatment modalities such as Mohs micrographic surgery in an appropriate elderly population may be beneficial. Further population-based studies are needed to explore areas including access to healthcare, socioeconomic factors, and practice patterns.

Table 1. Age-adjusted keratinocyte carcinoma mortality rates (total death number) in the United States, 1999-2012.

		1999-2012
Nongenital		0.53(21,810)
Males		0.89(14,555)
	Whites	0.94(14,173)
	Blacks	0.22(382)
Females		0.28(7,255)
	Whites	0.30(6,984)
	Blacks	0.28(271)
Genital		0.37(15,252)
Males		0.19(3,343)
	Whites	0.18(2,929)
	Blacks	0.26(414)
Females		0.49(11,909)
	Whites	0.51(11,142)
	Blacks	0.32(767)

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Figure 1. Age-specific crude nongenital keratinocyte carcinoma (KC) mortality rates in the United States, 1999-2012.

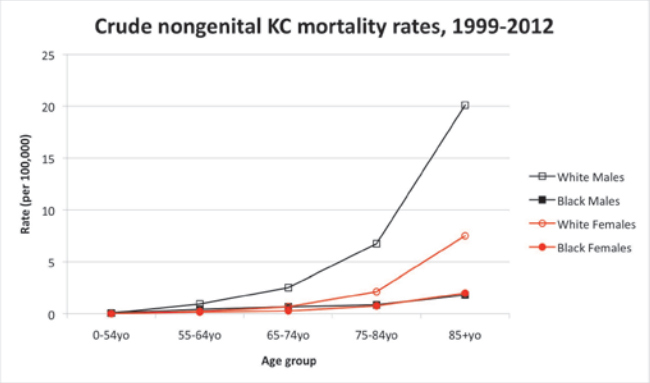
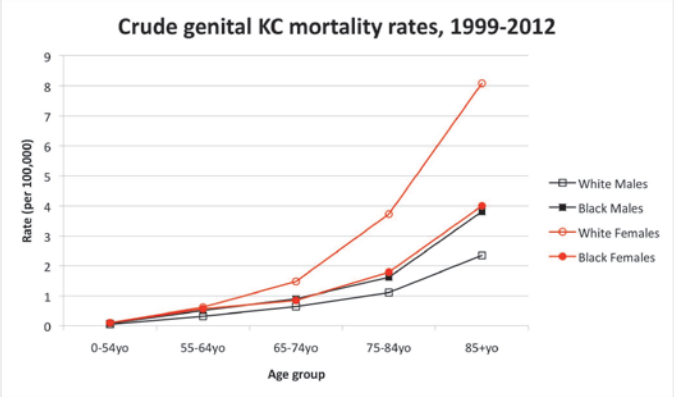


Figure 2. Age-specific crude genital keratinocyte carcinoma (KC) mortality rates in the United States, 1999-2012.



9

Presenter: Nkanyezi Ferguson, MD

Title: The Effect of Viewing Mohs Micrographic Surgical Defect on Patient Perception and Satisfaction of Final Surgical Closure

Authors: *Nkanyezi Ferguson, MD[1]; Margaret Moye, MD[1]; Nahid Vidal, MD[1]; Melissa Willis, MD[1]; Hillary Johnson-Jahangir, MD, PhD[1]; Marta VanBeek MD, MPH[1]*

Institutions: *1. University of Iowa Hospitals & Clinics, Iowa City, IA*

Purpose: Despite extensive pre-operative counseling patients undergoing Mohs surgery are sometimes surprised by the size and appearance of their surgical repair. This is compounded by the fact that many of these skin cancers are located on the face in cosmetically sensitive areas. The goal of this study is to determine if patient perception and satisfaction of their Mohs surgical closure will be changed if allowed the opportunity to view their final surgical defect.

Summary: Of 241 eligible patients, 143 patients consented to participate. Seventy-six patients were randomized to the D+R group and sixty-seven to the RO group. In the D+R group (n=76), 88% felt that viewing their defect helped them better understand why they underwent the type of closure they did, while 5% did not think it helped and 7% did not know. 83% of subjects in the D+R group felt that seeing their defect made a difference in their overall satisfaction as it gave them a better understanding of their surgery and made them feel more involved in the process, 14% did not think it made a difference and 3% did not know. There was however no statistically significant difference between the D+R or RO groups in overall satisfaction of their final surgical repair even when stratified for gender, history of previous Mohs surgery, age and type of repair. Several eligible subjects declined to participate in the study. Among those that had a documented reason for declining: 42% were not interested, 22.6% were concerned that the study would be too time consuming and 35.4% did not want to see their operative photographs.

Design: A prospective single-institution cohort study was performed at the University's Mohs surgical unit from September to December 2014. Subjects were randomized into two groups to view their surgical defect and repair (group D+R) or view their surgical repair only (group RO). Inclusion criteria included patients 18 years of age or older with skin cancer on the head and neck undergoing Mohs surgery. Exclusion criteria included patients who underwent repair by a separate surgical department or patients unable to complete the final questionnaire (including patients with mental impairment or those receiving medications such as narcotics or benzodiazepines on the day of surgery). After the surgery was completed the patients were shown their operative photographs and were asked to fill out a questionnaire to rate their overall surgical experience.

Conclusion: Although no significant difference was noted in overall satisfaction with the final surgical repair and entire surgical experience, the vast majority (83%) of patients in the D+R group felt that seeing their defect made a difference with their overall satisfaction of surgery as it gave them a better understanding of the appearance of their final closure.

Table 1: Study Population

	View surgical defect + repair (D+R)	View repair only RO)	p-value
Subjects, N	76	67	
Gender, N (%)			0.12
Male	39 (51.3%)	43 (64.2%)	
Female	37 (48.7%)	24 (35.8%)	
Age, years			
Mean (SD)	63.11 (12.15)	65.51 (13.10)	0.26
Age range, N			
< 50 years old, N	8	7	
>50 years old, N	68	60	
Type of tumor, N			0.16
BCC	60	49	
SCC	10	9	
SCCIS	2	3	
Lentigo maligna	4	4	
Other	0	2	
Area, cm2			
Mean (SD)	4.87 (18.63)	2.24 (2.47)	0.26
Mohs layers, N			
Mean (SD)	1.79 (0.88)	1.43 (0.52)	**0.005**
Type of closure, N			0.21
Secondary intention healing/xenograft	8		
Complex linear closure	42		
Graft	4		
Flap	22		
Location, N			0.80
Nose	23	20	
Ear	10	11	
Periorbital	1	0	
Perioral	6	6	
Cheek	13	10	
Forehead	10	11	
Temple	6	4	
Neck	6	3	
Scalp	1	2	
History of previous Mohs, N			0.73
Yes	24	23	
No	52	44	

Table II: Questionnaire Results

Question	View surgical defect + repair (D+R)	View repair only (RO)	p-value
More Mohs layers than expected, N (%)			0.92
Yes	15.8%	15.2%	
No	84.2%	84.8%	
Whether provider adequately prepared patient for appearance final closure			0.95
Adequately prepared and no suprise by repair	62.7%	71.6%	
Adequately prepared and surprised by repair	32%	20.9%	
Not adequately prepared and surprised by repair	5.3%	0%	
Not adequately prepared and shocked repair	0%	1.5%	
Nothing could have prepared me for this	0%	4.5%	
Don't Know	0%	1.5%	
Length of surgical scar			0.92
Much longer than expected	17.1%	18.5%	
Slightly longer than expected	42.1%	41.5%	
Exactly as expected	38.2%	33.8%	
Slightly smaller than expected	2.6%	6.2%	
Much smaller than expected	0%	0%	
Number of stitches expected			0.90
More stitches than expected	51.4%	50.8%	
Fewer stitches than expected	6.9%	6.2%	
Expected number of stiches	41.7%	43%	
Extent of surgical repair			0.40
More extensive than expected	43.4%	35.8%	
Extent of repair as expected	51.3%	58.2%	
Less extensive as expected	5.3%	6.0%	
Whether patient felt surgical repair was appropriate			0.86
Yes	97.7%	94%	
No	0%	0%	
Don't Know	5.3%	6%	
Most important issue regarding surgery			0.12
Making sure that all the cancer is gone	93.2%	98.5%	
Making sure that the scar looks really good	6.8%	1.5%	
Overall satisfaction with final surgical repair			0.91
Very satisfied	73.3%	76.1%	
Satisfied	24%	19.4%	
Neutral	2.7%	4.5%	
Dissatisfied	0%	0%	
Very dissatisfied	0%	0%	
Overall satisfaction with entire surgical experience			0.76
Very satisfied	82.7%	86.9%	
Satisfied	16%	9.8%	
Neutral	1.3%	3.3%	
Dissatisfied	0%	0%	
Very dissatisfied	0%	0%	

10

Presenter: Sabrina Martin, MD

Title: Squamoid Eccrine Ductal Carcinoma: A Case Report and Review

Authors: *Sabrina Martin, MD[1]; Andrew Breithaupt, MD[1]; Vishad Nabili, MD[1]; Gary Lask, MD[1]*

Institutions: *1. University of California, Los Angeles, Los Angeles, CA*

Purpose: To present a case of squamoid eccrine ductal carcinoma treated with Mohs micrographic surgery and review the current literature on this rare diagnosis.

Summary: A 68 year-old woman presented with a 1 cm painful, red lesion on her nose for one month. She had previously been diagnosed with a squamous cell carcinoma (SCC) in the same area three years before. It had been treated at another clinic with Mohs micrographic surgery (MMS), cleared after one stage, then repaired primarily. The new biopsy revealed squamous epithelial cells, some of which had central duct-like structures (Figure 1) that stained positive for carcinoembryonic antigen (CEA) (Figure 2) and thus was suggestive of a squamoid eccrine ductal carcinoma (SEDC). She was treated with MMS in two stages with reconstruction. SEDC is an uncommon neoplasm. In a review of the literature, 13 cases of SEDC were found. Ages ranged from 30-91, with a mean age of 67.5 and a median age of 68. Six patients were female, and seven were male. Sites included the extremities (7), head and neck (4), and trunk (2). Further details are outlined in Table 1.

Design: Case report and review.

Conclusion: Given the paucity of cases, predicting the outcome and deciding management for a patient with SEDC is challenging. As the diagnosis shows features of eccrine and squamous carcinoma, decisions are mostly guided by studies on those two separate entities, with the assumption that SEDC falls somewhere in-between. From this case and literature review, key things are evident. One, the diagnosis of SEDC is difficult, as one report described three biopsies on a patient initially read as SCC before an excisional biopsy diagnosed SEDC and retrospective CEA staining revealed the misdiagnosis. Our case is unique in that a prior SCC was treated in the same location. Whether this represents a misdiagnosis with subsequent recurrence or merely an incidental separate process is unclear. Two, the clinical course is variable. Eccrine cancers have local recurrences of 70-80% and 50% may metastasize. In contrast, SCCs have a 2-5% rate of metastasis. From our review, 3 of 13 cases had a local recurrence, two of which had lymph node involvement, and one that metastasized. Finally, treatment included excision (7), amputation (2), and MMS (3). No studies used chemotherapy or radiation. The Appropriate Use Criteria considers Mohs an acceptable treatment for eccrine carcinomas, regardless of site. Of cases treated with MMS, no recurrences occurred at 10-14 months.

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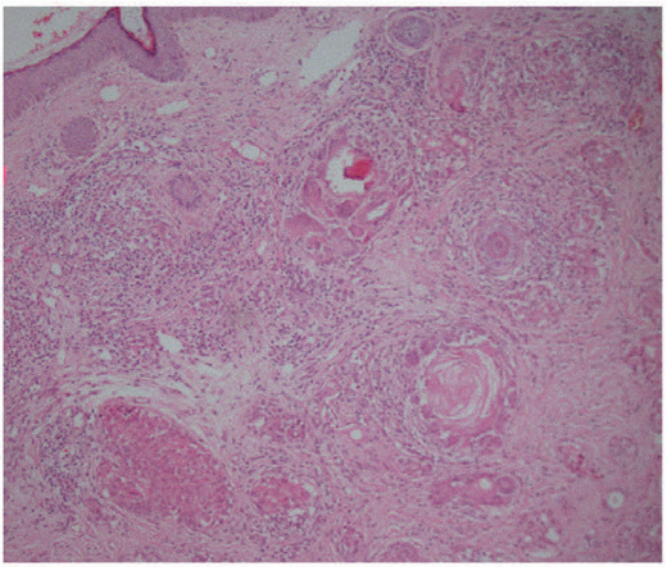

Figure 1. Hematoxylin and eosin stain highlights squamoid tumor cells, irregular in size and shape, with associated well-formed ductal structures lined by an eosinophilic cuticle.

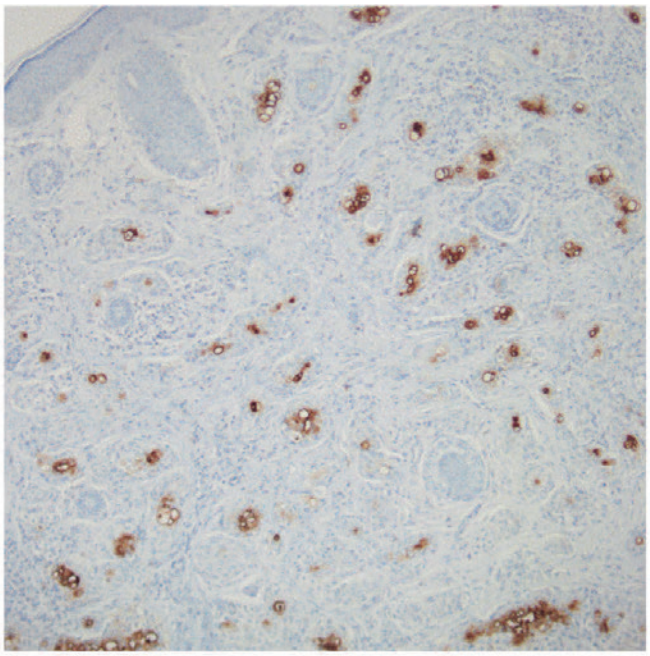

Figure 2. Immunohistochemical staining with CEA highlights numerous well-formed ductal structures surrounded by squamoid appearing tumor cells.

Case	Patient	Site	Treatment	Recurrence	Follow-up	References
1	81F	Ear	Excision	Yes (Local, three times)	3 years	Wong et al 1997
2	85F	Hand	Excision	No	3-5 months	Wong et al 1997
3	86M	Axilla	Excision	No	3-5 months	Wong et al 1997
4	41M	Knee	Excision	unknown	unknown	Herrero et al 1998
5	30F	Neck	MMS (1 stage)	No	14 months	Kim et al 2005
6	90M	Forearm	Excision	No	5 months	Chhibber et al 2007
7	68M	Chest	Excision	No (Negative sentinel LN biopsy)	1 year	Wasserman et al 2007
8	61F	Big toe	Amputation	No	8 months	Kavand et al 2009
9	63M	Cheek	MMS	No	10 months	Terushkin et al 2010
10	54F	Tibia	Excision	No	unknown	Pusiol et al 2011
11	53M	Scalp	Excision	Yes (Local and LN)	~2 years	Jung et al 2012, Kim et al 2012
12	75M	Clavicle	MMS (3 stages)	No	12 months	Clark et al 2013
13	91F	Finger	Amputation	Yes (Axillary LNs, metastasis to forearm, bone, muscle)	2 months	Wang et al 2014

Table 1. Summary of literature review. Abbreviations: female (F), male (M), Mohs micrographic surgery (MMS), lymph node (LN).

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Presenter: Irèn Kossintseva, MD, FRCPC, FAAD

Title: Complete Ear Reconstruction with Two Interpolation Flaps and Anti-Helix Cartilage Graft

Author: *Irèn Kossintseva, MD, FRCPC, FAAD*[1]

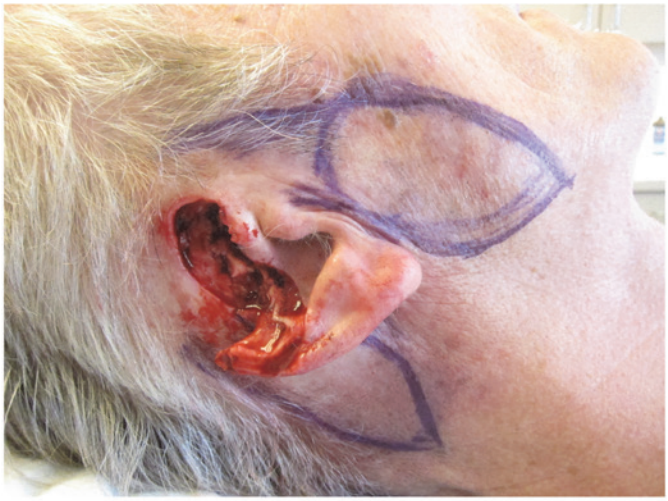
Institution: *1. University of British Columbia, Vancouver, British Columbia*

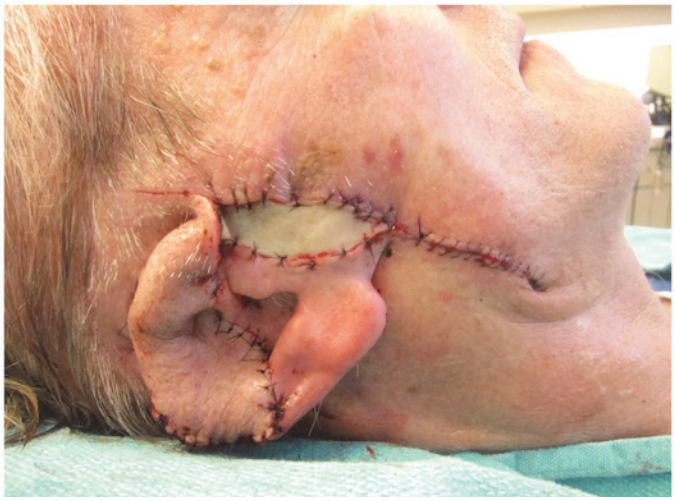
Purpose: Complete de novo ear reconstruction is a challenge necessitating both a framework that imitates the shape and projection of the contralateral ear, as well as the soft tissue covering with adequate blood supply. The traditional method of utilizing rib cartilage framework placed beneath temporoparietal fascia (TPF) flap and skin bears inherent limitations: first, safely harvesting rib cartilage under local anesthesia in Mohs surgical suites; second, problems with the learning curve of the TPF flap; third, using scalp for coverage. Alternatives to rib cartilage using a porous polyethylene framework are not readily available or widely used by Mohs surgeons. The author describes an elegant and safe alternative for complete external ear reconstruction by using two interpolation flaps and anti-helix cartilage graft.

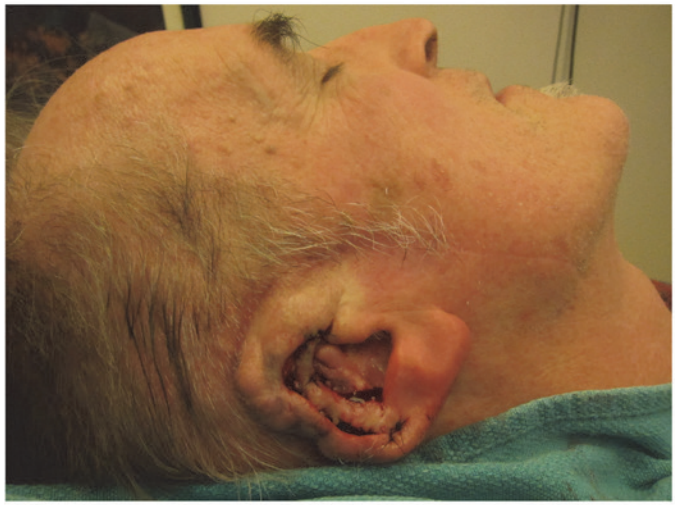
Summary: The entire external ear can be reconstructed by raising two innominate-artery interpolation flaps: one from the pre-auricular cheek, and the other from the post-auricular neck, and suspending them on a strut of anti-helix cartilage graft, inserted into the scalp at the superior aspect of the newly formed helix. Further gains in helical height, if necessary, can be attained by raising a supra-auricular scalp flap and dragging it back onto the helix, in a roll-over manner. Finessing linear concave contours of the scapha and triangular fossa can be accomplished with top sutures adjoining the epidermis on the concave side, to the dermis of the convex side of the repair.

Design: Patient presenting with a near-complete loss of external ear (where only an earlobe and cava remained) post-Mohs Micrographic Surgery, underwent a novel reconstruction of the entire ear using two interpolation flaps and anti-helix cartilage graft. Complete construction and finessing of the ear contours required three stages, plus minute adjustments along the way.

Conclusion: This novel method of complete ear reconstruction using pre-auricular cheek interpolation flap for the anterior portion of the ear and post-auricular neck for the posterior portion of the ear, while suspending the superior curve of the helix from an anti-helix cartilage graft strut, allows a Mohs surgeon to successfully and safely construct an ear under local anesthesia. This design effectively creates both the concave and the convex contours of the ear, as well as the arched shape of the helical root. Previously un-described roll-over scalp flap is an effective way of gaining helical height or focally increasing ear size. Linear concavities are elegantly created using epidermis-to-dermis sutures.







12

Presenter: Min Deng, MD

Title: A Potential Pitfall: Intravascular Basal Cell Carcinoma-Mimicker on Mohs Frozen Section

Authors: *Min Deng, MD[1]; Adaobi Nwaneshiudu, MD PhD[1]; Duri Yun, MD[1]; Diana Bolotin, MD, PhD[1]; Vesna Petronic-Rosic, MD MSc[1]; Vivek Iyengar, MD[1]*

Institutions: *1. University of Chicago, Chicago, IL*

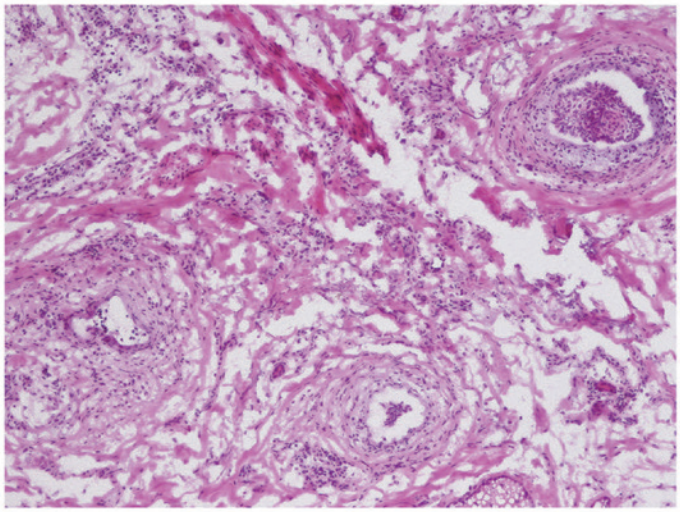
Purpose: Accurate interpretation of histopathologic findings on frozen sections is an integral component of Mohs micrographic surgery. We present a challenging case of basal cell carcinoma with retraction artifact mimicking intravascular tumor spread on a Mohs frozen section. To distinguish our case from true intravascular spread, the original hematoxylin and eosin stained frozen section was restained with antibodies against CD31 to highlight endothelial cells. We present this case as a potential diagnostic pitfall for Mohs surgeons.

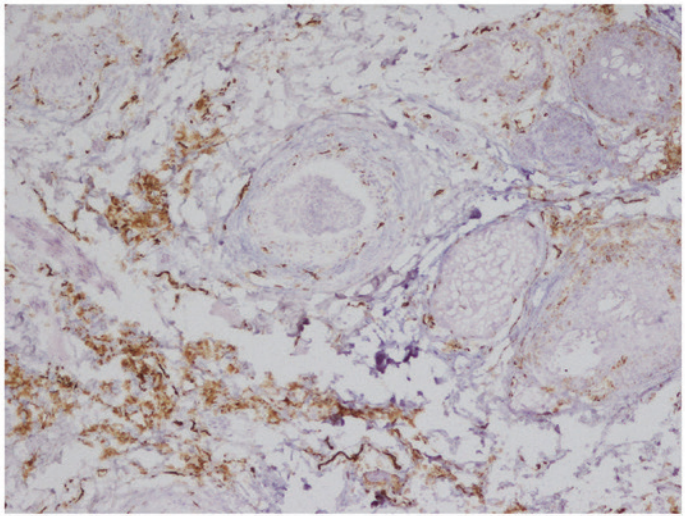
Summary: Retraction artifact surrounding basal cell carcinomas can mimic intravascular tumor spread on initial evaluation. These challenging cases can be distinguished from true intravascular basal cell carcinomas by restaining hematoxylin and eosin stained frozen sections with immunohistochemistry to detect CD31-positive endothelial cells.

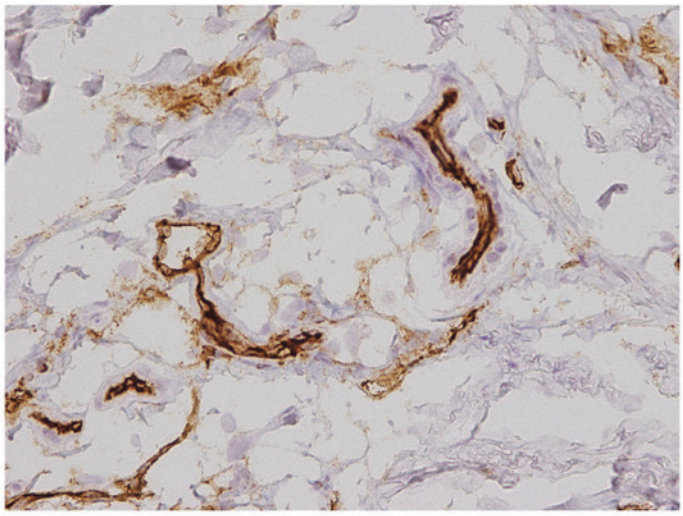
Design: A 57 year old immunocompetent Caucasian male with a past medical history of 2 basal cell carcinomas presented to us for Mohs micrographic surgery of a 0.5 by 0.8 cm nodular-infiltrative basal cell carcinoma on the left temple. The first stage of Mohs surgery demonstrated nodular and infiltrative aggregates of basaloid keratinocytes arranged in a peripheral palisade within a myxoid stroma in the dermis. There were focal tumor collections within annular lumen-like structures which were suspicious for intravascular tumor spread. To distinguish true vascular lumina from retraction artifact surrounding the basal cell carcinoma we submitted our frozen block for formalin-

fixation and paraffin-embedding so that permanent tissue sections could be evaluated. The foci suspicious for intravascular tumor spread were lost on these subsequent sections. Using the original hematoxylin and eosin stained frozen sections we restained the original tissue cuts with antibodies against CD31. Tissue vasculature served as an internal positive control with clear staining of endothelial cells. The lumen-like structures surrounding the basal cell carcinoma did not stain for CD31. While most cases of basal cell carcinomas diagnosed on frozen section will not warrant an extensive workup, we present a challenging case of an intravascular basal cell carcinoma-mimicker distinguished with the aid of immunohistochemistry. Basal cell carcinomas with intravascular tumor spread carry a worsened prognosis and accurate diagnosis is essential.

Conclusion: Retraction artifact surrounding basal cell carcinomas can mimic intravascular tumor spread and is a potential histopathologic pitfall for Mohs surgeons. In instances where accurate diagnosis is challenging, the original hematoxylin and eosin stained frozen sections can be restained with antibodies against CD31 to highlight endothelial cells and distinguish artifact from true intravascular tumor.







13

Presenter: Suyin Ong, MBBChir, MRCP(UK), MSc

Title: Utility of the Quadrilobe Flap for Repairing Defects of the Nasal Tip

Authors: *Suyin Ong, MBBChir, MRCP(UK), MSc[1]; Neil Mortimer, MBChB, MRCP(UK), FACMS[1]; Paul Salmon, MBChB, FRACP, FACMS[1]*

Institution: *1. Skin Cancer Institute, Tauranga, Bay of Plenty*

Purpose: Surgical defects of the distal nose can be challenging to reconstruct as there is no adjacent tissue reservoir. If the defect is shallow, it can be allowed to heal by secondary intention or repaired with a skin graft but deeper defects will require a flap repair. The bilobed transposition flap is traditionally the workhorse flap for defects of the distal nose. However, if the defect is very distal e.g. on the columella, a trilobe or quadrilobe flap facilitates access to tissue reservoirs of the nasofacial sulcus and the root of the nose, and permits favourable orientation of tension when repairing the tertiary or quaternary defects directly. The nasal sidewall rotation flap is another option for defects on the nasal dorsum and tip, but the more complicated scar lines of the quadrilobe flap are more difficult to detect visually. The quadrilobe flap is also more versatile as the smaller, pliable lobes can curve around to repair defects on the alar rim, nasal infratip and columella whilst preserving the alar crease.

Summary: We have performed fifteen quadrilobe flaps in our unit over the past year, with defect sizes ranging from 0.8x0.9cm to 3.0x1.0cm. The defects were on the nasal tip, alar rim, nasal infratip, nasal sidewall and columella. Laterally-based quadrilobe flaps were designed in the majority of cases. One patient with a medially-based quadrilobe had a 1.1x 0.8cm defect on the right nasal

infratip, and her second smaller defect on the right nasal ala was repaired with a full thickness skin graft. All healed well without affecting alar rim symmetry and there were no incidences of flap necrosis or post-operative infections.

Design: Multilobe transposition flaps can cause alar asymmetry by causing ipsilateral alar depression and contralateral alar elevation due to the Z-plasty lengthening effect. The risk is reduced by adding lobes to reduce the angle of transposition, and ensuring that tension across the tertiary or quarternary defect is perpendicular to the free margins of the alar rim. With a laterally-based bilobed flap, airflow obstruction may occur from twisting at the base of the flap, depressing the upper edge of the lower lateral cartilage into the nares. In the quadrilobe, each lobe is transposed fewer degrees compared to a bilobed flap, therefore reducing torsion and the risk of nasal obstruction. Each lobe is 90% narrower than the adjacent defect to be filled. A little undermining around the primary defect helps to form a horizontal layer of scarring which reduces the risk of the flap "pin- cushioning".

Conclusion: In summary, the quadrilobe flap is indicated for the repair of small but deep defects on the alar rim, nasal tip or infratip. The repair is confined to the cosmetic unit and does not alter the contours of the nose.

14

Presenter: Joanna L. Walker, MD

Title: Superior Cosmesis with Staples for Lower Leg Wound Closure After Mohs Micrographic Surgery

Authors: *Annie R. Wang, MD[1]; Joanna L. Walker, MD[1]; Antonio P. Cruz, MD[1]*

Institutions: *1. Warren Alpert Medical School of Brown University, Department of Dermatology, Providence, RI*

Purpose: Title: Superior cosmesis with staples for lower leg wound closure after Mohs micrographic surgery Wound healing after surgical intervention on the lower leg can be associated with secondary skin infections, increased morbidity, poor cosmesis and patient dissatisfaction. Staple closure is time-efficient and may provide superior tensile strength for closure on the lower leg. There is currently no literature on the use of staples as a method for wound closure in dermatologic procedures.

Summary: Surgical stapling is a time-efficient, cosmetically appealing and low-infection-risk alternative for wound closures in the lower legs after dermatologic surgeries.

Design: We present a retrospective case series comparing wound closures in the lower leg after dermatologic surgery using staples versus sutures. 10 patients underwent Mohs micrographic surgery (MMS) for treatment of cutaneous malignancies including squamous cell carcinoma and basal cell carcinomas of the lower legs. An elastic bandage was applied to the affected limb during Mohs layer processing to assist in reducing perioperative edema. Positioning of the patient's leg with the knee bent and heel on the examination table facilitated tissue undermining and approximation. A 3-0 polyglactin 910 suture placed in a buried vertical mattress fashion with assisted advancement by an assistant to overcome wound tension approximated the wound edges and created eversion. A premium fixed head skin stapler is used to place staples approximately 3-4 mm apart while the patient's leg remained at a 45 degree angle of flexion. The staples were removed 1 week later. Upon follow up, all wounds healed without secondary skin infection or dehiscence and had excellent cosmesis. These cases and ten cases closed by traditional suture method were shown to two blinded reviewers who rated the cosmesis of the final wound on a scale of 0 to 10, with 10 being the best possible outcome.

Conclusion: Surgical stapling is a time-efficient, cosmetically appealing and low-infection-risk alternative for wound closures in the lower legs after dermatologic surgeries. Comparatively, suturing lower leg wounds presents unique challenges including increased risk of chronic nonhealing wounds, site dehiscence, and infection. There are variable reports about post-operative infection rates when comparing the use of staples versus subcuticular sutures in the orthopedic, obstetrics and cardiothoracic literature. A Cochrane Review in 2012 found no difference in risk of secondary infections with the use of staples over sutures in closing clean leg wounds after vein graft harvesting for coronary artery bypass grafting. Another study, also based on experiences from saphenous vein harvesting, found increased risk of infections in diabetic patients with subcuticular sutures compared to staples. In our experience, using a premium fixed head skin stapler has been particularly well designed for lower extremity wound closure as it provides good strength and wound eversion with excellent cosmetic outcome.

15

Presenter: Abigail Baird, MD

Title: Whole-Exome Sequencing of an Aggressive Cutaneous Squamous Cell Carcinoma with In-Transit Metastases

Authors: *Abigail Baird, MD[1]; Jonathan Levinsohn, BA[1]; David Leffell, MD[1]*

Institutions: *1. Yale University School of Medicine, New Haven, CT*

Purpose: We aimed to identify cancer-related mutations that distinguished primary cSCC from metastatic tumor using whole-exome sequencing in a case of recalcitrant, metastatic cSCC on the scalp.

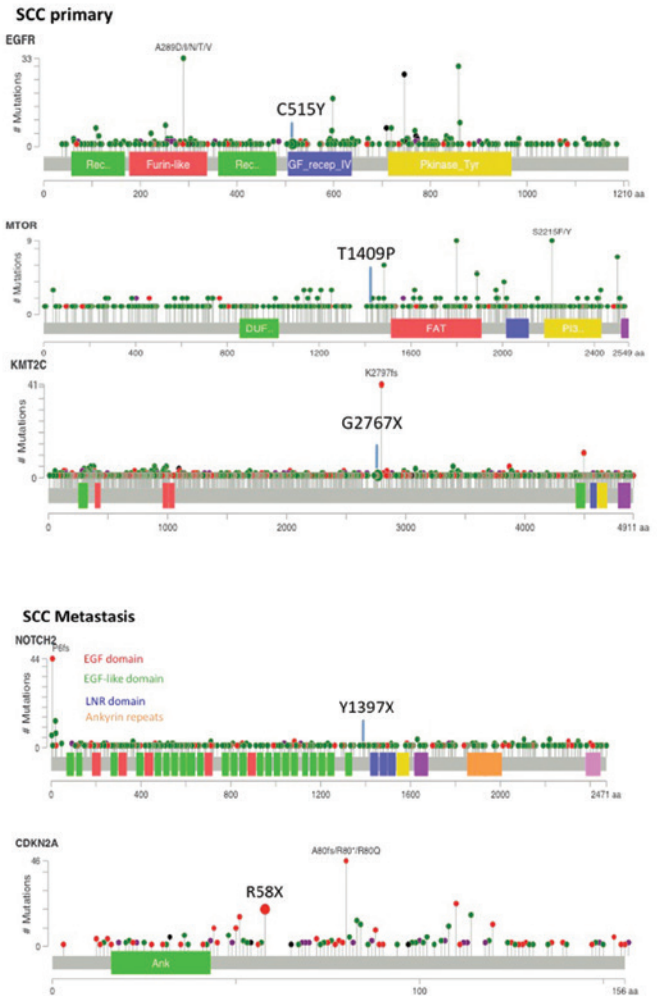
Summary: A 55-year-old male presented with a cutaneous SCC of the scalp penetrating to fat. Several months following MMS, the patient developed multiple subcutaneous nodules of SCC that lacked epidermal connection within 3-5 centimeters of the original lesion in the distribution of his prior herpes zoster, consistent with in-transit metastases in a zosteriform pattern. Imaging studies were negative.

Poster Presentation Summaries

HIV testing was performed due to concern for underlying immunosuppression and was found to be positive with a CD4 count of 30. Despite multiple surgeries, 2 courses of XRT, intralesional interferon (IFN) alfa-2b injections and HAART therapy with reconstitution of his immune system, he continued to develop new metastases. He refused cisplatin or any other chemotherapy. In order to better understand the relationship between the metastases with the primary aggressive tumor, whole-exome sequencing was performed on the primary and metastatic tumor sample. Protein altering missense mutations in EGFR (C515Y) and mTOR (T1409P) as well as an inactivating mutation in KMT2C (G2767X), were identified in both the primary and metastatic tumors. Unique to the metastasis were inactivating mutations in NOTCH2 (Y1397X) and CDKN2A (R58X).

Design: Whole-exome sequencing was performed on a primary aggressive cSCC of the scalp and in-transit metastasis. Clinically relevant genes were identified using the TARGET database and literature search and validated in cBIO and COSMIC. Patient blood was used as control.

Conclusion: Cutaneous SCC of the scalp with in-transit metastases spreading in a zosteriform pattern has proved very challenging to treat; failing surgery, XRT and intralesional chemotherapy with few systemic chemotherapy choices due to patient preference and underlying immunosuppression. A personalized approach using whole-exome sequencing allowed us to identify drug-targets EGFR and mTOR. EGFR and mTOR mutations have been shown to be common in cSCC (31% and 51% respectively) 1. EGFR inhibitors (e.g. cetuximab), either alone or with XRT, have demonstrated promise in the treatment of unresectable cSCC. KMT2C and NOTCH2 inactivating mutations are both shown to be associated with aggressive disease. KMT2C mutations are linked with shorter recurrent-free survival, shorter time to recurrence and bony metastasis. NOTCH2 mutations are common in cSCC (60%) and associated with perineural invasion1. The patient will undergo treatment with cetuximab. We conclude that cSCC continues to accumulate genetic mutations as it progresses from primary to metastatic disease and when performed on a larger scale, whole-exome sequencing has the potential to identify a gene expression profile of metastatic SCC that could allow for better understanding and treatment options. 1. Pickering CR, Zhou JH, Lee JJ, et al. Mutational landscape of aggressive cutaneous squamous cell carcinoma. Clin Cancer Res. 2014 Dec 15;20(24):6582-92.



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Presenter: Jane Yoo, MD, MPP

Title: Squamous Cell Carcinoma with Perineural Invasion Mimicking Benign Perineurium: Highlighting the Role of Immunohistochemical Stains

Authors: *Jane Yoo, MD, MPP[1]; Earl Glusac, MD[1]; David Leffell, MD[1]; Sean Christensen, MD, PhD[1]*

Institutions: *1. Yale University, New Haven, CT*

Purpose: Perineural invasion (PNI) is an independent risk factor for adverse outcome in squamous cell carcinoma (SCC). Tumors with PNI exhibit an increased risk of recurrence, nodal metastasis and disease specific mortality. However, benign perineural inflammation and normal structures such as perineurium can mimic PNI on hematoxylin and eosin (H+E) stained sections. We present a case in which immunohistochemical stains proved essential in the identification of SCC with PNI characterized by monomorphic, cytologically banal cells.

Summary: A 68 year old man with a history of non-Hodgkin lymphoma presented with an ulcerated, 1.2 x 1.0 cm SCC of the left frontal scalp, arising within 3 cm of an infiltrative SCC completely excised with Mohs surgery 17 months prior. No neurologic symptoms were present. The tumor was treated with Mohs surgery and infiltrative SCC was noted to extend into the subcutis and frontalis muscle. After four stages, resulting in a defect size of 3.2 x 3.5 cm, the margins were clear of unequivocal tumor; however, a prominent nerve at the deep margin was ensheathed by a single layer of monomorphic cells resembling perineurium. Given the clinical suspicion for PNI, the excised Mohs stages were sent for permanent sections and immunohistochemical analysis. The surgical defect was resurfaced with a porcine xenograft while the presence of PNI was assessed. On permanent H+E stained sections, the perineural cells were monomorphous and bland-appearing, in sharp distinction to the cytologic atypia of the remainder of the tumor. These cells were consistent with benign perineurium and stained positive with epithelial membrane antigen (EMA), a marker of normal nerve sheath. Surprisingly, however, the perineural cells also stained positive with cytokeratin, thus confirming the presence of SCC with PNI at the surgical margins. The patient was subsequently referred for adjuvant radiation therapy.

Design: Immunohistochemical stains for EMA and cytokeratin MNF116 were performed on permanent sections. EMA is expressed by normal perineurium and is often used to demarcate the nerve sheath in the detection of PNI, but may also be expressed by SCC. To illustrate the pathologic appearance of benign perineurium, which may be confused with tumoral PNI, we identified additional cases in which normal perineurium was present adjacent to SCC, either with or without PNI. These cases demonstrate that subtle perineural SCC can mimic normal perineurium morphologically, but can be identified by cytokeratin labeling.

Conclusion: The ability to identify PNI has significant implications for tumor staging, prognosis and management of cutaneous SCC. Benign entities including inflammation, fibrosis, and normal perineurium can mimic PNI in routine sections. When clinical suspicion for PNI is high, immunohistochemical analysis of excised Mohs specimens may facilitate detection of PNI and guide optimal therapy of these high risk tumors.

17

Presenter: Theresa Zaleski, DO

Title: Pemphigus Vegetans Mimicking Acantholytic Squamous Cell Carcinoma In Situ: A Potential Pitfall for Mohs Micrographic Surgery

Authors: *Theresa Zaleski, DO[1]; Megan Morrison, DO[1]; Jenny Cotton, MD, PhD[1]; Kent Krach, MD[2]*

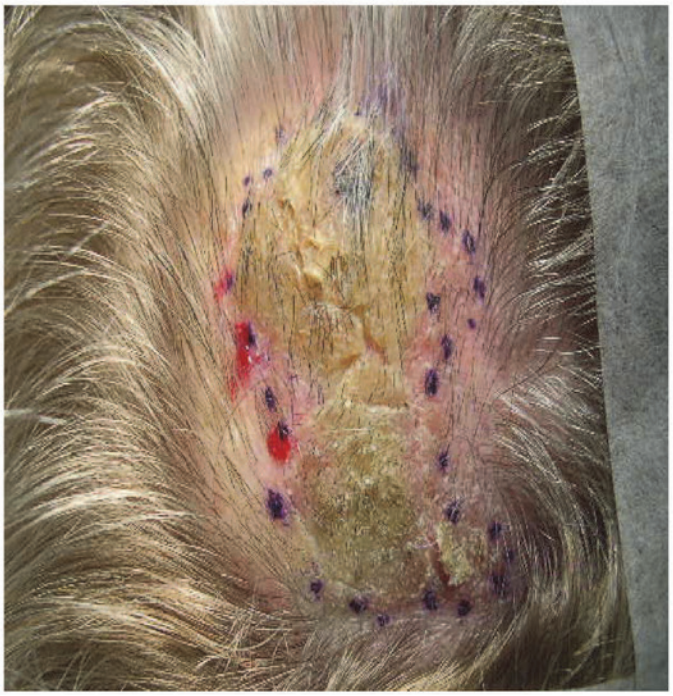
Institutions: *1. St. Joseph Mercy Hospital, Ypsilanti, MI 2. St. Joseph Mercy Hospital, Clinton Township, MI*

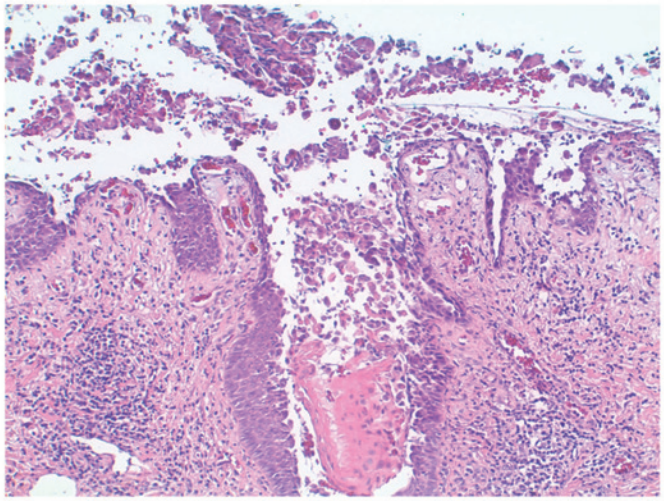
Purpose: To highlight the need for closer evaluation of acantholytic lesions of the head and neck prior to treatment with Mohs surgery. We report a case of pemphigus vegetans diagnosed during Mohs surgery at our institution, which was initially misdiagnosed on biopsy as acantholytic squamous cell carcinoma in situ. A high index of suspicion, in addition to a good clinical history, physical exam, and thorough review of histopathological findings prior to Mohs surgery can help avoid costly surgical intervention and unnecessary patient morbidity.

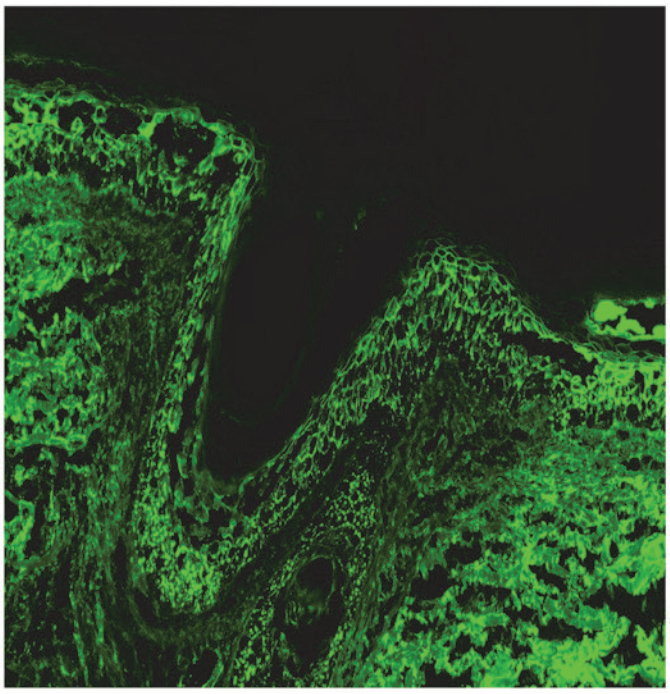
Summary: Acantholysis is defined as the loss of cohesion between keratinocytes due to the dissolution of demosomal intercellular connections. This phenomenon may be found in many disease states, including pemphigus vegetans/vulgaris and acantholytic squamous cell carcinoma (ASCC). Acantholytic processes may be differentiated by determining whether the acantholysis is due to a primary or secondary process. An example of a primary acantholytic process is pemphigus, while ASCC is a secondary acantholytic process. On histologic examination, the presence of an infiltrate and cellular atypia may help aid in diagnosis. Reactive processes, however, can result in atypia mimicking malignancy, as was the case in our patient. ASCC is an aggressive variant of squamous cell carcinoma, which occurs most frequently on the head, neck, and upper extremities of older individuals. It can clinically appear as an erythematous to flesh-colored ulceration or plaque. Histologically, there is atypical squamous differentiation with variable amounts of acantholysis, cellular atypia, hyperchromasia, and mitotic figures. The quality of the biopsy can make the histologic overlap of acantholytic disorders difficult to distinguish. Pemphigus vegetans is a rare variant of pemphigus with characteristic clinical findings, yet similar histologic and immunopathologic findings. Histologically, epidermal hyperplasia with or without intraepidermal bullae are seen, with the presence of acantholysis and tombstoning of the basal keratinocytes. There is often tracking of acantholysis down adnexal structures. The presence of a dense dermal inflammatory eosinophilic infiltrate at the base of the blister is another feature often present in established lesions of pemphigus. Further, although this case was originally mistakenly diagnosed as ASCC in situ, further review of frozen and permanent sections confirmed a robust acantholytic process but no evidence of squamous atypia or mitoses.

Design: Case Report

Conclusion: Autoimmune blistering disorders clinically and histologically can mimic malignancy to the unsuspecting clinician and dermatopathologist, creating a potential pitfall for both diagnosis and treatment. However, with the correct level of suspicion and attention, pemphigus vegetans can be differentiated from acantholytic squamous cell carcinoma in clinically aberrant cases, avoiding unnecessary surgery and morbidity to the patient and cost to the medical system.







18

Presenter: Lara Butler, MD

Title: High Frequency Electrosurgery for Partial Thickness Defects of the Distal Nose following Mohs Micrographic Surgery

Authors: *Lara Butler, MD[1]; Suzanne Olbricht, MD[1]*

Institutions: *1. Lahey Clinic/Harvard Medical School, Burlington, MA*

Purpose: Reconstruction of distal nasal defects such that skin color, texture, thickness and surface contour are respected remains one of the foremost challenges in reconstruction following Mohs Micrographic Surgery (MMS). For many patients, the thick sebaceous nature of the distal nose impedes healing; producing prominent scars with focal dehiscence, noticeable closure lines and suture marks. Second intention healing yields depressed sclerotic scars with sharp cliff-like edges and contour distortions. Because high frequency electrosurgery has been a well-documented technique for successful contouring of rhinophyma involving the distal nose, we considered that it may also offer a solution to this reconstructive conundrum. We present the results of a novel approach to repairing partial thickness distal nasal defects following MMS by treating the normal skin at the edges of the wound with high frequency wire loop electrosurgery with the objective of recontouring a partial or full cosmetic subunit.

Summary: All patients achieved excellent aesthetic results with no postoperative complications, tolerable postoperative erythema, and minimal scarring or reshaping of the nose. No patient had postoperative bleeding requiring an urgent visit or infection. Reepithelialization was complete after an average of 4 to 6 weeks.

Design: Three female patients and three male patients, aged 60 to 78 years, with basal cell carcinomas on the nasal tip or supratip underwent MMS resulting in partial thickness defects involving part of the cosmetic subunit. The defects ranged from 0.8 by 0.7cm to 2.0 by 2.5cm with a depth of 0.2 to 0.3cm. A high frequency electrosurgical unit was used in the cut/coagulate mode at 40W with a cutting 1/4″ wire loop. Defect edges were recontoured by using the cutting current with brief contact to remove elevated wound edges and then a 0.5 to 1.0 cm area surrounding the new defect was treated with coagulation current to feather the edges of the wound. The loop was also used with coagulation current as needed to cauterize any persistent sites of bleeding providing excellent hemostasis. In the setting of obvious excessive sebaceous tissue suggestive of rhinophyma, loop electrosurgery was performed on all distal nose subunits in both cutting and coagulation mode until a more normal contour throughout was achieved. The goal at the conclusion of the procedure was a smooth defect with good contour involving most and sometimes all of the cosmetic subunit. Second intention wound care was required with daily cleansing with soap and water, application of petrolatum jelly and placement of a small bandage until complete reepithelialization was achieved.

Conclusion: We report the use of high frequency wire loop electrosurgery recontouring for partial thickness MMS defects on the distal nose as an efficient, functionally and cosmetically appealing repair.

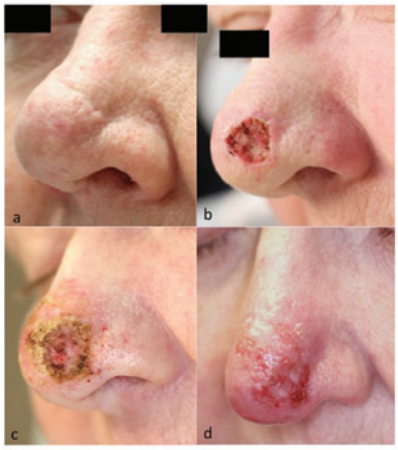


Figure 1. Case 1. 66-year-old female with basal cell carcinoma on the left nasal tip requiring MMS. (a) Preoperative tumor size 0.4 x 0.4 cm. (b) Postoperative partial thickness defect measuring 1.2 x 1.0 cm. (c) Repair with high frequency electrosurgery to remove elevated wound edges and excessive sebaceous tissue. (d) Results at 4 weeks with maintained nasal contour, complete reepithelialization and moderate residual erythema.

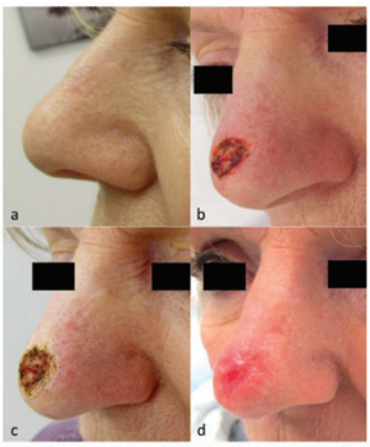


Figure 2. Case 2. 78-year-old female with basal cell carcinoma on the midline nasal tip requiring MMS. (a) Preoperative tumor size 0.5 x 0.5 cm. (b) Postoperative partial thickness defect 1.2 x 0.9cm. (c) Repair with high frequency electrosurgery to remove elevated wound edges. (d) Results at 5 weeks with maintained nasal contour, almost complete reepithelialization and moderate residual erythema.

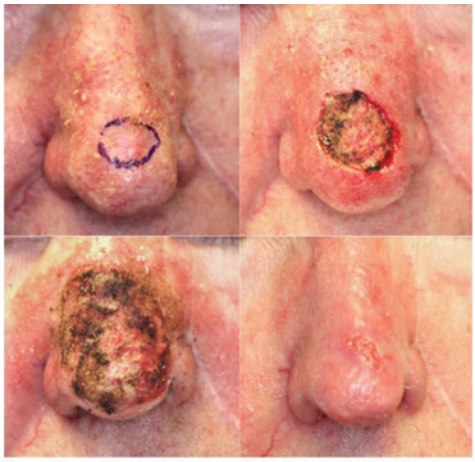


Figure 3. Case 3. 72-year-old male with basal cell carcinoma on the nasal tip requiring MMS. (a) Preoperative tumor size 1.2 x 0.8 cm. (b) Postoperative partial thickness defect 2.0 x 2.5 cm. (c) Repair with high frequency electrosurgery to remove elevated wound edges and excessive sebaceous tissue. (d) Results at 6 weeks with maintained nasal contour, almost complete reepithelialization and minimal residual erythema.

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Presenter: Alyssa Findley, MD

Title: Aggressive Digital Papillary Carcinoma: A Wolf in Sheep's Clothing

Authors: *Alyssa Findley, MD[1]; Nathaniel Jellinek, MD[1,2]; Nicole Velez, MD[1]; Ashlynne Clark, MD[1]*

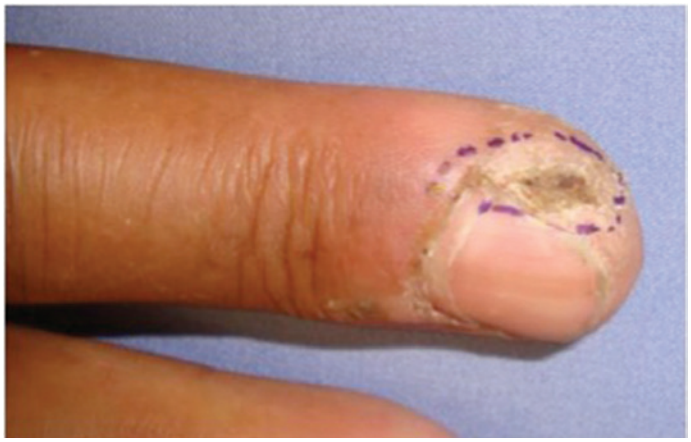
Institutions: *1. Dermatology Professionals, Inc., East Greenwich, RI*
2. University of Massachusetts Medical School, Division of Dermatology, Worcester, MA

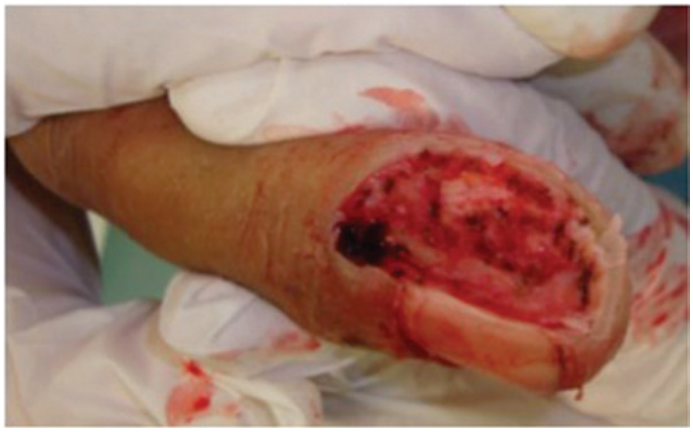
Purpose: Aggressive digital papillary carcinoma (ADPAC) is a rare sweat gland malignancy, that must be considered in the differential diagnosis for all neoplasms involving the digits. This tumor has a high tendency towards local recurrence, and metastatic cases have been reported. Unfortunately, there are no clinical or pathological characteristics that predict its behavior. This case illustrates possible presenting features of this tumor, and demonstrates that Mohs micrographic surgery may be a tissue sparing alternative.

Summary: A 53 year old male presented with a verrucous tender plaque on the right third medial nail fold, which had been present for at least 25 years and he attributed to trauma related to wood working (this patient's occupation). The surgeon's initial differential diagnosis included squamous cell carcinoma vs verruca vulgaris. An xray of the digit showed no bony abnormalities. A wedge biopsy was performed and revealed subungual large lobular aggregates of basaloid glandular cells with multiple papillary fronds and cystic areas, consistent with ADPAC. Mohs surgery was performed with 4 mm margins. Histological examination showed no tumor at the deep and lateral margins of the first stage. Given the tumor aggressiveness, a second stage with an additional lateral 2-3 mm and a deep bony margin (with use of rongeur), was excised and processed for frozen section analysis. No tumor was identified. Additional work-up included a CT scan of the chest that showed no evidence of metastatic disease, and a negative sentinel lymph node biopsy. There has been no evidence of recurrence at six months.

Design: This case illustrates a rare tumor that must be considered in the differential diagnosis of all digital tumors, regardless of the symptoms, duration, or other clinical history. An extensive literature review was performed regarding treatment options, which consist primarily of wide local excision +/- sentinel lymph node biopsy. Mohs micrographic surgery for ADPAC has only been reported once in the literature to date, but should be considered as a tissue-sparing treatment option that may spare a patient from loss of a digit.

Conclusion: Aggressive digital papillary carcinoma (ADPAC) may masquerade as other more common digital tumors. It is important for Mohs surgeons to understand its possible presentation and behavior so that this tumor can be recognized and then treated appropriately. The latter greatly decreases the chance for local recurrence and metastasis.





20

Presenter: Steven Peine, MD

Title: Plaque-Type Syringomatous Proliferation Associated with an Infiltrating Basal Cell Carcinoma

Author: *Steven Peine, MD*[1]

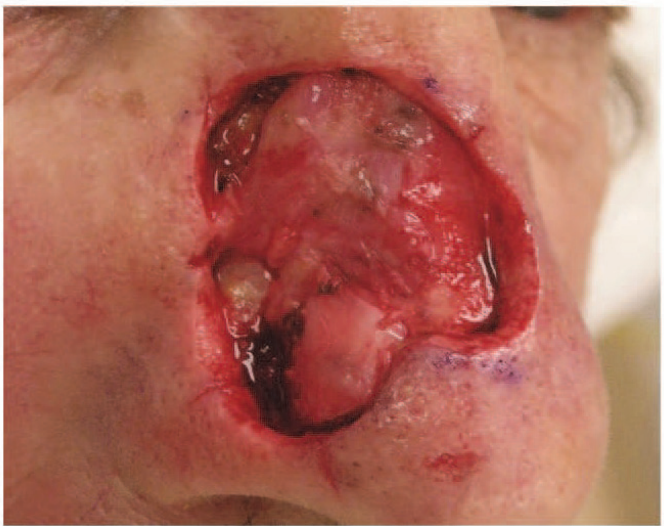
Institution: 1. *Geisinger Medical Center, Danville, PA*

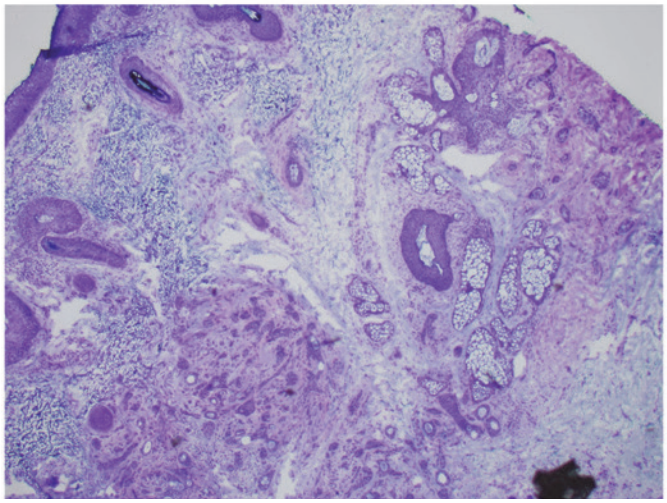
Purpose: Report of an unusual occurrence of a subclinical plaque-type syringomatous proliferation discovered during Mohs micrographic surgery for an infiltrative basal cell carcinoma on the nasal sidewall.

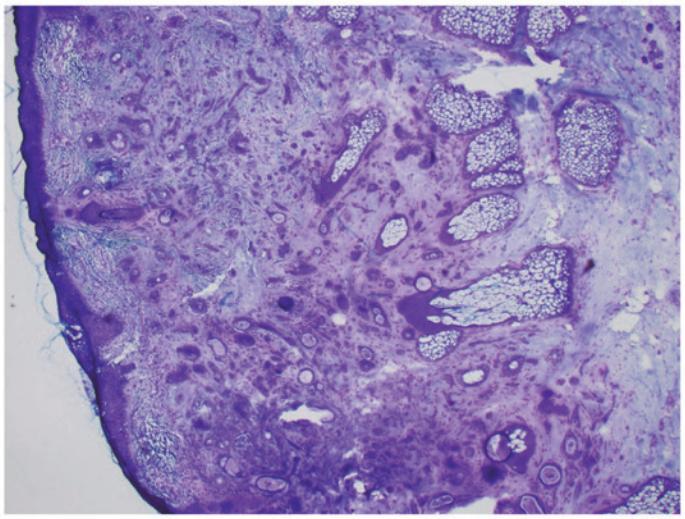
Summary: A continuous, plaque-type syringomatous proliferation was noted in association with an infiltrating basal cell carcinoma during Mohs surgery on the nasal sidewall. Given the atypical appearance and size of the proliferation, there was concern for microcystic adnexal carcinoma (MAC) vs. continued infiltrating basal cell carcinoma. This created a diagnostic and treatment dilemma resulting in 8 mohs stages attempting to clear the proliferation. The infiltrative basal cell tumor was cleared, but the syringomatous proliferation remained in the dermis with no muscular or perineural involvement. Given the overall benign appearance of the persistent syringomatous proliferation, further stages were halted and the tissue was sent for permanent sections. A diagnosis of syringoma was confirmed and no futher stages were performed.

Design: Clinical records and histologic sections were examined.

Conclusion: Although subclinical syringomas have been reported in association with basal cell carcinoma, a plaque-type syringomatous proliferation in association with an infiltrating BCC has not been previously reported. The presence of plaque-type syringomatous proliferation and the uncertainty as to whether it was an extension of the infiltrating basal cell carcinoma or a MAC complicated the management of this case resulting in numerous mohs stages and a large clinical defect. Dermatologic surgeons should be aware of the existence of this entity and consider permanent sections and dermatopathology consultation to better determine the nature of unusual incidental tumors identified in frozen sections during Mohs surgery.







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Presenter: Michael Graves, MD

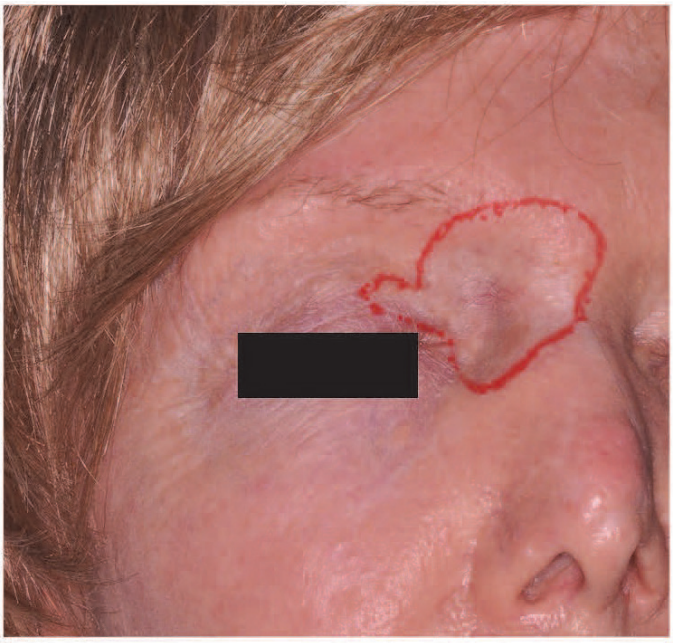
Title: Vismodegib Preceding Radiation Therapy May Be Associated with Exuberant Radiation Dermatitis

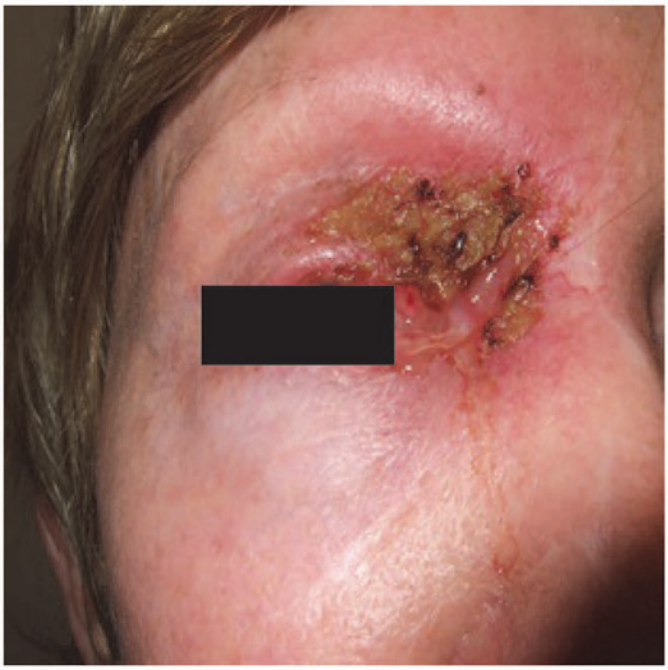
Authors: *Michael Graves, MD[1]; Amanda Lloyd, MD[1]; Prabhakar Tripuraneni, MD[1]; Geva Mannor, MD[1]; Seaver Soon, MD[1]*

Institution: *1. Scripps Clinic, La Jolla, CA*

Purpose: We describe 2 patients who exhibited marked radiation dermatitis associated with vismodegib preceding radiation therapy for basal cell carcinoma. This clinical effect may inform management decisions for radiation oncologists treating tumors subject to such sequential therapy.

Summary: In 2 separate patients, basal cell carcinoma of the right medial canthus and of the right upper eyelid were treated with vismodegib for 2 and 10 months, respectively. After limited response, both patients discontinued vismodegib for 1 month prior to initiating definitive radiation therapy. Both patients developed exuberant skin reaction near the end of their radiation therapy cycle; using this as a surrogate measure of tumor response, an experienced radiation oncologist decided to discontinue treatment in the second patient, although the planned cumulative dosage was not attained. The first patient exhibited no recurrence at 6 month follow-up, whereas the second patient demonstrated recurrent basal cell carcinoma and atypical squamous proliferation at 3 months follow-up. The recurrent tumor underwent salvage therapy with Mohs micrographic surgery. Exuberant radiation dermatitis may be related to the observation that hedgehog inhibition in non-small cell lung cancers enhances radiation efficacy. The persistence of basal cell carcinoma despite increased clinical parameters of response in the one patient suggests that exuberant radiation dermatitis may be a pharmacologic effect of vismodegib therapy rather than an indicator of clinical efficacy. Based on this report, lowering the planned dose of radiation therapy following vismodegib therapy may not be recommended despite the presence of an exuberant skin reaction.





22

Presenter: Amanda Robinson, MD

Title: Surgical Repair of the Lower Extremity: Maximizing Healing and Minimizing Complications

Authors: *Amanda Robinson, MD[1]; Dori Goldberg, MD[1]; Mary Maloney, MD[1]*

Institution: 1. *University of Massachusetts, Worcester, MA*

Purpose: Repairing leg wounds in the elderly patient is fraught with complications. The skin is often thin and fragile and some degree of lower extremity edema is almost ubiquitous. Wound closure when successful provides the shortest healing time as dehiscence, infection, and delayed wound healing are not uncommon. Here, we describe several techniques that minimize these complications and improve wound healing on the legs.

Summary: Effective skin preparation and good sterile technique are essential. We have previously described our protocol for skin prep of the lower extremity that involves cleansing the entire lower extremity twice prior to draping. Suturing through steri strips adds wound security by minimizing the risk of suture tearing through the wound edge or the cheese wire effect. This was first described in the *Journal of Plastic, Reconstructive and Aesthetic Surgery* in 2009. Tape or steri strips are applied to cover the wound edges either parallel or perpendicular to the incision. However, parallel placement allows for better visualization of the wound edges. Second intent healing only in the shallow lower extremity wound is a good option. In the shallow wound, it eliminates the risk of skin tearing and dehiscence and reduces postoperative pain. Unna boot application can be a component of postoperative care and serves to protect the surgical site from contamination, decrease edema, and minimize the amount of wound care required by the patient. The Unna boot is applied to the affected leg before the patient leaves the office then changed in 1 week and reapplied for 1 more week, until suture removal. In non-healing wounds, Medihoney has proven effective. Available over the counter, it has antimicrobial properties as well as an immunomoduatory effect on the wound. It is available in a sheet dressing or a paste that serves to keep the wound bed moist. Patients commonly report decreased wound pain with application of the honey.

Conclusion: The above described techniques have improved lower extremity wound healing in our practice. These should be considered in the elderly patient undergoing Mohs surgery on the lower extremity, and can be used alone or in combination to minimize complications.

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Presenter: Eduardo Moioli, MD, PhD

Title: Tumor Status at the Time of Excision of Squamous Cell Carcinoma In Situ (SCC-IS) in Immunocompetent and Immunosuppressed Patients

Authors: *Eduardo Moioli, MD, PhD[1]; Diana Bolotin, MD, PhD[1]*

Institution: 1. *University of Chicago, Chicago, IL*

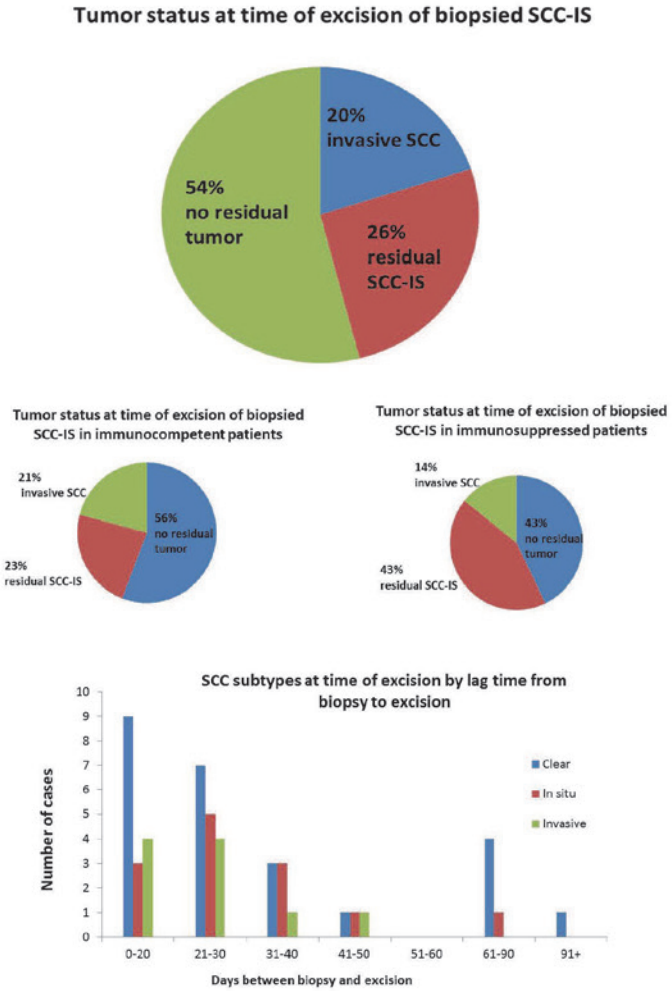
Purpose: The status of biopsy-proven SCC-IS observed at the time of complete excision is not well established. SCC-IS may be a precursor to invasive squamous cell carcinoma (SCC). On the other hand, a proportion of SCC-IS may resolve after biopsy, potentially due to an immunologic response against the tumor or to complete extirpation during biopsy. Given the implicated role of the immune system in the fate of biopsied SCC-IS, the rate of progression or resolution of SCC-IS after biopsy may be different between immunocompetent and immunosuppressed patients. The present study evaluates the rate of tumor clearance, persistence of in situ disease, and progression to invasion of previously biopsied lesions with histopathologic diagnosis of SCC-IS and compares findings between immunocompetent and immunosuppressed patients. Additionally, the effect of lag time between biopsy and excision on tumor status at the time of excision is evaluated.

Summary: A total of 50 consecutive cases of biopsied SCC-IS were evaluated. The average age was 69. Sixty percent of patients were men and 40% women. Ten out of 50 cases (20%) with initial diagnosis of SCC-IS at biopsy were in fact invasive SCC at the time of excision by Mohs Micrographic Surgery (MMS) (Figure 1). Thirteen cases (26%) demonstrated residual SCC-IS, and 27 cases (54%) showed no residual tumor. Seven of the 50 cases were immunosuppressed patients. Of the immunosuppressed cohort, 1 (14%) demonstrated invasive SCC, 3 (43%) demonstrated residual SCC-IS, and 3 (43%) demonstrated tumor clearance at the time of excision by MMS (Figure 2). The average lag time from biopsy to excision was 30.4 days for immunocompetent patients and 34.4 days for immunosuppressed patients. Lag time did not increase the rate of residual tumor and invasive subtype of SCC in either of the two groups (Figure 3).

Design: Consecutive cases of biopsied SCC-IS that subsequently underwent complete excision by MMS between 2010 and 2014 in an academic hospital were evaluated retrospectively according to the protocol approved by the institutional review board. Cases were then stratified by immune status and MMS maps were utilized to determine final histopathologic diagnosis at excision. Time between biopsy and excision was recorded.

Conclusion: The rate of SCC-IS clearance, persistence of in situ tumor, or progression to invasive subtype after biopsy is not well established, especially in immunosuppressed patients. The present study demonstrates a trend towards

decreased rates of tumor clearance after biopsy in this population. Confirmatory studies with larger sample sizes are currently underway to determine statistical significance. These results suggest that immunosuppressed patients with SCC-IS may benefit from complete excision given risk of tumor persistence. The timeframe observed between biopsy and excision did not appear to increase the rate of invasive subtype in immunosuppressed patients.



24

Presenter: Zachary Kozel, BS

Title: Processing High Adipose Tissue Samples: A Comparative Study of Effectiveness of Pre-Treatment with Flash Freezing Spray or Liquid Nitrogen

Authors: *Zachary Kozel, BS[1]; Cindy Krol, BS[1]; Jodi Speiser, MD[1]; Patricia Todd, MD[1]; Rebecca Tung, MD[1]*

Institution: 1. *Loyola University, La Grange Park, IL*

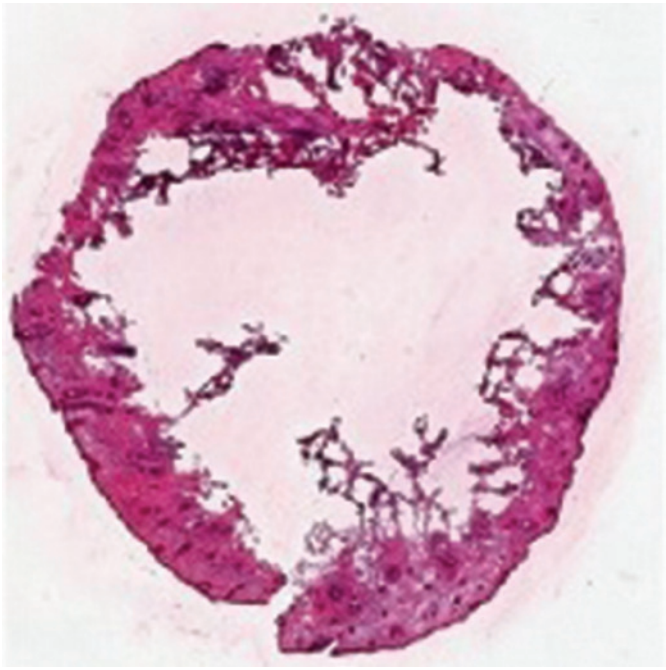
Purpose: High quality slide preparations are crucial to achieving the high cure and low recurrence rate associated with Mohs micrographic surgery. However, Mohs specimens involving a large amount of adipose tissue can be more challenging to prepare and can contribute to incomplete visualization of the central deep margin leading to falsely negative readings. Currently, no standardized approach exists to prepare such samples. Two methods that have shown promise include either pretreatment with liquid nitrogen or cryospray (flash freezing spray) immediately prior to horizontal sectioning.

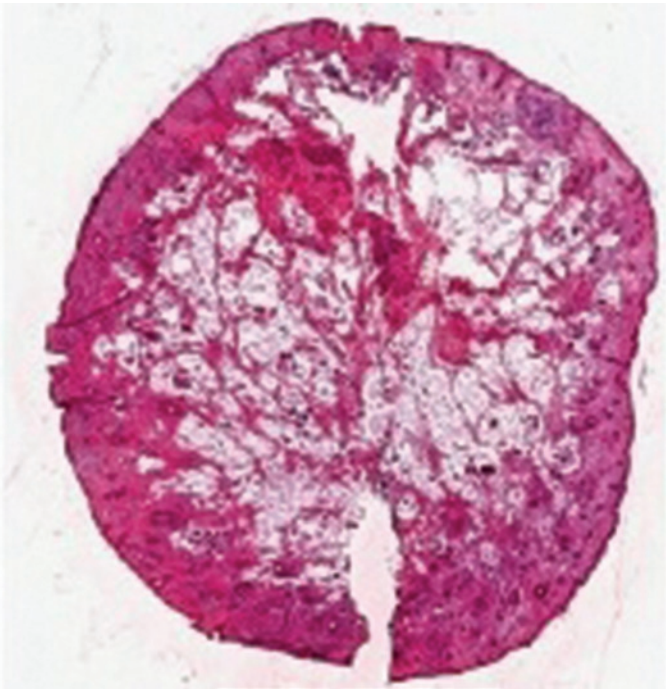
Summary: Overall, in the control group 0 of 24 slides were deemed high quality, in the cryospray group 1 of 24 slides were high quality, and in liquid nitrogen group 19 of 24 slides were high quality. Statistically significant differences in slide quality were detected between these preservation methods ($p < .001$), with the liquid nitrogen method yielding 95% high quality slides; the cryospray method yielded 5% high quality slides; and with no additional freezing, 0% high quality slides.

Design: Twenty-four consecutive high adipose tissue sample sets obtained in the course of normal Mohs surgery, were randomized to treatment with: (1) no additional freezing (control) , (2) 2 ten second pulses of cryospray (1,1,1,2 tetrafluoroethane tissue coolant), or (3) 3 two second sprays of liquid nitrogen. After embedding, the tissue block was cut until the full face of tissue was visible. Initially the block was treated with no additional freezing (control) and Mohs tissue sections (5 microns in thickness) were mounted onto slides, and stained. As the specimen block was sectioned, the tissue was then sprayed using a tissue coolant spray (1,1,1,2 tetrafluoroethane) with two 10 second pulses. Sections were mounted onto a slide and stained. After a brief waiting period (10 minutes), the specimen block was treated with liquid nitrogen in three 2 second pulses. Sections were

mounted onto microscope slides and stained. Following slide staining, each case was then evaluated on the basis of five preselected criteria (margin completeness, epidermal or adipose folding, holes, or other artifacts) by two blinded raters. A high quality slide was defined as one which allowed full visualization of all margins including adipose tissue without introduction nuclear clearing, epidermal/adipose folding, holes in the section from over-freezing, and venetian blind type artifacts.

Conclusion: Pre-treatment with liquid nitrogen enhances the quality of high adipose slides and should be further evaluated for widespread adoption.





25

Presenter: Maren Cotes, MD

Title: The Role of Teledermatology in the Diagnosis and Management of Non-Melanoma Skin Cancer

Authors: *Maren Cotes, MD[1]; Carl Washington, MD[1,2]; Suephy Chen, MD[3]*

Institutions: *1. Emory University School of Medicine, Atlanta, GA*
2. Dermatology Associates of Georgia, Decatur, GA
3. Emory University, Department of Dermatology, Atlanta, GA

Purpose: The use of telemedicine to provide enhanced access to medical services for patients in low service areas has become increasingly prevalent with the evolution of improved digital technology. There is a growing body of evidence to suggest that increasing availability of teledermatology services may enable dermatology providers to appropriately triage geographically remote patients with suspected cutaneous neoplasms. The goal of this study was to assess the sensitivity and specificity of teledermatology in the diagnosis of non-melanoma skin cancers (NMSC). The intent was to determine whether the specificity of a teledermatology diagnosis of NMSC is sufficiently high to directly schedule patients for a frozen section biopsy followed immediately by Mohs surgical excision, foregoing patients the cost of an additional trip for biopsy prior to scheduling a separate surgical appointment.

Summary: Of 425 lesions concerning for cutaneous malignancy, 361 were evaluated in person, resulting in a total of 162 malignant diagnoses. The overall sensitivity of teledermatology for the diagnosis of non-melanoma skin cancer was 91% for lesions with NMSC listed first on the differential diagnosis. Specificity was only moderate, however, at 49%. These data suggest that teledermatology may be used with a fairly high degree of confidence to rule out a NMSC diagnosis, sparing patients additional visits for in-person evaluation, but is likely not sufficiently specific to make direct scheduling for Mohs surgery of suspicious lesions cost effective. However, further analysis of specific tumor types and locations did reveal that diagnosis by teledermatology is more precise for certain subsets of NMSC. The sensitivity of a teledermatology diagnosis of a basal cell carcinoma (BCC) located within the H zone (as defined by the Mohs Appropriate Use Criteria) as the first listed diagnosis was found to be 70%, with a specificity of 88%.

Design: In 2013, 2214 patients were evaluated by the teledermatology service at a VA medical center using asynchronous, "store-and-forward" technology. These virtual consults resulted in a total of 425 cutaneous lesions felt to be concerning for a cutaneous malignancy. All lesions listed NMSC as a possible diagnosis and were further categorized into those with a primary differential diagnosis of NMSC versus those with a non-malignant diagnoses listed as the initial diagnosis. All patients with a concerning lesion were

scheduled for in-person consultation for evaluation and possible biopsy. Upon in-person evaluation, lesions that were felt to be suspicious for malignancy were biopsied, resulting in either a non-malignant or malignant diagnosis. Lesions that were not biopsied following clinical evaluation were considered non-malignant diagnoses.

Conclusion: For suspected BCC in high risk locations, a direct appointment for Mohs surgery, forgoing an initial confirmatory biopsy at a separate appointment, may be a cost effective care delivery model for remotely based patient populations with limited access to dermatologic services.

26

Presenter: Douglas Heiner, MD

Title: Matrilin-2 Labeling Can be Used in Mohs Surgery to Distinguish Basal Cell Carcinoma from Benign Structures

Authors: *Satori Iwamoto, MD, PhD[1]; Douglas Heiner, MD[1]; Fang Xiong, BA[1]; Ming Lu, MD[1]; Catherine Breen, MD, MPH[1]; Zhengke Wang, PhD[1]*

Institutions: *1. Roger Williams Medical Center, Providence, RI*

Purpose: Current immunostains for basal cell carcinoma have the disadvantage of potentially labeling benign structures. For example, immunolabeling using Ber-Ep4 antibodies stains basal cell carcinoma, but can also stain benign eccrine glands. We sought to identify an antibody that is more specific for basal cell carcinoma. Our approach was to identify proteins that are expressed when tumors invade into the dermis, as invasion is a feature of malignancy. First, we sought to determine how well matrilin-2, an extracellular matrix protein, acted as a marker for invasion of basal cell carcinoma. To this end, we studied the expression of matrilin-2 in basal cell carcinomas of different subtypes. Second, we sought to identify the stromal cells that produced matrilin-2.

Summary: The peritumoral stroma of all basal cell carcinomas expressed high levels of matrilin-2. In contrast, normal skin, including the stroma surrounding the adnexal structures, showed little or no matrilin-2 immunolabeling. Furthermore, matrilin-2 levels were differentially expressed depending on the subtype of basal cell carcinoma. Specifically, matrilin-2 levels were more highly expressed in more invasive nodular and infiltrative basal cell carcinoma. In contrast, relatively lower expression was seen in superficial basal cell carcinoma. In addition, we found that matrilin-2 is expressed by the fibroblasts in the peritumoral stroma.

Design: Tissues of basal cell carcinomas from 42 patients were immunolabeled with matrilin-2 antibody. This included 6 superficial basal cell carcinomas, 25 nodular basal cell carcinomas, and 11 infiltrative basal cell carcinomas.

To identify which cell types expressed matrilin-2 in the peritumoral stroma, 3 BCC carcinoma tissue samples were dissociated into single cells, stained with different cell markers, and flow cytometry was performed.

Conclusion: During Mohs surgery, matrilin-2 can be used to distinguish basal cell carcinoma from benign adnexal structures, including basaloid follicular hamartoma. Immunolabeling is used for more aggressive subtypes of basal cell carcinoma or in cases where the histology is ambiguous. To enhance the usefulness of immunolabeling during Mohs surgery, a double labeling method can be employed. We suggest using a pan cytokeratin marker that stains the tumor cells themselves and adding matrilin-2 as a second marker to highlight the peritumoral stroma. This double labeling technique may aid in identifying small tumor foci of basal cell carcinoma. As matrilin-2 labels the stroma around basal cell carcinomas, this marker can help identify the proximity of the surgical margin to tumor foci. This approach is proof of principle that markers of invasion, such as matrilin-2, can be used to evaluate the surgical margins of malignancies.

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Presenter: Thomas Jennings, MD, PhD

Title: Observation of Dog-Ear Regression by Anatomical Location

Authors: *Thomas Jennings, MD, PhD[1]; Stephanie Walsh, MD[2]; James Keane, MD[3]; David Raimer, MD[4]; Vineet Mishra, MD[5]; Conway Huang, MD[1]*

Institutions: *1. University of Alabama, Birmingham, Birmingham, AL*
2. Private Practice, Northport, AL
3. Private Practice, Shreveport, LA
4. Private Practice, Galveston, TX
5. University of Texas, San Antonio, TX

Purpose: When an excision is performed by a method other than elliptical excision (eg, Mohs micrographic surgery (MMS)) direct primary wound closure can result in standing cones or "dog-ears." In 2008, Lee et al. noted that dog ears of <8mm in height have a statistically greater tendency to resolve without further surgical correction than larger dog ears. The present study stratifies dog-ear regression by anatomic location and informs the need for correction at the time of surgery.

Summary: A total of 140 dog-ears were observed over the course of the study period. Anatomical locations included the hand/foot, trunk, limb, and head/neck. Among these dog-ears, 114/140 (81%) showed complete resolution. Dog-ears were further stratified into "normal" and "large" based on height less than or greater than 4mm. Dog-ears of any size were observed to approach complete resolution when located on the hand (34/35 cases [96%]). Dog-ears ≤4mm in height on the trunk were also observed to approach complete resolution (17/18 cases [94%]). Dog-ears on the head/neck and limbs were observed to show complete resolution in only

67% and 78% of cases, respectively. Six cases (4%) in the study showed less than 50% resolution. Patient satisfaction with the appearance of the resulting scar at the time of follow-up correlated well with the resolution of the dog-ears, with most patients rating the appearance of the scar as good to excellent. Dissatisfaction was most often noted with residual dog-ear height of 2 mm or greater or scar location on cosmetically sensitive areas such as the head or neck.

Design: Institutional Review Board approval was obtained for this study. After tumor extirpation via MMS, patients were counseled that primary closure of the surgical wound would result in a dog-ear at the wound apices. Primary closure was completed and the dog-ears were left uncorrected in participating patients. Photography of the wounds from above and laterally with a ruler was performed to record dog-ear height. Patients were then examined at 6 months to assess for resolution of the dog-ears, and the patient and investigators rated the appearance of the scar on a 1 (excellent) to 5 (poor) scale.

Conclusion: It is current standard of practice to remove dog-ears at the time of surgery. The results observed in this study suggest that dog-ears of any size on the hand and dog-ears ≤4mm on the trunk may be left/observed without any cosmetic penalty while also leaving patients with smaller wounds and shorter procedure times

Location	Cases	100 % resolution	normal (≤ 4 mm)	100% resolution	< 50% resolution	Large (> 4 mm)	100 % resolution in largecases	<50% resolution
Hand/Foot	35	34 (97%)	27	26 (96%)	0 (0%)	8	8 (100%)	0 (0%)
Limb	54	42 (78%)	42	33 (79%)	3 (7%)	12	9 (75%)	0 (0%)
Trunk	21	18 (86%)	18	17 (94%)	0 (0%)	3	1 (33%)	0 (0%)
Head/Neck	30	20 (67%)	26	20 (77%)	3 (12%)	4	0 (0%)	0 (0%)

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Presenter: David Weinstein, MD

Title: Long-Term Quality of Frozen Section Slides

Authors: *David Weinstein, MD[1]; Brett Coldiron, MD[2]*

Institutions: *1. The Good Samaritan Skin Cancer Center/ TriHealth, Cincinnati, Ohio*
2. The Skin Cancer Center, Cincinnati, OH

Purpose: CLIA guidelines usually require a 10-year retention for all histopathology slides, however, no prior studies to our knowledge have assessed quality of frozen sections over time or whether degradation of quality occurs. The purpose of this study was to evaluate the quality of frozen section slides used for diagnosis and Mohs layers with respect to time.

Summary: Comparisons of 20 vertical frozen section and Mohs frozen section slides from 1994 were generally similar to those collected in 2014. Of the 20 vertical frozen section slides from 1994, 71.3% had concordant diagnoses, and 80.0% of 20 vertical frozen section slides from 2014 had concordant diagnoses (p=0.319). The average quality of the 20 Mohs frozen sections from 1994 was 1.95 compared to 2.15 from 2014 (p=0.204), while 82.5% of 20 Mohs frozen section slides from 1994 and 77.5% 20 Mohs frozen section slides from 2014 had concordant diagnoses respectively (p=0.352). The one exception was the average quality (on a scale of 1 to 3) of the 20 vertical frozen sections from 1994, which was 1.56 compared 1.93 from 2014. Although this difference was significant (p=0.012), it may not have clinical significance as shown by a statistically insignificant difference in diagnosis concordance between the two groups.

Design: Twenty vertical frozen section slides and 20 Mohs frozen section slides were collected in 1994 and stored in a cabinet out of direct sunlight at room temperature until 2014. Another set of 20 vertical frozen section slides and 20 Mohs frozen section slides were collected and prepared by the same physician and technician in 2014. Four dermatologists evaluated all slides from both 1994 and 2014 on a 3-point scale for quality. In addition, vertical frozen sections were read for diagnoses and compared to original diagnoses for concordance. Mohs frozen sections also were read for tumor clearance and compared with the original Mohs reading.

Conclusion: Frozen section slides when stored in a cabinet out of direct sunlight at room temperature retain their quality for at least 20 years and perhaps longer with minimal degradation of quality. There is no need for special processing nor storage for frozen section slides to ensure that there is no degradation of quality.

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Presenter: Patrick Mulvaney, BA

Title: Keratoacanthomas and Squamous Cell Carcinomas Treated by Mohs Micrographic Surgery: Anatomic Similarities But Invasive Differences

Authors: *Patrick Mulvaney, BA[1]; Kachiu Lee, MD MPH[1]; Raymond G. Dufresne, MD[1]; Antonio Cruz, MD[1]; H. William Higgins, MD, MBE[1]*

Institutions: *1. Warren Alpert Medical School of Brown University, Department of Dermatology, Providence, RI*

Purpose: Keratoacanthomas (KAs) are keratinocyte-derived tumors often regarded as a clinical and pathologic variant of squamous cell carcinomas (SCCs). Their propensity to metastasize has been reported at rates much less than that of SCCs, but their degree of local tissue destruction has not been fully characterized in any large-scale review. With the need for data-driven comprehension and consensus on the appropriate use of Mohs micrographic surgery (MMS), we sought to determine the degree of anatomic similarity and local invasion between KA, SCC and SCCIS.

Summary: 2521 SCC, 1230 SCCIS and 257 KA cases were included for analysis. Average subject age was 73.7 years. Male subjects accounted for 70.5% of the total. Initial tumor area and final tumor measurements are shown in Figure 1.

Coefficient of determination for initial vs. final defect size divided by high, medium and low risk areas was 0.866 for SCC and SCCIS cases, increasing to 0.886 when including KA subjects (Figure 2). Average layers by location for each tumor type was significantly different at high-risk areas only (ANOVA, p=0.02) and not at medium or low-risk sites (Figure 3). KAs required 3 or more layers significantly less often than SCC and SCCIS (p <0.05) (Figure 4).

Design: A retrospective review was performed on Mohs surgery cases from 2005 to 2011 at a university-based Mohs surgery unit. Primary metrics included sex, age, anatomic location, tumor type and subtype, initial and final area, and number of Mohs stages. All histologically confirmed KAs and SCCs treated by MMS were included. Tumors were subdivided by location using the Mohs appropriate use criteria (AUC) for high, medium and low-risk areas. Data were analyzed using Student's t-tests, Fisher's exact tests, linear regression and analysis of variance (ANOVA) (Microsoft Excel 2013, v15.0).

Conclusion: KAs are a commonly encountered tumor in the Mohs surgery setting. As expected for accordance with Mohs AUC, average initial size for all tumor types was larger in lower-risk areas. Size characteristics of KAs were almost indistinguishable from SCCIS cases. While resulting of smaller final defects, KAs appear to mirror growth trends of SCC. Modeling for final size reveals a high degree of correlation with presenting size, indicating the efficacy of Mohs in general regardless of tumor type or location. Average layers for clearance were similar ranging from 1.12 (KA in low-risk areas) to 1.55 (SCC in high-risk areas). However, there was notable distinction in high-risk areas, where SCCs appear to be uniquely more invasive. KAs required extensive layers (3 or more) approximately half as often as SCC and SCCIS. Therefore, despite similarities in size, KAs do not appear to have the same locally invasive qualities as both SCC and SCCIS.

Figure 1.

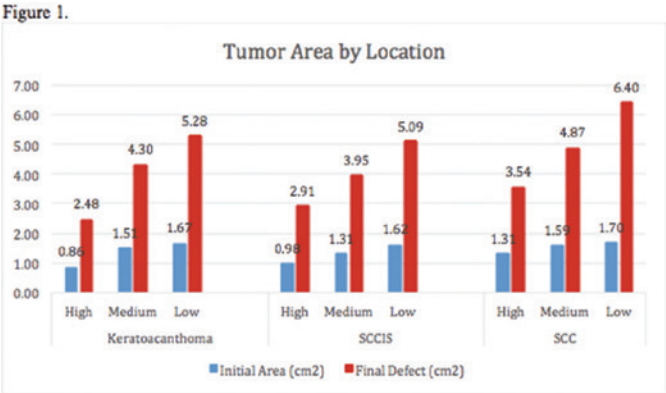


Figure 2.

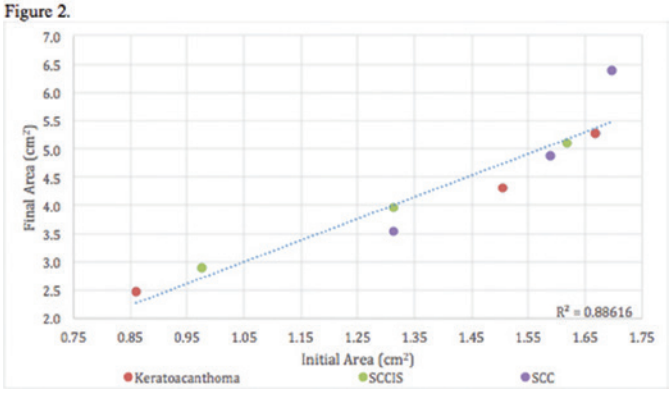


Figure 3.

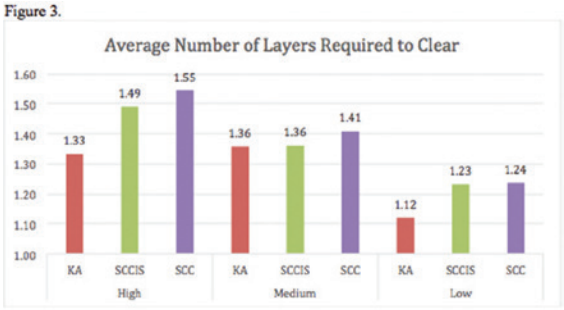
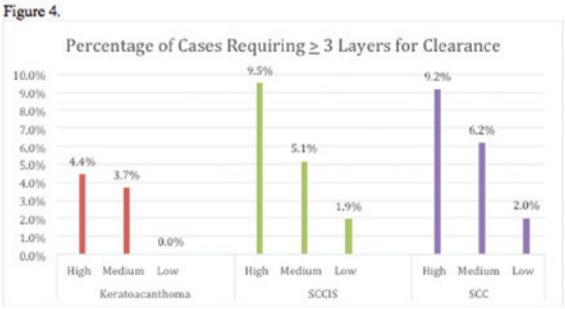


Figure 4.



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Presenter: Jennifer Ranario, MD, MBA

Title: Rate of Surgical Site Infections with New Protocol of Prophylactic Antibiotic Use in Dermatologic Surgery

Authors: *Jennifer Ranario, MD, MBA[1]; Ikue Shimizu, MD[2]*

Institutions: *1. MD Anderson Cancer Center, Houston, TX 2. Texas Tech University Health Sciences Center, Lubbock, TX*

Purpose: Infection prophylaxis practices vary greatly among dermatologic surgeons, and some studies report widespread usage of antibiotics. However, overall wound infection rates in dermatologic surgery are low. Overuse of antibiotics can contribute to increased incidence of adverse effects of antibiotics and antibiotic resistance. Based on the findings from a review of the literature, a new protocol for prophylactic antibiotics was implemented at our institution based on factors associated with a risk of infection over

5%. Data was retrospectively collected from patients who underwent standard excision or Mohs micrographic surgery to analyze the rate of infection and assess for any risk factors that are associated with infection.

Summary: Non-parametric tests and descriptive statistics were used due to sample size. The overall rate of infection was 0.8% (6/726). No risk factors assessed in our study (diabetes, HIV, lymphoma/leukemia, staphylococcal infection in previous 12 months, immunosuppression, blood thinners, smoking, type of closure, length of surgery >2 hours, closure material, age >60, sex, tumor size, size of defect) were associated with a statistically significant increased risk of infection. Closure with a porcine xenograft (p=.0812) and smoking (p=.0740) showed trend towards increased risk for infection.

Design: A retrospective chart review was performed of dermatologic surgery patients at a single academic center from May 2013 to April 2014. Antibiotics were given to patients prior to surgery when the surgical site was in the groin area or below the knee and given prior to closure with wedge excision of the lip or ear. Prophylactic antibiotics were also given to patients at high risk for infective endocarditis according to the 2007 American Heart Association guidelines if surgery involved perforation of the oral mucosa. In accordance with the consensus recommendation from the most recent practice guidelines from the American Academy of Orthopedic Surgeons/American Dental Association, patients undergoing procedures involving the oral mucosa were advised to maintain good oral hygiene. Patients who took oral antibiotics for any reason other than for surgical site infection prophylaxis, patients undergoing surgical reconstruction by an outside surgeon, and patients who developed a hematoma were excluded.

Conclusion: Due to the lack of randomized controlled studies specific to dermatologic surgery, guidelines for the use of antibiotic prophylaxis in dermatologic surgery are generally extrapolated from other fields. However, the rate of infection in dermatologic surgery is low. Limiting use of antibiotics to patients with an increased risk of infection specific to this setting would help to decrease risks associated with unnecessary and excessive use of antibiotics. Although sample size limited analysis, our findings suggest that routine antibiotic prophylaxis may often be unnecessary. Further research is needed to clarify when prophylactic antibiotics would be of significant benefit and if having multiple potential risk factors could affect infection risk.

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Presenter: Kevin Gardner, DO

Title: Superficial Liposarcoma: A Clinicohistopathologic Review of 13 Cases

Authors: *Kevin Gardner, DO[1]; Daniel Winchester, MD[1]; Julia Lehman, MD[1]; Clark Otley, MD[1]*

Institutions: *1. Mayo Clinic, Rochester, MN*

Purpose: Liposarcoma arising in the dermis or subcutaneous tissue is extremely rare. While high recurrence rates and metastases are well documented in liposarcomas of the deep soft tissue, less clinical and histopathologic information is available for the superficial form. Our aim was to characterize the clinicohistopathologic features and evaluate outcomes of the superficial variant of liposarcoma.

Summary: In our single-site retrospective study of 13 patients with superficial liposarcoma, the mean age at diagnosis was 58 years (range 12-98) with a slight male predominance (62%). The most common locations were the thigh (n=3) and back (n=3). The average clinical tumor diameter was 10.1 cm (range 3-25). There were a total of five dedifferentiated, three myxoid, two pleomorphic, two well-differentiated, and one unclassifiable tumor that was considered low-grade. Three cases metastasized (23.1%), of which one was previously treated with initial excision, one with previous excision and postoperative radiation, and one with prior neoadjuvant chemoradiation and excision. Of these metastatic cases, two showed definitive extension to the underlying skeletal muscle and/or fascia and all three involved pulmonary metastases. Of the metastatic cases, two tumors were classified as dedifferentiated and one pleomorphic; all were considered high grade. The mean time to metastasis was 1.1 years. We observed two disease-specific deaths (15.4%), both of which occurred in patients with metastasis. Of four cases that recurred (30.8%), three (75%) had been treated with excision only and one (25%) with excision and postoperative radiation. The mean time to recurrence was 2.4 years. Of those that recurred, three (75%) were dedifferentiated and one (25%) was myxoid. Three of the recurrent cases (75%) showed extension of the tumor into the underlying skeletal muscle and/or fascia. None of the well-differentiated tumors recurred or metastasized after wide local excision with clear margins. The average follow-up time for all cases was 5.4 years (range .1 -11).

Design: After institutional review board approval, 13 patients diagnosed with superficial liposarcoma involving predominantly the subcutis or dermis between 1993 and 2013 were reviewed. Clinical parameters of patient age, sex, tumor location, size, recurrence, and metastasis, cause of death, and timelines for these factors were reviewed. Available tissue specimens were reviewed by a dermatopathologist. Tumors were classified as atypical lipomatous neoplasm/well-differentiated liposarcoma, dedifferentiated liposarcoma, myxoid/round-cell

liposarcoma, or pleomorphic liposarcoma, according to WHO classification. Tumors were graded based on standard criteria. Margin status determination was based on prior report.

Conclusion: Superficial liposarcomas exhibit heterogeneous behavior, based on the microscopic subtype, histopathologic grade, and anatomic depth of invasion. High-grade tumors with extension into the underlying fascia and skeletal muscle are more likely to recur and metastasize. Well-differentiated tumors located in the subcutis and/or dermis respond favorably to wide local excision with tumor free margins.

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Presenter: Brett Blake, MD

Title: Trash Isn't Cheap: Cost of Inappropriate Disposal of Regulated Medical Waste in an Academic Dermatologic Surgery Clinic

Authors: *Sara Braswell, BS[1]; Brett Blake, MD[1]; Paul Hargarten, BS, BA[1]; Keith Zirkle, BS[1]; Algin Garrett, MD[1]*

Institution: *1. Virginia Commonwealth University, Richmond, VA*

Purpose: In contrast to solid waste (SW), which may be deposited in landfills, regulated medical waste (RMW) must undergo specific treatment methods and therefore the cost of disposal is significantly higher. We sought to determine how much waste was inappropriately discarded in a dermatologic surgery clinic, hypothesizing that a significant amount of SW was being disposed of in the receptacle intended for RMW.

Summary: Over the course of five days, 75.13% of waste disposed of in red biohazard bags, a total of 28.37 lbs, did not meet the state law's criteria for regulated medical waste. Resultant cost over a five day period amounted to $8.79, which could be extrapolated to $457.08 over an entire year.

Design: Two investigators independently weighed the total waste discarded in red biohazard bags, intended for RMW, in five exam rooms used by a single dermatologic surgeon over the course of five days. This waste was then sorted as SW or RMW as dictated by state law and then weighed.

Conclusion: These results highlight the importance of educating physicians and staff regarding appropriate classification and disposal of refuse in the dermatology clinic.

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Presenter: Kaleena Noland, BSN OCN

Title: The Use of RNs and Other Ancillary Staff in Mohs Micrographic Surgery: A Survey of Fellow Members of the ACMS

Authors: *Kaleena Noland, BSN OCN[1]; Mark Hyde, PA[2]; Glen Bowen, MD[1]; Stephanie Murphy, MA[1]; Brady Donaldson, EMT[1]*

Institutions: *1. University of Utah, Salt Lake City, UT 2. University of Utah Department of Dermatology, Salt Lake City, UT*

Purpose: Many Mohs practices are employing an increasing number of physician extenders as well as other office assistants and technicians in an effort to improve the delivery of patient care. Currently, there is little data regarding the specific roles of registered nurses (RNs) and other ancillary staff members in Mohs surgery. In order for practice managers and supervising physicians to better understand the utilization of these health care professionals and improve the efficiency and care in their Mohs clinics, access to this information is vital. In order to ascertain this in the context of a Mohs practice, basic information was requested in the form of a survey.

Summary: A two page survey was mailed to Fellows of the American College of Mohs Surgery. Out of 817 surgeons, 179 (21.9%) returned the survey. 49% of those who replied reported employing one or more RNs, and 35% employed one or more licensed practical nurses (LPNs). Seventy-three percent employed two or more medical assistants (MAs), with the average number of MAs per practice being 2.9. The average number of histotechs per surgeon is 1.6, and 57% of Mohs surgeons report there is cross coverage between roles, i.e. a medical assistant may act as a histotech, and vice versa. Of the 179 respondents, 73.7% performed Mohs surgery in a stand-alone private practice setting followed by 12.8% practicing within an academic institution. The remainder practice in a hospital or a combination of the above. The average number of Mohs surgeons per practice was 1.7, with an average of 27 individual tumors removed weekly per surgeon.

Design: A two page survey used in a previous study was modified and mailed to Fellows of the American College of Mohs Surgery. Results were tabulated using Stata.

Conclusion: While it is accepted that a team approach is the best way to conquer Mohs surgery, efficient use of RNs, LPNs, MAs and histotechs in Mohs Micrographic surgery is unknown, with no data on the topic. This survey intends to facilitate the ongoing discussion of how, when, and where these employees are best utilized in Mohs surgery to advance and improve delivery of care for skin cancer across the nation.

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Presenter: Robert Cook, PhD

Title: Utility of Gene Expression Profile (GEP) Signature for a Cohort of Patients with Head and Neck Melanoma

Authors: *Brooke Middlebrook, BS[1]; Derek Maetzold, BS[1]; Robert Cook, PhD[1]*

Institution: *1. Castle Biosciences, Inc., Friendswood, TX*

Purpose: Mohs surgery has been shown to be an effective method for treating primary cutaneous melanomas that develop in the head and neck region. However, the unique aspects of head and neck melanomas can pose challenges to the subsequent use of sentinel lymph node biopsy (SLNB) for accurately determining metastatic risk associated with the primary tumor. We have previously described a GEP signature that accurately predicted risk in a cohort of cutaneous melanoma cases, providing a binary outcome of Class 1 (low risk of metastasis) or Class 2 (high risk). In the current study, we evaluate the prognostic capabilities of the GEP independently, and in combination with SLNB status, in a cohort of patients with primary head and neck melanoma. The results indicate that Mohs surgery followed by GEP testing can provide an opportunity to accurately identify high-risk melanoma patients.

Summary: A total of 98 patients were identified with primary melanoma tumors in the head and neck region. Locations of the tumors included the mid-face (n=32), lateral face (n=24), scalp (n=30), and neck (n=12). Median age of patients in the cohort was 62 (range 25-87) and median Breslow depth was 2.6 mm (range 0.6-16.0 mm). Only 5 SLN-positive patients were GEP Class 1, compared to 34 (49%) SLN-negative patients who were Class 2. Median tumor thickness in SLN-positive patients was 3.0 mm; in SLN-negative patients it was 2.4 mm. Median tumor thickness in GEP Class 1 was 1.7 mm and in Class 2 was 3.6 mm. Kaplan-Meier (K-M) analysis of SLN-positive patients demonstrated a 5-year distant metastasis-free survival (DMFS) of 40%, compared to 36% for GEP Class 2 cases. K-M analysis of combined GEP and SLNB predicted risk resulted in 5-year DMFS outcomes of 82% for Class 1/SLN-negative (n=36) cases but 29% for Class 2/SLN-positive cases (n=23). 25 of 70 (36%) SLN-negative patients developed distant metastases; median thickness was 2.8 mm in this subgroup and 12 presented with ulceration. Of this subgroup of SLN-negative patients, 34 were GEP Class 2, with a 5-year disease-free survival (DFS) and DMFS of 23% and 41%, respectively.

Design: Primary tumor samples and associated clinical data were collected under an IRB-approved, multicenter protocol. qPCR analysis was performed to assess expression of the gene signature and Radial Basis Machine predictive modeling was used to predict risk (Class 1 vs. Class 2). DFS (includes in transit and regional metastasis) and DMFS were assessed.

Conclusion: The results presented in the current study illustrate the prognostic accuracy of the GEP test for identifying low- and high-risk cases of head and neck melanoma. Following Mohs surgery for treatment of the primary tumor, GEP testing can be a clinically useful tool for use in SLN-negative patients who may still be at high risk for metastasis.

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Presenter: Lauren Rimoin, MD

Title: Non-Cultured Epidermal Suspension Transplantation as a Novel, Effective Treatment for Segmental Vitiligo: A Pilot Study

Authors: *Lauren Rimoin, MD[1]; Sulochana Bhandarkar, MD[1]*

Institution: 1. *Emory University School of Medicine, Atlanta, GA*

Purpose: Segmental vitiligo is condition in which patients have depigmented lesions on only one segment of their body that remain stable with time. These lesions are poorly responsive to medical treatment and current surgical treatments are limited; punch grafts yield poor cosmetic outcomes and cultured melanocyte transplantation requires special equipment and personnel. A non-cultured melanocyte transplant technique called Melanocyte-Keratinocyte Transplantation Procedure (MKTP) has shown promising results in treating vitiligo without special culture requirements or equipment, yet is widely underutilized in the United States. Only one academic center in North America has published a study using MKTP. We hypothesized that a modified version of MKTP called Non-Cultured Epidermal Suspension Transplantation (NEST) would attain higher repigmentation rates for segmental vitiligo. MKTP is typically performed with a trypsin-based heated separation technique; however, using colder temperatures and recombinant protease, which is free of animal products, instead of trypsin, should lead to a safer procedure with a higher yield of cells for transplantation, thus improving repigmentation rates. This recombinant protease-based cold cell separation technique has not been used for treating vitiligo in the United States.

Summary: The procedure required two visits by the patients on two subsequent days. At 3 and 6 months, one patient showed excellent repigmentation (>95%), one showed good repigmentation (65%-94%), and one showed poor repigmentation (0%-24%) (Figure 1). Two were extremely satisfied with the procedure and one was fairly satisfied. All 3 believed it changed their lives, they would repeat it for other lesions, and would recommend it to others.

Design: 3 adult patients with segmental vitiligo were enrolled; 2 additional patients are being recruited for a goal of 5 total. Split-thickness epidermal grafts were harvested from the patients' upper thighs under local anesthesia. The grafts were placed in a centrifuge tube with recombinant protease and cooled to 4° C for 16 to 18 hours. The next

day, the cells were suspended in PBS and transplanted to dermabraded vitiligo lesions. A layered gauze dressing was placed and left in place for one week. The patients were subsequently at 3 months for photography and satisfaction questionnaires. They will be reassessed at 6, 9, and 12 months. The primary outcome assessed was feasibility of the study measured by time to perform the outpatient procedure. The secondary outcomes were extent of repigmentation and patient satisfaction.

Conclusion: Non-Cultured Epidermal Suspension Transplantation is a feasible outpatient procedure that is capable of yielding significant repigmentation and positive patient satisfaction in cases of segmental vitiligo in just 3 months. Of note, the patient with poor regimentation was covering her lesions with sunblocking makeup after the procedure, which may have slowed the repigmentation process.

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Presenter: Jessica Dietert, MD

Title: Intralesional 5-Fluorouracil for the Treatment of Follicular Actinic Keratoses in the Setting of Patient Immunosuppression: A Case Series

Authors: *Jessica Dietert, MD[1]; Hubert Chodkiewicz, MD[1]; Jennifer Ranario, MD, MBA[1]; Valencia Thomas, MD[2,3]*

Institutions: *1. University of Texas, Houston, TX*
2. MD Anderson Cancer Center, Houston, TX
3. UT Houston School of Medicine, Houston, TX

Purpose: Follicular, also known as proliferative, actinic keratoses (FAK) present a distinct therapeutic challenge, especially in the setting of immunosuppression. The adnexal involvement and sideways growth pattern that characterize this subtype of actinic keratoses make recurrences common with standard treatments for actinic keratoses and make invasion possible. Though intralesional 5-fluorouracil (IL 5-FU) has been used in the treatment of squamous cell carcinoma, the treatment of FAK in immunosuppressed patients has not been extensively addressed. The purpose of this study was to attempt to quantify a dose of IL 5-FU that can successfully treat FAK.

Summary: Six immunosuppressed patients with a combined 30, biopsy-proven FAK treated with IL 5-FU were identified. The average time to resolution was 12 weeks. The most common IL 5-FU dose was 0.1 ml of fluorouracil 50 mg/ml solution per square centimeter. Follow-up times ranged from 3 to 36 months. 90% of FAK resolved after 2 doses of IL 5-FU at 6 week intervals. Alternative treatment options were pursued after FAK failed to resolve or grew after 3 treatments (10%).

Design: A retrospective review of 6 patients with FAK treated with IL 5-FU was performed. Pre-treatment photographs of FAK were used to estimate each lesion size. The time to resolution, IL 5-FU dose, and the duration of clinical clearance was recorded.

Conclusion: IL 5-FU appears to be an effective treatment option for immunosuppressed patients with FAK. Additional prospective studies are necessary to further correlate treatment success with dose and depth of immunosuppression.

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Presenter: Sean Mazloom, MD

Title: A Case of Basal Cell Carcinoma with Vascular Invasion Treated with Postoperative Adjuvant Radiotherapy

Authors: *Sean Mazloom, MD[1]; Douglas Grider, MD[1]; Rahul Chavan, MD, PhD[1]; Mariana Phillips, MD[1]*

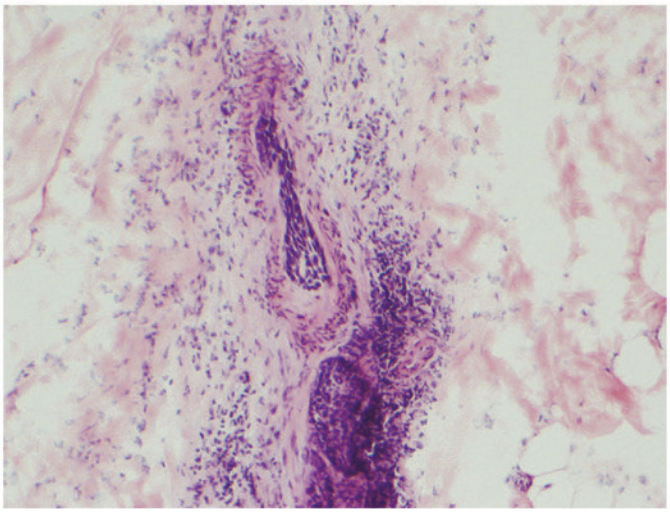
Institution: *1. Virginia Tech-Carilion Clinic, Roanoke, VA*

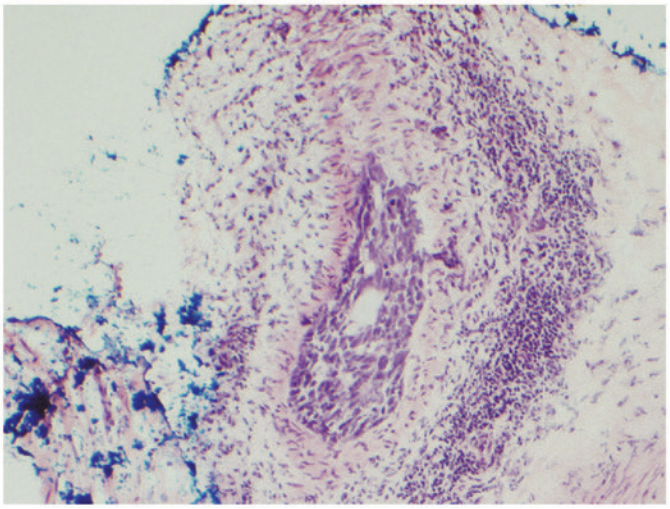
Purpose: Although exceedingly rare, non-melanoma skin cancer can invade vascular structures, and present diagnostic and therapeutic challenges to the Mohs surgeon. A case of intravascular basal cell cancer (IVBCC) was encountered and is reported with the intent of increasing awareness of this rare entity.

Summary: A 61 year-old male was referred for Mohs excision of an infiltrative BCC on the vertex of the scalp. An attempt at excising the lesion with frozen sections was aborted by the referring plastic surgeon due to the persistence of positive margins. On Mohs pre-operative examination, there was a 4.0 cm linear scar and no palpable lymphadenopathy. A BCC in the lumen of a medium sized artery(images 1-2) as well as perineural invasion with cords and islands of BCC surrounding a medium sized nerve (approximately 40 mm) were noted on the stage I frozen sections (image 3). The tumor was cleared with four Mohs stages, resulting in an 8.2 x 6.2 cm defect. Post-operatively patient received 50 Gy divided over 25 treatments. At one year post-operative follow up, he was clinically tumor free and PET-CT did not reveal any evidence of metastatic disease.

Design: Case report and literature review

Conclusion: Few Mohs surgeons have encountered IVBCC on the routine review of Mohs frozen sections. We report a patient with IVBCC who received adjuvant radiotherapy postoperatively due to the large size of tumor, perineural involvement, and vascular invasion. Although our patient showed no sign of metastatic disease on PET-CT scan one year after Mohs excision, long term follow-up is planned since the median interval between the onset of primary BCC and metastasis can approach years(1). Intravascular BCC is rarely emphasized in the literature and is likely underreported. The significance of IVBCC has been debated. The viability of the epithelial tumor cells that invade the vasculature has been questioned based on the known stromal dependence of the tumor. In a previous publication reporting five cases of metastatic BCC, intravascular invasion was present in two of five primary tumors. Metastasis to the lymph nodes and lungs occurred in both cases approximately ten years after treatment of the primary tumor(1). Another report detailed a case of recurrent BCC with intra-arteriolar invasion that metastasized to the lungs and lymph nodes five years after treatment(2). Until the clinical significance of IVBCC without end organ metastasis is better understood, it may be prudent for the Mohs surgeon to consider close clinical follow up, serial imaging, and adjuvant therapy for IVBCC in patients with other high-risk factors for recurrence/metastasis. References: 1. von Domarus H , Stevens PJ. Metastatic BCC. Report of five cases and review of 170 cases in the literature. JAAD 1984;10:1043-60. 2. Robinson JK , Dahiya M. BCC with pulmonary and lymph node metastasis causing death. Archives of dermatology 2003;139:643-8.





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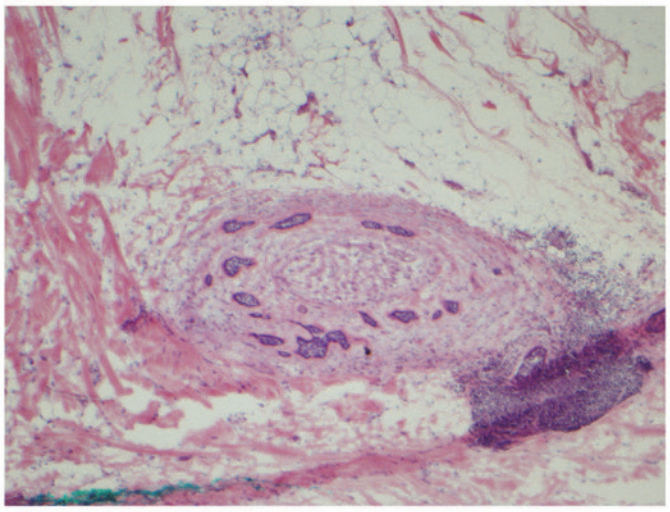

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Presenter: Ramin Fathi, MD

Title: A Large, Plaque-like Variant of Atypical Fibroxanthoma

Authors: *Ramin Fathi, MD[1]; Dominic Ricci, MD[1]; Theodore Alkousakis, MD[1]; Joshua Wisell, MD[1]; Mariah Brown, MD[1]*

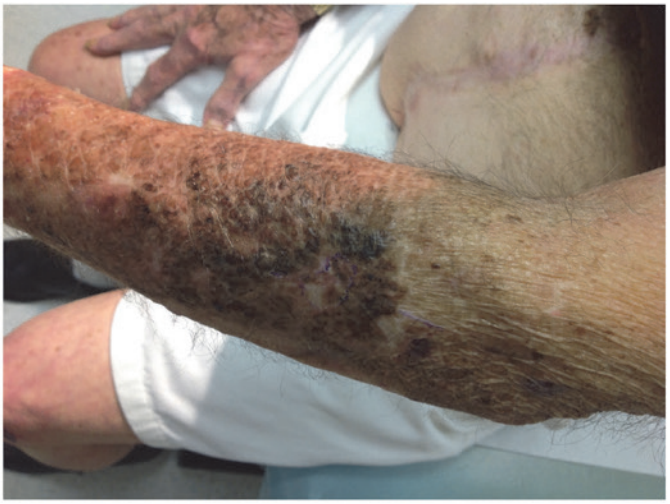
Institutions: *1. University of Colorado Health Center, Aurora, CO*

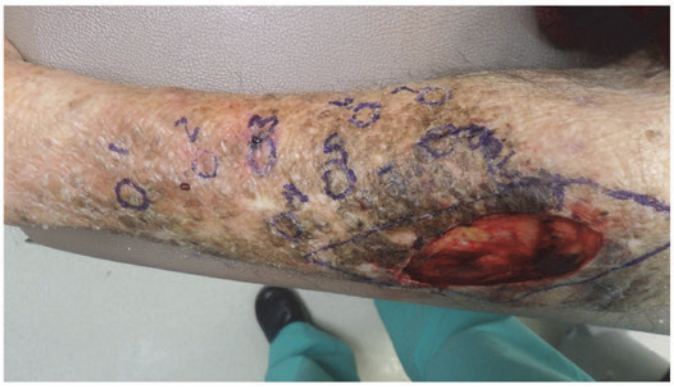
Purpose: Atypical fibroxanthoma (AFX) is an uncommon cutaneous malignancy that most frequently occurs on the head and neck of elderly men with significant sun damage. Total microscopic margin control using Mohs micrographic surgery (MMS) is the most effective means of treating AFX (1). While AFX most commonly presents as a small, well-circumscribed nodule, Mohs surgeons should be aware that more unusual and extensive variants exist (2-5).

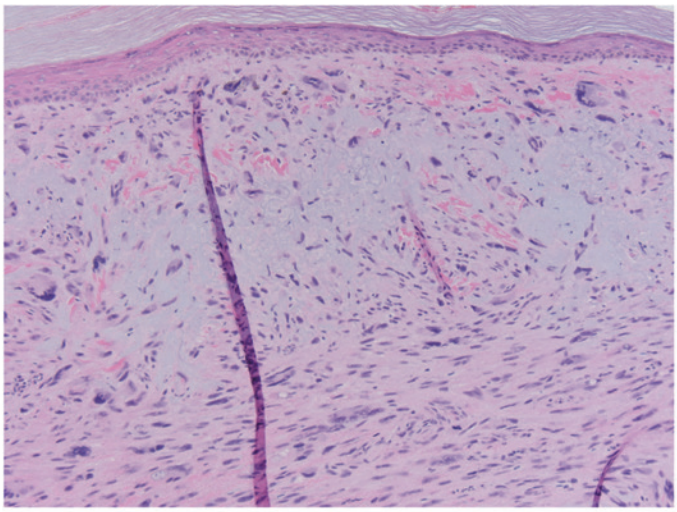
Summary: The plaque-like variant of AFX has been rarely described as a very small fraction of all AFXs. This patient was unusual due to the extreme size of his plaque-like AFX, representing the largest of this tumor type ever described.

Design: An 81 year-old man presented to his dermatologist for an 8 mm firm, pink papule on the left dorsal forearm. A shave biopsy was performed and demonstrated spindle cells in the dermis, with immunohistochemical analysis consistent with AFX (CD10+, procollagen+, S100-, pan-CK-). An excision of the lesion with a 6 mm margin resulted in positive lateral margins and the patient was referred for MMS. Upon presentation for MMS, he was found to have a well-healed surgical scar surrounded by confluent, poorly defined, hyperpigmented, "lizard-like" plaques on the majority of his dorsal forearm. Given the unusual clinical presentation, the most nodular area around the initial excision was taken for the first stage of MMS (2 x 2.5 cm). On frozen section histology, there were atypical spindle cells with numerous mitotic figures in the superficial dermis, with no connection to the epidermis and no extension into the deep dermis or subcutis. After two stages of MMS, there were positive peripheral margins in all quadrants. MMS was stopped and an additional peripheral margin was taken around the defect for permanent histology, leading to a defect size of 7.3 x 4.7 cm. Eight scouting shave biopsies were then performed across the entire dorsal forearm to try to delineate the extent of the tumor. The permanent histology from the peripheral margin and all eight scouting biopsies were found to be positive for AFX, defining an approximate lesion size of 12 x 23 cm. There was no clinical evidence of metastatic disease. Given the involvement of the entire dorsal forearm with a large, ill-defined tumor, additional surgical therapy was not considered a viable option. The patient was treated with radiation therapy and tolerated the treatment well.

Conclusion: This case describes a plaque-like variant of AFX of extremely large size and extensive growth to 23 cm. Mohs surgeons should be aware that this rare variant of AFX exists and that the use of scouting biopsies can help delineate the tumor before undertaking definite excision. Given its rarity, non-surgical treatments for this AFX variant are undefined, but radiation was used in this case.







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Presenter: Megan Morrison, DO

Title: Vemurafenib Induced Multiple Keratoacanthomas Responsive to Intralesional 5-Fluorouracil: A Case Report and Review of the Literature

Authors: *Megan Morrison, DO[1]; Pezhman Shoureshi, DO[1]; Kent Krach, MD[2]*

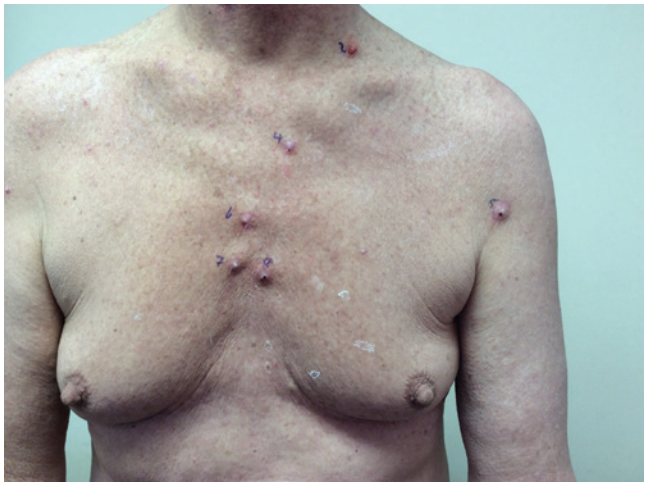
Institutions: *1. St. Joseph Mercy Hospital, Ypsilanti, MI 2. St. Joseph Mercy Hospital, Clinton Township, MI*

Purpose: The purpose of this study was to review current treatment recommendations for patients with eruptive keratoacanthomas (KAs) who are taking vemurafenib for metastatic melanoma. We will also evaluate the efficacy of intralesional 5-fluoruacil in 64-year-old male with a history of BRAF-positive metastatic melanoma. He presented with multiple eruptive crateriform nodules on his face and trunk, which appeared 8-12 weeks after initiation of vemurafenib therapy.

Summary: Vemurafenib is a gene-targeted therapy that is FDA approved for the treatment of metastatic and unresectable melanoma, with response rates of 48% and an increased median survival of 12.3 months. It works as a potent inhibitor of the BRAF gene with the V600E mutation, which is found in over 60% of all melanomas. The BRAF gene is key to the mitogen-activated protein kinase signal transduction pathway. Clinical trials have established a recommended dose of 960mg of vemurafenib twice daily and have reported the following cutaneous side effects in order of frequency: photosensitivity skin reactions, nonspecific rash, verrucous keratosis, squamous cell carcinoma (SCC)/KA, palmar plantar erythrodyesthesia, basal cell carcinoma, hyperkeratosis, pruritus, and alopecia. The most common associated malignancy is KAs, with the onset ranging from 2-36 weeks post treatment initiation, and a median time of 8 weeks. The short latency time between starting vemurafenib and the appearance of KAs is due to a potentiating effect of the BRAF inhibitor on preexisting ras mutations. In the package insert for vemurafenib, the recommended treatment for SCC/KA is excision. Other reported treatments have included topical 5-fluourouracil (5-FU) as well as combination therapy using acitretin with intralesional 5-FU. These alternative therapies provide a reasonable option for those patients with multiple KAs in whom surgical treatment may be more difficult.

Design: Facing the therapeutic challenge of treating multiple lesions on the trunk, a total of 8 lesions were treated with serial injections of 0.3cc 5-FU (2.5g/50mL) every 1-2 weeks. The patient developed resolution of some sites in as early as 3 visits and complete resolution of all sites after 5 visits. Due to size (2.6X2.4 cm) and location, the lesion on the left temple was treated with Mohs micrographic surgery.

Conclusion: We elected to treat our patient primarily with intralesional 5-FU with the temple lesion treated with Mohs. This treatment option has minimal to no systemic side effects, unlike acitretin. The in-office treatments allow the injection of 5-FU to be controlled, monitored and measured. It also spares the patient from the inconvenience and variability of at home application of topical 5-FU. Our patient had an excellent response to intralesional 5-FU with full resolution of all treated KAs. To our knowledge this is the first reported case of a patient with multiple KAs secondary to vemurafenib treated successfully with monotherapy intralesional 5-FU.



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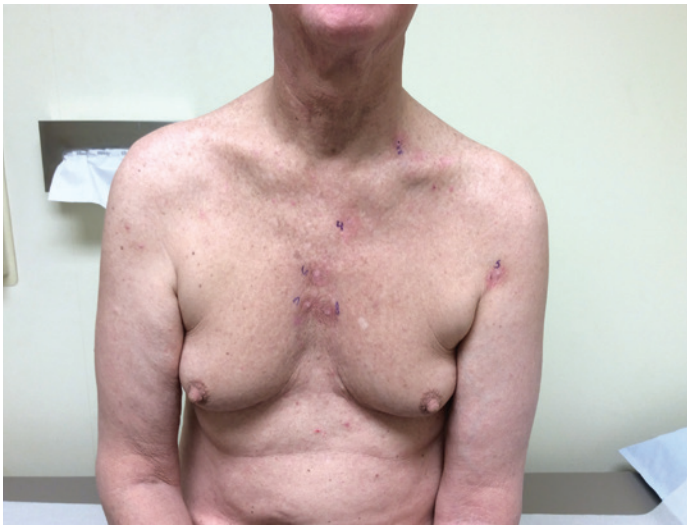

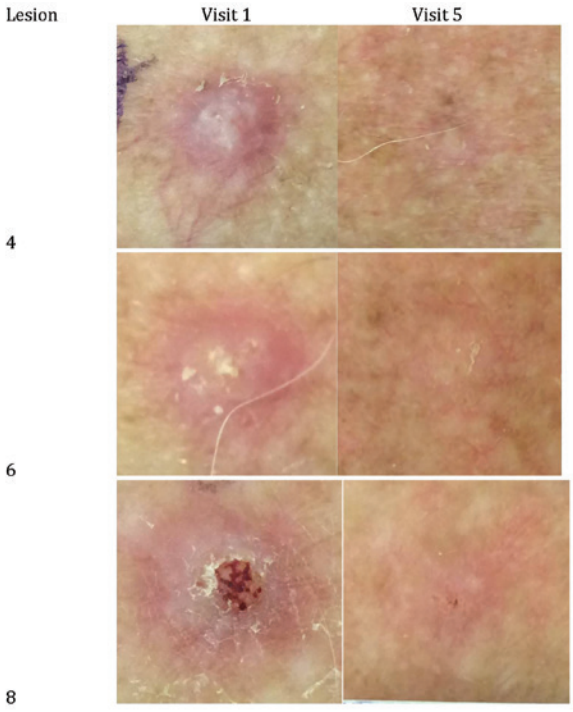

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Presenter: Timothy Chang, MD

Title: Complications with Antiplatelet Agent Ticlopidine in Cutaneous Surgery

Authors: *Timothy Chang, MD[1]; Christopher Arpey, MD[1]; Christian Baum, MD[1]; Jerry Brewer, MD[1]; Phillip Hochwalt, MD[1]; Thomas Hocker, MD[1]; Randall Roenigk, MD[1]; Clark Otley, MD[1]*

Institutions: 1. *Mayo Clinic, Rochester, MN*

Purpose: As many as 25-38% of patients who undergo cutaneous surgery are taking an antithrombotic agent. While data has suggested that patients taking aspirin, warfarin, or clopidogrel may be at slightly higher risk of minor bleeding from cutaneous surgery, there has been no association with severe life-threatening hemorrhagic complications. In contrast, perioperative discontinuation of medically necessary aspirin and warfarin during cutaneous surgery has been associated with severe thrombotic complications. With the advent of new oral blood-thinning medications, perioperative management of patients taking these medications during cutaneous surgery is uncertain. Ticlopidine is an oral antiplatelet agent of the thienopyridine class, approved by the FDA in 2001. Indications include use after coronary artery stent implantation and stroke prophylaxis. Clopidogrel is in the same drug class and has not been found to be associated with severe life-threatening hemorrhagic complications during cutaneous surgery. Physicians may increasingly encounter patients on ticlopidine who seek cutaneous surgery. Patient safety is of the utmost importance and, to our knowledge, there is currently no published data on the use of ticlopidine in patients undergoing cutaneous surgery. We report the first study of perioperative complications associated with patients taking ticlopidine during cutaneous surgery.

Summary: There were 5 patients taking ticlopidine who underwent a total of 44 cutaneous surgeries. Bleeding complications occurred in 1 of 44 surgeries. The case involved a 79 year-old Caucasian man taking ticlopidine 250mg twice daily and aspirin 81mg daily. Mohs micrographic surgery for three basal cell carcinomas on the bilateral superior helices and left nasal sidewall was performed. The left nasal sidewall lesion was cleared in one stage and repaired with an intermediate layered closure. Bleeding and small hematoma formation occurred several hours following the procedure. Sutures were removed and then electrocoagulation and vessel ligation performed. There were no further complications. The other two sites were treated without complication.

Design: IRB approval was obtained. Since ticlopidine was FDA approved in 2001, our institution diagnostic index and medication databases were queried to identify all patients who underwent Mohs micrographic surgery or basic excision while taking ticlopidine between 2001 and 2014.

Retrospective analysis was performed to identify related bleeding complications in the perioperative period. Case controls were planned but not used due to the low rate of complications.

Conclusion: Among the 44 cutaneous surgeries of patients taking ticlopidine, there was 1 minor bleeding complication observed. Our findings offer reassurance that no severe or life-threatening hemorrhagic complications were noted. Given the potential for severe thrombotic complications associated with discontinuation of antithrombotic medications and the apparent low risks of continuing these medications, a strategy of continuing ticlopidine during cutaneous surgery is most reasonable.

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Presenter: James Behan, MD

Title: Koebnerizing Squamous Cell Carcinoma

Authors: *James Behan, MD[1]; Dominic Ricci, MD[1]; Joshua Wisell, MD[1]; Mariah Brown, MD[1]*

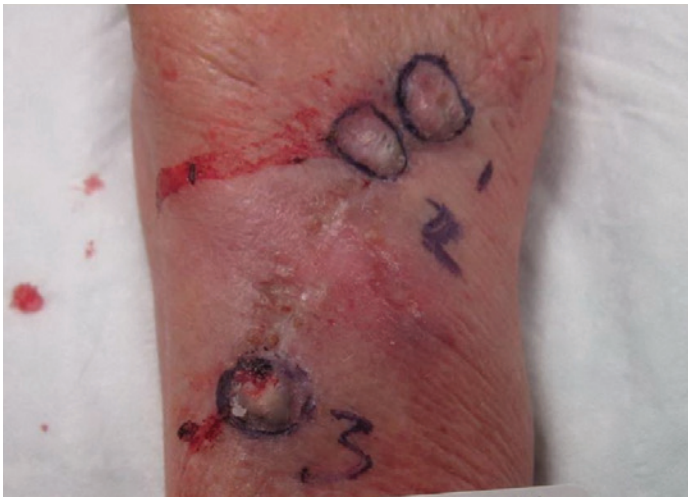
Institutions: *1. University of Colorado Health Center, Aurora, CO*

Purpose: There are case reports and series in the literature associating the development of keratoacanthomas (KAs) and squamous cell carcinomas (SCCs) with the trauma of dermatologic procedures [1-4]. In these cases, the isomorphic response of Koebner has been associated with the development of single or multiple KAs or SCCs after photodynamic therapy, skin grafting, laser therapy, excisional surgery and Mohs micrographic surgery (MMS). The majority of these Koebnerizing tumors have been treated with surgical therapy with complete resolution [2,3]. We present a patient with recurring episodes of Koebnerizing SCC at the same anatomic location after surgical excision with clear margins, including the development of tumors at the site of deep suture placement.

Summary: A 65 year-old woman received electrodessication and curettage for SCC on the right dorsal forearm. The tumor recurred within two months and she then underwent excision with clear surgical margins. Within two months, she had developed new/recurrent tumor along the scar line and was referred for MMS. The patient underwent MMS with clear surgical margins after one stage. At four months post-MMS, she presented for rebiopsy of new growth along the incision line. Pathology was consistent with well-differentiated SCC and the tissue culture was negative for fungal, bacterial and acid fast bacilli. The patient then underwent a second MMS procedure with the debulked specimen demonstrating well-differentiated SCC and the surgical margins clear of tumor after one stage. The standing cones were submitted for permanent histology and found to be free of tumor. Within one month, spitting dermal sutures in the area of the standing cones complicated the patient's healing and suture material was removed from three papules along the scar line. These three papules continued to grow and became increasingly tender. Shave biopsy at two months post-MMS demonstrated well-differentiated SCC in all three papules at the site of dermal sutures. The patient was diagnosed with Koebnerizing SCC and the decision was made to treat with intralesional 5-fluorouracil or radiotherapy and to avoid all surgical therapy to the area.

Design: Koebnerizing SCCs or KAs associated with surgical excisions are a rare complication. In most reported cases, the tumors developing from procedural pathergy can be treated with surgical excision with complete resolution. Our case is unique in that the patient displayed Koebnerization after multiple surgical procedures, developing tumors after each of the three excisions/MMS with clear margins. This case is also unique in that the patient developed tumors at the site of dermal suture placement.

Conclusion: When confronted with tumor recurrence after surgical removal with clear margins, dermatologic surgeons should be aware of the unusual phenomenon of Koebnerizing tumors. Although most of these tumors respond to surgical excision, tumors that repeatedly recur in areas of surgical "trauma" must be treated with different modalities.



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Presenter: Eric Wilkerson, MD

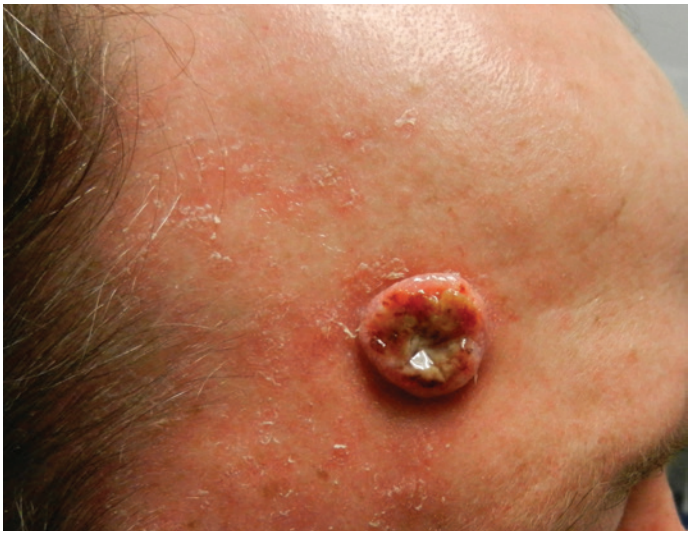
Title: The Use of an Injectable Diphenhydramine Solution as the Local Anesthetic for Mohs Surgery

Authors: *Eric Wilkerson, MD[1]; W. Elliot Love, DO[1]*

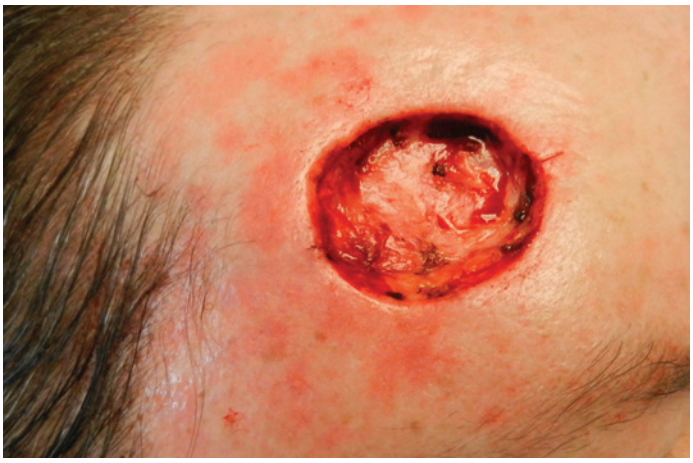
Institution: *1. Case Western Reserve University, Cleveland, OH*

Purpose: True systemic allergic reactions such as anaphylaxis to lidocaine are extremely rare. Diphenhydramine has been suggested as a possible alternative anesthetic in patients with adverse reactions and allergy to lidocaine. Reported is a case of a 48-year-old man with a history of anaphylaxis to lidocaine who presented for Mohs surgery to treat a 1.7-cm well-differentiated invasive squamous cell carcinoma. A constituted solution of 1% diphenhydramine was chosen as the alternative local anesthetic and was used as the sole anesthetic for the entirety of his Mohs procedure. The patient did not experience pain throughout the procedure indicating successful anesthesia with the diphenhydramine solution. This case represents the only known reported successful use of a diphenhydramine solution as the sole local anesthetic used for the entirety of a Mohs surgery.

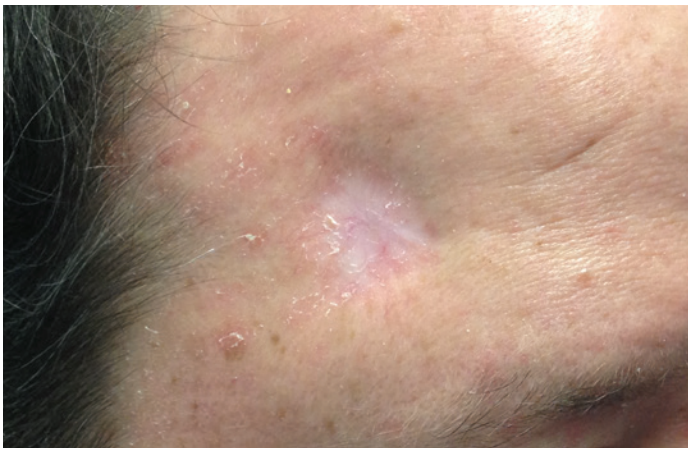
Conclusion: Dermatologists and dermatologic surgeons should consider a 1% diphenhydramine injectable solution as an alternative local anesthetic for cutaneous procedures including Mohs surgery when the use of lidocaine is contraindicated.



pre-op



post-op



7.5 months post-op

Notes

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