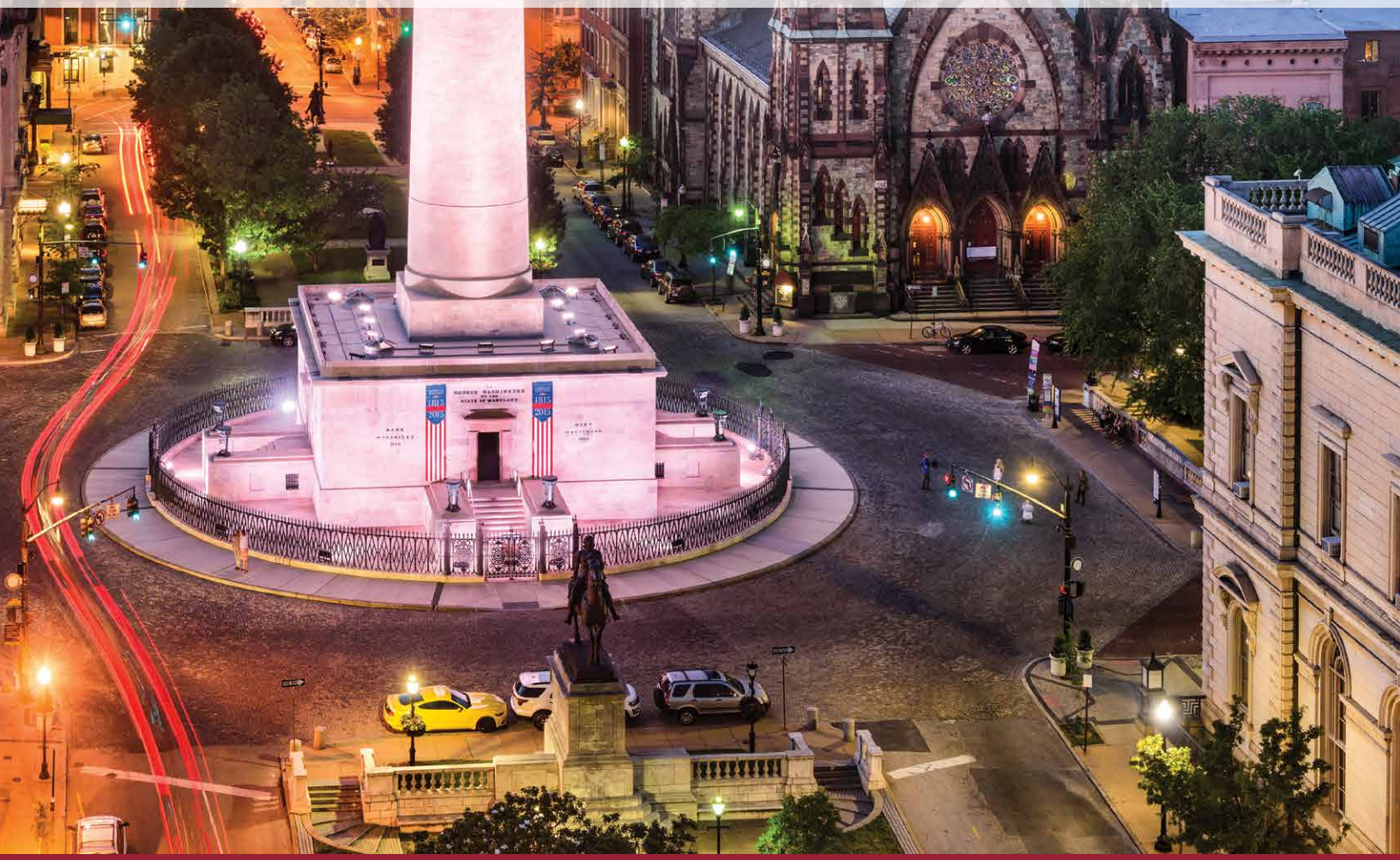
CME & ABSTRACTS

ACMS American College of Mohs Surgery

51st ANNUAL MEETING

BALTIMORE

THURSDAY, MAY 2 — SUNDAY, MAY 5, 2019



www.MohsCollege.org/AnnualMeeting

Table of Contents

ACMS American College of Mohs Surgery

Fellowship trained skin cancer and reconstructive surgeons

American College of Mohs Surgery
555 East Wells Street, Suite 1100
Milwaukee, WI 53202

Phone: (414) 347-1103
(800) 500-7224

Fax: (414) 276-2146

Email: info@mohscollege.org

Website: www.MohsCollege.org
www.SkinCancerMohsSurgery.org

CME Information and Learning Objectives

Learning Objectives

Upon completion of the Annual Meeting, participants will be able to describe the latest advances in the treatment of skin cancer, discuss recent research findings in the area of Mohs micrographic surgery and cutaneous oncology, and explain new techniques in reconstruction that promote optimal surgical outcomes.

Specific learning objectives, upon completion of the ACMS Annual Meeting, include:

- Design and execute Mohs stages and routine and advanced reconstructions of the face, hands, nails, feet and genitalia
- Describe current recommendations for diagnosis and treatment of melanoma, and Merkel cell cancer;
- Recall the benefits and techniques involved in utilizing immunohistochemistry in the treatment of melanoma and non-melanoma skin cancers;
- Refine reconstruction techniques to improve scars post Mohs micrographic surgery;
- Identify anatomic landmarks and integrate knowledge of those landmarks into the practice of Mohs micrographic surgery;
- Recognize potential errors in frozen section examination of skin cancers and develop ways to minimize those errors;
- Explain proper billing and coding practices for Mohs and reconstructive surgery;
- Maximize collaboration with surgical colleagues in other disciplines to improve patient outcomes postoperatively;
- Identify elements of the preoperative history that require management preoperatively;
- Review the most recent literature regarding dermatologic surgery and cutaneous oncology
- Describe recent developments in the management of skin cancer in organ transplant recipients.

Accreditation Statement

This activity has been planned and implemented in accordance with the Essential Areas and Policies of the Accreditation Council for Continuing Medical Education (ACCME) through the sponsorship of the American College of Mohs Surgery (ACMS). ACMS is accredited by the ACCME to provide continuing medical education for physicians.

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The American Academy of Physician Assistants accepts *AMA PRA Category 1 Credit(s)*™ from organizations accredited by the ACCME. Physician Assistants attending the Annual Meeting can submit certificates or transcripts showing how many physician CME credits were offered for an activity to the AAPA and get them "converted" to PA CME credit. The AAPA also grants and counts *AMA PRA Category 1 Credit(s)*™, but those are specifically for PAs and have to come from a provider accredited by the AAPA. The AAPA label's their credits Category 1 CME, but the labels, though they read the same, refer to different evaluations.

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2. On the 'Session Evaluations' tab, click on 'Click here to choose the sessions you attended'; once your sessions are selected, click 'Save entries'.
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   The CME claim site will be available Monday, May 6, 2019 through Thursday, September 5, 2019.

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May 2, 10:00 - 10:08 am

Presenter: Theresa N. Canavan

Title: Molecular and Clinical Characteristics of High Risk Squamous Cell Carcinoma

Authors: Theresa N. Canavan[1]; Nicole Doudican, PhD[1]; John Carucci, MD, PhD[1]; Mary Stevenson, MD[1]

Institution: 1. New York University Langone Medical Center, New York, NY

Introduction & Objectives: Cutaneous squamous cell carcinoma (CSCC) may result in poor outcome (PO) including local recurrence (LR), nodal metastasis (NM) and disease specific death (DSD). Tumor size, invasion beyond fat, perineural invasion (PNI), poor differentiation, and immunosuppression are all features associated with PO. PO are rare and may sometimes be difficult to predict using current staging systems including the American Joint Committee on Cancer 8th edition (AJCC-8) and Brigham and Women's Hospital (BWH). We aimed to better characterize high-risk patient features and tumor markers in patients with PO.

Study Type: Retrospective review.

Study Setting: Academic center.

Methods: We conducted a retrospective chart review of 1,486patients with an ICD 9/10 diagnosis of non-genital primary CSCC seen at New York University from 2012-2016. Patient and tumor characteristics were compared between immunosuppressed and immunocompetent patients with PO defined as LR, NM, or DSD.

Using NanoString technology, expression of ~850 cancer specific or immune system specific genes were amplified and examined in 4 PO tumors. These findings were then compared to gene expression profiles in good outcome CSCC with PNI or deep infiltration (18 tumors), superficial CSCC (6 tumors), and normal skin (7 patients). Data obtained via the NanoString nCounter system were analyzed using NanoString nSolver software. Relative expression of genes were assessed and expressed as fold change comparison between groups, $p < 0.05$ considered significant.

Results: Immune suppressed patients were ~19-fold more likely than immunocompetent to have PO (11/58 vs. 16/1458, P<0.0001). There was a trend toward older age and male gender in immune competent patients with PO (Table 1). Immunosuppressed patients were more likely to develop a PO from a lower stage tumor (Table 2). This finding was consistent using both the AJCC-8 and BWH staging systems, but only reached statistical significance with the AJCC-8 (p=0.028). We found increased expression of the following genes in PO CSCC compared to normal skin: cytokine IL-8 (285-fold), cell cycle mediators CDC6 (5.81-fold) and CCNB1 (7.8 fold), protease MMP1 (731 fold), and angiogenic factor VEGFA (2.31 fold, P< 0.01 for all). These were also significantly increased in PO CSCC vs. infiltrative SCC, and PO CSCC vs. superficial SCC. (Table 3).

Conclusion: CSCC PO are significantly more common in immunosuppressed patients and may be more likely to occur from lower stage primary tumors. PO may be driven in part by factors associated with angiogenesis, such as IL8 and VEGF-A and upregulation of cell cycle maintenance molecules, such as CDC6 and CCNB1. MMP1 may drive PO via epitheial mesenchymal transition and degradation of adjacent collagen.

Table 1: Demographics of non-genital CSCC patients with poor outcomes

	Immunosuppressed (n=11, 12 tumors)	Immunocompetent (n=16, 17 tumors)	*P* value
Age at diagnosis	66.6	71.7	0.41
Gender			0.16
Male	58.3	76.5	
Female	41.7	23.5	
Percent of total patients*	1.1% (1428)	19.0% (58)	<0.0001
Tumor location			0.13
Leg	50% (6)	17.6% (3)	
Scalp	16.7% (2)	5.9% (1)	
Face (excluding ear, nose, eyelid, temple, lip)	0	29.4% (5)	
Temple	8.3% (1)	17.6% (3)	
Time to first PO (d)	309.5	205.1	0.24
Type of immunosuppression			
SOTR	36.4% (4)		
Hematologic malignancy	45.4% (5)		
HIV	18.2% (2)		

Table 2: Stage at presentation for CSCC resulting in poor outcome

	Immunosuppressed	Immunocompetent	*P* value
AJCC-8			0.028
T2	6 (60%)	1 (12.5%)	
T3	4 (40%)	6 (75%)	
T4	0	1 (12.5%)	
BWH			0.119
T2a	7 (70%)	1 (14.3%)	
T2b	1 (10%)	4 (57.1%)	
T3	2 (20%)	2 28.6%)	

Table 3: Biomarkers in CSCC of immunocompetent patients resulting in poor outcomes

	Fold increase in PO tumors	*P* value
IL-8		
Compared to tumors with deep infiltration or PNI	5.65	0.0017
Compared to superficial SCC		
Compared to normal skin	22.72	0.0095
	285.07	0.0042
CDC6		
Compared to tumors with deep infiltration or PNI	2.63	<0.0001
Compared to superficial SCC		
Compared to normal skin	2.54	0.0005
	5.81	<0.0001
CCNB1		
Compared to tumors with deep infiltration or PNI	2.88	<0.0001
Compared to superficial SCC		
Compared to normal skin	3.48	0.0009
	7.79	<0.0001
MET		
Compared to tumors with deep infiltration or PNI	2.88	0.0095
Compared to superficial SCC		
Compared to normal skin	3.48	0.0021
	7.89	0.0013
MMP1		
Compared to tumors with deep infiltration or PNI	6.73	<0.0001
Compared to superficial SCC		
Compared to normal skin	30.75	0.0057
	731.71	0.0025
VEGF-A		
Compared to tumors with deep infiltration or PNI	2.17	0.0001
Compared to superficial SCC		
Compared to normal skin	2.09	0.0277
	2.32	0.0043

May 2, 10:10 - 10:18 am

Presenter: Evan P. Stiegel, MD

Title: Mastering Mohs Histopathology Over a 1-year Fellowship

Author: Evan P. Stiegel, MD[1]; John A. Zitelli, MD[2]; David G. Brodland, MD[2]

Institutions: 1. Wilson Dermatology, Wilson, NC
2. Zitelli & Brodland, PC, Pittsburgh, PA

Introduction & Objectives: A previous pilot study found that the number of cases and time required to reduce errors in the interpretation of Mohs histopathology sections for a single Micrographic Surgery and Dermatologic Oncology (MSDO) fellow's experience was substantial, necessitating six months to reduce errors to a minimum acceptable level. While this study was innovative, it is unclear whether the progress of one individual over the course of a year is representative of the progress of a "standard" fellow. The goal of the current study is to quantify and analyze the number of cases and amount of time required to achieve a satisfactory level of expertise in the reading and interpretation of Mohs histopathology for a collective group of past fellows at a single MSDO fellowship program. The results could serve as a benchmark for MSDO fellowship programs to determine the minimum number of cases required for a fellow to achieve proficiency in this critical aspect of Mohs surgery.

Study Type: Quality Improvement Study.

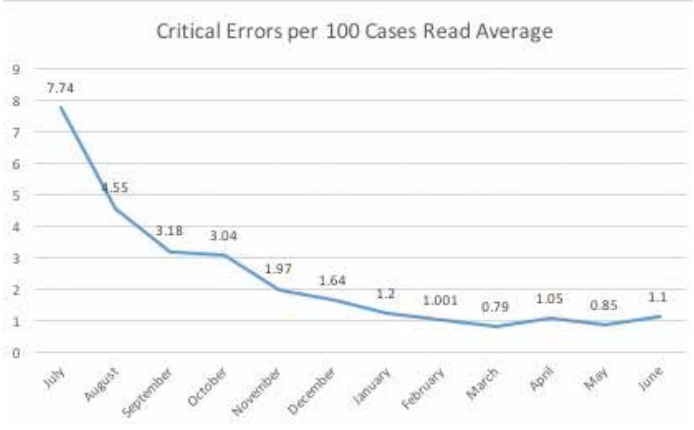
Study Setting: Academic Center.

Methods: Current and past MSDO fellows from a single institution independently preread Mohs cases and marked his or her interpretation on the Mohs map. One of the two Mohs program directors subsequently reviewed and corrected all cases, and errors were graded on a scale and tracked over the one-year fellowship. The Mohs histopathology assessment results for a total of ten fellows were collected and evaluated. The number of total cases previewed and critical errors found for each fellow for each month were recorded. Critical errors committed per 100 cases graded were then calculated. It was then chosen to monitor the threshold when the critical error rate per 100 cases reached one, which was selected because of the 98-99% cure rate of Mohs surgery for the most common primary tumors.

Results: The average number of critical errors per 100 cases for July (first month of fellowship) was 7.74 with a wide standard deviation (Table 1). The critical errors per 100 cases then decreased over the 12-month period in what appears to be logarithmic fashion, ultimately reaching a minimal and consistent baseline in February (Figure 1). The critical error rate threshold of 1 error per 100 cases evaluated was reached after eight months for the collective group, corresponding to approximately 1200 cases reviewed.

Conclusion: The findings of this study emphasize that a significant amount of time and number of cases required for a fellow to become adept at reading and interpreting Mohs histopathology is quite substantial. The time and number of cases required to reach the acceptable threshold is considerably higher than the minimum number of cases required for a fellowship to be credentialed by the Accreditation Council for Graduate Medical Education, suggesting that their requirements may not be stringent enough.

	Critical Error Average	Total Case Average	Errors per 100 cases Average
July	6.56	88	**7.74** (±7.78)
August	6.1	142.2	**4.55** (±2.69)
September	3.7	125.3	**3.18** (±1.96)
October	3.7	132	**3.04** (±2.14)
November	1.9	138.4	**1.97** (±1.29)
December	2	143.3	**1.64** (±1.38)
January	1.9	223.4	**1.2** (±0.53)
February	1.5	186.4	**1.001** (±0.88)
March	1.3	199.9	**0.79** (±0.72)
April	1.63	238.13	**1.05** (±0.86)
May	1	216.25	**0.85** (±1.17)
June	1	91	**1.1** (±0.43)



May 2, 10:20 - 10:28 am

Presenter: Jessica B. Dietert

Title: Follicular Extension of Squamous Cell Carcinoma in situ in Immunosuppressed Patients: A Retrospective Slide and Chart Review

Authors: Jessica B. Dietert[1]; Eva Hurst, MD[2]

Institutions: 1. Snyder Dermatology, Austin, TX
2. Washington University in St. Louis, Creve Coeur, MO

Introduction & Objectives: Immunosuppressed patients have a much higher risk of skin cancer, including squamous cell carcinoma in situ (SSCIS), and have a higher baseline rate of recurrence of such tumors. Various methods of treatment can be implemented, including topical therapies, superficial destruction, surgical excision and Mohs micrographic surgery. SCCIS may have extension of the tumor down the hair follicle (Figure 1), which increases depth of the tumor and may be associated with a higher risk of recurrence if superficial treatment modalities are used. The purpose of this study was to determine if the incidence of follicular extension within SCCIS is higher among the immunosuppressed population, as this could impact the effectiveness of certain treatment modalities and the risk of recurrence of SCCIS in this population.

Study Type: Retrospective Review.

Study Setting: Academic Center, single site.

Methods: A retrospective chart and slide review of all patients with SCCIS treated with Mohs micrographic surgery between 1/1/2017 to 12/31/2017 was performed. Chart review data collected included immunosuppression status, type and duration of

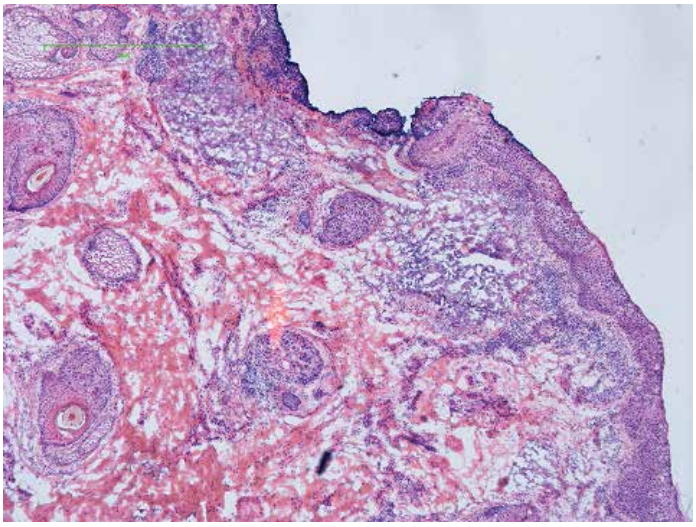
immunosuppression, gender, age, race, and smoking status. Pathology slides were then reviewed by two separate Mohs surgeons (blinded to immunosuppression status) to determine if follicular extension was present. P-values were calculated using the N-1 Chi squared test.

Definition of immunosuppression included immunosuppressive medication, prior solid organ or stem cell transplant, hematologic malignancy, and HIV/AIDS. "Immunosuppressive medications" included azathioprine, mycophenolate, methotrexate, tacrolimus, chronic prednisone, or any combination thereof.

Results: A database and case log search yielded a total of 435 cases of squamous cell carcinoma in situ treated within the one-year time frame outlined above. Fifteen cases were excluded as they were on non-hair bearing sites (acral, oral). All cases with one stage only and no curetting to review were excluded, as no SCCIS was present to review for follicular extension. The remaining 264 cases were reviewed. No evidence of follicular extension was seen in 176 cases. Follicular extension was present in 88.

Results are summarized in Table 1. The group with follicular extension was much more likely to be immunosuppressed than not (38/88, 43.18% versus 25/176, 14.2%; p-value < 0.0001). Males were over-represented in the group with follicular extension (p-value = 0.0299). There was not a statistically significant difference in age, smoking status or head and neck site versus other between the two groups.

Conclusion: Follicular extension of SCCIS is much more common in the immunosuppressed population. For this reason, superficial modalities of treatment such as topical therapy or electrodessication and curettage may lead to a higher rate of recurrence than in the general population. More definitive treatment with excision or Mohs micrographic surgery may be warranted for SCCIS in immunosuppressed patients. Close monitoring of SCCIS lesions treated with less definitive measures is also recommended.



	Follicular Extension (88/264, 33.33%)	No Follicular Extension (176/264, 66.67%)	p-Value
Average Age (years)	72	72	1
Male Gender, N (%)	64 (72.72%)	104 (59.09%)	0.0299
Head/Neck Location, N (%)	76 (86.36%)	152 (86.36%)	1
Positive Smoking Status, N (%)	5 (5.68%)	9 (5.11%)	0.8460
Immunosuppressed, N (%)	38 (43.18%)	25 (14.2%)	<0.0001

May 2, 10:30 - 10:38 am

Presenter: Hao Feng

Title: Characteristics of Opioid Prescriptions by Mohs Surgeons in the Medicare Population

Authors: Hao Feng[1]; Efe Kakpovbia[2]; Aldis Petriceks[3]; Paula Feng[4]; Roy G. Geronemus, MD[1,2]

Institutions: 1. Laser & Skin Surgery Center of New York, New York, NY
2. New York University School of Medicine, New York, NY
3. Stanford University School of Medicine, Stanford, CA
4. Yale University School of Medicine, New Haven, CT

Introduction & Objectives: The opioid epidemic has become a public health emergency in the U.S. Mohs and reconstructive surgery may require post-operative opioid prescriptions to address moderate-to-severe pain, especially when other strategies fail to provide adequate pain relief. We sought to characterize the national opioid prescription patterns among Mohs surgeons, particularly analyzing how these practices may vary based on factors such as procedural volume and geography. General dermatologists were also analyzed as a comparison group.

Study Type: Retrospective cross-sectional study.

Study Setting: National database.

Methods: We used data from the Medicare Provider Utilization and Payment Data for 2014. Claim count includes original prescriptions and refills filled by providers. Mohs surgeons were defined as dermatologists that billed for Mohs surgery using the Current Procedural Terminology code 17311.

Results: In 2014, 2190 Mohs surgeons dispensed a total of 86,526 opioid prescriptions while 10,347 non-Mohs dermatologists dispensed 45,033 opioid prescriptions (Table 1). Among Mohs surgeons, 178 (8.1%) prescribed 0, 877 (40.0%) prescribed between 1-10, and 1135 (51.8%) prescribed more than 10 opioid prescriptions. Among general dermatologists, 5127 (49.5%) prescribed 0, 4531 (43.8%) prescribed between 1-10, and 689 (6.7%) prescribed more than 10 opioid prescriptions. The estimated opioid prescription rates for Mohs surgeons and general dermatologists were 5.9% and 0.7%, respectively. Among those prescribing at least 10 opioid claims, the mean number of opioids supplied and mean opioid prescription rate were 72.4 and 13.5 for Mohs surgeons vs 32.5 and 5.1 for general dermatologists. The mean days' supply of opioids was 3.9 for Mohs surgeons vs 7.9 for general dermatologists. Opioid prescriptions varied based on region (Figure 1). Among Mohs surgeons prescribing greater than 10 opioids, male providers and providers practicing in the South had a significantly higher mean number of opioids prescribed (Table 2; $p < 0.01$). Members of the American College of Mohs Surgery (ACMS) had a higher mean number of opioid claims, but it was not significant ($p=0.085$). Male surgeons, members of ACMS, and surgeons practicing in the South also had higher procedural volume. There was a minimal-to-moderate association between procedural claims and opioid claims ($r = 0.44$, $p < 0.01$). Although Mohs surgeons prescribed significantly more opioids than general dermatologists, the estimated opioid prescription rate for both groups was lower than the national opioid prescription rate of 6.8% among all healthcare providers. Furthermore, the opioid prescription rate for Mohs surgeons was significantly lower than specialties which frequently care for patients in pain – such as surgery (36.5%), dentistry (29.0%), and pain medicine (48.6%).

Conclusion: Mohs surgeons prescribed significantly more opioids than general dermatologists, but less than the national average and providers that care for patients in pain.

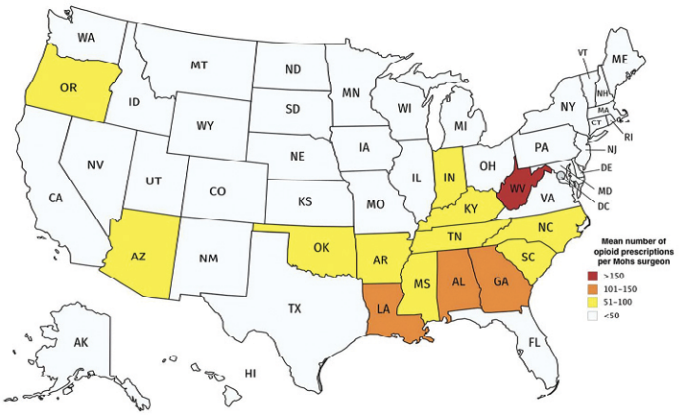


Table 1. Opioid Prescribing Practices Among Dermatologists in Medicare Beneficiaries

	Mohs Surgeons (n=2,190)	General Dermatologists (n = 10,347)	P values
Total Number of Opioid Prescriptions [a]	86,526	45,033	
Mean [Median] Number of Opioid Prescriptions per Dermatologists	39.5 [12]	4.4 [5]	<.001
No. (%) of Male Providers	1,567 (71.6)	5,332 (51.5)	
Estimated Opioid Prescription Rate[b]	5.9%	0.7%	
Dermatologists Prescribing >10 Opioid claims (No., %)	1,135 (51.8)	689 (6.7)	
Total number of opioid prescriptions	82,141	22,378	
Male (No., %)	844 (74.4)	484 (70.2)	
Female (No., %)	291 (25.6)	205 (29.8)	
Mean [Median] Number of Opioid Claims per Dermatologists	72.4 [33]	32.5 [19]	<.001
Mean number of days' supply per opioid claim (Interquartile Range)	3.9 (1.7)	7.9 (7.0)	<.001
Mean number of opioid claims per beneficiary	1.14	1.28	<.001
Mean [Median] Opioid Prescriber Rate	13.5 [8.2]	5.1 [2.5]	<.001

[a] Data extrapolated based on the assumption of 5 opioid prescription claims annually for dermatologists whose individual-level data were not available due to the number of opioid prescriptions claims was between 1 and 10, inclusive.
[b] Total opioid claim count divided by the total medication claim count prescribed by dermatologists.

Table 2: Characteristics and Procedural Volume of Mohs Surgeons prescribing >10 Opioids

Characteristic	Mohs Surgeons, (n=1135)	Mean number of Opioid claims per Dermatologist	Mean number of split thickness grafts	Mean number of full thickness graft	Mean number of flap repairs	Mean number of malignant lesion excisions	Mean number of Mohs procedures	Mean number of All procedures
Sex, No. (%)								
Female	291 (25.6)	54.2	0.3	14.8	42.7	35.2	308.1	401.2
Male	844 (74.4)	78.6	0.65	24.7	94.7	59.8	450.1	629.9
Professional membership organization, No. (%)								
ACMS	698 (61.5)	78.3	0.77	27.2	82.6	39.8	486.7	637.0
ASMS	283 (24.9)	59.8	0.18	15.5	81.8	83.9	300.1	481.4
Neither	154 (13.6)	68.6	0.27	11.2	75.1	59.9	291.5	438.0
Geographic Distribution, No. (%)								
Midwest	204 (18.0)	51.7	0.68	16.2	65.2	40.5	354.6	476.9
Northeast	139 (12.2)	49.9	0.27	22	114.4	49.9	439.0	625.5
South	500 (44.1)	98.4	0.59	28.2	88.2	67.6	485.8	670.4
West	292 (25.7)	53.0	0.55	15.9	65.2	40.3	319.3	441.4
Top 1% of Opioid Prescribers, No.	12	840.7	4	140.9	231.3	76.8	1510.5	1963.5
Total	1,135	72.4	0.56	22.1	81.4	53.5	413.6	571.2

May 2, 10:40 - 10:48 am

Presenter: Geoffrey F.S. Lim, MD

Title: Correlation of Basal Cell Carcinoma Subtype with Histologically Confirmed Subclinical Extension during Mohs Micrographic Surgery

Authors: Geoffrey F.S. Lim, MD[1]; Oliver A. Perez, MD[2]; John A. Zitelli, MD[1]; David G. Brodland, MD[1]

Institutions: 1. Zitelli & Brodland, PC, Pittsburgh, PA
2. Advantage Dermatology, Jacksonville, FL

Introduction & Objectives: Histologic subtypes of basal cell carcinoma (BCC) are used as predictors of subclinical extension (SCE). Subtypes are specifically used in the Appropriate Use Criteria (AUC) to validate the appropriateness of Mohs micrographic surgery (MMS) for BCC. Recent literature has suggested that MMS for superficial BCC (sBCC) represents overtreatment and has called to re-evaluate this subtype as an "appropriate" indication for MMS altogether. Clinically, we find in performing MMS on sBCC that this subtype's tendency for SCE is underestimated. Here, we sought to prospectively correlate the histologic subtype of BCC with increased likelihood of SCE as defined by the number of MMS stages required to clear tumor.

Study Type: Prospective cohort.

Study Setting: Multi-center.

Methods: In a prospective, multi-center study involving 17 Mohs surgeons in 16 different practices across the United States, cases of BCC undergoing MMS were collected. Data was obtained in 2012, immediately prior to the implementation of the AUC for MMS. Patient demographics, tumor characteristics, number of MMS stages required for tumor clearance, and specific BCC subtypes noted on index biopsy as well as last positive MMS stage were recorded. BCC subtypes included superficial, nodular, infiltrative, metatypical/keratotic, micronodular, morpheaform/fibrosing/sclerosing, basosquamous, and unspecified.

Results: Overall, 1474 cases of BCC were prospectively collected. Analysis of average number of MMS stages required to clear tumor revealed three distinct degrees of SCE: 1) very high - unspecified (mean 2.3, 0.7 SD) and morpheaform/fibrosing/sclerosing (mean 2.1, 0.9 SD);

2) high - infiltrative (mean 1.9, 1.0 SD), metatypical/keratotic (mean 1.9, 1.5 SD), superficial (mean 1.9, 1.0 SD); 3) low - nodular (mean 1.6, 0.9 SD), basosquamous (mean 1.6, 1.1 SD), micronodular (mean 1.7, 1.0 SD). When subdivided by location according to the AUC, sBCC exhibited a greater tendency toward multiple stages as compared to all BCC subtypes combined for every location. Among subtypes noted on the last positive MMS stage for all tumors requiring more than 1 stage, superficial and nodular were most common (37.6 vs. 32.4%, p<0.0001).

Conclusion: Superficial BCC exhibited SCE that was more akin to BCC subtypes that are widely considered to exhibit aggressive behavior and carry an "appropriate" label by the AUC. Our study suggests that MMS is not only appropriate for the treatment of sBCC, but may be especially indicated for sBCC located on AUC regions that include the head and neck (Areas H and M) given its propensity to extend beyond clinically-appreciable margins.

Table 1. Patient demographics and tumor characteristics

	All subjects	
Gender	N	%
Female	607	41.2
Male	867	58.8
Total	1474	
Age	N	%
18-29	8	0.5
30-39	27	1.8
40-49	97	6.6
50-59	231	15.7
60-69	373	25.3
70-79	393	26.7
80-89	299	20.3
90+	46	3.1
Total	1474	
Tumor History	N	%
Primary	1323	89.8
Recurrent	151	10.2
Total	1474	
Perineural Invasion	N	%
No	35	94.6
Yes	2	5.4
Total	37	
Tumor Anatomical Site	N	%
Ear	131	8.9
Extremity lower	47	3.2
Extremity upper	70	4.8
Eyelid	90	6.1
Face	473	32.1
Genitalia/Groin	1	0.1
Lip	59	4.0
Neck	73	5.0
Nose	382	25.9
Scalp	64	4.3
Trunk	84	5.7
Total	1474	
Tumor Anatomical Region	N	%
H	799	54.2
M	474	32.2
L	201	13.6
Total	1474	

Number of Mohs layers	N	mean (SD)
	1474	1.8 (1.0)
Number of Mohs layers	N	%
1 layer	690	46.8
2 layers	557	37.8
3 layers	146	9.9
4 layers	52	3.5
5 layers	21	1.4
≥ 6 layers	8	0.5
Total	1474	
Index Tumor Subtype	N	%
Adenoid/Nodular	860	58.3
Basosquamous	22	1.5
Infiltrative	137	9.3
Metatypical/Keratotic	16	1.1
Micronodular	37	2.5
Morpheaform/Fibrosing/Sclerosing	44	3.0
Unspecified	86	5.8
Superficial	272	18.5
Total	1474	
Final Tumor Subtype	N	%
Adenoid/Nodular	721	48.9
Basosquamous	25	1.7
Infiltrative	178	12.1
Metatypical/Keratotic	13	0.9
Micronodular	52	3.5
Morpheaform/Fibrosing/Sclerosing	41	2.8
Unspecified	43	2.9
Superficial	401	27.2
Total	1474	
Tumor Drift (Different Subtypes Noted vs Index Biopsy Subtype)	N	%
No	1150	78.0
Yes	324	22.0
Total	1474	

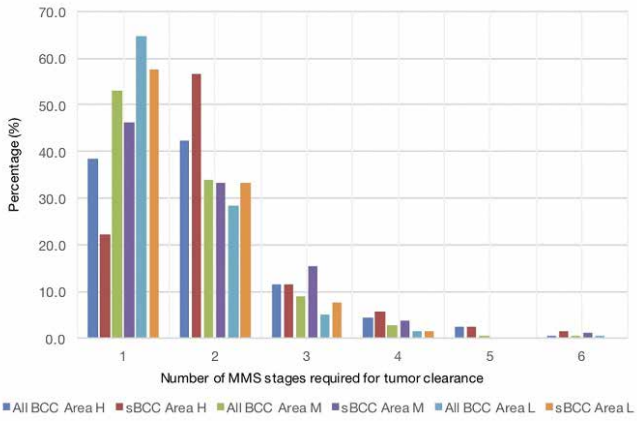


Figure 1. Tendency toward multiple MMS stages for all BCC subtypes and sBCC subtype per AUC location

Table 2. Tumor subtypes identified on the last positive MMS stage among cases requiring multiple (>1) layers to clear tumor

Final Tumor Subtype	N	%	p-value
Adenoid/Nodular	254	32.4	<.0001
Basosquamous	8	1.0	
Infiltrative	121	15.4	
Metatypical/Kertotic	5	0.6	
Micronodular	29	3.7	
Morpheaform/Fibrosing/Sclerosing	29	3.7	
Not Specified	43	5.5	
Superficial	295	37.6	
Total	784	100.0	

May 2, 10:50 - 10:58 am

Presenter: Michael Saco, MD

Title: Optimal Timing of Post-Operative Pharmacologic Pain Management in Mohs Micrographic Surgery

Authors: Michael Saco, MD[1]; Nicholas Golda, MD[1]

Institution: 1. University of Missouri, Columbia, MO

Introduction & Objectives: Post-operative pain control constitutes an important part of the patient experience in dermatologic surgery. Ensuring that patients have appropriate analgesics available when they are experiencing the greatest amount of pain is crucial. We seek to determine the optimal timing of pharmacologic pain control after Mohs surgery.

Study Type: Prospective cohort.

Study Setting: Academic.

Methods: Patients were given a diary to record pain information starting immediately after surgery and continuing in 8-hour increments until 0600 on post-operative day 4. Following surgery, each patient was prescribed six tramadol 50 mg tablets to take every 4-6 hours as needed for pain ≥7/10. Patients were advised to take acetaminophen, NSAIDs, or a combination of these for any lesser pain.

Results: 90 of 160 surveys were returned. Gender distribution was 68% male and 32% female, with a mean age of 73 years. The average defect size was 2.15cm2. 42% of cases were performed on eyelids, lips, noses, and ears, whereas 49% were on other head and neck sites, 8% on truncal and extremity sites, and one genital case. Linear closures were performed in 69%, flaps were performed in 20%, grafts in 7%, and granulation in 4%.

Pain was reported as "well-controlled" in 97% of all of the recorded 8-hour increments. The greatest average pain level reported was 3.3. This occurred on the day of surgery during the 1400-2200 timeframe when the perioperative anesthetic had lost effect (Table 1). Pain scores gradually decreased thereafter and approached zero at the end of the study period (Figure 1). The 1400-2200 period following surgery was also when post-operative analgesic use, both narcotic and non-narcotic, was highest (Figure 2). The amount of analgesics used gradually decreased after this time period. Narcotic pain medications were not needed by any patients at the end of the study period.

Conclusion: This study demonstrates that following Mohs surgery, postoperative pain and the need for pharmacologic analgesia is greatest in the evening on the day of surgery. Based on this data, protocols and

regulations that act to prevent patients from having access to narcotic analgesia on the evening of surgery will have a negative impact on pain control and patient experience. We propose that surgeons, while still encouraging the use of non-narcotic analgesics over the use of opioids, be free to prescribe a small amount of narcotic analgesics to patients before they leave the office on the day of surgery. Accordingly, patients will have immediate access to narcotic analgesics at the time when their post-operative pain has been shown to be greatest. The fact that patients in this study reported that their pain was well-controlled in 97% of all of the 8-hour increments recorded is a testament to this practice.

	POD0 6AM-2PM	POD0 2PM-10PM	POD0-1 10PM-6AM	POD1 6AM-2PM	POD1 2PM-10PM	POD1-2 10PM-6AM	POD2 6AM-2PM	POD2 2PM-10PM	POD2-3 10PM-6AM	POD3 6AM-2PM	POD3 2PM-10PM	POD3-4 10PM-6AM
Mean Pain Score (Scale of 0-10)	0.6	3.3	1.9	1.6	1.4	1.0	0.8	0.8	0.6	0.5	0.4	0.2
Standard Deviation	1.6	2.8	2.4	2.2	2.1	2.0	1.8	1.7	1.5	1.3	1.2	0.8

Table 1. Mean pain scores and standard deviations for each post-operative timeframe. POD, post-operative day.

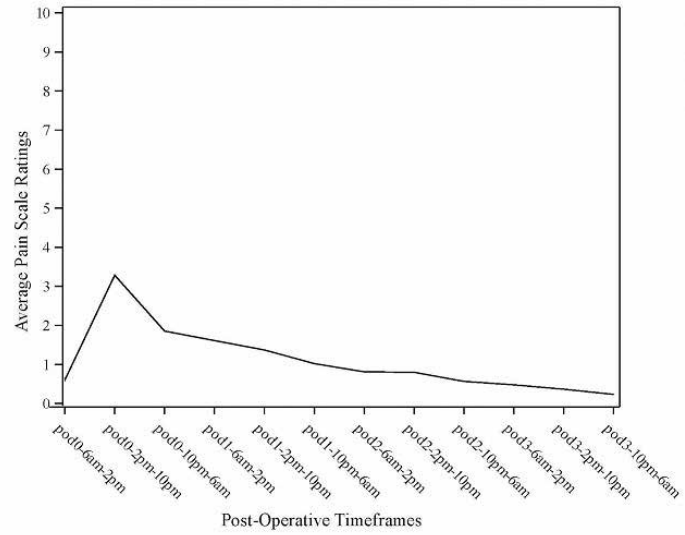


Figure 1. Average pain scores for each post-operative timeframe. POD, post-operative day.

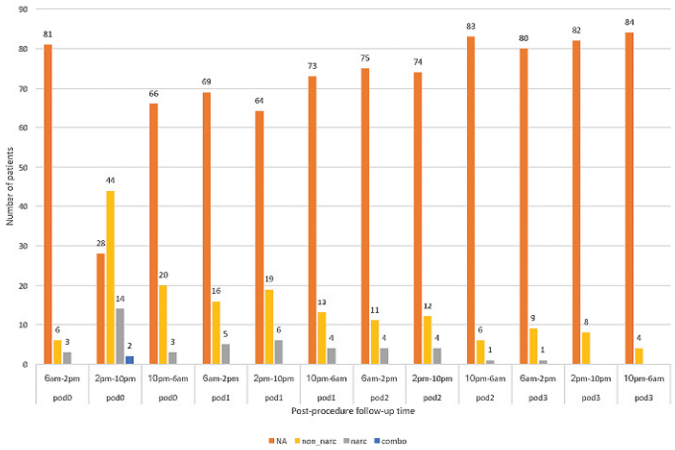


Figure 2. Number of patients taking analgesic medications in each post-operative timeframe. Combo, combination of non-narcotic and narcotic medications; NA, not applicable because patient did not take pain medication; narc, narcotic medications including tramadol and hydrocodone taken by one patient who took hydrocodone that was not on his medication list; non-narc, non-narcotic medications including acetaminophen and non-steroidal anti-inflammatory drugs; POD, post-operative day.

Clinical Pearls Abstract Session – Thursday, May 2: 3:00 – 4:00 pm

May 2, 3:00 – 3:06 pm

Presenter: Ekama Carlson, MD, PhD

Title: Squamoid Eccrine Ductal Carcinoma: Clinicopathologic Study, and Pearls for Mohs Micrographic Surgical Management of this Mimicker of Squamous Cell Carcinoma

Author: Ekama Carlson, MD, PhD[1]

Institution: 1. Kaiser Permanente, San Rafael, CA

Purpose: Describe clinical and histological features of squamoid eccrine ductal carcinoma, and pearls for management using Mohs micrographic surgery.

Summary: Squamoid eccrine ductal carcinoma (SEDC) is an exceedingly rare cutaneous adnexal carcinoma that demonstrates eccrine ductal differentiation combined with a squamoid component. Histologically, these tumors resemble well differentiated squamous cell carcinoma superficially. The deeper aspect of the tumor is marked by infiltrative growth of ductal structures with severe cytologic atypia extending into the deep dermis and subcutis, often with lymphovascular and perineural invasion. Clinically, these tumors exhibit aggressive clinical behavior, with high rates of local recurrence, and a propensity for distant metastasis and death. Reported treatment is surgical, with wide local excision and Mohs micrographic surgery (MMS). To date, only three reports of treatment with the latter exist. Herein, we report a case of SEDC with extensive, multifocal perineural invasion treated with Mohs surgery. We offer pearls for management of this condition with Mohs surgery.

Design: A 79 year old man presented with a 2 cm firm, indurated plaque on the left temple. An initial biopsy showed a primary eccrine carcinoma. The patient was referred for treatment with MMS. A debulk of the tumor at the time of MMS showed a biphasic tumor with predominantly squamous differentiation connected to an underlying dermal proliferation of ductal differentiation within small, angular, infiltrating nests, cords, and strands of tumor within a desmoplastic stroma. The tumor demonstrated moderate cytologic atypia, and a high mitotic rate. Immunohistochemical analysis revealed prominent staining of the ductal differentiated portion of the tumor with CK 7, which did not stain the upper squamous component, and to a lesser extent, CEA which confirmed the presence of lumen. The tumor was extirpated in 5 stages using MMS. Histologic examination of Mohs sections revealed multiple foci of perineural invasion, perineural inflammation, along with more subtle neurotrophic spread of tumor cells, which was characterized by the presence of small basaloid and otherwise bland cells in single or double layers wrapped tightly around multiple small and medium caliber nerves at distances away from the main mass of tumor. Sections were sent for permanent section histopathologic analysis and immunohistochemistry. There was heavy CK 7 staining of the bland perineural cells, confirming the presence of neuropathic tumor spread.

Conclusion: Extensive perineural involvement and neurotrophic spread of tumor may be seen in SEDC. Utilization of immunohistochemistry during Mohs micrographic surgery aids in visualization of this high risk histological feature, a finding which may be subtle on routine hematoxylin and eosin sections. Intraoperative identification of this infiltrative tumor with high risk of recurrence and distant spread, is paramount in ensuring successful extirpation and favorable outcomes in patients with SEDC.

May 2, 3:07 – 3:13 pm

Presenter: Kourosh Beroukhim, MD

Title: Relationship of Cutaneous and Noncutaneous Malignant Melanoma in Persons with Multiple Primary Tumors

Authors: Kourosh Beroukhim, MD[1]; Daniel B. Eisen, MD[1]

Institution: 1. University of California-Davis, Sacramento, CA

Introduction & Objectives: Noncutaneous melanomas, which account for approximately 10% of all melanomas, are more aggressive and associated with worse outcomes compared to cutaneous melanomas. The shared progenitor cell type among cutaneous and noncutaneous melanomas suggests that patients with a history of primary cutaneous melanoma may be at higher risk for subsequent noncutaneous melanoma. This has led some dermatologists to advocate for periodic ophthalmologic, dental, and gynecologic examinations for patients with a history of cutaneous malignant melanoma.

The objective of this study was to determine whether patients with primary cutaneous melanoma demonstrate an increased risk of second primary melanoma, including cutaneous, ocular, oral, and vaginal/exocervical melanoma, compared to the general population.

Study Type: Population-based retrospective cohort study.

Study Setting: Academic Center. Data was extracted from the Surveillance, Epidemiology, and End Results database.

Methods: Using the Surveillance, Epidemiology, and End Results database, we identified patients diagnosed with cutaneous melanoma between 1973 and 2015. We obtained standardized incidence ratios and excess absolute risks of second primary cutaneous, ocular, oral, and vaginal/exocervical melanoma in patients with prior primary cutaneous melanoma compared to a reference population, adjusted for age, sex, race, year of diagnosis, and residence.

Results: Patients with cutaneous melanoma (n=164,149) were more likely than the general population to develop a second primary cutaneous melanoma (observed to expected [O:E] ratio=8.19; 95% confidence interval [CI]=8.02-8.35) ocular melanoma(O:E=2.00; 95% CI=1.54-2.56) oral melanoma (O:E=7.09; 95% CI=2.3-16.56), and vaginal/exocervical melanoma (O:E=10.51; 95% CI=4.80-19.95). For second primary cutaneous, ocular, and vaginal/exocervical melanomas, the risk remained elevated even 120 months or more after the diagnosis of primary cutaneous melanoma. Non-whites with a history of cutaneous melanoma had a persistently elevated risk of second primary cutaneous melanoma.

Conclusion: Our research indicates that patients with cutaneous melanoma are at increased risk for subsequent primary melanoma, including cutaneous, ocular, oral, vaginal/exocervical melanoma. The data support a shared etiology for cutaneous and noncutaneous melanomas. In caring for patients with a history of cutaneous melanoma, physicians should be vigilant not only about risk of recurrence but also about second primary cutaneous and noncutaneous melanomas.

Observed and Expected Number of Persons Developing a Second Primary Melanoma Following an Initial Primary Cutaneous Melanoma in SEER Registries, 1973–2015

Second primary melanoma	O	E	O:E	95% CI		Excess Risk
Cutaneous	9,196	1,122.98	**8.19**	8.02	8.36	47.90
Ocular	64	31.84	**2.01**	1.55	2.57	0.19
Oral	7	0.83	**8.42**	3.38	17.34	0.04
Vaginal/Vulvar	10	3.97	**2.52**	1.21	4.64	0.04
Penile	3	0.24	**12.31**	2.54	35.97	0.02

Expected number of cases were based on population rates adjusted for age, sex, race, year of diagnosis, and residence.

Excess risk is per 10,000.

O, observed; E, expected; O:E, observed to expected ratio; 95% CI, 95% confidence interval. Bold font indicates statistically significant finding.

May 2, 3:14 – 3:20 pm

Presenter: Omar Badri, MD

Title: A Systematic Review of Oral Skin Cancer Prophylaxis: Acitretin Halves Occurrence of Basal and Squamous Cell Carcinoma

Authors: Omar Badri, MD[1,2]; Emily Ruiz[2]; Chrysalyne Schmults, MD[2]

Institutions: 1. University of Massachusetts, Worcester, MA
2. Brigham & Women's Hospital, Boston, MA

Introduction & Objectives: Introduction: Studies on acitretin for keratinocyte carcinoma (KC) chemoprevention have reported varying degrees of efficacy; however, quantitative estimates are limited and there have been no cost analyses performed.

Objective: Synthesize data for patients on acitretin for KC chemoprevention and perform a cost analysis.

Study Type: Systematic review and cost analysis.

Study Setting: Academic center.

Methods: Design: Systematic review of all English language articles in MEDLINE and EMBASE databases of acitretin for KC chemoprevention published 1982 and August 2018 was conducted. The number of basal cell carcinoma (BCC), squamous cell carcinoma (SCC), and KC were analysed pre- and post-acitretin. The annual cost of acitretin, including office visits and laboratory studies, was estimated using National Average Drug Acquisition Cost data and the All-Payer Claims Database (APCD) Council data set.

Study Selection: Eligible studies included 5 or more subjects that reported the number of BCCs and/or SCCs pre- and post-acitretin. Studies were excluded if they did not report the number of KCs or follow up duration.

Data Extraction and Synthesis: Data extraction included the dose of acitretin, duration of therapy, side-effects, number of subjects that withdrew, pre- and post-acitretin BCC and SCC development, and relevant past medical history. The reduction in BCC, SCC, and KC was generated by pooling data from eligible studies.

Main outcome and measures: Reduction in KCs and annual cost of acitretin.

Results: Five studies containing 111 patients met inclusion criteria. Acitretin dosing varied from 25mg-30mg daily. The percent reduction in BCC, SCC, and KC formation was 73%, 60%, and 61%, respectively, which corresponds to an average annual reduction of 0.82 KCs per patient. The annual cost of acitretin was $5986 (direct drug cost: $5482) in 2018, which represents a 67% increase since 2000. The direct cost of managing 0.82 KCs per patient using Mohs micrographic surgery and reconstruction was $778.48, excision and reconstruction was $294.40, and ED&C was $84.27 Acitretin is cost effective based on a direct cost analysis for patients who develop 5-6 tumors annually. The cost analysis does not account for quality of life reduction/morbidity associated with surgery, costs associated with management of metastasis, indirect costs, savings associated with a reduction in actinic keratoses, or patient preferences.

Conclusion: Acitretin is associated with a 61% reduction in KC formation. Acitretin use is limited by its high cost, which has risen in recent years despite its off-patent status. Efforts should be made to increase acitretin affordability in order to expand its use and reduce skin cancer morbidity.

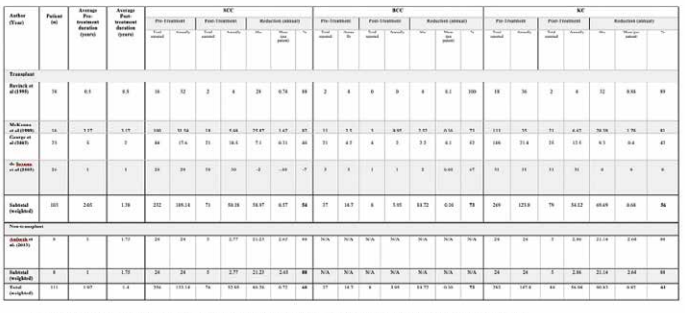
Table 1. Summary of studies included in the systematic review.

Reference	Publication Year	Study Design	Quality of Evidence[1]	Inclusion criteria	Medium FU (Range), Months	No. of Cases	Dose	Patient Population
Bavinck et al.[6]	1995	RCT	1	10+ keratotic lesions	6	38 (n=19 in each arm)	30mg QD	Renal Transplant
McKenna et al.[22]	1999	Prospective	3	2+ KC	38	16	0.3mg/kg/day	Renal Transplant
George el al.[7]	2002	Randomized cross over trial	1	3+ KC or 10 actinic keratoses	24	23	25mg QD or QOD	Renal Transplant
de Sevaux et al.[5]	2003	RCT using 2 different doses	1	1+ KC with 10+ actinic keratoses	12	26	0.4mg/kg/d (n=14) or 0.4 x 3 months -> 0.2mg/kg/d x 9 months (n=12)	Renal Transplant
Anforth et al.[24]	2013	Prospective	3	5+ KC	4-12	8	10-50mg QD	BRAF inhibitor

Abbreviations: FU: follow up; RCT: randomized controlled trial; KC: keratinocyte carcinoma; No.: number; d: day; QD: one a day; QOD: one every other day; Wk: week

[1]Quality of evidence assessed using the Quality Rating Scheme for Studies and Other Evidence: 1) Properly powered and conducted randomized clinical trial or systematic review with meta-analysis; 2) Well-designed controlled trial without randomization or prospective comparative cohort trial; 3) Case-control studies or retrospective cohort study; 4) Case series with or without intervention or cross-sectional study; and 5) Opinion of respected authorities or case reports.

Table 2. Summary of number of pre- and post-acitretin SCC, BCC, and KC.



Abbreviations: Abs, absolute; SCC, squamous cell carcinoma; BCC, basal cell carcinoma; KC, keratinocyte carcinoma

Table 3. Summary of Acitretin and surgical costs.

Reference	Description	Cost
Acitretin Related Costs		
APCD [10]	E/M	$58.20
APCD [10]	CBC	$10.03
APCD [10]	LFT	$26.97
APCD [10]	Lipid panel	$20.14
APCD [10]	BMP	$9.09
NADAC [9]	Acitretin 25mg pill (U.S. as of May 2018)	$15.02
Canadarxconnection.com [18]	Acitretin 25mg pill (International as of May 2018)	$1.50-$4.00
Surgical Costs		
APCD [10]	Average Mohs micrographic surgery (MMS) first stage	$392.33
APCD [10]	Average Mohs micrographic surgery (MMS) additional stage	$338.32
APCD [10]	Average excision of malignant lesion	$156.16
APCD [10]	Average intermediate/complex repair	$202.86
APCD [10]	Average flap/graft repair	$634.75
APCD [10]	Electrodessication and curettage (ED&C)	$102.77

APCD: All-Payers Claims Database
E/M: Evaluation and management
CBC: Complete blood count
LFT: Liver function test
BMP: Basic metabolic panel
NADAC: National Average Drug Acquisition Cost data

May 2, 3:21 – 3:27 pm

Presenter: Lauren M. Ogrich, MD

Title: Perineural Invasion in Basal Cell Carcinomas: A Multi-Institutional Retrospective Chart Review Examining Local Recurrence Rates Between Treatment Modalities

Authors: Lauren M. Ogrich, MD[1]; Lina Husienzad, MD[1]; Baillie Bronner, BS[2]; John R. Durkin, MD[2]; Shayan Waseh, MPH[3]; Bryan T. Carroll, MD, PhD[1]; Shelly Stepenaskie, MD[2]; Jonhan Ho, MD, MS[1]; Melissa Pugliano-Mauro, MD[1]

Institutions: 1. University of Pittsburgh, Pittsburgh, PA
2. University of New Mexico School of Medicine, Albuquerque, NM
3. Sidney Kimmel Medical College- Thomas Jefferson University, Philadelphia, PA

Introduction & Objectives: Perineural invasion (PNI) occurs in an estimated 1-10% of all basal cell carcinomas (BCC). It is characterized by tumor growth in or around a nerve via spread of the tumor along tissue planes. BCC with PNI is associated with an increased risk of recurrence, larger lesion size, location on the head and neck, aggressive histologic pattern, and requires more stages during Mohs micrographic surgery (MMS) compared to tumors without PNI. Currently there is limited data on these tumors and a consequent need for consensus between dermatologists on management of these tumors, particularly in the setting of incidental PNI noted after excision. This study seeks to characterize local recurrence rates of BCC exhibiting PNI with the aim of better understanding the risk of recurrence specific to currently employed treatment modalities.

Study Type: Multi-institutional retrospective chart review.

Study Setting: Academic center.

Methods: Patients were identified by a natural language search at two academic centers between 2000-2018. Inclusion criteria included patients with a histological diagnosis of BCC with PNI and at least 6 months of clinical follow up. Basic demographics and tumor characteristics were collected through a retrospective chart review. Descriptive statistics were used to calculate an overall recurrence rate as well as recurrence rates within subgroups of patients including those treated with MMS and wide local excision (WLE). Statistical analysis was completed using Crosstabs in SPSS.

Results: Ninety-one patients were identified through the search while 42 were excluded due to lack of follow up. Forty nine patients were included in our study with an average follow up of 2.9 years (Table 1). Overall, there was a 24% recurrence rate (12/49). Thirteen patients were initially treated with MMS with 2 recurrences while 36 patients were initially treated with WLE with 10 recurrences. (Table 2). The odds of recurrence were 2.12 times higher in patients treated with WLE as compared to MMS (95% CI 0.40-11.28).

Conclusion: Given the low incidence of BCC with PNI and the paucity of available literature, our study supports previous studies suggesting a higher recurrence rate in BCCs exhibiting PNI compared to tumors lacking PNI. As per NCCN guidelines, MMS remains treatment of choice for these high risk BCCs if PNI is noted on the diagnostic biopsy as our study suggests improved recurrence rates with MMS versus WLE. Often, incidental PNI is noted only after surgical excision representing a treatment dilemma. In our cohort, these patients experienced higher recurrence rates and should be followed closely for recurrence or even considered for further treatment with MMS on a case-by-case basis. The limitations of this study include lack of uniformity between pathology reporting, confounding risk factors, a retrospective and non-comparative design, and a small sample size which prevented statistical significance in our chi square testing.

Table 1. Demographics of 49 Histologically Confirmed Basal Cell Carcinoma with Perineural Invasion

Sex (N=49)		**Previous treatment (N=47)**	
Male	31 (63%)	No prior treatment	38 (78%)
Female	18 (37%)	Cryotherapy	1 (2%)
Mean Age at Diagnosis (N=49)	67 (12-91)	Curettage and cautery	2 (4%)
Mean Follow up (months) (N=49)	35 (6-146)	Surgical excision/MMS	7 (14%)
Histologic subtype (N=49)		Radiation therapy	1 (2%)
Infiltrating	38 (78%)	**Initial Treatment after Identification of PNI (N=49)**	
Nodular	4 (8%)	WLE	36 (73%)
Morpheic/Sclerosing	5 (10%)	MMS	13 (27%)
Micronodular	2 (4%)	**Adjuvant treatment (N=49)**	
Tumor Size (cm) (N=43)		Radiation therapy	9 (18%)
< 1	9 (21%)	Smoothened inhibitor	1 (2%)
1.0 to 2.0	16 (37%)	**Identification of PNI (N=49)**	
2.1 to 3.0	8 (19%)	Diagnostic biopsy pathology	13 (27%)
3.1 to 4.0	5 (12%)	Surgical excision pathology	34 (69%)
4.1 to 5.0	3 (7%)	Frozen sections from MMS	2 (4%)
> 5	2 (5%)	**Recurrence rate (N=49)**	
Location (N=49)		WLE (N=36)	10 (28%)
Head and Neck	41 (84%)	MMS (N=13)	2 (15%)
Trunk and extremities	7 (14%)		
Hands/genitalia	1 (2%)		

Table 2. Cases of Recurrence with Basal Cell Carcinoma and Perineural Invasion

Patient No.	Age (year)/Sex	Location	Identification of PNI	Primary vs Recurrent tumor	Prior Treatment	Histological Subtype	Tumor Size (cm)	Initial Treatment After Identification of PNI	Time until Recurrence (months)	Adjuvant Therapy
1	87/F	Scalp	Excision	Primary	None	Infiltrative	1.2	WLE	13	Radiation
2	84/M	Ear	Excision	Recurrent	Radiation	Infiltrative	3.5	WLE	12	None
3	78/F	Cheek	Excision	Recurrent	Excision, Radiation Therapy	Infiltrative	2	WLE	10	None
4	49/M	Ear/Neck	Excision	Primary	None	Infiltrative	12	WLE	8	Radiation
5	36/F	Scalp	Excision	Recurrent	Excision	Nodular	Unknown	WLE	36	Vismodegib
6	71/M	Neck	Excision	Primary	None	Infiltrative	0.8	WLE	3	Unknown
7	81/M	Scalp	Biopsy	Primary	none	Infiltrative	1.8	WLE	26	Unknown
8	66/F	Neck	Excision	Primary	None	Infiltrative	1.1	WLE	4	None
9	84/M	Ear	Excision	Recurrent	MMS	Infiltrative	3.5	WLE	12	None
10	91/M	Temple	Excision	Recurrent	Excision	Infiltrative	3.8	WLE	4	Radiation
11	67/M	Lip	Biopsy	Recurrent	MMS	Infiltrative	0.7	MMS	26	None
12	91/M	Forehead	Mohs frozen section	Primary	None	Morpheaform	1.5	MMS	6	Radiation

May 2, 3:28 – 3:34 pm

Presenter: Michael Kunz

Title: Optimizing the Histological Mapping of Thin Delicate Tissue in Mohs Micrographic Surgery – the 'Paper Cut Technique'

Authors: Michael Kunz[1]; Lauren E. Poynter, HT (ASCP)[1]; Kimberley A. Walker, HT (ASCP)[1]; Ally-Khan Somani, MD, PhD[1]

Institution: 1. Indiana University School of Medicine, Indianapolis, IN

Introduction & Objectives: Accurate processing and mapping of thin delicate layers (i.e. fascia, perichondrium, periosteum, or muscle) during Mohs Micrographic Surgery (MMS) can be challenging since this tissue is inherently fragile and prone to desiccation and shrinkage. This can lead to tissue distortion during tissue transfer for histological processing and ultimately leading to imprecision in tissue mapping. Herein we

present a simple and novel method to facilitate accurate tissue mapping of delicate Mohs layers which we call the 'Paper Cut Technique' (PCT).

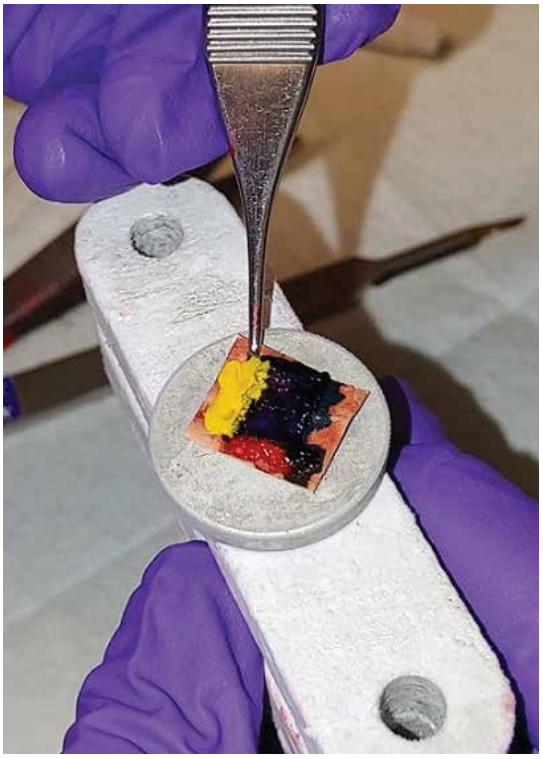
Study Type: Clinical pilot study.

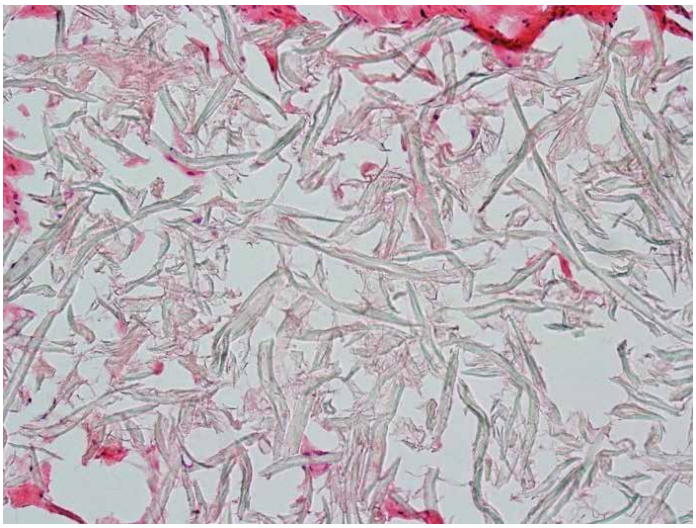
Study Setting: Academic center.

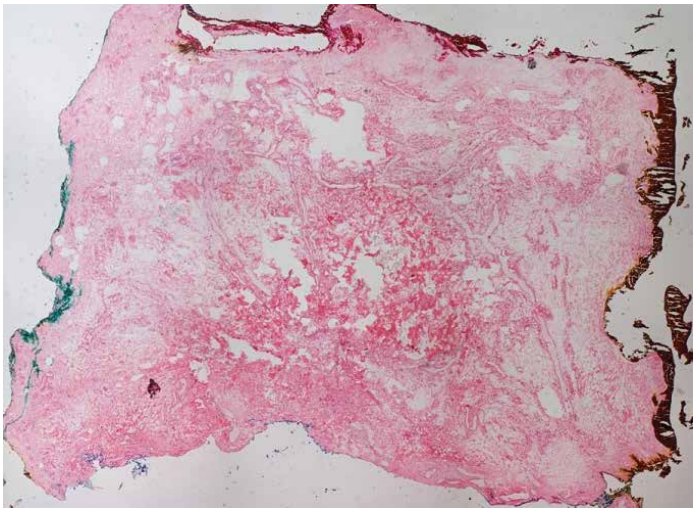
Methods: During MMS when deep margins were found to be positive for tumor and it was necessary to procure additional thin Mohs layers, the PCT was utilized. We first inked the deep tissue with dye to ensure complete removal. The excised thin tissue layer (prone to desiccation and contraction), was then immediately oriented and placed directly on the paper and color mapped. The redundant part of the paper was trimmed off with a scalpel blade or scissors, leaving behind paper attached to the entire deep margin (bottom) of the removed tissue (Fig. 1). The tissue along with the attached paper was then processed for cryosectioning in the usual manner without need for additional tissue manipulation. The initial sections consisted of paper and were discarded until the blade contacted the target tissue. Histologically, paper fibers are readily distinguished from other structure found on skin, subcutaneous tissue, fascia or tumors (Fig. 2). To date, we have successfully employed the PCT with great reproducibility for layers taken from scalp periosteum, auricular perichondrium, and periocular fascia/ muscle (Fig. 3).

Results: From April 2018 until February 2019 we successfully processed a total of 12. All tissue layers subjected to PCT were obtained from patients undergoing MMS for Nonmelanoma Skin Cancer. In all cases, the PCT maintained the configuration of the procured tissue with minimal to no distortion, ensuring accurate histological mapping. We further tested several paper sources (WhatmanTM 3MM filter paper, Fisherbrand filter paper, Standard printer paper Xerographic 8.5x11 and Kimwipes KIMTECH) for the PCT. The paper was rated by our histology technicians according to its stability, thickness, absorptive capacity, tissue adherence and ease of cryosectioning. We found regular petri dish filter paper (Fisherbrand Filter Paper, Qualitative P4, Porosity Medium – Fine, Flow Rate: Slow, Fisher Scientific) to perform the best.

Conclusion: The PCT is a novel innovative method that can be readily incorporated into the daily routine of MMS for selected cases. It minimizes tissue manipulation by avoiding the need for tissue transfer during histological processing. This technique facilitates the reliable production of high-quality histological slides and retains the accurate micrographic mapping of thin delicate tissues normally prone to desiccation, shrinkage and distortion.







May 2, 3:35 – 3:41 pm

Presenter: Benjamin F. Kelley, MD

Title: Endocrine Mucin Producing Sweat Gland Carcinoma and Primary Cutaneous Mucinous Carcinoma

Authors: Solomiya Grushchak, MD[1]; Benjamin F. Kelley, MD[1]; Geva E. Manor, MD[1]; Thomas Barlow, MD[1]; Hubert T. Greenway, Jr., MD[1]

Institution: 1. Scripps Green Hospital, La Jolla, CA

Purpose: The aim of this study is to present two new cases of endocrine mucin producing sweat gland carcinoma (EMPSGC) and two cases of primary cutaneous mucinous carcinoma (PCMC) treated surgically. We discuss the clinical and histopathologic spectrum, differential diagnosis, and treatment options gleaned from the literature.

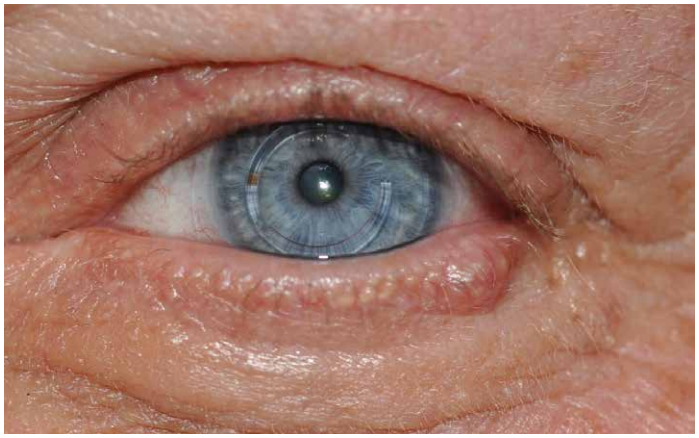
Summary: Endocrine mucin producing sweat gland carcinoma (EMPSGC) and primary cutaneous mucinous carcinoma (PCMC) are two adnexal malignancies on a single histopathologic continuum from in situ to invasive carcinoma, respectively. They share immunophenotypical and morphologic similarity to endocrine ductile carcinoma in situ (E-DCIS) or solid papillary carcinoma of the breast. Clinically, both neoplasms have a strong predilection to the peri-orbital region, (specifically the lower eyelids) of middle-aged and elderly people. These slow growing tumors present as flesh-colored solid or cystic nodules. Histologically, EMPSGC appears as a solid nodules of cells with papillary or cribriform appearance, with intracellular or extracellular mucin, while PCMC is characterized by floating epithelial cell nests in mucinous lakes. Although diagnosis can be challenging, positive expression of at least one neuroendocrine marker (i.e., synaptophysin, neuron-specific enolase, chromogranin) and low-molecular cytokeratin (C7 and Cam5.2) aids in the diagnosis of EMPSGC, PCMC, and other adnexal tumors.

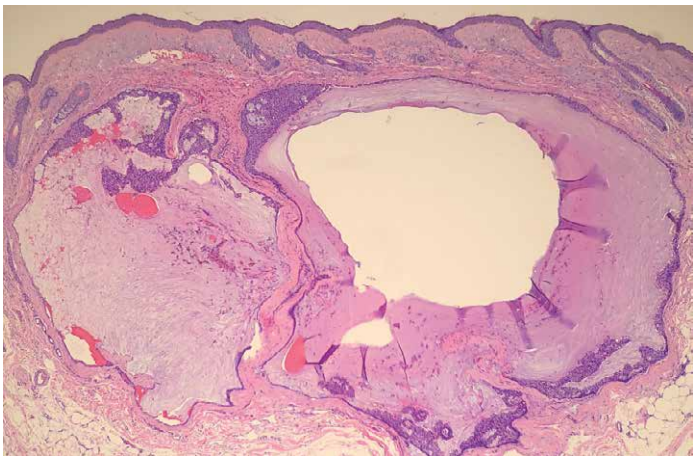
There is little consensus on the optimal management of these indolent yet locally aggressive tumors. Current treatment of PCMC and EMPSGC involves wide local excision (WLE) with > 5mm margins or Mohs micrographic surgery (MMS) in cosmetically sensitive areas. Local recurrence of PCMC after WLE with narrow margins can be as high as 30-40%, especially on the eyelid. Most recent reports cite MMS as an effective method to reduce local recurrence.

Design: A retrospective, single institution case series was complied. Electronic medical records dating to 1994 were searched for relevant tumors. Two cases of EMPSGC and two cases of PCMC diagnosed and treated at our institution were included and listed in Table 1.

Conclusion: We present 2 new cases of EMPSGC and 2 cases of PCMC. Within each subcategory, one case was treated by modified MMS processed with permanent sections (slow Mohs) and another case was treated by WLE with traditional histopathologic processing (bread loafing). Follow-up mean was 35 months. There were no recurrences or metastases in either group. Depending on the prior history of the patient, a metastatic workup may be warranted due to the histopathologic overlap with certain breast carcinomas. Due to the high recurrence rate reported in the literature and the predilection for the eyelid and face, MMS provides an excellent alternative to WLE for tissue preservation and meticulous margin control. We advocate for the use of the Mohs technique with permanent sectioning, which allows the full array of special stains that may be useful markers for these tumors.

SUBJECT ID	Final Diagnosis	Age	SEX (M/F)	LOCATION	HISTORY OF SKIN CANCER (Y/N)	HISTORY OF INDOOR TANNING (Y/N)	SKIN TYPE (FITZPATRICK)	DURATION OF LESION (MON)	BIOPSY TYPE (PUNCH/SHAVE /EXCISION)	TYPE OF SURGERY	MOHS: PERMS VS. FROZEN	PRE-OP SIZE (mm)	POST-OP SIZE (mm)	LAYER NUMBER	REPAIR TYPE	Follow Up (MON)	Recurrence (Y/N)
1	EMPSGC	61	M	L LOWER EYELID	N	N	II	12	SHAVE	MMS	PERMANENT	7 x 5	22 x 12	1	LOT LOWER LID ADVANCEMENT FLAP	6	N
2	EMPSGC	65	F	R LOWER EYELID	N	N	II	9	EXCISION	WLE	NA	12 x 10	15 x 9	NA	LAYERED CLOSURE	6	N
3	PCMC	83	M	R LATERAL ORBITAL RIM	Y	NA	NA	NA	PUNCH	MMS	PERMANENT	3 x 3	17 x 25	1	NA	120	N
4	PCMC	87	F	L ABDOMEN	N	N	II	24	PUNCH	WLE	NA	25 x 25	60 x 90	NA	LAYERED CLOSURE	1	N





May 2, 3:42 – 3:48 pm

Presenter: Robert M. Gathings, MD

Title: The Nasal Tip Rotation Flap: A Reliable Single-Stage Repair Option for Defects Involving the Lateral Nasal Tip, Soft Triangle, and Anterior Ala

Authors: Robert M. Gathings, MD[1]; Stanislav N. Tolkachjov, MD[2]

Institutions: 1. Surgical Dermatology Group, Birmingham, AL
2. Epiphany Dermatology, Dallas, TX

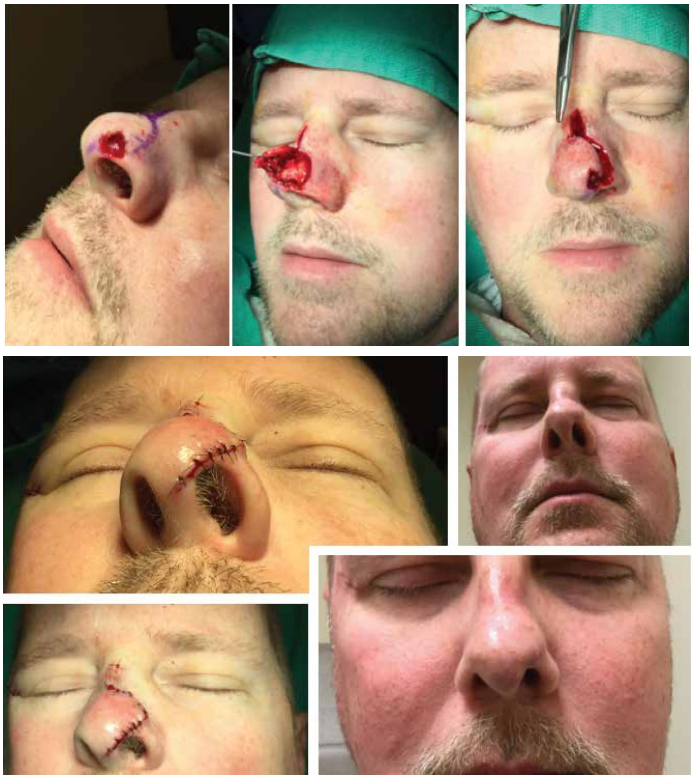
Purpose: Deep defects of the anterior ala, lateral nasal tip and soft triangle can present reconstructive conundrums to even the most experienced reconstructive surgeons. If left to granulate without support, rim notching can develop. Reconstructive options are limited to cartilage composite grafts, which have a high failure rate, and local flaps. These include the bilobed or trilobed transposition flap, nasal Burow's advancement flap ("East/West" advancement flap), and dorsal nasal rotation flap. However, for defects encroaching on the alar rim, a two-stage repairs such as a melolabial interpolation or the paramedian forehead flap are often chosen. Due to the difficulty in flap planning and execution, the potential for composite graft or interpolation flap failure, and the morbidity associated with multi-staged flaps, a robust and reproducible single-stage flap is important for a nasal reconstructive armamentarium. By elevating a broad, robust flap and hiding incision lines at the junction of nasal cosmetic subunits, the nasal tip rotation flap is a reliable reconstructive option imparting appropriate cosmetic outcomes

Summary: We present our experience with the nasal tip rotation flap as a case series of 8 patients with defects involving the lateral nasal tip (7/8) and soft triangle (1/8). All experienced acceptable to excellent cosmetic and functional outcomes. None required surgical revision or resurfacing or experienced nasal valve dysfunction. Inappropriate postoperative bleeding or pain were not reported.

Design: The flap is designed as described by Benoit et al. as two Burow's triangles separated by an arc of rotation. The angle of the Burow's triangle at the base of the flap parallels the line connecting the mid alar rim to the inferior nasal tip. The angle of rotation extends from the lateral aspect of the defect superomedially to the ipsilateral nasal sidewall. Depending on the laxity of the proximal nasal dorsum, or for more thick, sebaceous noses, the arc may extend to the contralateral nasal sidewall and the size and direction of the Burow's triangles may vary slightly. An equalizing Burow's triangle is drawn perpendicular to the arc of rotation to avoid alar displacement. The flap is incised to the submuscular plane and undermined widely. The equalizing superior Burow's triangle is closed first with a buried vertical mattress, which rotates the flap into place. The second suture is placed in the inferoposterior groove. Trimming of the proximal rotating tip may be needed. Subsequent buried vertical mattress sutures are placed along the arc preferably at equal distances to displace tension equally on the nasal rim followed by running cuticular sutures. If the rim is greatly involved, attention must be taken to avoid rim ischemia when sutures are placed.

Conclusion: The nasal tip rotation flap offers a single-stage reliable reconstructive option for defects involving the lateral nasal tip, soft triangle, and anterior ala.

Reference: Benoit A, Hollmig ST, Leach BC. The Nasal Tip Rotation Flap for Reconstruction of the Lateral Nasal Tip, Anterior Ala, and Soft Triangle: The Authors' Experience With 55 Patients. Dermatol Surg 2017 Oct;43(10):1221-1232.



May 2, 3:49 – 3:55 pm

Presenter: Emily S. Ruiz, MD, MPH

Title: Dermatologist-Performed Ultrasound is Useful for Regional Lymph Node Surveillance for High-Stage Cutaneous Squamous Cell Carcinoma

Authors: Emily S. Ruiz, MD, MPH[1]; Chrysalyne D. Schmults, MD, MSCE[1]

Institution: 1. Brigham and Women's Hospital, Boston, MA

Purpose: Approximately 4% of cutaneous squamous cell carcinomas (CSCC) will develop a nodal metastasis, but high-stage tumors (defined as T2b or T3 by the Brigham and Women's (BWH) staging system) have a much higher risk of at least a 21%. Early diagnosis of nodal metastasis with radiologic imaging has been shown to positively impact outcomes, yet there are no standardized guidelines to determine which patients should undergo radiology and which imaging modalities should be utilized. Ultrasound is a non-invasive cost-effective imaging modality that is recommended for regional lymph node monitoring for melanoma; however, it is highly user dependent. Ultrasounds performed by dermatologists in Europe for melanoma have been shown to be highly sensitive and specific for nodal disease.

Summary: While computerized tomography (CT) scans primarily evaluates lymph node dimensions, ultrasound assesses a number of additional lymph node parameters, including shape, architecture, and vasculature. Ultrasound has the ability to identify early lymph node and in transit metastases. The quality of the ultrasound can be improved if performed by a dermatologist since it allows the same physician to perform the clinical examination and ultrasound (which has improved the sensitivity and specificity in melanoma) and standardizes the ultrasound at each visit. Since 70% of patients who die of CSCC only have locoregional disease without distant metastases, dermatologist-performed ultrasound could streamline care and minimize cost and radiation exposure while also offering a highly sensitive and specific imaging modality.

Design: Patients with high-stage CSCC (defined as Brigham and Women's (BWH) tumor stage T2b/T3) undergo both CT scan and dermatologist-performed ultrasound at the time of diagnosis and every six months for two years. Concordance between CT scan and ultrasound are compared at each time interval.

Conclusion: By enabling dermatologists to perform ultrasounds to do nodal staging, we are better streamlining patient care and resource utilization. Ultrasound reduces the inconvenience of having a second imaging appointment, radiation exposure, and variability of ultrasounds.

May 3, 3:30-3:37 pm

Presenter: Amanda J. Tschetter, MD

Title: Long-Term Clinical Outcomes of Patients with Cutaneous Squamous Cell Carcinoma (CSCC) Treated with Mohs Surgery: A Five-Year, Multicenter, Prospective Cohort Study

Authors: Amanda J. Tschetter, MD[1]; Michael Campoli, MD, PHD[2]; John A. Zitelli, MD[3]; David G. Brodland, MD[3]

Institutions: 1. Dermatology Specialists, PA, Edina, MN
2. Fairview Health Services, Wyoming, MN
3. Zitelli & Brodland, PC, Pittsburgh, PA

Introduction & Objectives: Long term clinical outcomes for patients with CSCC treated with Mohs Surgery (MMS) in the United States (US) have never been prospectively defined. Risk factors as they relate to local recurrence (LR), nodal metastasis (NM) and disease specific death (DSD) in the CSCC are primarily derived from single-institution, retrospective data without regard for treatment modality. The most relevant staging systems in CSCC, the Brigham and Women's Hospital staging system (BWH-SS) and the American Joint Committee on Cancer Staging Manual, 8th edition staging system (AJCC8-SS) have not been prospectively validated by treatment modality. This study aimed to quantify outcomes of LR, NM and DSD by BWH-SS and AJCC8-SS T-stage, and to verify previously identified high risk features as they pertain to those outcomes in invasive CSCC treated with MMS.

Study Type: Prospective, multi-center cohort study.

Study Setting: 4 academic and 11 community private practice institutions.

Methods: A prospective, multi-center analysis of patients undergoing MMS for invasive CSCC was conducted in 2011 across 4 academic and 11 community private practice institutions. A total of 745 invasive CSCC across 637 patients were consecutively enrolled over 25 working days.

Results: Recurrence data was available for 686 CSCC (92.1%) with a median follow up of 61 months. The overall five-year recurrence free survival (RFS), LR-free survival (LR-FS), and NM-free survival (NM-FS) were 98.5%, 99.3% and 99.2%, respectively. Five-year disease-specific survival (DSS) and all-cause survival (ACS) were 93.2% and 78.8% respectively. Both the AJCC8-SS and the BWH-SS were predictive of NM, disease-specific death (DSD) and all-cause death; neither was predictive of LR. Breslow depth was statistically associated with LR, NM and DSD. Incidental perineural invasion (IPNI) was not statistically associated with LR, NM or DSD.

Conclusion: This is the first US-based, multi-center, prospective outcomes study on primary and locally recurrent, invasive CSCC and the only prospective study to classify outcomes by AJCC8-SS and BWH-SS by treatment modality. The value of exhaustive histologic evaluation via MMS is evident as it provides the lowest reported local recurrence rates to date. Tumor characteristics typically associated with a high risk for poor outcomes appear less relevant with MMS as the treatment modality. No patients with IPNI in the present study were adjuvantly treated with XRT; yet, the presence of IPNI was not associated with LR, NM, or DSD when controlled for other factors. Consideration should be made for reporting Breslow thickness on pathology reports for all invasive CSCC as it was the only tumor characteristic predictive of LR, NM and DSD on multivariate modeling. Given the risk nullification of tumor features well-known to be associated with LR and NM, the value of complete margin evaluation via MMS in the treatment of CSCC is made resoundingly evident in this study.

May 3, 3:38-3:45 pm

Presenter: Sarah T. Arron, MD, PhD

Title: Development of a Prognostic Gene Expression Profile Test in Cutaneous Squamous Cell Carcinoma in Patients with One or More High Risk Features

Authors: Sarah T. Arron, MD, PhD[1]; Ashley Wysong, MD[2]; Sherrif F. Ibrahim, MD, PhD[3]; Nathan J. Cleaver, DO[4]; Ian A. Maher, MD[5]; David Panther, MD[6]; David G. Brodland, MD[6]; Jason G. Newman, MD, FACS[7]; Kyle R. Covington, PhD[8]; Chrysalyne D. Schmults, MD, MSCE[9]

Institutions: 1. University of California San Francisco, San Francisco, CA
2. University of Nebraska Medical Center, Omaha, NE
3. University of Rochester, Rochester, NY
4. Cleaver Dermatology, Kirksville, MS
5. University of Minnesota, Minneapolis, MN
6. Zitelli & Brodland, P.C., Pittsburgh, PA
7. University of Pennsylvania, Philadelphia, PA
8. Castle Biosciences, Inc., Friendswood, TX
9. Brigham and Women's Hospital, Boston, MA

Introduction & Objectives: Cutaneous squamous cell carcinoma (cSCC) is one of the most common cancers in the United States with nearly 1 million new diagnoses per year. Although most patients are cured by surgical intervention, a subset will experience disease recurrence with the number of annual deaths from cSCC being similar to those from cutaneous melanoma. In high-risk cSCC, management decisions like radiation, chemotherapy, sentinel lymph node biopsy, complete lymph node dissection, or active surveillance are based on risk of local recurrence or metastasis, but are complicated due to the low positive predictive value (PPV) from current staging systems. Prognostic tests have successfully informed management treatment decisions in other types of cancer, including cutaneous and uveal melanoma, along with thyroid, breast, and prostate cancers. Given various interventions for high-risk cSCC patients, such a clinical test could prove beneficial for this population. The objective of this study was to develop a gene expression-based signature associated with recurrence and/or metastasis in cSCC.

Study Type: Development study using archival primary cSCC tumor tissue with associated clinical data and outcomes.

Study Setting: Multi-institutional with centralized tissue and data collection and processing.

Methods: For the purposes of test development and validation, archival formalin-fixed paraffin-embedded primary cSCC tissue, verified clinicopathologic information, and outcomes data were collected from 18 centers under IRB-approval (n=442). Candidate genes were selected by a two-pronged approach: literature search and global gene expression profiling. Bioinformatics and machine-learning approaches were used to identify and prioritize gene sets, and cross-validation was performed to assess initial performance and feasibility.

Results: Using qPCR analysis,19 of 73 literature-identified genes were found to be significantly different between recurrent and non-recurrent cases, including 6, 2, and 15 genes associated with any recurrence, local recurrence, and regional/distant metastasis, respectively ($p<0.05$, n=217 development cohort). Principal component analysis of ClariomD Affymetrix microarray data on a subset of the development cohort

(n=80 cases) demonstrated clustering of samples with regional/distant metastasis, suggesting potential shared gene expression patterns. Using deep learning approaches and in silico analysis with 10-fold cross-validation, 67 top-performing genes were identified that were able to predict metastasis with 100% sensitivity, 99.1% specificity, 97.1% PPV, and 99.6% overall accuracy from in silico assays, suggesting that gene expression profiling could potentially outperform current staging criteria. Additional qPCR with machine learning for the 67 discriminatory genes on the full development cohort is ongoing. Once complete, these findings will be combined with gene expression data on the literature-selected genes, and additional predictive modeling approaches will be applied to identify the optimal assay that will then be validated in an independent cohort.

Conclusion: A gene expression signature to provide accurate prognosis in cSCC is feasible and could help guide appropriate disease management strategies based on biological risk of recurrence.

May 3, 3:46-3:53 pm

Presenter: Saud Aleissa, MD

Title: Combined Reflectance Confocal Microscopy and Optical Coherence Tomography to Evaluate Basal Cell Carcinoma Residual Disease and Margins

Authors: Saud Aleissa, MD[1]; William Phillips[1]; Kishwer S. Nehal, MD[1]

Institution: 1. Memorial Sloan Kettering Cancer Center, New York, NY

Introduction & Objectives: Reflectance confocal microscopy (RCM) and Optical Coherence Tomography (OCT) have been used to evaluate basal cell carcinoma (BCC) prior to Mohs micrographic surgery. While each has unique strengths and limitations, with RCM images having high resolution but limited in depth (200 microns) while OCT can image up to 750-1000 microns in depth with limited cellular resolution. A combined imaging approach utilizing both RCM and OCT prior to Mohs has not been studied extensively.

Study Type: Prospective study.

Study Setting: Academic center.

Methods: To assess the feasibility of a combined RCM-OCT imaging modality to increase the diagnostic accuracy of assessing BCC residual disease and margins. Biopsy-proven BCC cases referred for Mohs surgery were included from 10/2018-12/2018. On day of Mohs surgery, surgical margins were marked by a Mohs surgeon. The lesion was then imaged with a handheld RCM-OCT device, assessing the center for residual disease and assessing 4 quadrants for margin status along clinically demarcated initial Mohs margin. If BCC criteria were observed under RCM or OCT, the case was labeled as 'RCM and/or OCT positive'; if no BCC-criteria were found, case was labeled "RCM and/or OCT negative'. Mohs surgery was performed according to standard procedure (Mohs surgeon was blinded to RCM-OCT results) and Mohs frozen sections (FS) were evaluated. If residual BCC noted at FS margins, the case was labeled as 'FS positive'. 15 µm-serial vertical sectioning of the tumor debulk (remaining Mohs FS block) was performed to assess the center of the lesion for residual BCC and the histopathological depth was measured. RCM and OCT images were correlated to Mohs FS pathology.

Results: 24 patients were included. Three patients were excluded (1 patient with missing data, and 2 patients were not able to obtain images due to challenging anatomical areas). Mean age was 67.4 years (range 36 – 83); female 52% (12/23). 65% were located on the head and neck. The sensitivity for residual BCC in the center for was 75.00% (RCM), 91.67% (OCT) and 100% (RCM+OCT). The Specificity was 75.00% (RCM), 71.43% (OCT) and 75% (RCM+OCT). The PPV was 81.82% (RCM), 84.62% (OCT) and 85.71 (RCM+OCT). The NPV was 66.67% (RCM), 83.33% (OCT) and100% (RCM+OCT). The Kappa was 0.490 (RCM), 0.65 (OCT) and 0.783 (RCM+OCT). When evaluating the 4 quadrants for residual BCC at initial Mohs margins, there was also an improvement in all categories for the combined RCM-OCT versus RCM or OCT alone. The OCT depth measurement correlated well when compared to histopathology with an r2 of 0.514.

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

May 3, 3:54-4:01 pm

Presenter: David Xiong, BS

Title: Outcomes in Intermediate Risk Squamous Cell Carcinomas Treated with Mohs Micrographic Surgery Compared to Wide Local Excision

Authors: David Xiong, BS[1]; Brandon T. Beal, MD[1]; Vamsi Varra, BS[1]; Hannah Cundall, BS[1]; Marla Rodriguez, BS[1]; Neil Woody, MD[1]; Allison T. Vidimos, MD, RPh[1]; Shlomo A. Koyfman, MD[1]; Thomas Knackstedt, MD[1,2]

Institutions: 1. Cleveland Clinic Foundation, Cleveland, OH
2. MetroHealth, Cleveland, OH

Introduction & Objectives: Brigham and Women's hospital (BWH) stage T2a squamous cell carcinoma (SCC) are tumors with a single feature deemed high-risk for a poor outcome (size ≥ 2 cm, poor differentiation, perineural invasion, invasion beyond fat). While less frequently life threatening than their more aggressive counterparts, the published local recurrence rate of T2a SCC (5-9%) is significantly higher than in T1 SCC (0.6-2%). We aimed to study outcomes for intermediate-risk T2a SCC treated by Mohs micrographic surgery (MMS) compared to those treated by wide local excision with routine permanent sections (WLE).

Study Type: Retrospective cohort study.

Study Setting: Single institution academic tertiary care medical center.

Methods: An IRB-approved single institution registry of patients with invasive SCC between January 1, 2010 and December 31, 2012 was utilized. Patient demographics, tumor characteristics, and treatment variables were extracted. Incomplete medical records were excluded. Patients were staged according to the BWH T-staging system and only BWH T2a SCC were included in the analysis. Tumors were stratified into two groups: 1) tumors treated with MMS and 2) tumors treated with wide local excision with routine permanent sections (WLE).

Primary outcomes of interest were overall recurrences (including local, nodal, and distant metastasis) and disease specific death. Data was analyzed in JMP Pro 14 (SAS, Cary, NC) using Pearson's Chi Squared tests, ANOVA, and logistic regression. Results with $p<0.05$ were considered statistically significant.

Results: A total of 410 T2a SCC tumors were included in the study. 269 tumors were treated with MMS and 141 were treated with WLE. The only significant differences between the two treatment groups was a higher proportion of tumors in immunosuppressed patients and in high-risk head and neck locations in the MMS group (Table 1). Tumor size over two centimeters was the most common high-risk feature (92.6%) causing T2a designation. Mean follow-up across both groups was 2.74

years. In total, there were 16 local recurrences in the cohort during this time. Local recurrence was three times more likely after WLE (7.1% recurrence rate) than after MMS (2.2% recurrence rate)(p=0.02).

Furthermore, logistic regression modeling showed poor tumor differentiation (Odds Ratio (OR) 6.0, 95% Confidence Interval (CI) 1.6-22.4, p=0.007), treatment with wide local excision (OR 3.4, 95% CI 1.2-9.9, p=0.02), and recurrent tumor status (OR 8.2, 95% CI 2.6-26.4, p=0.0004) to be associated with local recurrence.

Conclusion: Based on current staging systems, we demonstrate that treatment of BWH T2a intermediate-risk SCC with MMS is associated with a significantly lower rate of local recurrence than WLE.

Variable of Interest	Treatment Modality		P-value
	Mohs Surgery (N=269)	Wide Local Excision (N=144)	
Mean Age at Diagnosis (years)	71.7 (SD 12.9)	71.3 (SD 15.5)	0.73
Gender			0.23
- Male	191 (71.0%)	94 (65.3%)	
- Female	78 (29.0%)	50 (34.7%)	
Immunosuppression			0.002
- No	171 (63.6%)	113 (78.5%)	
- Yes	98 (36.4%)	31 (21.5%)	
Tumor Differentiation			0.76
- Well	156 (58.4%)	84 (58.3%)	
- Moderate	56 (21.0%)	30 (20.8%)	
- Poor	21 (7.9%)	11 (7.6%)	
- Undifferentiated	0 (0%)	1 (0.7%)	
- Unknown	34 (12.7%)	18 (12.5%)	
Invasion Beyond Fat			0.46
- Yes	1 (0.4%)	0 (0%)	
- No	267 (99.6%)	144 (100%)	
Treatment Status			0.9
- Primary	242 (90.0%)	129 (89.6%)	
- Recurrent	27 (10.0%)	15 (10.4%)	
Anatomic Location*			<0.0001
- High Risk Head & Neck			
- Head & Neck	55 (20.5%)	13 (9.0%)	
- Non-Head & Neck	78 (29.0%)	23 (16.0%)	
	136 (50.6%)	108 (75.0%)	
Perineural Invasion			0.19
- Yes	4 (1.5%)	5 (3.5%)	
- No	265 (98.5%)	139 (96.5%)	
Mean Tumor Size (cm)	2.6 (SD 1.3)	2.8 (SD 1.8)	0.15
Oncologic Follow-up (years)	2.8 (SD 2.6)	2.7 (SD 3.1)	0.96
Tumor Recurrence			0.003
- Yes	10 (3.7%)	16 (11.1%)	
- No	259 (96.3%)	128 (88.9%)	

*High Risk Head & Neck = Appropriate Use Criteria H-Zone (J Am Acad Dermatol. 2012 Oct;67(4):531-50)

May 3, 4:02-4:09 pm

Presenter: Michael P. Lee

Title: Trends in Interpolated Flap Repairs on the Nose, Eyelids, Ears, and Lips Following Skin Cancer Excision in the United States from 2007-2016

Authors: Michael P. Lee[1,2]; Christopher J. Miller, MD[1]; Joseph F. Sobanko, MD[1]; Thuzar M. Shin, MD[1]; Nicole Howe[1]; Shannon W. Zullo[1]; Jeremy R. Etzkorn, MD[1]

Institutions: 1. University of Pennsylvania, Philadelphia, PA
2. Eastern Virginia Medical School, Norfolk, VA

Introduction & Objectives: Staged interpolation flaps may be necessary when wounds near the facial free margins (i.e., nose, eyelids, ears, lips) are too large for adjacent tissue rearranging flaps. These flaps require extensive knowledge of anatomy and careful reconstruction design. While dermatologists perform the majority of reconstruction following skin cancer excision,1 it is unclear if this trend applies to more complex reconstruction with interpolated flaps. The objectives of this study were to (1) determine the breakdown of provider specialties that are performing nasal, eyelid, auricular, or oral interpolated flaps and (2) to describe the trends over time.

1. Kantor J. Dermatologists perform more reconstructive surgery in the Medicare population than any other specialist group: A cross-sectional individual-level analysis of Medicare volume and specialist type in cutaneous and reconstructive surgery. J Am Acad Dermatol. 2018;78(1):171-173 e171.

Study Type: Repeated cross-sectional analysis.

Study Setting: United States Insurance Claims.

Methods: A repeated cross-sectional analysis from 2007-2016 was performed using Optum© Clinformatics® DataMart de-identified commercial claims data to evaluate trends in interpolated flap repairs on the nose, eyelids, ears, and lips following skin cancer resection. Basal, squamous, and melanoma skin cases were identified by ICD 9th and 10th editions and linked to CPT codes for narrow excision, wide excision, or MMS followed by interpolated flap repair codes (15731 and 15576). Claims with unknown provider specialty, unclear individual specialty due to surgical center or hospital facility designation, or specialties that performed less than 1% of the total number of interpolated flap repairs for a given year were excluded from analysis. Descriptive analysis was used to summarize the breakdown of specialties and the trend over time.

Results: Utilization of interpolated flaps has increased over time. Table 1 summarizes the demographic information and tumor characteristics from the surgeries. Table 2 displays the total number of flap repairs by each specialty for the different years. Figure 3 demonstrates the stacked number and stacked area proportions of flap repairs performed by each specialty. Dermatology and plastic surgery consistently performed the most flap repairs of all specialties, and dermatologists performed the most interpolated flaps in 7 of the 10 years analyzed.

Conclusion: Among all specialties, dermatology and plastic surgery consistently performed the most interpolated flap repairs following skin cancer excision from 2007-2016, and dermatologists performed the most interpolated flaps in 7 of the 10 years analyzed. Additional research is warranted to evaluate the setting (e.g. office versus operating room) and cost implications of different specialties performing interpolated flaps.

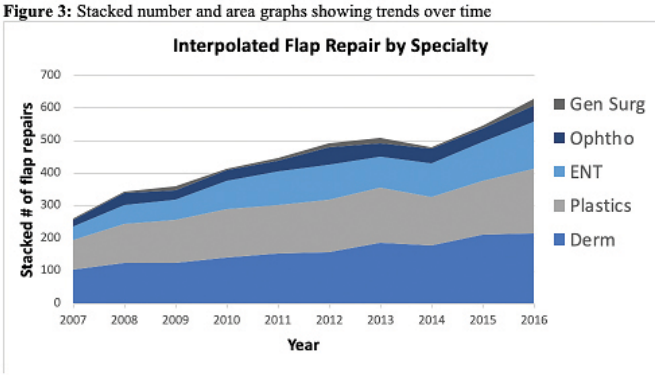
Table 1: Demographic and tumor type of patients who received interpolated flap repairs following skin cancer excision

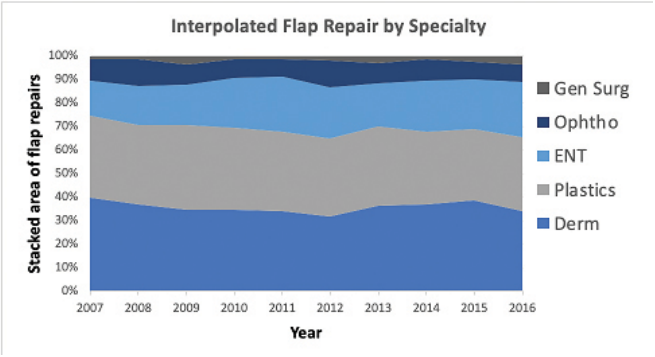
Mean age (SD)	70 (12.3)
Sex N (%)	
Male	2624 (58.5)
Female	1862 (41.5)
Tumor Type N (%)	
BCC & SCC	4219 (94.0)
Melanoma	267 (6.0)

Table 2: Breakdown of provider specialties performing interpolated flap repairs (CPT 15731 & 15576)

Year	Derm N (%)	Plastics N (%)	ENT N (%)	Ophtho N (%)	Gen Surg N (%)	Total
2007	105 (40.1)	91 (34.7)	39 (14.9)	24 (9.2)	3 (1.1)	262
2008	127 (36.8)	117 (33.9)	58 (16.8)	39 (11.3)	4 (1.2)	345
2009	126 (34.8)	130 (35.9)	62 (17.1)	31 (8.6)	13 (3.6)	362
2010	143 (34.5)	146 (35.2)	87 (21.0)	33 (8.0)	6 (1.4)	415
2011	152 (34.2)	149 (33.5)	104 (23.4)	34 (7.6)	6 (1.3)	445
2012	158 (32.1)	161 (32.7)	107 (21.7)	56 (11.4)	10 (2.0)	492
2013	185 (36.3)	173 (34.0)	93 (18.3)	43 (8.4)	15 (2.9)	509
2014	177 (37.0)	149 (31.1)	103 (21.5)	45 (9.4)	5 (1.0)	479
2015	213 (38.9)	164 (29.9)	118 (21.5)	41 (7.5)	12 (2.2)	548
2016	214 (34.0)	199 (31.6)	146 (23.2)	48 (7.6)	22 (3.5)	629

Figure 3: Stacked number and area graphs showing trends over time





May 3, 4:10-4:17 pm

Presenter: Jamie Hanson, MD

Title: Improved Overall Survival of Melanoma of the Head and Neck Treated with Mohs Micrographic Surgery versus Wide Local Excision

Authors: Jamie Hanson, MD[1,2]; Addison Demer, MD[1,2]; Walter Liszewski, MD[1,2]; Ian A. Maher, MD[2]

Institutions: 1. Minneapolis Veterans Affairs Medical Center, Minneapolis, MN
2. University of Minnesota, Minneapolis, MN

Introduction & Objectives: Optimal surgical management for melanoma of the head and neck remains controversial. Despite several retrospective studies that have demonstrated excellent local control with Mohs micrographic surgery (MMS), in addition to comparative retrospective data showing no survival disadvantage for melanoma treated with MMS, current management guidelines deemphasize MMS utilization in favor of wide local excision (WLE).

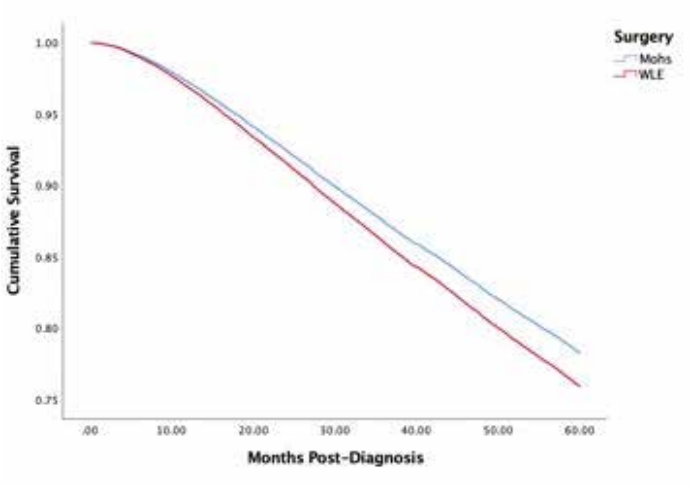
Study Type: Retrospective cohort study.

Study Setting: Commission on Cancer (CoC)-accredited hospital.

Methods: Melanoma data from the National Cancer Database (NCDB) were analyzed in SPSS. NCDB only provides all-cause mortality data, and individuals were censored at 5 years post-diagnosis. A multivariate Cox regression model was fit to identify factors associated with greater mortality at 5 years after melanoma diagnosis. Covariates in the multivariate model included age, sex, race, comorbidity status, treatment facility, primary tumor location, ulceration, Breslow depth, histologic melanoma subtype, and surgical treatment. Individuals with incomplete covariate data were excluded from the final analysis.

Results: 50,620 melanoma cases of the head and neck were reviewed from the NCDB from 2004-2016. 3,529 (7%) were treated with MMS and 47,091 (93%) with WLE. Histologic subtypes included nodular (5,137; 10.1%); lentigo maligna (8,901; 17.6%); superficial spreading (10,679; 21.1%); desmoplastic (1,948; 3.9%); and other (23,955; 47.3%). Most melanomas had a Breslow depth (BD) of <0.75mm (23,939; 47.3%), with the remainder as follows: BD 0.75-1.0 = 4,528 (9%); BD 1.01-2.0 = 9,592 (19%); BD 2.01-4.0 = 6,956 (13.7%); BD >4 = 5,605 (11%). After controlling for potential confounding variables (age, sex, race, comorbidity, treatment facility, tumor location, ulceration, Breslow depth and histologic melanoma subtype), patients with melanoma of the head and neck treated with MMS were more likely to survive after 5 years than patients treated with WLE (Hazard ratio 1.13, 95% confidence interval 1.032-1.226, p=0.008). Factors associated with a statistically significant survival disadvantage were location on the lip (Hazard ratio 1.149, 95% confidence interval 1.104-1.196, p=0.000), tumor ulceration (Hazard ratio 1.593, 95% confidence interval 1.525-1.663, p=0.000), and positive surgical margins (Hazard ratio 1.449, 95% confidence interval 1.357-1.548, p=0.000). Patient survival was inversely proportional to tumor BD.

Conclusion: MMS is a valid treatment option for melanoma of the head and neck; NCDB data suggests that MMS may confer a survival benefit over WLE.



May 3, 4:18-4:25 pm

Presenter: Emily Ruiz, MD, MPH

Title: Evaluation of the Utility of Localized Adjuvant Radiation for Primary Cutaneous Squamous Cell Carcinoma with Clear Histologic Margins

Authors: Emily Ruiz, MD, MPH[1]; Syril K. Que, MD, MPH[2]; Chrysalyne Schmults, MD, MSCE[1]

Institutions: 1. Brigham and Women's Hospital, Jamaica Plain, MA
2. Indiana University, Indianapolis, IN

Introduction & Objectives: Localized adjuvant radiation is sometimes used following surgery with clear histologic margins for select cases of cutaneous squamous cell carcinomas CSCC). However, there is limited evidence on the impact of adjuvant radiation on outcomes. The objective of this study is to compare surgery plus adjuvant radiation (S+ART) to surgical monotherapy (SM) for primary cutaneous squamous cell carcinoma (CSCC) with histologically clear margins.

Study Type: Retrospective matched cohort study.

Study Setting: Academic tertiary care center.

Methods: All primary CSCCs treated with localized adjuvant radiation following surgery with clear histologic margins were identified over an 18-year period. Matching on prognostic features including gender, tumor diameter, tissue level of invasion, large caliber (≥0.1mm) perineural invasion (PNI), and differentiation was used to select similar controls treated with SM. A subgroup analysis of CSCCs with large caliber PNI was performed, stratified by treatment (S+ART vs SM).

Results: 62 CSCCs in the match-case control analysis (31 in each cohort) and 33 CSCCs in the large caliber PNI analysis (S+ART: 16, SM: 17). For the case-control analysis, there is no difference in LR (S+ART 3 (10%) vs. SM 1 (3%), p=0.3), NM (S+ART 1 (3%) vs. SM 0 (0), p=0.3), DM (S+ART 1 (3%) vs. SM 0 (0), p=0.3), and DSD (S+ART 2 (6%) vs. SM 0 (0), p=0.2) in the SM compared to the S+ART group. For the large-caliber PNI analysis, there was no statistically significant difference in NM, DM, and DSD, but there was a trend toward a reduction in LR with S+ART (SM 3 (18%) vs. S+ART 0 (0), p=0.2).

Conclusion: Though adjuvant radiation did not significantly improve outcomes compared to surgical monotherapy, the 18% local recurrence risk in large-caliber PNI cases treated with surgical monotherapy is relatively high as compared to 0 recurrences in 16 large-caliber PNI cases receiving adjuvant radiation. This may be a target group for randomized trials of adjuvant radiation in CSCC.

Rapid Pearl Abstract Session – Saturday, May 4, 3:30 – 4:30 pm

May 4, 3:30-3:32 pm

Presenter: Ankit Gor, MD

Title: Flipped Island Pedicle Flap for Reconstruction of Broad Nasal Defects

Authors: Ankit Gor, MD[1]; Todd Holmes, MD[1]

Institution: 1. University of Vermont Medical Center, Burlington, VT

May 4, 3:33-3:35 pm

Presenter: Toby Nelson, BSc (Hons), MB, BS, MRCP

Title: Refining the 'Pin-Point Technique' for Pexing Sutures in Facial Reconstruction

Authors: Toby Nelson, BSc (Hons), MB, BS, MRCP[1]; Neil Mortimer, MbChB Bsc (Hons), FRCP (UK)[2]; Paul Salmon, BhB, MBChB, FRACP[2]

Institutions: 1. University Hospitals Plymouth NHS Trust, United Kingdom
2. Skin Cancer Institute, Tauranga, New Zealand

May 4, 3:36-3:38 pm

Presenter: Stanislav N. Tolkachjov, MD

Title: "West by East-West": A Combination Reconstruction of a Burow's Advancement and Crescentic Advancement Flaps for Large or Multiple Defects of the Nasal Tip

Authors: Stanislav N. Tolkachjov, MD[2]; Brian J. King, MD[1]

Institutions: 1. Surgical Dermatology Group, Vestavia, AL
2. Epiphany Dermatology, The Colony, TX

May 4, 3:39-3:41 pm

Presenter: Michael S. Stratton, MD

Title: "Clock Face" Mapping Combined with Coverslip Marking to Improve Subsequent Mohs Layer Accuracy and Precision

Authors: Michael S. Stratton, MD[1]; Conway Huang, MD[1]; Carlton B. Phillips, MD[1]

Institution: 1. University of Alabama – Birmingham, Birmingham, AL

May 4, 3:42-3:44 pm

Presenter: Geoffrey F.S. Lim, MD

Title: Utility of the Medial Cheek to Repair Nasal Mucosal Lining: The Combined Medial Cheek Island Turn-Over Flap and Paramedian Forehead Flap

Authors: Geoffrey F.S. Lim, MD[1]; David G. Brodland, MD[1]

Institution: 1. Zitelli & Brodland, PC, Pittsburgh, PA

May 4, 3:45-3:47 pm

Presenter: Richard G. Bennett, MD

Title: Decolorizing Hematoxyiln and Eosin Stained Mohs Frozen Sections and Subsequent Immunostaining

Authors: Richard G. Bennett, MD[1,2]; Gene Kim[1]

Institutions: 1. Keck School of Medicine, University of Southern California, Los Angeles, CA
2. David Geffen School of Medicine, University of California Los Angeles, Los Angeles CA

May 4, 3:48-3:50 pm

Presenter: Kayla L. McNiece

Title: Mucosal Rhombic Transposition Flap

Authors: Kayla L. McNiece[1]; David Kent, MD[1]

Institution: 1. Skin Physicians of Georgia, Macon, GA

May 4, 3:51-3:53 pm

Presenter: James L. Griffith, MD, MS

Title: Retrospective Review of Double-Opposed Z-Plasties in the Closure of Mohs Micrographic Defects on the Lower Leg

Authors: James L. Griffith, MD, MS[1]; Mario Mitkov, MD[1]; Kelly Flynn, MS[2]; Mary Dyson, BS[3]; Leonard H. Goldberg, MD[3]; Arash Kimyai-Asadi, MD[3]

Institution: 1. Houston Methodist Hospital, Houston, TX
2. Texas A&M Health Science Center, Bryan, TX
3. DermSurgery Associates, Houston, TX

May 4, 3:54-3:56 pm

Presenter: Zain Syed, MD, MBA

Title: The Use of Cross-Polarized Surgical Loupes in Mohs Micrographic Surgery

Author: Zain Syed, MD, MBA[1]

Institution: 1. Skin Care Specialty Physicians, Lutherville, MD

May 4, 3:57-3:59 pm

Presenter: Ally-Khan Somani, MD, PhD

Title: Easy and Precise Method for Drawing Z-Plasty Angles

Author: Ally-Khan Somani, MD, PhD[1]

Institution: 1. Indiana University School of Medicine, Indianapolis, IN

May 4, 4:00-4:02 pm

Presenter: Su Luo, MD

Title: Harnessing IoT buttons to Enhance Mohs Clinic Efficiency

Author: Su Luo, MD[1]

Institution: 1. Lahey Hospital and Medical Center, Burlington, MA

May 4, 4:03-4:05 pm

Presenter: Daria Marley Kemp, MD

Title: Running Locked Bolster Suture Technique for Securing Bolster Dressings

Authors: Daria Marley Kemp, MD[1]; Paul Benedetto, MD[1]; Ernest Benedetto, MD[1]; Anthony Benedetto, MD[1]

Institution: 1. Dermatologic SurgiCenter, Drexel Hill, PA

Rapid Pearl Abstract Session – Saturday, May 4, 3:30 – 4:30 pm

May 4, 4:06-4:08 pm

Presenter: Ekama Carlson, MD, PhD

Title: Successful Treatment of Penile Verrucous Carcinoma with Mohs Micrographic Surgery

Author: Ekama Carlson, MD, PhD[1]

Institution: 1. Kaiser Permanente, San Rafael, CA

May 4, 4:09-4:11 pm

Presenter: Jeffrey F. Scott, MD

Title: Single-Stage Reconstruction of Full-Thickness Alar Defects with Dual Island Pedicle Flaps

Authors: Jeffrey F. Scott, MD[1]; Jeremy Bordeaux, MD, MPH[1]

Institution: 1. University Hospitals Cleveland Medical Center, Cleveland, OH

May 4, 4:12-4:14 pm

Presenter: Ravi Krishnan, MD

Title: Interpolated Paranasal Flaps for Defects Involving the Nasal Tip

Author: Ravi Krishnan, MD[1]

Institution: 1. Virginia Mason Medical Center, Seattle, WA

Poster Presentation List

Posters will be displayed in the Harborside Foyer outside the Exhibit Hall (Harborside Ballroom/4th Floor), and will be displayed from 11:00 am Thursday, May 2 through 4:00 pm Saturday, May 4.

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

Even Number Posters (2 – 50):
Thursday, May 2 from 12:00 – 1:00 pm

Odd Number Posters (1 – 49):
Saturday, May 4 from 12:00 – 1:00 pm

1

Mohs Micrographic Surgery for DFSP: No Local Recurrences in 67 Patients and Minimal Negative Impact on Patient-Reported Quality of Life

Julie M. Bittar, BA[1]; Donald E. Neal, BA[2]; Marilyn T. Wan, MBChB[3]; John M. Sharkey, BA[4]; Nicole M. Howe, MD[3]; Thuzar M. Shin, MD, PhD[3]; Jeremy R. Etzkorn, MD[3]; Joseph F. Sobanko, MD[3]; Christopher J. Miller, MD[3]

1. Indiana University School of Medicine, Indianapolis, IN
2. Sidney Kimmel Medical College, Thomas Jefferson University, Philadelphia, PA
3. Hospital of the University of Pennsylvania, Philadelphia, PA
4. St. George's University School of Medicine, Grenada, West Indies

2

Repair of Anterior Ear Defects Utilizing Transcartilage Island Pedicle Flaps

Mary E. Dyson, BS[1]; Maideh Orangi[1]; Leonard H. Goldberg, MD[1]; Arash Kimyai-Asadi, MD[1]

1. DermSurgery Associates, Houston, TX

3

Association Between Closure Type, Post-Operative Care and Surgical Site Infection Rate in Lower Extremity Dermatologic Surgery

Neera Nathan, MD, MSHS[1]; Jeffrey Tiger, MD[2]; Laura Sowerby, MD[2]; Suzanne Olbricht, MD[3]; Su Luo, MD[2]

1. Harvard Combined/Massachusetts General Hospital, Boston, MA
2. Lahey Hospital and Medical Center, Burlington, MA
3. Beth Israel Deaconess Medical Center, Boston, MA

4

Post-Operative Pain after Mohs Micrographic Surgery: Analyzing Physician Perceptions of Postoperative Pain and how Those Perceptions Affect Opioid Prescribing Practices

Joshua D. Eikenberg, MD, MPH[1]; Savannah Taylor, MS[1]; Kyle A. Prickett, MD[1]; Mariana A. Phillips, MD[1]

1. Virginia Tech Carilion School of Medicine, Roanoke, VA

5

Immune Checkpoint Inhibitor Therapy in Solid Organ Transplant Recipients: A Patient-Centered Systematic Review

Juliya Fisher, MD[1]; Nathalie Zeitouni, MD[2]; Faramarz H. Samie, MD, PhD[1]

1. Columbia University Medical Center, New York, NY
2. University of Arizona, Phoenix, AZ

6

Bacteriostatic Saline Reduces Discomfort of 1% Lidocaine with Epinephrine Injection

Kayla L. McNiece[1]; Steven Kent[2]; David Kent, MD[1,2]

1. Skin Physicians of Georgia, Macon, GA
2. Medical College of Georgia, Augusta, GA

7

Novel Observations Regarding Infection Risk in Lower Extremity Wounds Healing by Second Intention

Gabriel E. Molina, BS[1]; Sherry H. Yu, MD[2]; Victor A. Neel, MD, PhD[2]

1. Harvard Medical School, Boston, MA
2. Massachusetts General Hospital, Boston, MA

8

Optimal Shape of Post-Primary Mohs Layers for Tumors of the Head and Neck, an International Survey

Kimberlee Lim, MD[1,2]; Gregory Neal-Smith, MD[2]; Bethan Swift, MSc[3]; Zoe Askham[2]; Sarah Felton, MD[2]

1. Bristol Royal Infirmary, Bristol, United Kingdom
2. Oxford University Hospitals NHS Foundation Trust, Oxford, United Kingdom
3. Lincoln College, Oxford, United Kingdom

9

Surgical Site Infection Risk Associated with Integra Bilayer Wound Matrix Use Following Excision of Cutaneous Neoplasms – A Multi-Specialty Single Institution Study

Michael P. Lee[1,2]; Christopher J. Miller, MD[1]; Joseph F. Sobanko, MD[1]; Thuzar M. Shin, MD[1]; Nicole Howe[1]; Shannon W. Zullo[1]; Jeremy R. Etzkorn, MD[1]

1. University of Pennsylvania, Philadelphia, PA
2. Eastern Virginia Medical School, Norfolk, VA

10

Conversion of a Validated Melanoma Risk Stratification Tool into an Electronic Medical Record-Based Patient Questionnaire for Melanoma Screening

Dennis Kim, MD[1]

1. Brigham and Women's Hospital, Jamaica Plain, MA

Poster Presentation List

11

A Comprehensive Case Series of a Monday through Friday Vismodegib Dosing Regimen for the Treatment, Neoadjuvant Treatment, and Palliative Treatment of Advanced Basal Cell Carcinoma

Christina Wong, MD[1]; Allison T. Vidimos, MD[1]

1. Cleveland Clinic Foundation, Cleveland, OH

12

Does Any Mask Block Potentially Hazardous Chemicals Produced During Procedures that Generate a Smoke Plume?

Lisa Chastant, MD[1]; Hillary Johnson-Jahangir, MD, PhD [2]

1. Keesler AFB, USAF, Biloxi, MS
2. University of Iowa, Iowa City, IA

13

Defining Perineural Invasion in Cutaneous Squamous Cell Carcinoma

Mariam Totonchy, MD[1]; Kathleen Suozzi, MD[1]; David Leffell, MD[1]; Sean Christensen, PhD, MD[1]

1. Yale, New Haven, CT

14

Clinicopathologic Characteristics, Tumor Staging, and Outcomes of Patients with Metastatic Cutaneous Squamous Cell Carcinoma

Adam Schmitt, MD, MS[1]; Aaron Mangold, MD[2]; Connor Maly[2]; Lanyu Mi[2]; Christian Baum, MD[1]

1. Mayo Clinic, Rochester, MN
2. Mayo Clinic, Scottsdale, AZ

15

Interrupted Subdermal Suture Spacing during Linear Wound Closures and the Effect on Wound Cosmesis: A Randomized Evaluator Blinded Split Wound Comparative Effectiveness Trial

Karin Eshagh, MD[1]; Daniel B. Eisen, MD[1]

1. UC Davis, Sacramento, CA

16

Skin Cancer Awareness in Solid Organ Transplant Recipients: Patient Survey Study

Colton B. Nielson[1]; Abel Torres, MD, JD, MBA[1]

1. University of Florida, Gainesville, FL

17

Gender Disparities in Reimbursement among Board-Certified Dermatologists and Dermatologic Surgeons

Radhika Srivastava, BA[1]; Ann M. John, MD[1]; Troy Brancard, BA[2]; Roger Henry, MBS[1]; Pamela A. Ohman-Strickland, PhD[2]; Bahar F. Firoz, MD, MPH[1]

1. Rutgers Robert Wood Johnson Medical School, Somerset, NJ
2. Rutgers University School of Public Health, West Piscataway, NJ

18

Evaluating the Impact of Margin Documentation and Margin Appropriateness on Cutaneous Squamous Cell Carcinoma Outcomes

Brandon T. Beal, MD[1]; David Xiong, BS[1]; Hannah Cundall, BS[1]; Vamsi Varra, BS[1]; Marla Rodriguez, BS[1]; Neil Woody, MD[1]; Allison T. Vidimos, MD, RPh[1]; Shlomo A. Koyfman, MD[1]; Thomas Knackstedt, MD[1,2]

1. Cleveland Clinic Foundation, Cleveland, OH
2. MetroHealth, Cleveland, OH

19

Efficacy of Smoke Evacuation Systems in the Filtration of Particulate Matter Present in Surgical Plume

Nayoung Lee, MD[1]; S. Brian Jiang, MD[1]

1. University of California-San Diego, San Diego, CA

20

Patient Satisfaction with Facial Appearance and Scar Outcome after Skin Cancer Surgery

Thomas Bander[1,2]; Toral S. Vaidya, MPH[1]; Erica Lee, MD[1]

1. Memorial Sloan Kettering Cancer Center, New York, NY
2. Weill Cornell Medical Center, New York, NY

21

Developing Standards for Surgical Technique of Mohs Micrographic Surgery with Frozen Section Cytokeratin-7 Immunostains for Primary Extramammary Paget's Disease (EMPD): No Local Recurrences and Favorable Patient-Reported Assessment of Function and Scar Appearance in 20 Cases

Julie M. Bittar, BA[1]; Donald E. Neal, BA[2]; Marilyn T. Wan, MBChB, MPH[3]; Peter G. Bittar, MD[1]; John M. Sharkey, BA[4]; Jeremy R. Etzkorn, MD[3]; Thuzar M. Shin, MD, PhD[3]; Joseph F. Sobanko, MD[3]; Christopher J. Miller, MD[3]

1. Indiana University School of Medicine, Indianapolis, IN
2. Sidney Kimmel Medical College, Thomas Jefferson University, Philadelphia, PA
3. Hospital of the University of Pennsylvania, Philadelphia, PA
4. St. George School of Medicine, Grenada

22

Gene Expression Profiling of Cutaneous Basal Cell Carcinomas and Squamous Cell Carcinomas Reveals Distinct Transcriptomic Landscapes

Jun Wan, PhD[1]; Hongji Dai, PhD[2]; Xiaoli Zhang, BSc[1]; Yuan Lin, MD, PhD[1]; Ally-Khan Somani, MD, PhD[1]; Jingwu Xie, PhD[1]; Jiali Han, PhD[1]

1. Indiana University School of Medicine, Indianapolis, IN
2. Indiana University, Indianapolis, IN

23

Pain Anticipation and Subsequent Pain Perception with the Application of a Vibratory Stimulus: A Single-Center, Randomized Trial

Panayiota Govas, MD, MScMed[1]; Rashek Kazi, MD, PhD[1]; Rachel M. Slaugenhaupt[1]; Bryan T. Carroll, MD[1]

1. University of Pittsburgh Medical Center, Pittsburgh, PA

24

Understanding Public Awareness of Mohs Surgery and Skin Cancer through Social Media Trends

Gaurav Singh, MD, MPH[1]; Hao Feng, MD, MHS[1,2]

1. NYU Langone Health, New York, NY
2. Laser and Skin Surgery Center of New York, New York, NY

26

Patient Satisfaction with Mohs Surgery for Melanoma in situ

Daniel Condie, MD[1]; Jerry Smith, MD[2]; Lindsey West[1]; Divya Srivastava, MD[1]

1. UT Southwestern Medical Center, Dallas, TX
2. Belle Meade Dermatology, Nashville, TN

27

Tumors of the Nasal Vestibule: Crucial Distinctions

Patricia Richey[1]; Brian Swick[1]; Hillary Johnson-Jahangir, MD[1]

1. University of Iowa, Iowa City, IA

28

Photodynamic Therapy for Primary Squamous Cell Carcinoma in situ: Impact of Anatomic Location, Tumor Diameter and Incubation Time on Efficacy

Nour Kibbi, MD[1]; Yuemei Zhang, MD[1]; David J. Leffell, MD[1]; Sean R. Christensen, MD, PhD[1]

1. Yale University, New Haven, CT

30

Complication Rates of Serial Staged Excision and Delayed Reconstruction of Pigmented Cutaneous Neoplasms: A Single Institution Retrospective Review

Jonathan St. Pierre Smith, DO[1]; Brenda Young[2]; S. Brian Jiang, MD[1]

1. University of California-San Diego Health, San Diego, CA
2. University of California San Diego School of Medicine, La Jolla, CA

31

Variable Pain Reduction with Application of Vibratory Stimulus

Rashek Kazi, MD, PhD[1]; Panayiota Govas, MD, MSCMed[1]; Rachel Slaugenhaupt[2]; Bryan Carroll, MD[1]

1. University of Pittsburgh Medical Center, Pittsburgh, PA
2. Emory University, Atlanta, GA

32

Characterizing Recurrent Non-Melanoma Skin Cancers in a Subset of Constant Patients

Kirsten E. Dickinson[1]; Emily Weig[1]; Faraaz Zafar[1]; Nkanyezi Ferguson, MD[1]; Marta VanBeek, MD[1]; Hillary Johnson-Jahangir, MD[1]

1. University of Iowa, Iowa City, IA

33

Platelet Count Correlates with Stage and Predicts Survival in Melanoma

Saleh Rachidi, MD, PhD[1]; Maneet Kaur, MPH[1]; Tim Lautenschlaeger, MD[2]; Zihai Li, MD, PhD[3]

1. Johns Hopkins, Baltimore, MD
2. Indiana University, Indianapolis, IN
3. Medical University of South Carolina, Charleston, SC

34

Meta-Analysis of the Prognostic 31-Gene Expression Profile Test in 1472 Cutaneous Melanoma Cases

Bradley N. Greenhaw, MD[1]; Kyle R. Covington, PhD[2]; Kristen M. Plasseraud, PhD[2]; Robert W. Cook, PhD[2]; Maria L. Wei, MD, PhD[3,4]

1. Dermatology Center of North Mississippi, Tupelo, MS
2. Castle Biosciences, Inc., Friendswood, TX
3. University of California-San Francisco, San Francisco, CA
4. San Francisco Veterans Affairs Medical Center, San Francisco, CA

Poster Presentation List

35

Free Cartilage Batten Grafting with Secondary Intention Healing for Surgical Defects on the Distal Nose: Our 129 Case Experience

Dong Joo Kim, MD[1]; Joy Makdisi, MD[2]; Christina Regan, BS[3,4]; Elizabeth Chao, MD, PhD[5]; Adam M. Rotunda, MD[1,4]

1. University of California-Irvine, Irvine, CA
2. The University of British Columbia, Vancouver, BC, Canada
3. Cornell University, Ithaca, NY
4. Newport Skin Cancer, Newport Beach, CA
5. University of Pittsburgh, Pittsburgh, PA

36

Local Recurrence Rates for Different Surgical Techniques to Treat Cutaneous Melanoma of the Head and Neck: A Systematic Review

Julie M. Bittar, BA[1]; Peter G. Bittar, MD[1]; Jeremy R. Etzkorn, MD[2]; Thuzar M. Shin, MD, PhD[2]; Joseph F. Sobanko, MD[2]; Renee Pride, MD[3]; Jerry Brewer, MD, MS[3]; Christopher J. Miller, MD[2]

1. Indiana University School of Medicine, Indianapolis, IN
2. Hospital of the University of Pennsylvania, Philadelphia, PA
3. Mayo Clinic, Rochester, MN

37

Evaluation of Virtual H&E-Stained Optical Sections using Nonlinear Microscopy for Recognizing BCC in Mohs Surgery—An Alternative to Frozen Sections

Daihung Do, MD[1]; Michael Giacomelli, PhD[2]; Beverly Faulkner-Jones, MD, PhD[1]; James Fujimoto, PhD[3]

1. Beth Israel Deaconess Medical Center, Boston, MA
2. University of Rochester, Rochester, NY
3. Massachusetts Institute of Technology, Cambridge, MA

38

Transient Delayed Facial Nerve Palsy after Local Anesthesia at Mandible for Mohs Surgery

Maggie L. Chow, MD, PhD[1]; Jeremy Hu, MD, MPH[1]

1. Keck Medical Center of the University of Southern California, Los Angeles, CA

39

High Local Recurrence Risk Features Associated with the Use of Frozen Section Cytokeratin AE1/AE3 Immunohistochemical Staining during Mohs Micrographic Surgery of 5,974 Squamous Cell Carcinomas: A Case-Control Study

Shannon W. Zullo, MS[1];Christopher J. Miller, MD[1]; Jeremy R. Etzkorn, MD[1]; Michael P. Lee, BS[1]; Nicole M. Howe, MD[1]; Thuzar M. Shin, MD[1]; Nadia Abidi, MD[2]; Joseph F. Sobanko, MD[1];

1. University of Pennsylvania, Philadelphia, PA
2. University of Missouri, Columbia, MO

40

Don't Underestimate SCCIS!

Vanessa B. Voss, MD[1]; Daniel F. Lozeau, MD[1]; Jordan B. Slutsky, MD[1]

1. Stony Brook University Hospital, Stony Brook, NY

41

The Empty Stromal Sandwich Sign: A Potential for False Negatives in Mohs Micrographic Surgery Slides when Evaluating Basal Cell Carcinoma

Mary E. Dyson, BS[1]; James L. Griffith, MD[1]; Leonard H. Goldberg, MD[1]; Arash Kimyai-Asadi, MD[1]

1. DermSurgery Associates, Houston, TX

42

Superficial Basal Cell Carcinoma, the Tip of the Iceberg?

Erik T. Petersen, MD[1]; Deborah MacFarlane, MD, MPH[1]

1. MD Anderson Cancer Center, Houston, TX

44

Clinical Factors Influencing Clearance Rate for Melanoma in situ in a Cohort of 243 Cases at a Single Institution

Brianna Olamiju[1]; Kathleen C. Suozzi, MD[1]; Nathaniel Smith, MD[1]; Gauri Panse, MD[1]; David J. Leffell, MD[1]; Sean R. Christensen, MD, PhD[1]

1. Yale School of Medicine, New Haven, CT

45

Nail Unit Melanoma in situ Treated with Mohs Micrographic Surgery

Nicole Strickland, MD[1]; Divya Srivastava, MD[1]; Rajiv Nijhawan, MD[1]

1. UT Southwestern Medical Center at Dallas, Dallas, TX

46

Histologic Perineural Invasion Does Not Negatively Impact Patient Outcomes in a Retrospective Matched Cohort Study of Basal Cell Carcinoma

Paul R. Massey, MD[1]; Emily S. Ruiz, MD, MPH[1]; Frederick Morgan, BSPH[1]; Chrysalyne D. Schmults, MD, MSCE[1]

1. Brigham and Women's Hospital, Jamaica Plain, MA

47

Changing Anatomy and Histologic Trends in an Academic Mohs Surgery Program

Rebecca K. Jacobson, MD[1]; Jake Fagan, MD[1]; Michael L. Ramsey, MD[1]

1. Geisinger Medical Center, Danville, PA

48

Anatomic Study of Forehead Lines: 4 Distinct Patterns and Implications for Reconstruction

Julia Baltz, MD[1]; Amanda Foy[1]; Alyssa Findley[1]; Sue Sweeney, MD[1]; Nathaniel Jellinek, MD[1,2]

1. Dermatology Professionals, Inc., East Greenwich, RI
2. University of Massachusetts, Worcester, MA

49

Utilization of Keratinocyte Carcinoma Internet-Based Support and Education Groups on Facebook

Tatyana Petukhova, MD, MS[1]; Mariam Gtadjiko[1]; Britney Wilson, BA[2]; Jennifer Wang[2]; Erica Lee, MD[2]; Anthony Rossi, MD[2]; Kishwer Nehal, MD[2]

1. Weill Cornell Medicine, New York, NY
2. MSKCC, New York, NY

50

Endocrine Mucin-Producing Sweat Gland Carcinoma Treated with Mohs Micrographic Surgery

Christine N. Schafer, MD[1]; Jessica B. Dietert, MD[1]; Philip L. Custer, MD[1]; Steven M. Couch[1]; Ilana S. Rosman, MD[1]; Eva A. Hurst, MD[1]; M. Laurin Council, MD[1]

1. Washington University School of Medicine, St. Louis, MO

1

Presenter: Donald E. Neal, BA

Title: Mohs Micrographic Surgery for DFSP: No Local Recurrences in 67 Patients and Minimal Negative Impact on Patient-Reported Quality of Life

Authors: Julie M. Bittar, BA[1]; Donald E. Neal, BA[2]; Marilyn T. Wan, MBChB[3]; John M. Sharkey, BA[4]; Nicole M. Howe, MD[3]; Thuzar M. Shin, MD, PhD[3]; Jeremy R. Etzkorn, MD[3]; Joseph F. Sobanko, MD[3]; Christopher J. Miller, MD[3]

Institutions: 1. Indiana University School of Medicine, Indianapolis, IN
2. Sidney Kimmel Medical College, Thomas Jefferson University, Philadelphia, PA
3. Hospital of the University of Pennsylvania, Philadelphia, PA
4. St. George's University School of Medicine, Grenada, West Indies

Introduction & Objectives: Treatment of dermatofibrosarcoma protuberans (DFSP) with Mohs micrographic surgery (MMS) results in lower published local recurrence rates (LRR) than conventional wide local excision (WLE), but the impact of MMS on quality of life (QOL) of DFSP patients has not been reported. Our objective is to evaluate LRR and patient-reported quality of life (QOL) after MMS of primary DFSP.

Study Type: Retrospective cohort study.

Study Setting: Academic center.

Methods: In this retrospective cohort study, we identified from a prospectively-updated database 80 DFSP patients treated with MMS at our center between 2006 and 2016. Local recurrence, defined as biopsy-proven DFSP arising within the scar of MMS, and follow-up data were obtained via review of electronic medical records and telephone calls. Consenting patients completed the skin cancer index (SCI), a validated instrument to measure the impact of skin cancer surgery on QOL with 15 questions that address appearance, emotions, and societal interactions. Patients were also asked to rate pain, sensation, tightness, and physical impairment associated with the scar.

Results: Sixty-seven patients consented to participate in the study (Table 1). No patients (0/67) experienced a local recurrence with a mean follow-up time of 53 months (median: 47 months, range: 7-149 months) [Table 1]. 52/67 (77.6%) patients completed the SCI quality of life survey and reported minimal concern with the impact of MMS on QOL categories of emotions, appearance, and societal interactions [Table 2]. Patients' greatest concern was worry about future cancers. They reported minimal pain or changes in sensation, tightness, or compromise in physical function.

Conclusion: This retrospective study corroborates the exceedingly low LRR (0/67 patients) after MMS of DFSP, and adds to the literature by demonstrating that MMS has minimal negative long-term impact on patient QOL.

Table 1. Cohort characteristics (n=67)

Gender	
Male	33/67 (49.3%)
Female	34/67 (50.7%)
Age, years	
Range	5 – 82
Mean	45.9
Median	47
Location	
Head/Neck	11 (16.4%)
Trunk	53 (79.1%)
Leg	1 (1.5%)
Genitalia	2 (3.0%)
Follow-up, months	
Range	7 – 149
Mean	53
Median	47
Local Recurrence	0/67 (0%)

Table 2. Skin Cancer Index (SCI) results with patient-reported assessment of skin cancer surgery on quality of life (n=52). A 5-point Likert scale was used to assess the extent each item described the perceptions of the patient with 1 (very much) to 5 (not at all)

Question number	Quality of Life Factor	Raw Score, Mean (SD)
Questions addressing impact of surgery on emotions		
1	Worry about metastases	4.50 (0.73)
2	Anxiousness	4.35 (0.88)
3	Worry about family members	4.60 (0.82)
4	Worry about cause of cancer	4.40 (0.85)
5	Frustration	4.46 (1.06)
6	Worry about cancer transformation	4.63 (0.79)
7	Worry about future cancers	3.98 (1.02)
Questions addressing impact of surgery on social interactions		
8	Uncomfortable meeting new people	4.79 (0.75)
9	Concern about family or friend worrying	4.73 (0.72)
10	Worried about going out in public	4.81 (0.72)
11	Bothered by people's questions	4.98 (0.14)
12	Embarrassed by cancer	4.75 (0.71)
Questions addressing impact of surgery on appearance		
13	Worried about scar size	4.46 (0.94)
14	Worried about attractiveness	4.48 (0.96)
15	Worried about scar noticeability	4.33 (1.10)

2

Presenter: Mary E. Dyson, BS

Title: Repair of Anterior Ear Defects Utilizing Transcartilage Island Pedicle Flaps

Authors: Mary E. Dyson, BS[1]; Maideh Orangi[1]; Leonard H. Goldberg, MD[1]; Arash Kimyai-Asadi, MD[1]

Institution: 1. DermSurgery Associates, Houston, TX

Introduction & Objectives: Surgical reconstruction of the anterior surface of the ear (concha, antihelix, scapha, and triangular fossa) is complicated by the paucity of mobile local skin. The objective of this study is to describe our experience with the use of transcartilage island pedicle flaps for reconstruction of Mohs micrographic surgery defects in this anatomic location.

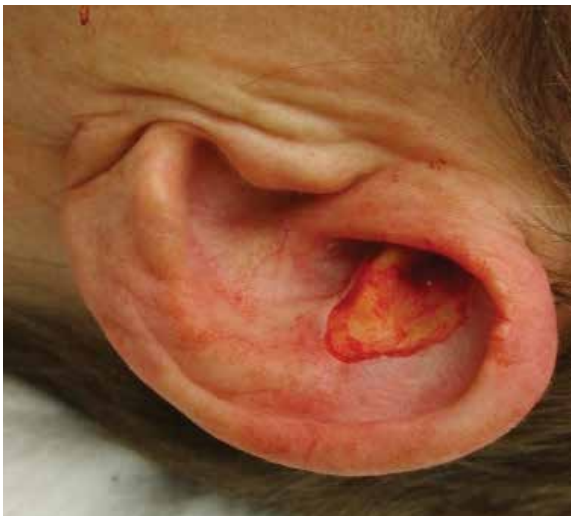
Study Type: This is a retrospective study of the transcartilage island pedicle flap for reconstruction of surgical defects of the anterior ear.

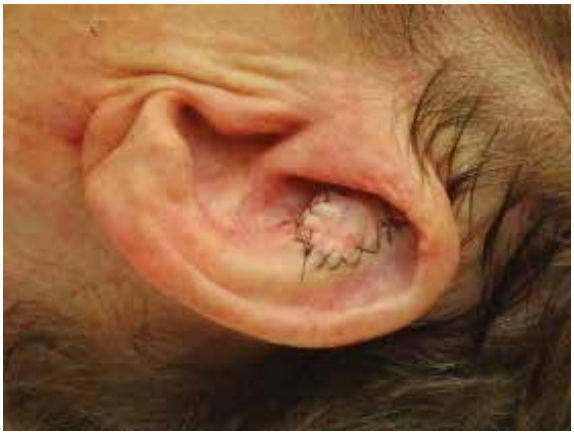
Study Setting: Outpatient private Mohs micrographic surgery practice.

Methods: Two hundred thirty-two Mohs micrographic surgery defects were included in the study. The technique involves circumferential incision of the flap in the postauricular sulcus, transfer of the flap to the anterior ear through a surgically-created cartilage slit, suturing of the flap on the anterior surface of the ear, and repair of the secondary postauricular defect. Preoperative, intraoperative, and postoperative details of each case were tabulated and analyzed.

Results: The mean defect size was 1.9 x 1.5 cm. Complications included flap edema (n=6, 2.6%), postoperative bleeding (n=4, 1.7%), partial thickness flap necrosis (n=2, 0.9%), pinning back of the ear (n=2, 0.9%), and central flap dimpling (n=2, 0.9%). There was one acute staphylococcal abscess and one sterile abscess that developed thirteen months postoperatively. All complications resolved with medical or surgical management.

Conclusion: Transcartilage island pedicle flaps may be considered for single-stage surgical reconstruction of defects involving the anterior ear.





3

Presenter: Neera Nathan, MD, MSHS

Title: Association Between Closure Type, Post-Operative Care and Surgical Site Infection Rate in Lower Extremity Dermatologic Surgery

Authors: Neera Nathan, MD, MSHS[1]; Jeffrey Tiger, MD[2]; Laura Sowerby, MD[2]; Suzanne Olbricht, MD[3]; Su Luo, MD[2]

Institutions: 1. Harvard Combined/Massachusetts General Hospital, Boston, MA
2. Lahey Hospital and Medical Center, Burlington, MA
3. Beth Israel Deaconess Medical Center, Boston, MA

Introduction & Objectives: Surgical site infection (SSI) is the most common adverse event following dermatologic surgery, especially when the procedure is performed on the lower extremity. We sought to evaluate factors that may contribute to or help reduce SSI in this anatomic location.

Study Type: Retrospective review.

Study Setting: Academic center.

Methods: We performed a retrospective chart review of Mohs surgery and surgical excisions performed on the lower extremity over an 18-month period, including location of tumor, closure type, defect size and use of Unna boot post-procedure. SSI was determined by presence of pathogenic organism on culture or evidence of clinical infection after review of photographs and/or supporting documentation.

Results: We demonstrated an SSI rate of 10% (42/411 cases). Of these, 27 (6.6%) were culture-proven, while the other 15 cases were determined to be clinically infected. Ninety-two percent of the infected cases (39/42) were located below the knee. The rate of infection was higher for Mohs surgery (12.3%) than for excisions (7.8%). The predominant organism demonstrated on culture was Methicillin-susceptible Staphylococcus aureus, contained in 15 out of 27 cases. A complex layered closure was significantly associated with increased rate of SSI compared to intermediate layered closure (Fisher's exact test, p=0.005). Cases allowed to heal by second intention did not appear to have a significantly increased or decreased rate of SSI compared to cases that were closed. There was also no significant difference between post-operative defect size and type of closure within the infected cohort.

Unna boot was applied post-procedure in 71 cases. Eleven of the 71 cases (15.5%) were complicated by infection and thus this addition was neither significantly protective nor harmful (p=0.13).

Conclusion: Our study suggests that complex layered closures may be associated with increased infection rates in lower extremity dermatologic surgery. One hypothesis is that these wounds are under greater tension and/or require extensive undermining, leading to complications such pressure necrosis, tissue injury and excess dead space. Second intention healing did not impact rate of infection. While defect size appeared to have no bearing on infection rate, information about depth of the defect was not available. There was also no significant difference between the rate of infection with and without Unna boot applied post-procedure. It is possible that selection for patients with an increased risk of infection, including patients with venous stasis or limited ability to perform home wound care, was enriched in the Unna boot cohort.

The control of infections following dermatologic surgery has implications not only for our field, but for the health care system at-large. Notably, second intention healing appears to be a safe alternative to closing lower extremity surgical wounds with no increased risk of infection. Thorough investigation of this topic will exemplify dermatologists as leaders in preventing complications and good antibiotic stewardship.

4

Presenter: Joshua D. Eikenberg, MD, MPH

Title: Post-Operative Pain after Mohs Micrographic Surgery: Analyzing Physician Perceptions of Postoperative Pain and How Those Perceptions Affect Opioid Prescribing Practices

Authors: Joshua D. Eikenberg, MD, MPH[1]; Savannah Taylor, MS[1]; Kyle A. Prickett, MD[1]; Mariana A. Phillips, MD[1]

Institution: 1. Virginia Tech Carilion School of Medicine, Roanoke, VA

Introduction & Objectives: Opioid abuse in the United States has become an epidemic. Opioid prescribing by dermatologists is generally limited to the surgical setting. Nevertheless, there is evidence to suggest that thousands of patients are at risk for long term opioid use as a result of prescriptions that they receive from dermatologists. However, little is known about dermatologists' perceptions of postoperative pain and how they correlate with patient perceptions of pain.

It is also unclear if physician perceptions of patient pain affect opioid prescribing practices or if receiving prescription opioids affects patient reported satisfaction with pain control. The objective of this study was to determine how physician's perceptions of postoperative pain after Mohs micrographic surgery correlate with patient reported pain and affect physician opioid prescribing practices. We also sought to determine if patients receiving opioids were more likely to be satisfied with their pain control.

Study Type: Prospective survey study.

Study Setting: Academic center.

Methods: Patients presenting for Mohs micrographic surgery completed pain surveys using the Numerical Rating Scale on the evening of (day 0) and the first four nights after the procedure. Patients also rated their satisfaction with their pain control on a 0-10 scale. After the repair, the physician recorded a prediction of the patient's pain level on day 0 using the Numerical Rating Scale. The predicted pain was compared to the recorded patient pain. The age, sex, diagnosis, postoperative size, closure type, number and location of surgery sites and oral analgesics used were recorded.

Results: A total of 260 of the 396 patients recruited completed the surveys (Table 1). There were no significant differences in post-operative pain based on age, sex, closure type, postoperative size, number of surgery sites, or tumor location. There is no significant difference between mean day 0 patient reported pain (2.7±2.5) and physician predicted pain (2.9±1.1; p=0.13). Correlation between physician predicted pain and patient reported pain was significant ($p<0.0001$;$r=0.27$). The majority (70%) of physician predictions were within 2 points or less of patient reported pain. Opioids were only prescribed to 45 patients (17%). The mean predicted pain score of patients who were prescribed opioids (3.4±1.2) was significantly higher than those who were not prescribed opioids (2.8±1.1; p=0.0018). There was no significant difference in patient satisfaction scores between those who were prescribed opioids and those who were not (p=0.688).

Conclusion: Physician predictions of perceived patient pain were within two points of patient reported pain in most cases. Physicians were more likely to prescribe opioids for patients with higher predicted pain. Patients who were prescribed opioids were no more satisfied with their level of pain control than patients who did not receive opioids. Patient characteristics, tumor location, number of sites, postoperative defect size and closure type were not associated with patient reported pain score.

Table 1. Patient characteristics (N = 280)

Characteristic	Value
Age, mean ± standard deviation	70.8 ± 10.5
Age, n (%)	
<60	37 (14.7)
60-69	85 (33.9)
70-79	88 (33.2)
≥80	50 (20.2)
Sex, n (%)	
Male	94 (36.2)
Female	166 (64.8)
Diagnosis, n (%)	
Basal cell carcinoma	187 (71.9)
Squamous cell carcinoma	58 (22.3)
Squamous cell carcinoma in situ	12 (4.6)
Melanoma in situ	1 (0.4)
Adrenal carcinoma	1 (0.4)
Atypical fibroxanthoma	1 (0.4)
Site, n (%)	
Nose	64 (24.6)
Cheek	47 (18.1)
Ear	34 (13.1)
Forehead	32 (12.3)
Scalp	17 (6.5)
Temple	14 (5.4)
Lip	10 (3.8)
Neck	10 (3.8)
Chin	9 (3.5)
Leg	8 (3.1)
Eyelid	6 (2.3)
Hand	4 (1.5)
Back	2 (0.8)
Arm	1 (0.4)
Forearm	1 (0.4)
Foot	1 (0.4)
Number of Stages, n (%)	
1	175 (67.3)
2	67 (25.8)
3	13 (5.0)
4	5 (1.9)
Defect size in cm^2, n (%)	
<1.0	17 (6.5)
1.0-1.9	48 (18.5)
2.0 – 2.9	56 (21.5)
>3.0	139 (53.4)
Closure type, n (%)	
Complex linear	155 (59.6)
Graft	42 (16.2)
Flap	40 (15.4)
Secondary intention	17 (6.5)
Graft with Cartilage	4 (1.5)

5

Presenter: Juliya Fisher, MD

Title: Immune Checkpoint Inhibitor Therapy in Solid Organ Transplant Recipients: A Patient-Centered Systematic Review

Authors: Juliya Fisher, MD[1]; Nathalie Zeitouni, MD[2]; Faramarz H. Samie, MD, PhD[1]

Institutions: 1. Columbia University Medical Center, New York, NY
2. University of Arizona, Phoenix, AZ

Introduction & Objectives: The recent success of immune checkpoint inhibitors for the treatment of metastatic cancers has created significant progress in the field. However, challenges in treating special populations still remain. Solid organ transplant recipients (SOTR) are routinely excluded from clinical trials for these medications, given the understandable concern for transplant rejection. Thus, there is limited data on safety and efficacy for treatment of metastatic cancers. The objective was to perform a comprehensive evaluation of the literature regarding the safety and efficacy of immunotherapies in SOTR with metastatic cancers (cutaneous and non-cutaneous).

Study Type: Randomized controlled trial.

Study Setting: Academic center.

Methods: A systematic review was performed, in line with PRISMA guidelines. PubMed and Embase databases were searched, without date restrictions. After reviewing all available articles for relevance, a total of 36 articles, with a total of 58 patients were identified for inclusion here.

Results: The detailed outcomes and demographics of each patient are reported in Table 1. The rates of rejection, clinical outcome and death are subcategorized by drug administered and transplant type in Table 2. There were a total of 21 graft rejections (36.2%), and 8 deaths secondary to rejection of graft (13.7%). The highest rate of rejection was reported with nivolumab, 12/23 (52.2%), followed by pembrolizumab, 4/15 (26.7%), and ipilimumab 3/12 (25%). The highest rate of rejection was seen in patients with kidney transplant (40.1%), followed by liver (35%), then heart (16.7%). The number of patient that experienced death secondary to rejection by organ were 2, 6 and zero for kidney, liver, and heart, respectively. The immunosuppressive regimens (Table 1) used in these cases is variable. No one medication seemed to be consistent with transplant preservation. In this series, there were a total of 32 cases of cutaneous melanoma, 4 cases of cutaneous squamous cell carcinoma and one case of Merkel cell carcinoma and their outcomes are detailed in Table 3. For all cases (cutaneous and non-cutaneous), rates of progression or death secondary to disease were highest for ipilimumab (75%), followed by nivolumab (45%), and pembrolizumab (40%). Whereas, overall response rate was highest for pembrolizumab (40%), followed by nivolumab (32%), and ipilimumab (25%).

Conclusion: Physicians need to continue to be cautious when administering immunotherapy to solid organ transplant recipients. However, in the majority of cases, graft rejection is not the most common cause for death in this population. In cutaneous malignancies, overall response rates are comparable to those reported in the literature for the general population. Further studies investigating the safety and efficacy of immunotherapy in solid organ transplant patients are needed and may help to delineate a subset of patients that may benefit from treatment.

Immunotherapy	Age / Gender	Transplant	Cancer treated	Previous Treatments	Time from transplant to initiation of immunotherapy	Immune suppression at time of initiation of immunotherapy	Reason for initial organ failure	Final clinical outcome	Disposition of transplanted organ	Time until rejection	Reference
Ipilimumab	59 Female	Liver	Metastatic melanoma	Interferon, radiation therapy	8 years	Continued tacrolimus 1mg twice a day	Cirrhosis secondary to alpha 1 anti-trypsin deficiency	Progression of disease	Preserved	NR	(1)
Ipilimumab	67 Male	Liver	Metastatic melanoma	Wide local excision, paclitaxel, radiation therapy	8 years	Sirolimus 1mg daily	Cirrhosis secondary to hepatitis C and hepatocellular carcinoma	Remission at 10 month follow-up	Preserved	NR	(2)
Ipilimumab	67 Female	Liver	Ocular melanoma	Clinical trial (Clinicaltrials.gov NCT 01311)	18 months	Prednisone 10mg daily (discontinued sirolimus and mycophenolate mofetil)	Metastatic ocular melanoma	Death secondary to disease	Preserved	~14 days	(3)
Ipilimumab	72 Male	Kidney	Metastatic melanoma	Wide local excision, radiation therapy, resection of metastasis, temozolomide, platinum based chemotherapy	11 years	Prednisone 5mg daily (discontinued tacrolimus)	Hypertension	Partial response at 1 year follow-up	Preserved	NR	(4)
Ipilimumab	58 Male	Kidney	Metastatic melanoma	Wide local excision, temozolomide	8 years	Prednisone 5mg daily (discontinued tacrolimus and mycophenolate mofetil)	Polycystic kidney disease	Progression of disease	Preserved	NR	(4)
Ipilimumab	67 Male	Kidney	Metastatic melanoma	Wide local excision	3 years	Everolimus	Nephrosclerosis and diabetes mellitus	Death secondary to disease	Preserved	NR	(5)
Ipilimumab	57 Female	Kidney	Metastatic melanoma	Wide local excision, dacarbazine	5 years	Sirolimus and prednisone	Polycystic kidney disease	Death secondary to disease	Preserved	NR	(5)
Ipilimumab	68 Female	Kidney	Metastatic melanoma (2 primary lesions)	Wide local excision	10 months	Mycophenolate mofetil, everolimus, prednisone	Polycystic kidney disease	Death secondary to disease and respiratory distress	Preserved	NR	(5)
Ipilimumab	66 Male	Kidney	Metastatic melanoma	Wide local excision	23 years	Everolimus, prednisone 5mg daily	IgA nephropathy	Partial response and surgical remission Death secondary to underlying cardiac disease	Preserved	NR	(5)
Ipilimumab	44 Female	Kidney	Metastatic desmoplastic melanoma	Surgical excision, radiation therapy	13 years	Prednisone 20mg daily (discontinued everolimus)	Reflux nephropathy	Death secondary to disease and infection	Preserved	27 days	(5)
Ipilimumab	40 Male	Kidney	Metastatic ocular melanoma	Local brachytherapy, resection of metastasis	17 years	Prednisone 5mg daily (discontinued tacrolimus)	Unknown etiology	Death secondary to disease	Acute rejection/IgA nephropathy, loss of graft	After 2 cycles of ipilimumab (unknown time course)	(6)

Ipilimumab	69 Female	Heart	Metastatic melanoma (primary lesion melanoma in-situ)	Local resection	5 years	Tacrolimus (discontinued mycophenolate mofetil)	NA	Death secondary to disease	Preserved	NR	(7)
Pembrolizumab	35 Male	Liver	Metastatic melanoma	Wide local excision, radiation therapy, carboplatin, paclitaxel	20 years	Tacrolimus	Biliary atresia	Complete response at 6 month follow-up	Preserved	NR	(8)
Pembrolizumab	70 Male	Liver	Hepatocellular carcinoma	Sorafenib, capecitabine, radiation therapy	8 years	Tacrolimus at 50% baseline dose	Cryptogenic cirrhosis and hepatocellular carcinoma	Death secondary to disease	Preserved	NR	(9)
Pembrolizumab	57 Male	Liver	Hepatocellular carcinoma	Transarterial chemoembolization and radiofrequency ablation, sorafenib	4 years	Tacrolimus (decreased dose), mycophenolate mofetil, prednisone, sorafenib	Hepatocellular carcinoma	Complete response	Preserved	NR	(10)
Pembrolizumab	54 Male	Liver	Metastatic melanoma	NA	5.5 years	Everolimus, mycophenolate mofetil	Hepatocellular carcinoma	Complete response	Preserved	NR	(11)
Pembrolizumab	63 Male	Liver	Metastatic melanoma	NA	NA	Cyclosporine	NA	Death secondary to graft failure	Acute rejection, graft failure	NA	(12)
Pembrolizumab	63 Male	Liver	Metastatic melanoma	NA	3.1 years	Mycophenolate mofetil, prednisone	Cholangiocarcinoma	Death secondary to graft failure	Graft rejection	NA	(11)
Pembrolizumab	46 Male	Kidney	Metastatic melanoma	Wide local excision, interferon alpha	10 months	NA	Light chain cast nephropathy secondary to multiple myeloma	Progression of disease	Preserved	NR	(13)
Pembrolizumab	55 (?)	Kidney	Metastatic uveal melanoma	Enucleation, radiation therapy	32 years	Cyclosporine	Hydronephrosis	Progression of disease and death	Preserved	NR	(14)
Pembrolizumab	61 Female	Kidney	Urothelial carcinoma	Concurrent bevacizumab and cisplatin/gemcitabine	8 years	Tacrolimus, mycophenolate mofetil	Hypertension and diabetes mellitus	Partial response	Preserved	NR	(15)
Pembrolizumab	70 Male	Kidney	Metastatic melanoma	NA	NA	Tacrolimus, prednisone	NA	Progression of disease	Preserved	NR	(12)
Pembrolizumab	75 Male	Kidney	Metastatic melanoma	NA	NA	Prednisone	NA	Partial response	Preserved	NR	(12)
Pembrolizumab	65 Male	Kidney	Metastatic melanoma	NA	NA	Prednisone, mycophenolate mofetil, tacrolimus	NA	Progression of disease	Preserved	NR	(12)
Pembrolizumab	58 Male	Kidney	Metastatic melanoma	None	>13 years	Azathioprine 100mg daily, everolimus 0.5mg BID	IgM nephropathy	Death secondary to graft failure (refused hemodialysis)	Graft failure	6 weeks	(16)
Pembrolizumab	57 Female	Kidney	Metastatic cutaneous SCC	Cetuximab, trametinib	25 years	Cyclosporine, prednisone 5mg daily	NA	Partial response	Graft failure	2 months	(17)
Pembrolizumab	67 Male	Heart	Metastatic melanoma	Wide local excision, trametinib	8 years	Tacrolimus, mycophenolate mofetil	Ischemic cardiomyopathy	Progression of disease and death	Preserved	NR	(18)

Nivolumab	54 Male	Liver	Non-small cell lung cancer	Lobectomy, cisplatin-vinorelbine	13 years	Prednisone 60mg daily and tapered to 5mg daily within 1 week, tacrolimus, everolimus	Cirrhosis and hepatitis C	Progression of disease and death	Preserved	NR	(19)
Nivolumab	41 Male	Liver	Hepatocellular carcinoma	Transarterial chemoembolization and microwave ablation, sorafenib	11 months	Tacrolimus (dose reduced)	Hepatocellular carcinoma	Progression of disease	Preserved	NR	(20)
Nivolumab	56 Male	Liver	Hepatocellular carcinoma	NA	2.7 years	Tacrolimus	Hepatocellular carcinoma	Progression of disease	Preserved	NR	(11)
Nivolumab	55 Male	Liver	Hepatocellular carcinoma	NA	5.5 years	Mycophenolate mofetil, sirolimus	Hepatocellular carcinoma	Progression of disease	Preserved	NR	(11)
Nivolumab	34 Female	Liver	Hepatocellular carcinoma	NA	3.7 years	Tacrolimus	Hepatocellular carcinoma	Progression of disease	Preserved	NR	(11)
Nivolumab	63 Male	Liver	Hepatocellular carcinoma	NA	1.2 years	Tacrolimus	Hepatocellular carcinoma	Multi-organ failure	Preserved	NR	(11)
Nivolumab	20 Male	Liver	Hepatocellular carcinoma	Gemcitabine, oxiliplatin with radiation therapy (pre-transplant) Sorafenib then capecitabine	3 years	Sirolimus	Hepatocellular carcinoma	Death secondary to graft failure	Graft failure	2 weeks and 3 days	(21)
Nivolumab	14 Male	Liver	Hepatocellular carcinoma	Sorafenib, doxorubicin and cisplatin (pre-transplant) Sorafenib then gemcitabine/oxaliplatin	1 year	Tacrolimus	Hepatocellular carcinoma	Death secondary to graft failure	Graft failure	1 week	(21)
Nivolumab	53 Male	Liver	Hepatocellular carcinoma	None	2 years	Mycophenolate mofetil, everolimus	Hepatocellular carcinoma, liver cirrhosis secondary to hepatitis C	Death secondary to graft failure	Graft failure	1 week	(22)
Nivolumab	68 Male	Liver	Hepatocellular carcinoma	NA	1.1 years	Sirolimus	Hepatocellular carcinoma	Death secondary to graft failure	Graft failure	NA	(11)
Nivolumab	70 Male	Kidney	Adenocarcinoma of the duodenum	Standard chemotherapy (unknown)	6 years	Prednisone 50mg daily, sirolimus	Renal cell carcinoma	Remission at 7 month follow-up	Preserved	NR	(23)
Nivolumab	60 Female	Kidney	Metastatic melanoma	Wide local excision and radiation therapy	13 years	Prednisone, mycophenolate mofetil (discontinued cyclosporine)	Polycystic kidney disease	Progression of disease and death	Preserved	NR	(14)
Nivolumab	69 Female	Kidney	Metastatic cutaneous SCC	Excision, topical 5-fluorouracil, radiation therapy, cetuximab, erlotinib, capecitabine, interferon, palbociclib	14 years	Sirolimus, prednisone 5mg	Focal segmental glomerular sclerosis	Partial response	Preserved	NR	(24)
Nivolumab	71 Female	Kidney	Merkel cell carcinoma	Excision, neck dissection, radiation therapy	12 years	Prednisone 10mg daily (discontinued mycophenolate mofetil)	Polycystic kidney disease	Partial response	Preserved	NR	(25)

Nivolumab	74 Male	Kidney	Non-small cell lung cancer	None	3 years	Cyclosporine (decreased dose), prednisone	Hypertension and diabetes mellitus	NA	Graft failure	After 3 doses of nivolumab (time unknown)	(26)
Nivolumab	63 Female	Kidney	Metastatic melanoma (2 primary lesions)	Wide local excision	11 years	Prednisone 10mg daily (discontinued mycophenolate mofetil and tacrolimus	Hypertension and diabetes mellitus	Nearly complete remission at 8 month follow-up	Graft failure	8 days	(27)
Nivolumab	73 Male	Kidney	Metastatic melanoma	None	15 months	Everolimus, immune suppression reduced (not specified)	NA	Death secondary to disease	Graft failure	55 days	(28)
Nivolumab	50 Male	Kidney	Metastatic cutaneous SCC	Excision, radiation therapy, cetuximab, carboplatin, paclitaxel, gemcitabine, entrectinib	8 years	Prednisone 5mg daily (discontinued sirolimus)	Polycystic kidney disease	Partial response	Graft failure	13 days	(29)
Nivolumab	59 Male	Kidney	Non-small cell lung cancer	Surgical resection, carboplatin, paclitaxel	6 years	Immunosuppression discontinued	Hypertension and diabetes mellitus	Death secondary to graft failure (refused hemodialysis)	Graft failure	9 days	(30)
Nivolumab	64 Male	Kidney	Non-small cell lung cancer	Paclitaxel, carboplatin	6 years	Tacrolimus, mycophenolate mofetil (doses decreased)	Acute renal ischemia	Progression of disease	Preserved	9 cycles of nivolumab (time unknown)	(31)
Nivolumab	48 Male	Kidney	Metastatic melanoma	NA	NA	Prednisone, tacrolimus	NA	Partial response	Graft failure	NA	(12)
Nivolumab	72 Female	Heart	Non-small cell lung cancer	Lobectomy, radiation therapy, paclitaxel, carboplatin	10 years	Cyclosporine, mycophenolate mofetil (doses reduced)	Mitral valve dysfunction and rheumatic heart disease	Partial response	Preserved	NR	(24)
Nivolumab	49 Male	Heart	Metastatic cutaneous SCC	Mohs surgery, radiation therapy, carboplatin, docetaxel	19 years	Sirolimus, prednisone and tacrolimus	Familial dilated cardiomyopathy	Death secondary to disease	Preserved	5 days	(32)
Ipilumumab followed by Nivolumab	74 Male	Kidney	Metastatic melanoma	Wide local excision, concurrent radiation therapy	4 years	Everolimus, azathioprine	IgA nephropathy	Death secondary to disease	Preserved	NR	(5)
Ipilumumab followed by Nivolumab	77 Male	Kidney	Metastatic melanoma	Wide local excision, additional resection after local recurrence	7 years	Prednisone 5mg daily, tacrolimus 2mg twice a day	Diabetes mellitus	Progression of disease	Preserved	NR	(13)
Ipilumumab followed by Nivolumab	48 Male	Kidney	Metastatic melanoma	Concurrent radiation therapy	12 years	Prednisone 5mg daily (discontinued tacrolimus)	IgA nephropathy	Stable disease after 6 cycles nivolumab (time unclear)	Graft failure	8 days	(33)
Ipilimumab followed by Pembrolizumab	62 Female	Liver	MPNST-like metastatic melanoma	Sirolimus, pazopanib	6 years	Sirolimus 1mg daily, mycophenolate mofetil 500mg twice a day	Alcoholic cirrhosis and hepatocellular carcinoma	Disease response at 1.5 year follow-up	Preserved	NR	(34)

Ipilimumab followed by Pembrolizumab	68 Male	Kidney	Metastatic melanoma	None	5 years	Prednisone (discontinued cyclosporine)	Polycystic kidney disease	NA	Graft failure	3 weeks	(35)
Ipilimumab followed by Pembrolizumab	62 Male	Heart	Metastatic melanoma	NA	NA	Tacrolimus	NA	Death secondary to disease	Preserved	NR	(18)
Ipilimumab followed by Pembrolizumab	75 Male	Heart	Metastatic melanoma	Wide local excision, axillary lymph node dissection	12 years	Tacrolimus 3mg twice a day	Ischemic cardiomyopathy	Progression of disease	Preserved	NR	(36)
Pembrolizumab followed by ipilimumab	65 Male	Kidney	Metastatic melanoma	NA	NA	Prednisone, mycophenolate mofetil and everolimus	NA	Progression of disease	Preserved	NR	(12)

NR: No rejection
SCC: squamous cell carcinoma
NA: Data not available

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Table 2. Rates of rejection and clinical outcomes by drug administered and transplanted organ type

Drug	Transplant Type	Rejection N (%)	Remission N (%)	Partial Response N (%)	Overall Response Rate %	Progression/Death Secondary to Disease N (%)	Death Secondary to Rejection N (%)
Ipilimumab	Kidney: 8	2 (25%)	1 (12.5%)	1 (12.5%)	25%	6 (75%)	0 (0%)
	Liver: 3	1 (33.3%)	1 (33.3%)	0 (0%)	33%	2 (66.6%)	0 (0%)
	Cardiac: 1	0 (0%)	0 (0%)	0 (0%)	0%	1 (100%)	0 (0%)
Nivolumab	Kidney: 11*	7 (64%)	1 (10%)	5 (50%)	60%	3 (30%)	1 (9%)
	Liver: 10	4 (40%)	0 (0%)	0 (0%)	0%	6 (60%)	4 (40%)
	Cardiac: 2	1 (50%)	0 (0%)	1 (50%)	50%	1 (50%)	0 (0%)
Pembrolizumab	Kidney: 8	2 (25%)	0 (0%)	3 (37.5%)	37.5%	4 (50%)	1 (20%)
	Liver: 6	2 (33%)	3 (50%)	0 (0%)	50%	1 (16.6%)	2 (33.3%)
	Cardiac: 1	0 (0%)	0 (0%)	0 (0%)	0%	1 (100%)	0 (0%)
Ipilimumab followed by Nivolumab	Kidney: 3	1 (33.3%)	0 (0%)	1 (33.3%)	33%	2 (66.6%)	0 (0%)
Ipilimumab followed by Pembrolizumab	Kidney: 1*	1 (100%)	0 (0%)	0 (0%)	0%	0 (0%)	0 (0%)
	Liver: 1	0 (0%)	0 (0%)	1 (100%)	100%	0 (0%)	0 (0%)
	Cardiac: 2	0 (0%)	0 (0%)	0 (0%)	0%	2 (100%)	0 (0%)
Pembrolizumab followed by ipilimumab	Kidney: 1	0 (0%)	0 (0%)	0 (0%)	0%	1 (100%)	0 (0%)

*the clinical outcome of one patient was not reported in the original case report

Table 3. Reported response rates in patients with cutaneous malignancy

Drug	Tumor type	Total number of cases	Remission N (%)	Partial Response N (%)	Overall Response Rate %	Progression/Death Secondary to Disease N (%)	Death Secondary to Rejection N (%)
Ipilimumab	Melanoma	10*	1 (10%)	2 (20%)	30%	7 (70%)	0 (0%)
Nivolumab	Melanoma	4	0 (0%)	2 (50%)	50%	2 (50%)	0 (0%)
	SCC	3	0 (0%)	2 (66.6%)	2 (66.6%)	1 (33.3%)	0 (0%)
Pembrolizumab	Melanoma	10	2 (20%)	1 (10%)	30%	4 (40%)	3 (30%)
	SCC	1	0 (0%)	1 (100%)	100%	0 (0%)	0 (0%)
Ipilimumab followed by Nivolumab	Melanoma	3	0 (0%)	1 (33.3%)	33.3%	2 (66.6%)	0 (0%)
Ipilimumab followed by Pembrolizumab	Melanoma	4^	0 (0%)	1 (33.3%)	33.3%	2 (66.6%)	0 (0%)
Pembrolizumab followed by Ipilimumab	Melanoma	1	0 (0%)	0 (0%)	0 (0%)	1 (100%)	0 (0%)

*one case of desmoplastic melanoma
^the clinical outcome of the patient was not reported in the original case report

6

Presenter: Kayla L. McNiece

Title: Bacteriostatic Saline Reduces Discomfort of 1% Lidocaine with Epinephrine Injection

Authors: Kayla L. McNiece[1]; Steven Kent[2]; David Kent, MD[1,2]

Institutions: 1. Skin Physicians of Georgia, Macon, GA
2. Medical College of Georgia, Augusta, GA

Introduction & Objectives: Lidocaine with epinephrine (LE) is routinely used as local anesthesia for a variety of skin procedures including skin biopsies, wide local excisions, and Mohs surgery. Unfortunately, LE injection is associated with marked stinging and pain producing heightened patient anxiety. Although it is well established that bacteriostatic saline (BS) containing benzyl alcohol inherently contains local anesthetic properties, reports of its use in excisional surgery are

few regarding its ability to reduce and eliminate the sting and discomfort of LE injections.

Study Type: Clinical trial.

Study Setting: Private practice.

Methods: We designed a single blinded study to evaluate the effectiveness of preceding BS injection in reducing the pain and stinging associated with cutaneous injection of LE. A total of 26 patients received two series of cutaneous injections in the flexor forearms. One arm received two consecutive injections of LE (LE/LE). The other arm received an injection of BS followed by LE (BS/LE). Patients were blinded to the order of series injections. Using a four-point scale, patients rated each series of injections based on the associated the pain and stinging—none (0), mild (1), moderate (2), or severe (3). A questionnaire was also used to assess a patient's preference between series and the likelihood of a patient requesting the preferred series in the future.

Results: Out of 26 patients who completed the study, the average pain rating for injection of LE/LE was 0.88 in comparison to BS/LE which was 0.46. The average rating for stinging was 1.46 in the LE/LE group and 0.58 in the BS/LE group. Overall, the pain and stinging associated with LE injections was reduced by approximately 50-60%, respectively, with preceding injection of BS. Twenty-one of the 26 patients preferred the BS/LE series and 18 said they would request this anesthetic technique in the future.

Conclusion: Injection of BS prior to injection of LE reduced pain and stinging associated with needlesticks and infiltration of LE by approximately 50-60%. As a result, patient anxiety is decreased and the patient-physician relationship is strengthened. In practice, this technique has proven valuable for multiple types of excisional surgeries and is easier and substantially more effective compared to buffered LE. Also, in light of the increasing barriers to the use of in-office compounding pharmaceuticals, the BS technique may provide an acceptable alternative to the use of buffered LE injections.

7

Presenter: Gabriel E. Molina, BS

Title: Novel Observations Regarding Infection Risk in Lower Extremity Wounds Healing by Second Intention

Authors: Gabriel E. Molina, BS[1]; Sherry H. Yu, MD[2]; Victor A. Neel, MD, PhD[2]

Institutions: 1. Harvard Medical School, Boston, MA
2. Massachusetts General Hospital, Boston, MA

Introduction & Objectives: Second intention healing (SIH) is a common repair strategy for lower extremity wounds generated by Mohs micrographic surgery (MMS). Nevertheless, there is minimal understanding of the nature of postoperative infections among such wounds as well as common misconceptions regarding the association between postoperative defect size and infection rate. We sought to characterize the timing of postoperative infections and elucidate the impact of defect size on infection risk among lower extremity wounds undergoing SIH.

Study Type: Retrospective chart review.

Study Setting: Academic referral center.

Methods: Patients treated with MMS on the lower extremities from October 2012 through September 2018 were identified. Medical chart review identified patients whose wounds underwent SIH and who received wound cultures for suspected infection within 90 days of surgery. Surface areas of wounds were estimated based on recorded postoperative width and length measurements and an assumption that the wounds were approximately ellipsoidal in shape. Statistical analyses included Pearson $\chi 2$ and unpaired t-test for comparison of baseline characteristics and two-proportion z-test for comparison of infection rates.

Results: Of the 555 patients with lower extremity wounds undergoing SIH, 24 (4.3%) developed wound infections within 90 days of surgery. Figure 1 depicts the size distribution of all wounds. Infection rates were statistically similar between large wounds (defined as postoperative surface area greater than 4 cm2; n=204, 37%) and small wounds (n=204, 37%; infection rates, 4.9% and 4.0%, respectively; $p = .61$). None of the wounds in the top decile by surface area developed infections. Furthermore, wound infections tended to occur in the early wound healing period, as 80% (n=19) of infections were diagnosed within three weeks after surgery (Figure 2). Among all infections, the median time from surgery to wound culture was 14.5 days (range, 4-64 days). There was no statistically significant difference in average time to infection between small and large defects (difference of means, 1.6 days; 95% confidence interval, 12.07 days; $p > .05$; Figure 3).

Conclusion: Our findings indicate that infection risk is not correlated with postoperative defect size for lower extremity wounds undergoing SIH. Large wounds, which may remain open and exposed to the environment for months, were no more likely to become infected than small wounds. Furthermore, all wounds – regardless of size – were most likely to become infected within three weeks after surgery. These findings, which have not been previously reported, may suggest important protective mechanisms that manifest early in the wound healing process as well as challenge underlying assumptions on the infection risk of wounds allowed to heal by SIH.

Figure 1

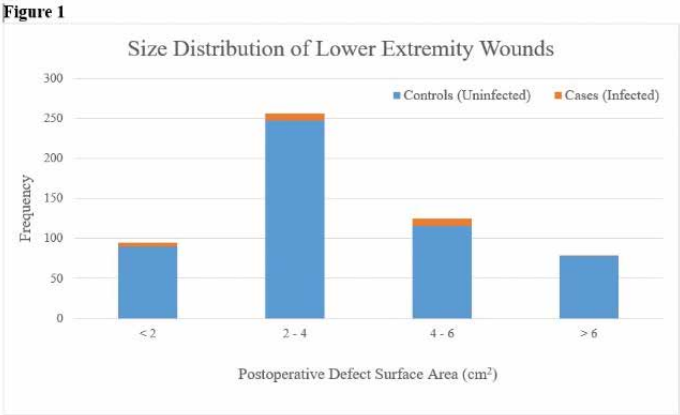


Figure 1. Distribution of the surface area of postoperative lower extremity wounds, including infected cases (orange) and uninfected controls (blue). Postoperative wounds were treated as ellipses for surface area calculations.

Figure 2

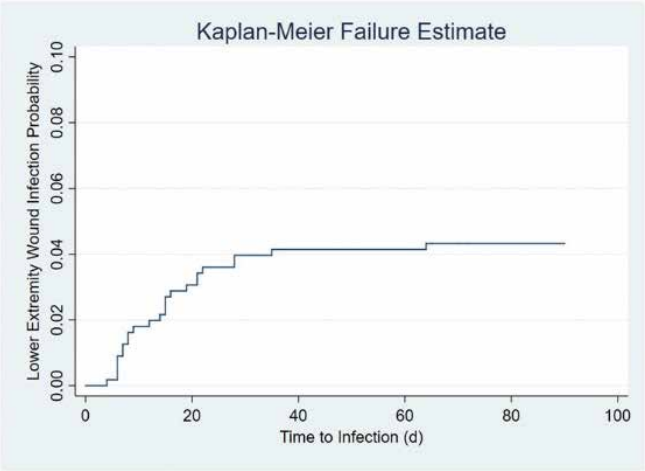


Figure 2. Kaplan-Meier failure estimate demonstrates cumulative infection risk of lower extremity wounds undergoing SIH over a 90-day period following surgery.

Figure 3

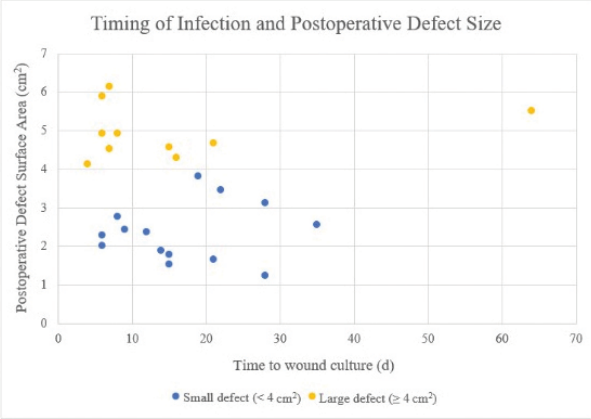


Figure 3. Scatter plot of 24 wound infections depicting time from surgery to wound culture (in days) and surface area of postoperative defects. Plot demonstrates that majority of wound infections – regardless of postoperative defect size – occur within three weeks of surgery. Postoperative wounds were treated as ellipses for surface area calculations.

8

Presenter: Kimberlee Lim, MD

Title: Optimal Shape of Post-Primary Mohs Layers for Tumors of the Head and Neck, an International Survey

Authors: Kimberlee Lim, MD[1,2]; Gregory Neal-Smith, MD[2]; Bethan Swift, MSc[3]; Zoe Askham[2]; Sarah Felton, MD[2]

Institutions: 1. Bristol Royal Infirmary, Bristol, United Kingdom
2. Oxford University Hospitals NHS Foundation Trust, Oxford, United Kingdom
3. Lincoln College, Oxford, United Kingdom

Introduction & Objectives: Mohs micrographic surgery (MMS) is the gold-standard for management of non-melanoma skin cancer due to its unparalleled cure rate, achieved via visualization of the tumor's full histological margin. Whilst integrity of the initial surgical margin is paramount, there are no detailed methods to ensure that post-primary layers (stage 2 and beyond) are as carefully analyzed. We therefore performed an anonymous questionnaire survey of Mohs surgeons internationally to review current practices with regards to post-primary layers for tumors on the head and neck.

Study Type: International Questionnaire Survey.

Study Setting: Academic center.

Methods: A 16-question online survey was sent to all members of the American College of Mohs Surgery, Australasian College of Dermatologists, British Society for Dermatological Surgery and New Zealand Dermatological Society Incorporated. MMS technique in four key facial areas (nose, eyelid, ear, lip) was queried, specifically regarding shape of Mohs layer on post-primary stages. Responses were collected March-June 2018; only those from Mohs surgeons were analyzed.

Results: 354 responses were analyzed: 81% (n=254) from United States, 10% (n=37) from United Kingdom, 6% (n=20) from Australia and 3% (n=12) from New Zealand, Portugal, Canada and the Netherlands collectively. 55% (n=195) of respondents had >10 years' MMS experience and 63% (n=225) perform >15 Mohs cases/week. Overall, 83% of respondents (n=281) would choose crescents for post-primary Mohs layers, with 15% (n=50) preferring rectangles and 2% (n=7) a diamond or other shape. 42% (n=150) always take the same shape, whilst others vary this according to factors including aggressive tumor subtypes (n=134), anatomical site (n=130) and anticipated closure (n=124). Reasons for choosing a crescent were overwhelmingly due to tissue preservation, ease of flattening tissue and confidence in achieving higher clearance rates. Rectangles were mostly chosen again due to abilities to preserve tissue and also to visualize defects in patients, should multiple layers be required. Usage of the diamond was mainly attributed to site of surgery, specifically the eyelid (n=14) or lip (n=21). Surgeons with >10 years' experience were significantly more likely to choose crescents for all surgical sites than those with <5 years' experience (p=0.008). Surgeons performing >15 cases/week were also more likely to choose crescents for the ear and eye than those surgeons performing 1-5 cases/week (p<0.001 and p=0.02 respectively). US-trained surgeons were significantly more likely to choose crescents for all sites than UK-trained ones (p<0.01).

Conclusion: The results of our survey demonstrate that the majority of Mohs surgeons internationally take crescenteric layers, for optimal histological accuracy and ease of tissue processing, whilst rectangles are occasionally chosen for better tissue preservation. As recent studies have suggested that processing rectangular layers gives a theoretical risk of incomplete visualization of vertical edges, leading to false-negative readings, further research to review tissue preservation and recurrence rates from each shape would help optimize practice.

9

Presenter: Michael P. Lee

Title: Surgical Site Infection Risk Associated with Integra Bilayer Wound Matrix Use Following Excision of Cutaneous Neoplasms – A Multi-Specialty Single Institution Study

Authors: Michael P. Lee[1,2]; Christopher J. Miller, MD[1]; Joseph F. Sobanko, MD[1]; Thuzar M. Shin, MD[1]; Nicole Howe[1]; Shannon W. Zullo[1]; Jeremy R. Etzkorn, MD[1]

Institutions: 1. University of Pennsylvania, Philadelphia, PA
2. Eastern Virginia Medical School, Norfolk, VA

Introduction & Objectives: Integra® Bilayer Wound Matrix (IBWM) is a dermal substitute often used to reconstruct wounds after surgical excision of skin cancer. The product has a silicone layer to prevent graft

desiccation and is typically removed three weeks after initial placement. Use of IBWM for burn wounds has been associated with relatively high infection rates, but it is unclear whether IBWM placement after skin cancer excision experiences similar complications. The objectives of this study were to (1) determine the risk of infection associated with the use of IBWM after surgical excision of skin cancer and (2) to evaluate risk factors associated with surgical site infection.

Study Type: Retrospective cohort study.

Study Setting: Academic Center.

Methods: A retrospective cohort study was performed to investigate infection rates and risk factors for infection with using IBWM following excision of cutaneous neoplasms. Patients receiving Mohs surgery or conventional excision for skin cancer and whose defects were repaired with IBWM from 2012-2018 were included in the study. Covariate data collected included demographics, comorbidities, medications, tumor type and location, antibiotic prophylaxis, provider specialty, service dates, and culture results. STATA was used for all statistical analysis. T-tests and tests of proportion were used for univariate comparative hypothesis testing. A multivariable logistic regression analysis with multiple imputation to account for missing covariates was performed to further evaluate the association between covariates and surgical site infection.

Results: 207 defects resulting from excision of skin cancer were repaired with IBWM between 2012-2018. Table 1 summarizes tumor characteristics along with the type of antibiotic prophylaxis (administered in 188/207 cases) and other surgical data. There were 30 surgical site infections (14.5%) and mean time to infection was 20.9 days. Table 2 shows the univariate analysis for possible infection risk factors. Use of furosemide at the time of surgery was associated with a significantly higher risk of univariate analysis. After controlling for other covariates via multivariable logistic regression, the association between furosemide use and infection remained significant (odds ratio 6.06, $p < 0.001$). No other risk factors were significantly associated with infection. Table 3 displays the cultured bacteria, antibiotic sensitivity testing results, and the type of antibiotic prophylaxis. The most common cultured bacteria were methicillin-resistant Staphylococcus aureus (7), methicillin-sensitive Staphylococcus aureus (7), and Pseudomonas aeruginosa (5).

Conclusion: Surgical site infection associated with IBWM is higher than reported rates for skin grafts and flaps. Whereas previous studies have shown that patient and tumor characteristics correlate with higher infection rates, no clinical factors, except furosemide use, correlated with infection of IBWM. The mean time to infection was 20.9 days, so retention of the silicone layer of the IBWM may promote infection. Administration of perioperative prophylactic antibiotics did not reduce the rate of late infections.

Table 1. Patient demographics and co-morbidities and clinical management characteristics. *23 patients were missing data on their smoking status

Patient demographics and co-morbidities	
Age, mean (SD)	71.8 (16)
Sex, n (%)	
Male	149 (72)
Female	58 (28)
Diabetes, n (%)	
Yes	36 (83)
No	171 (17)
Current Smoker*, n (%)	
Yes	14 (92)
No	170 (8)
Furosemide use, n (%)	
Yes	23 (89)
No	184 (11)
Clinical management	
Tumor type	
BCC	36 (17)
SCC	92 (44)
Melanoma	65 (31)
Other/mixed types	14 (7)
Same day integra placement, n (%)	
Yes	19 (9)
No	188 (91)
Antibiotic prophylaxis, n (%)	
No	18 (9)
Yes, n (%)	189 (91)
Cephalosporins	132 (70)
Clindamycin	30 (16)
Levofloxacin	9 (5)
Trimethoprim-sulfamethoxazole	3 (2)
Doxycycline	2 (1)
Amoxicillin	1 (1)
Combination	11 (6)
Specialty for Integra Placement, n (%)	
Dermatologic Surgery	164 (79)
Plastic Surgery	29 (14)
Otorhinolaryngology	10 (5)
Oncologic Surgery	2 (1)
Orthopaedic Surgery	2 (1)
Reconstruction Type, n (%)	
Second Intent	134 (65)
Graft	66 (32)
Flap	7 (3.4)

Table 2. Univariate analysis of covariates associated with surgical site infection
*23 patients were missing data on their smoking status

Risk Factors	Surgical Site Infection N = 30	No Surgical Site Infection N = 177	P Value
Mean Age (SD)	75 (2)	71.4 (1)	0.27
Sex, n (%)			0.79
Male	21 (70)	128 (72)	
Female	9 (30)	49 (28)	
Obese, n (%)			0.41
Yes	6 (20)	48 (27)	
No	24 (80)	129 (73)	
Diabetes, n (%)			0.9
Yes	5 (17)	31 (18)	
No	25 (83)	146 (82)	
Current Smoker*, n (%)			0.5
Yes	3 (10)	12 (7)	
No	27 (90)	165 (93)	
Furosemide use, n (%)			<.001
Yes	9 (30)	14 (8)	
No	21 (70)	163 (92)	
Same day Integra placement, n (%)			0.23
Yes	29 (3)	159 (90)	
No	1 (97)	18 (10)	
Antibiotic prophylaxis, n (%)			
No	2 (7)	16 (9)	0.67
Yes, n (%)	28 (93)	161 (91)	

Table 3. Gram positive and gram negative culture susceptibility testing and antibiotic prophylaxis at time of infection. 'R' signifies resistance.
*P Aeruginosa not tested for TMP-SMX susceptibility

Antibiotic Prophy	Organism	Amp-Sulbac	Cefazolin	Clindamycin	Erythromycin	Levofloxacin	Oxacillin	Penicillin	Tetracycline	TMP-SMX	Vancomycin
Levofloxacin	MRSA	R	R			R	R	R			
Clindamycin	MRSA	R	R	R	R	R	R	R			
Levofloxacin	MRSA	R	R	R	R	R	R	R			
Cephalexin	MRSA	R	R		R		R	R			
None	MRSA	R	R		R		R	R			
Cephalexin	MRSA	R	R		R		R	R			
Cephalexin	MRSA	R	R		R		R	R			
Cephalexin	MSSA							R			
Cephalexin	MSSA			R	R			R			
Clindamycin	MSSA			R	R			R			
Amoxicillin	MSSA			R	R			R			
None	MSSA			R	R			R			
Cephalexin	MSSA							R	R		
Cephalexin	MSSA			R	R			R			
Cephalexin	E Faecalis										

Antibiotic Prophy	Organism	Amikacin	Amox-Clav	Ampicillin	Cefazolin	Cefepime	Ceftazidime	Ceftriaxone	Gentamicin, Levofloxacin, Meropenem, Pip-Taz, TMP-SMX, Tobramycin
Levofloxacin	P Aeruginosa*			R					
Doxycyline	P Aeruginosa*								
Cephalexin	P Aeruginosa*		R	R	R		R	R	
Cephalexin	P Aeruginosa*								
Clindamycin	P Aeruginosa*								
Clindamycin	S Marcescens		R	R	R				
Cephalexin	S Marcescens		R	R	R				
Clindamycin	Enterobacter		R	R	R				
Cephalexin	Enterobacter		R	R	R				
Clindamycin	P Mirables								
Cephalexin	Acinetobacter			R	R				

10

Presenter: Dennis Kim, MD

Title: Conversion of a Validated Melanoma Risk Stratification Tool into an Electronic Medical Record-Based Patient Questionnaire for Melanoma Screening

Author: Dennis Kim, MD[1]

Institution: 1. Brigham and Women's Hospital, Jamaica Plain, MA

Introduction & Objectives: Population based screenings have not been shown to be cost-effective since the number needed to screen (NNS) to diagnose one melanoma is so high. This has influenced the United States Preventative Task Force's statement that there is insufficient evidence to support population-based skin cancer screenings. Since survival from melanoma is closely linked to tumor stage, early identification is the most important intervention to reduce mortality. Screening individuals with a personal history of melanoma is cost-effective by detecting earlier stage melanomas. However, no standardized method has been employed to identify other individuals at high-risk for melanoma.

The risk stratification tool developed by Mackie et al, identifies patients with a median excess risk for melanoma of 60-90-fold in men and 40-fold in women compared to the general population. The tool was based on physician assessments of four patient characteristics (number of nevi, number of atypical nevi, freckling tendency, and sunburn history). The objective of this study is to validate a questionnaire based on the Mackie risk stratification tool that is performed by patients in order to reduce the NNS to diagnose a melanoma.

Study Type: Prospective cohort study.

Study Setting: Academic center.

Methods: Patients seen in general dermatology and melanoma clinics completed the questionnaire. The Mackie tool was then completed by dermatologists blinded to the patient's responses based on physical examination findings. Patients were classified based on survey responses into four risk groups defined by Mackie's tool. Those classified as a 3 or 4 were considered high-risk. The sensitivity and specificity of the questionnaire was assessed using the physician's assessment as the gold standard. The text and photos of the questionnaire were revised and re-tested to optimize the sensitivity and specificity.

Results: A total of 189 patients completed four iterations of the survey. Of the 94 patients who completed the fourth version of the survey, 41 had a prior history of melanoma, and 40 were classified as high-risk. The sensitivity and specificity of the fourth version of the questionnaire based on the patient responses was 63% and 74%, respectively. Assuming a melanoma prevalence of 0.00038, the NNS to diagnose one melanoma diagnosis is 108 among the general population.

Conclusion: The NNS to diagnose a melanoma based on this tool is half that reported by an academic dermatology practice (NNS 215) and a fraction of population-based screenings by the American Academy of Dermatology (620). Based on published data, the cost to diagnose one melanoma is $15,0000 using the tool presented herein. Further studies are needed to evaluate the sensitivity and specificity of the tool in a larger cohort and the patents identified need to be followed longitudinally to understand how screening impacts outcomes and cost.

11

Presenter: Christina Wong, MD

Title: A Comprehensive Case Series of a Monday Through Friday Vismodegib Dosing Regimen for the Treatment, Neoadjuvant Treatment, and Palliative Treatment of Advanced Basal Cell Carcinoma

Authors: Christina Wong, MD[1]; Allison T. Vidimos, MD[1]

Institution: 1. Cleveland Clinic Foundation, Cleveland, OH

Introduction & Objectives: Current published studies discuss dosing vismodegib with monthly or weekly drug holidays. We present an alternative and effective daily dosing regimen for vismodegib with a two day drug holiday for the treatment of advanced basal cell carcinomas that mitigates adverse effects, has been successful in slowing disease progression, is effective as a neoadjuvant therapy, and can be used as a palliative treatment option.

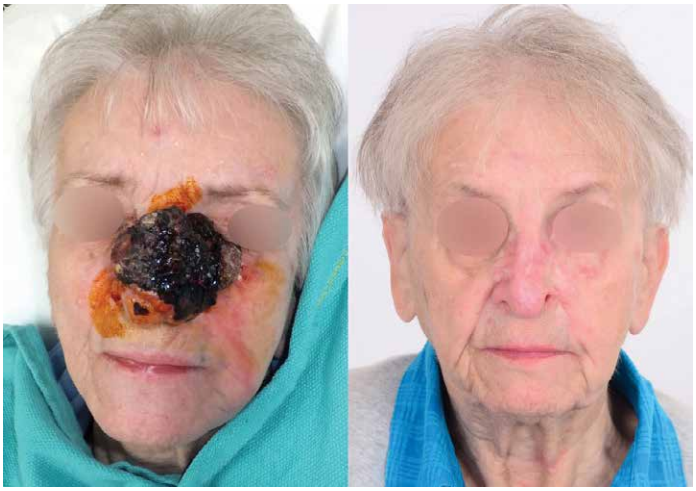
Study Type: Case series.

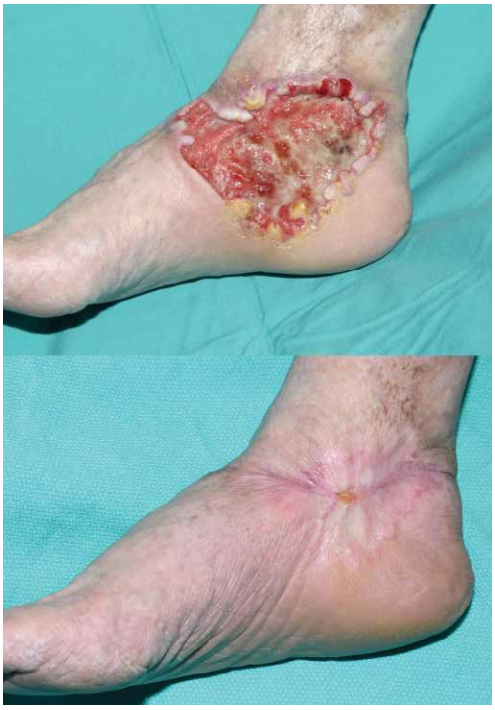
Study Setting: Academic Center.

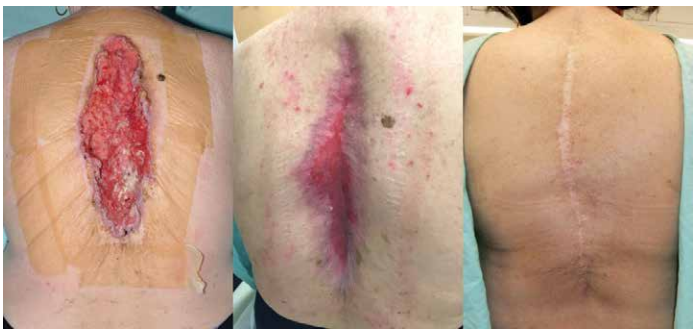
Methods: We reviewed 21 patients with extensive basal cell carcinoma or basal cell nevus syndrome successfully treated between 2012 to 2018 with vismodegib 150mg with only a one to two-day drug holiday.

Results: The most encountered side effects include dysgeusia, hair loss, muscle cramps, GI upset, and weight loss which affected 16 (76%) of our patients but these were mitigated with our dosing regimen. One patient was hospitalized for chemically induced hepatitis thought to be secondary to vismodegib. Five patients (24%) achieved disease free tumor burden after 4 to 15 months of treatment [Figure 1 & 2]. Patient 2, 3 and 20 had tumors totaling 26cm [Figure 3], 16.5cm, and 15cm, respectively which were treated neoadjuvantly with vismodegib prior to surgery. Three patients with basal cell nevus syndrome were included in our review of 17, 47, and 68 years of age. The 17-year-old patient has been treated successfully with intermittent daily vismodegib for 37 months without requiring surgery for any BCCs. The 47-year-old patient has been treated for 24 months without requiring surgery for any BCCs. The 68-year-old patient was started on vismodegib in 2013 for a 9 by 5 mm basal cell on the right lower eyelid which resolved to no visible tumor nine months after treatment and continued disease free until recurrence was noted at 29 months. Patient 4, 7, and 21 received additional treatment with pembrolizumab for recurrent disease, radiation therapy for palliative treatment, and injectable 5-florouracil for concurrent squamous cell carcinoma, respectively.

Conclusion: This is the first known study to our knowledge of a one to two-day drug holiday of vismodegib for advanced BCCs resulting in tolerable AEs that has led to a successful halt in disease progression, neoadjuvant treatment, and palliative treatment option in patients declining surgery.







12

Presenter: Lisa Chastant, MD

Title: Does Any Mask Block Potentially Hazardous Chemicals Produced During Procedures that Generate a Smoke Plume?

Authors: Lisa Chastant, MD [1]; Hillary Johnson, MD, PhD[2]

Institutions: 1. Keesler AFB, USAF, Biloxi, MS
2. University of Iowa, Iowa City, IA

Introduction & Objectives: There are concerns about the risks associated with long-term exposure to surgical smoke plume. Previous studies have highlighted the risk of ultrafine particles within the plume and reported that there are more than 13 known or suspected carcinogens and more than 20 known environmental toxins produced during laser hair removal. Ultimately engineering controls, such as smoke evacuators and effective ventilation, are best to mitigate the exposure risk from the plume. However, personal protective equipment (masks and respirators) remains an important part of risk mitigation for health care workers as many do not have access to engineering controls. This study was done to identify which of four products (surgical mask, high filtration laser mask, N95 respirator, R95 respirator) was the most effective at filtering potentially hazardous chemical compounds within plume produced during electrosurgery, CO2 ablation, and laser hair removal.

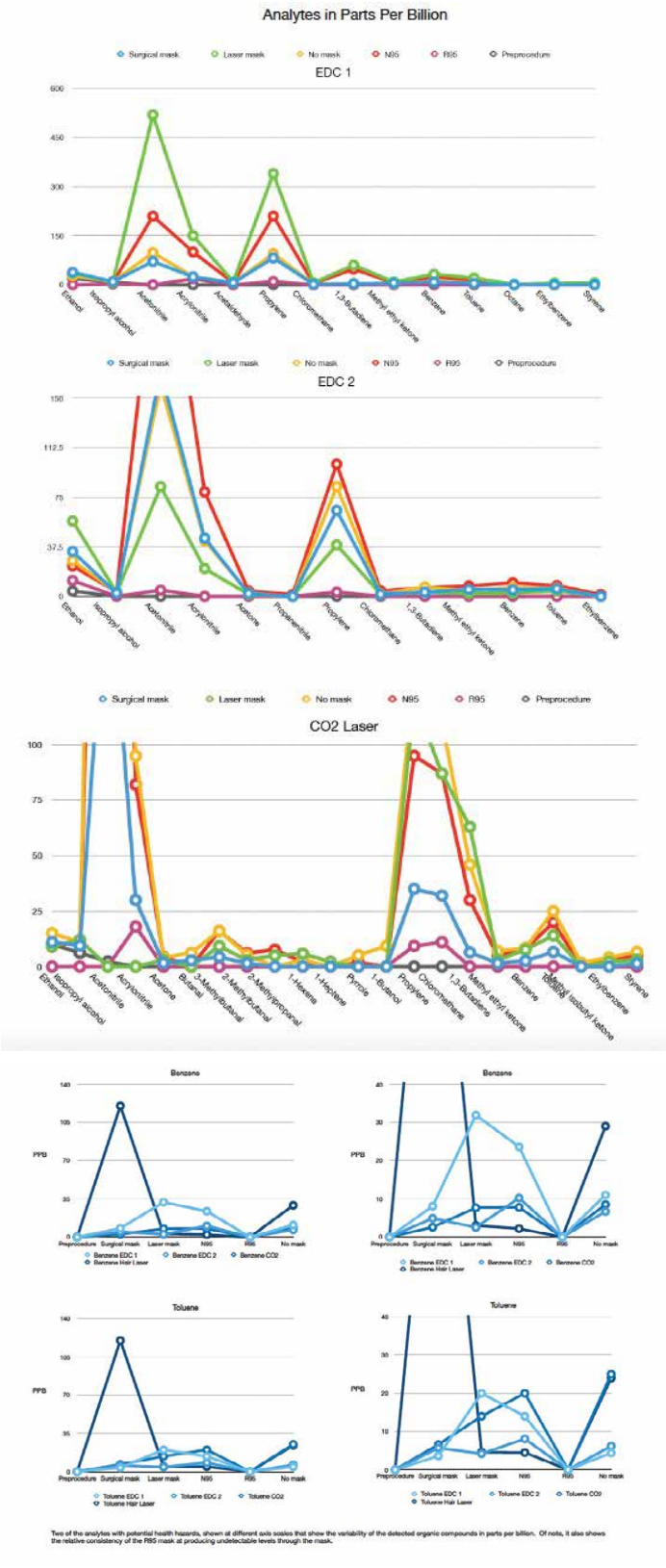
Study Type: Applied Experimental.

Study Setting: Academic center.

Methods: We used vacuum sealed glass bottles to take grab samples of plume filtered through various masks and respirators during simulated electrosurgery and laser procedures. Then utilizing Gas Chromatography/ Mass Spectrometry, the contents of the the bottle vacs were analyzed for organic compounds and the estimated concentrations in parts per billion (volume) were recorded. A total of four trials were done to include two curettage and electrodessication trials, one CO2 laser trial and one hair laser trial. For each trial, a total of 6 grab samples were collected in bottle vacs. A room pre-procedure sample was taken before each trial to look for background levels of organic chemical contamination. For each procedure, at least one minute of plume generation was done before any other sample was taken. Smoke evacuators were not used. The samples were taken in the following order: surgical mask, high filtration laser mask, no mask, N95 respirator, and then the R95 respirator sample was collected during the expected maximum plume concentration.

Results: The concentration of each chemical detected was highly variable and overall the concentration of many of the analytes was in the low parts per billion. But the trend is shown in the line graphs. The R-95 respirator is the only one that prevented almost all of the organic chemicals from transmitting through at a detectable level. The surgical mask, laser mask, and N-95 respirator mirrored the control done with no mask.

Conclusion: The R95 respirator is designated by the National Institute for Occupational Safety and Health (NIOSH) as “oil resistant”, so it is not surprising that it was the most effective at blocking volatile organic chemicals. The N95 respirator, which is certified by the NIOSH to filter at least 95% of airborne particles less than 100 microns, was as ineffective at blocking the organic compounds as the surgical mask and laser mask.



13

Presenter: Mariam Totonchy, MD

Title: Defining Perineural Invasion in Cutaneous Squamous Cell Carcinoma

Authors: Mariam Totonchy, MD[1]; Kathleen Suozzi, MD [1]; David Leffell, MD[1]; Sean Christensen, PhD, MD[1]

Institution: 1. Yale, New Haven, CT

Introduction & Objectives: Cutaneous squamous cell carcinoma (cSCC) is increasing in prevalence, and with it the frequency of adverse events including recurrence, metastasis and death. It is currently believed that one of the major factors predicting risk of recurrence or metastasis in cSCC is the presence of perineural invasion (PNI). Current staging systems include PNI as a risk factor, but do not define extent or severity of perineural disease, and the classification of cSCC with PNI remains a challenge.

Study Type: Retrospective.

Study Setting: Academic single institution.

Methods: We identified cases of cSCC with PNI treated with Mohs surgery from 2013-2016. Electronic medical records were reviewed for demographic data, tumor characteristics and clinical course. Histopathologic slides were reviewed from formalin fixed paraffin embedded sections. We scored pathologic features of PNI including the size and number of nerves involved, the depth of nerve involvement, intra- versus extra-tumoral nerve involvement, and isolated versus concentric involvement of nerve sheaths. Based on these pathologic features, each tumor was given a pathologic score of the extent of PNI from 0 (least) to 6 (greatest).

Results: We identified 32 cases of cSCC with PNI. The mean age was 75.8, and the mean tumor size was 2.0 centimeters, ranging from 0.4-4.5 centimeters. There were 17 tumors on the face, 6 on the scalp, 4 on the ear, 3 on the extremities and 2 on the trunk. A total of 8 patients were immunosuppressed and 3 tumors were recurrent. Pathologic scoring of PNI is summarized in Table 1. The mean nerve diameter was 0.12 mm (range 0.03-0.45 mm). A total of 23 patients had PNI of nerves >0.1 mm, 19 patients had >2 nerves involved, and 19 patients had nerves involved in the subcutis or deeper tissue. Four patients had extra-tumoral extension of PNI and 19 patients had circumferential nerve sheath involvement. The mean pathologic score was 3.1 for all cases

and 5.0 for those presenting with recurrent disease. The mean duration of follow-up was 27.5 months. Three patients had adverse events, including one local recurrence, one metastasis and one tumor-related death. The mean pathologic score for patients with an adverse event was 4.3; all three had circumferential nerve sheath involvement, and two were immunosuppressed. The two patients with metastasis or death had PNI in >2 nerves, diameter >0.15 mm, and PNI depth at least in the subcutis.

Conclusion: Patients with adverse outcomes due to cSCC with PNI tended to have larger nerves involved, a greater number of nerves involved, deeper PNI, and circumferential nerve sheath involvement. While this was not a quantitative study, it suggests that additional factors beyond nerve diameter will be important to consider in future studies of PNI and its clinical significance.

Histopathologic Parameters of Perineural Invasion

Size of nerve	Number of Cases
<0.1mm	9
0.1-0.15mm	10
>0.15	13
Number of nerves	
1-2	13
>2	19
Depth	
Dermis	13
Subcutis or deeper	19
Extension	
Intratumoral	28
Extratumoral	4
Degree of PNI	
Isolated cells	13
Circumferential involvement >50% of sheath	19

14

Presenter: Adam Schmitt, MD, MS

Title: Clinicopathologic Characteristics, Tumor Staging, and Outcomes of Patients with Metastatic Cutaneous Squamous Cell Carcinoma

Authors: Adam Schmitt, MD, MS[1]; Aaron Mangold, MD[2]; Connor Maly[2]; Lanyu Mi[2]; Christian Baum, MD[1]

Institutions: 1. Mayo Clinic, Rochester, MN
2. Mayo Clinic, Scottsdale, AZ

Introduction & Objectives: Cutaneous squamous cell carcinoma (cSCC) is the second most common type of skin cancer. While most cSCCs do not behave aggressively, studies estimate a 2-5% rate of nodal metastasis, and an estimated 3,932-8,791 people die from cSCC in the United States each year. Our aim is to identify clinicopathologic features and outcomes of a cohort of patients with metastatic cSCC, allowing clinicians to more readily identify patients at highest risk of recurrence, metastatic disease, and disease-specific death.

Study Type: Retrospective chart review.

Study Setting: Academic center.

Methods: A retrospective review was performed of patients with metastatic cSCC seen at our institution between 2000 and 2015. Patient, tumor, and outcome data were abstracted. Available histology was reviewed to confirm histologic characteristics, such as level of differentiation, level of invasion, and presence of perineural involvement. Primary tumors were staged according to the Brigham and Women's Hospital (BWH) staging system for cSCC, in which T2b/T3 tumors account for the majority of adverse outcomes, despite comprising only 5% of the total number of cSCCs.

Results: A total of 45 patients met study inclusion criteria. The majority (38/45, 84%) of patients were male. Nine patients (20%) were immunosuppressed iatrogenically at the time of diagnosis. More than half (25/45, 56%) had a history of tobacco use. The median age at the time of metastasis was 77. The most common location of metastasis was local-regional lymph nodes (37/45, 82%), followed by non-nodal metastases (5/45, 11%) and concurrent solid organ and nodal metastases (3/45, 1%). Disease-specific death occurred in at least 10 patients, and the median time from metastasis to death was 321 days. Histologically, most primary tumors were either poorly differentiated or undifferentiated (26/45, 58%). Twenty tumors could be staged by BWH criteria based on available data, with 0 cases staged as T1, 1 as T2a, 9 as T2b, and 10 as T3. Among the 25 cases of indeterminate stage, six were at least T2b. Thus, at least 25 (56%) cases fell into either the T2b or T3 stages.

Conclusion: Cutaneous squamous cell carcinomas may behave aggressively in a certain contingent of patients. Elderly men and those with a history of tobacco use and immunosuppression are disproportionately represented in this group. BWH stage T2b/T3 tumors appear to be at highest risk for metastasizing. Disease specific death occurs quickly, often within one year of metastasis. Genomic and epigenetic studies will be performed on tumors that metastasized to identify unique genomic and epigenetic changes that may predict which patients are at highest risk of nodal metastasis and disease specific death. These findings will be compared to non-metastatic cSCCs with matched tumor stage and clinicopathologic features.

15

Presenter: Daniel B. Eisen, MD

Title: Interrupted Subdermal Suture Spacing During Linear Wound Closures and the Effect on Wound Cosmesis: A Randomized Evaluator Blinded Split Wound Comparative Effectiveness Trial

Authors: Karin Eshagh, MD[1]; Daniel B. Eisen, MD[1]

Institution: 1. UC Davis, Sacramento, CA

Introduction & Objectives: Background: Sutures are the standard of care in repairing cutaneous wounds. Most surgical reconstructions following Mohs micrographic surgery and standard surgical excisions require two layers of sutures: a deep layer and a top layer. Some surgeons feel the need to place many deep sutures in order to reduce tension on the sutures and hence decrease the chance of wound separation and dehiscence. However, there are other surgeons who feel that deep sutures are only required in areas of high tension and that a higher number of deep sutures increases the risk of a spitting suture which leads to patient anxiety and poor wound cosmesis. Thus, it is important to understand if an increased number of subdermal sutures is actually beneficial in terms of wound cosmesis. To our knowledge, there are no studies published on the effect of subdermal suture spacing on wound cosmesis.

Objective: To determine whether the spacing between subdermal interrupted sutures during repair of linear cutaneous surgery wounds

affects scar cosmesis. In other words, the goal was to determine which of the following yields a more cosmetically appealing scar: many closely approximated subdermal sutures or fewer, more widely spaced subdermal sutures. The study specifically compared the effects of one versus two centimeter spacing between sutures.

Study Type: Randomized controlled trial, evaluator blinded, split wound model.

Study Setting: Academic center.

Methods: 50 patients were enrolled in a randomized clinical trial using a split wound model, where half of the wound was repaired with sutures spaced two centimeters apart and the other half was repaired with sutures spaced one centimeter apart. Both the physician and patient were blinded as to which side received which treatment. Three-months post-surgery, the scar was evaluated via POSAS: the Patient and Observer Scar Assessment Scale, a validated scar instrument.

Results: The total mean Patient Observer Scar Assessment Scale score for observers for the side that received 1 cm-spaced subdermal sutures and the side that received 2 cm-spaced subdermal sutures did not differ significantly at 3 months (p=0.34). There was also no significant difference in the patient assessment scale score between the side with 1 cm spaced sutures versus the side with 2 cm spaced sutures at 3 months (p=0.084).

Conclusion: We found that 1 cm suture spacing was not significantly associated with improved overall scar assessment compared with 2 cm suture spacing when evaluated by blinded observers or the patients themselves. Our results do not support the use of increased subdermal sutures for improvement of cosmetic outcome.

16

Presenter: Colton B. Nielson

Title: Skin Cancer Awareness in Solid Organ Transplant Recipients: Patient Survey Study

Authors: Colton B. Nielson[1]; Abel Torres, MD, JD, MBA[1]

Institution: 1. University of Florida, Gainesville, FL

Purpose: To assess patient education and knowledge of the increased risk of skin cancer following solid organ Transplant. Reveal risk factors that place solid organ transplant patients at increased risk of non-melanoma skin cancer.

Summary: Solid organ transplant recipients (SOTRs) represent a complex patient demographic for Mohs surgeons. In 2017, over 34,000 transplants were performed in the United States.1 Non-melanoma skin cancer (NMSC) is the most common malignancy with an increased incidence of 60-250 times for squamous cell carcinoma (SCC) and 10-40 times for basal cell carcinoma (BCC), respectively.2 NMSC is responsible for up to 8% of cancer-specific death in transplant recipients.3 Yet, few studies have evaluated risk factors, patient education and knowledge of skin cancer in the transplant population.

Design: We provide a survey study of 107 SOTRs (62 male, 45 female) designed to assess these questions. Logistic regression and chi-square analysis were performed. Statistical significance was defined as a p-value of 0.05 or less.The average age of our patient population was 55 years old (range 20-84). Seventy-eight patients received an abdominal transplant (kidney, liver, pancreas), while 29 received a thoracic transplant (heart and lung). Our study determined SOTRs who had a sunburn before age 18 were 2.68 (95% CI~0.16 – 0.85) more likely to be diagnosed with skin cancer or AKs compared to patients without prior sunburn before the age of 18. SOTRs with a history of tanning bed use were 3.85 times (95% CI~0.07 – 0.96) more likely to be diagnosed with skin cancer (p=0.042) or AKs than SOTRs with no prior history of tanning-bed use. Patients performing monthly self-skin-examinations were 4.63 times (p=0.001) more likely to be diagnosed with any type of skin cancer or AKs. SOTRs who were familiar with the appearance of precancerous skin lesions were 5.7 times more likely (p<0.001) to be diagnosed with any type of skin cancer of AKs than patients that could not identify precancerous lesions. Those with previous skin checks were 9.52 times (p<0.001) more likely to be diagnosed with any type of skin cancer or AKs than a patient with non-previous skin checks. Blue eyed SOTRs were 11.1 times more likely (95% CI~0.03 – 0.28) to be diagnosed with any type of skin cancer or AKs than non-blue-eyed patients. These statistics emphasize the importance of patient education, skin surveillance, and early recognition and treatment in the SOTR population.

Conclusion: SOTRs represent a significant and high risk population for dermatological surgeons. Proper risk stratification and patient education on risk factors and preventative measures can reduce patient morbidity and ultimately patient mortality. This study both confirms previously described risk factors and introduces several new factors to consider in the management of this complex patient population.

Statistically significant findings (Development of AK or NMSC)	Odds Ratio (P< 0.05)
History of sunburn before age 18	2.7
Thoracic transplants vs. Abdominal transplants	3.9
History of tanning beds	3.9
Do you or someone you know perform a skin exam monthly	4.6
Do you know what pre-cancerous or cancerous skin lesions look like	5.7
Previous skin exam	9.5
Blue eyes	11.1

17

Presenter: Radhika Srivastava, BA

Title: Gender Disparities in Reimbursement among Board-Certified Dermatologists and Dermatologic Surgeons

Authors: Radhika Srivastava, BA[1]; Ann M. John, MD[1]; Troy Brancard, BA[2]; Roger Henry, MBS[1]; Pamela A. Ohman-Strickland, PhD[2]; Bahar F. Firoz, MD, MPH[1]

Institutions: 1. Rutgers Robert Wood Johnson Medical School, Somerset, NJ
2. Rutgers University School of Public Health, West Piscataway, NJ

Introduction & Objectives: Several studies have demonstrated gender disparities in compensation across various specialties in medicine (1-3). However, no similar study has been performed in the field of dermatology.

Study Type: Survey-based cross-sectional.

Study Setting: Academic.

Methods: We performed a survey-based cross-sectional study to determine if there is a difference in several factors, including compensation, between male and female board-certified dermatologists.

Anonymous surveys were distributed to approximately 20% of the American Academy of Dermatology membership in 2018.

Results: There were a total of 397 respondents. Of the overall group of dermatologists, 53.65% were female and 46.35% were male. Of these 397 respondents, 66 (16.62%) respondents completed surgical fellowships (34 men and 32 women).

Overall, chi squared analysis showed a statistically significant difference in annual total income between male and female dermatologists (p=<.0001), with male dermatologists earning a significantly higher salary (Figure 1). Interestingly, in a subgroup analysis of dermatologic surgeons (Figure 2), although women earned on average $49K less than men, chi squared analysis showed no significant difference (p=0.1669). Female dermatologic surgeons were more often employed in academic settings (p=0.0453) compared to males more often employed in group private practices.

Statistical significance existed between male and female dermatologic surgeons in maternity or FMLA leave taken over their careers, with 54.83% of women reporting leave taken, as compared to 12.12% of male dermatologic surgeons (p=0.0004). Chi squared analysis showed a significant difference in hours worked per week in direct patient care between male and female dermatologic surgeons (p=.0092), with 70.97% of male surgeons working 40+ hours per week, as compared to 32.14% of female surgeons. Interestingly, there was no significant difference in patient visits per week between male and female dermatologic surgeons (p=0.1454). Despite this discrepancy, there was no statistical difference in income. No significant differences existed between male and female surgeons comparing scientific publications, degrees held, pay structure of the practice, weeks worked per year, number of residencies completed, private verses public medical school at graduation, involvement in clinical trials or NIH funding, or rural verses urban settings.

Univariate and multivariate regression analyses found that none of the aforementioned variables had a significant impact on the income of dermatologic surgeons.

Conclusion: In 2018, self-reported discrepancies in salary between male and female dermatologists exist (1, 3). However, within the subgroup of dermatologic surgeons, there is no statistically significant difference in annual total income between men and women. Our data suggests that completion of a surgical fellowship attenuates the income differences seen in the overall population of dermatologists.

References:

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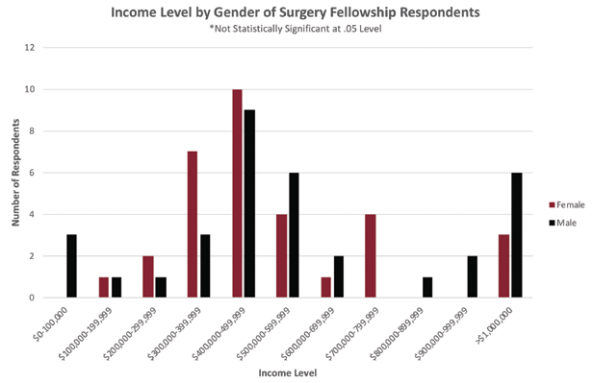
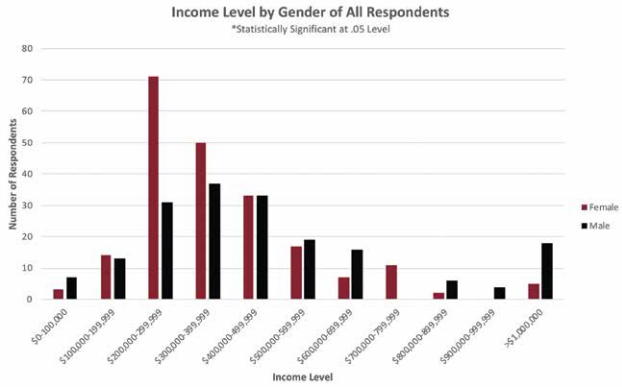




18

Presenter: Brandon T. Beal, MD

Title: Evaluating the Impact of Margin Documentation and Margin Appropriateness on Cutaneous Squamous Cell Carcinoma Outcomes

Authors: Brandon T. Beal, MD[1]; David Xiong, BS[1]; Hannah Cundall, BS[1]; Vamsi Varra, BS[1]; Marla Rodriguez, BS[1]; Neil Woody, MD[1]; Allison T. Vidimos, MD, RPh[1]; Shlomo A. Koyfman, MD[1]; Thomas Knackstedt, MD[1,2]

Institutions: 1. Cleveland Clinic Foundation, Cleveland, OH
2. MetroHealth, Cleveland, OH

Introduction & Objectives: Multiple organizations outline recommended excision margins for squamous cell carcinoma (SCC). Documentation of margins in the operative report has intuitive benefits for reimbursement and outcomes tracking. However, to our knowledge, the direct relationship between margin documentation, margin appropriateness, and outcomes in conventional wide local excision (WLE) of SCC has not been studied.

Study Type: Retrospective cohort study.

Study Setting: Single institution academic tertiary care medical center.

Methods: An IRB-approved single institution registry of patients with invasive SCC between January 1, 2010 and December 31, 2012 was utilized. Patient demographics, tumor characteristics, and treatment variables were extracted. Incomplete medical records were excluded. All surgical specialties were included. Tumors with local invasion beyond the fat, nodal disease, or distant disease were excluded to allow for uniform comparison.

Margin appropriateness was graded and stratified into three groups: 1) Documented margins and appropriate margins, 2) Documented and inappropriate margins, and 3) No documentation of

surgical margins. NCCN guidelines (4-6 mm margins) were used to determine margin appropriateness. Primary endpoints were the need for a subsequent surgical procedure due to positive excision margins and tumor recurrence. Data was analyzed using JMP Pro 14 (SAS, Cary, NC). Results with $p<0.05$ were considered statistically significant.

Results: A total of 832 SCC occurring in 565 patients were included. Demographics and tumor specific variables are presented in Table 1.

65.3% (n=521) excisions had documented margins, with 71% (n=369) of those falling within the 4-6mm guideline recommended by the NCCN. 6.2% (N=51) excisions resulted in positive margins requiring a subsequent surgical procedure. 4.9% (N=41) of excised tumors recurred, with 32 local recurrences, 8 nodal or regional metastasis, 2 in-transit metastases, and no cases of distant metastases.

Analysis of excisions by surgical specialty (dermatologist vs non-dermatologist) and matched for BWH Stage demonstrates that positive margin status (p=0.0001) and recurrence after treatment (p=0.009) were significantly more common amongst non-dermatologists. In a multiple logistic regression model of tumor recurrence, recurrent tumor status at presentation (OR 28.4, 95% CI 9.9-81.6, $p<0.0001$) and Head & Neck location (OR 3.7, 95% CI 1.4-9.7, p=0.009) were significantly associated with increased odds of overall tumor recurrence. In a multiple logistic regression model of positive surgical margins, lack of margin documentation (OR 5.6, 95%CI 1.8-16.9, p=0.002), and Head/Neck location (OR 4.5, 95% CI 2.1-9.4, $p<0.0001$) were significantly associated with increased odds of positive margins on excision.

Conclusion: Documentation of surgical margins during WLE is significantly associated with lower rates of positive margins on pathology. Documentation of surgical margins in SCC reduces the need for re-excision. Tumor recurrences are more frequently observed with non-dermatologist surgeons. Margin documentation can serve as a quality metric for surgical excision of SCC.

Variable	N (%)
Age at Diagnosis (years)	71.1 (SD 13.0)
Gender	
- Male	457 (54.93)
- Female	375 (45.07)
Immunosuppression	
- No	673 (80.89)
- Yes	159 (19.11)
Tumor Differentiation	
- Well	622 (74.85)
- Moderate	94 (11.31)
- Poor	21 (2.53)
- Undifferentiated	1 (0.12)
- Unknown	93 (11.19)
Anatomic Location	
- Head & Neck	161 (19.35)
- Non-Head & Neck	671 (80.65)
Tumor Size (cm)	1.43 (SD 1.19)
Perineural Invasion	
- Yes	16 (1.92)
- No	816 (98.08)
BWH Stage	
- T1	673 (80.89)
- T2a	143 (17.19)
- T2b	14 (1.68)
- T3	2 (0.24)
Treatment Status	
- Primary	796 (95.90)
- Recurrent	34 (4.10)
Surgical Margins Specified	
- Yes	521 (65.29)
- No	277 (34.71)
Surgical Margins NCCN Appropriate	
- Yes	369 (71.10)
- No	150 (28.90)
Inappropriate Surgical Margin	
- <4 mm	87 (58.00)
- > 6 mm	63 (42.00)
Treatment Specialty	
- Dermatology	500 (60.10)
- Non-dermatology	309 (37.14)
- Unknown	23 (2.76)
Surgical Margin Status	
- Negative	774 (93.82)
- Positive	51 (6.18)
Tumor Recurrence	
- Yes	41 (4.93)
- No	791 (95.07)

NCCN: National Comprehensive Cancer Network

19

Presenter: Nayoung Lee, MD

Title: Efficacy of Smoke Evacuation Systems in the Filtration of Particulate Matter Present in Surgical Plume

Authors: Nayoung Lee, MD[1]; S. Brian Jiang, MD[1]

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

Introduction & Objectives: Dermatologic surgeons are exposed to significant amounts of surgical smoke on a daily basis. Many have expressed concerns about long-term health risks, including transmission of infections, cardiopulmonary disease and carcinogenesis. Surgical smoke is composed of ultrafine and fine particulates, including volatile organic compounds that are well known to be toxic. Although the effects of chronic electrosurgical smoke exposure in humans has been difficult to study, animal models and in vitro studies have demonstrated various deleterious effects. In light of this evidence, in addition to the anecdotal reports of viral transmission in dermatologic surgeons, dermatologists should take precaution against surgical plume. Multiple modalities exist that are designed to reduce smoke exposure during procedures, ranging from to the basic procedural mask to various smoke evacuation machines. However, little is known about the relative efficacy of these vacuum filtration systems. We sought to investigate the efficacy of two smoke evacuation modalities, the nozzle attachment and the pen-style handpiece attachment (figure 1), in the filtration of ultrafine and fine particles present in electrosurgical plume.

Study Type: Clinical pilot study.

Study Setting: Academic center.

Methods: Monopolar electrosurgery was applied for 30 seconds to normal human skin derived from excision of standing tissue cones during procedures. The generated particulate matter levels were recorded using the DustTrack meter to measure fine particles >2.5 µm in diameter and the P-Track meter to measure ultrafine particles >0.1 µm in diameter. This was performed in the presence of vacuum filtration via the nozzle attachment (n=10) or via the pen attachment (n=10). Measurements were performed at a distance of 18 inches from cauterization to simulate a real life scenario.

Results: Significant reductions in ambient fine particulate matter >2.5 µm in diameter (figure 2A) and ultrafine particulate matter >0.1 µm in diameter (figure 2B) were seen in both the nozzle ($p=0.0001$, $p<0.0001$, respectively) and the pen groups ($p=0.0001$, $p<0.0001$, respectively). When the two modalities were compared to each other, there was no significant difference in the filtration efficacy of fine ($p=0.3553$) or ultrafine ($p=0.5873$) particulates.

Conclusion: Despite the alarming data on the hazards of surgical plume, smoke evacuation systems are not widely used by dermatologic surgeons. Some reasons cited as the cause of noncompliance with smoke evacuation include loud noise, bulkiness, and cost. The data in this study not only demonstrates the marked reduction of aerosolized particulate matter released during electrosurgery when smoke evacuation is utilized, but it also suggests that the more cost efficient nozzle attachment could be as effective in the filtration of both ultrafine and fine particulate matter as the pen attachment that must be replaced with each patient.

Thus, the decision to choose one modality over the other should consider the associated cost, ease of use and feasibility, in addition to surgeon preference.

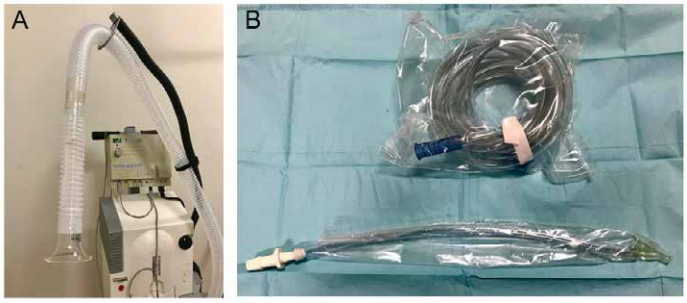


Figure 1. Smoke evacuation system with the nozzle (A) and handpiece (B) attachments.

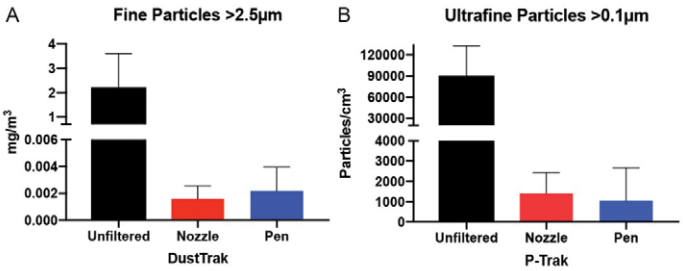


Figure 2. Comparative efficacies of the nozzle and pen-style handpiece attachments in the filtration of fine (A) and ultrafine (B)particles.

20

Presenter: Toral S. Vaidya, MPH

Title: Patient Satisfaction with Facial Appearance and Scar Outcome after Skin Cancer Surgery

Authors: Thomas Bander, MD[1,2]; Toral S. Vaidya, MPH[1]; Erica Lee, MD[1]

Institutions: 1. Memorial Sloan Kettering Cancer Center, New York, NY 2. Weill Cornell Medical Center, New York, NY

Introduction & Objectives: Surgical outcomes after treatment of keratinocyte carcinoma and early stage melanoma have traditionally been assessed from the surgeon's perspective. The FACE-Q Skin Cancer Module is a validated patient-reported outcome measure that comprehensively evaluates surgical outcomes and satisfaction from the patient's point of view. It measures five independently functioning scales in three domains: appearance (i.e., facial satisfaction and scar bother), health-related quality of life (i.e., cancer worry and appearance-related psychosocial distress), and information (i.e., skin cancer appearance after surgery). The purpose of this study is to elucidate factors that contribute to satisfaction and quality of life in patients undergoing facial surgery for skin cancer.

Study Type: Prospective cross-sectional study.

Study Setting: Academic center.

Methods: All patients 21 years or older who were diagnosed with skin cancer and underwent dermatologic surgery from March 2016 through March 2018 were identified and invited to participate in the study. Of 1049 eligible patients, 412 (51% male, median age 67, range 28-94 years) answered one or more of the following post-operative FACE-Q questionnaires: Satisfaction with Facial Appearance, Appraisal of Scars, and Appearance-Related Psychosocial Distress (response rate 39.3%).

Results: Patient-reported outcomes were analyzed based on demographics, wound repair technique, surgery location, and past medical history. Higher satisfaction with facial appearance was associated with male gender, older age (>65 years), and married status. Primary repair closures were associated with higher facial satisfaction, while flap repairs were associated with lower facial satisfaction. Of all wound healing types, flap repair was associated with lowest facial satisfaction.

Among facial anatomic locations, the nose was associated with the most scar bother. Patients with history of two or more recently treated facial skin cancers and those who underwent flap repair had greater scar bother. Greater appearance-related psychosocial distress was seen in individuals with prior history of anxiety and/or depression and in those with recent history of two or more facial skin cancer surgeries.

Conclusion: This study evaluated patient-reported outcomes after facial skin cancer surgery. Many variables contribute to an individual patient's cancer worry, psychosocial distress, and satisfaction with surgical scars and overall facial appearance. Better understanding of the patient experience before, during, and after surgery may guide pre- and post-operative clinical counseling to improve patient care and quality of life.

21

Presenter: Peter G. Bittar, MD

Title: Developing Standards for Surgical Technique of Mohs Micrographic Surgery with Frozen Section Cytokeratin-7 Immunostains for Primary Extramammary Paget's Disease (EMPD): No Local Recurrences and Favorable Patient-Reported Assessment of Function and Scar Appearance in 20 Cases

Authors: Julie M. Bittar, BA[1]; Donald E. Neal, BA[2]; Marilyn T. Wan, MBChB, MPH[3]; Peter G. Bittar, MD[1]; John M. Sharkey, BA[4]; Jeremy R. Etzkorn, MD[3]; Thuzar M. Shin, MD, PhD[3]; Joseph F. Sobanko, MD[3]; Christopher J. Miller, MD[3]

Institutions: 1. Indiana University School of Medicine, Indianapolis, IN
2. Sidney Kimmel Medical College, Thomas Jefferson University, Philadelphia, PA
3. Hospital of the University of Pennsylvania, Philadelphia, PA
4. St. George School of Medicine, Grenada

Introduction & Objectives: Conventional surgery for EMPD has high rates of positive margins and local recurrence (LR), and wide margins or additional surgeries to remove residual disease may negatively impact function and appearance. Mohs micrographic surgery (MMS) reduces the risk of LR, but variations in technique may contribute to higher LR rates in some studies. No study has examined patient perception of function and appearance after MMS for EMPD. Developing standards for MMS of EMPD may result in uniformly superior outcomes.

We aim to describe the surgical techniques used for a cohort of patients who had primary EMPD treated with MMS and intraoperative frozen section cytokeratin-7 (CK-7) immunostains, and to evaluate patient-reported assessment of function and appearance after surgery.

Study Type: Retrospective Cohort Study.

Study Setting: Academic Center.

Methods: We identified from a prospectively-updated database all EMPD patients treated with MMS at our center between 2009 and 2016. MMS followed one of two protocols: 1) comprehensive MMS with frozen section microscopic evaluation of the complete peripheral and deep margins, or 2) modified MMS with en face frozen section microscopic evaluation of a strip of skin excised to fascia around the peripheral tumor margin and repaired with sutures; followed by en bloc excision of the central tumor and immediate reconstruction under general anesthesia with post-reconstruction assessment of the deep margin with formalin-fixed paraffin-embedded breadloaf sections. All MMS frozen sections were examined with both Hematoxylin & Eosin and CK-7 immunostains. LR, defined as biopsy-proven EMPD arising within the scar of MMS, and follow-up data were obtained via review of records and phone calls to patients. Patient assessment of postoperative appearance and function was evaluated via survey administered by phone or email.

Results: Twenty cases of EMPD diagnosed in 19 patients were treated with MMS between 2006 and 2016 (Table 1). 85% (17/20) of cases were treated with comprehensive MMS and 15% with modified MMS. More than one stage of MMS was necessary to clear the tumor in 35% (7/20) of patients. No tumors had LR during mean follow-up of 45.1 months.

All patients completed the survey to assess postoperative scar appearance and function (Table 2). The majority reported satisfaction with scar (17/19,89.5%), no pain/discomfort (17/19,89.5%), no decreased sensation (14/19,73.7%), no tightness (14/19,73.7%), and no change in function (14/19,73.7%). Patients with genital EMPD reported no pain with intercourse (16/17,94%) and no difficulty reaching orgasm (16/17,87.5%). Women reported no lubrication difficulty (6/6,100%), and men reported no difficulty with erection (10/11,91%).

Conclusion: Comprehensive and modified MMS with CK-7 immunostains result in low LR rates and high rates of patient satisfaction with postoperative appearance and function. Standardizing technique with CK-7 immunostains and rational use of comprehensive versus modified MMS may reduce variation in LR rates and patient-reported outcomes after MMS for primary EMPD.

Table 1. Cohort characteristics (n=20 tumors in 19 patients)

Gender		
Male	12/19 (63.2%)	
Female	7/19 (36.8%)	
Age, years		
Range	49 – 78	
Mean	65.3	
Median	64	
Location		
Genitalia	18/20 (90%)	
Axilla	2/20 (10%)	
Follow-up, months		
Range	13 – 93	
Mean	45.1	
Median	37.5	
Local Recurrence	0/20 (0%)	

Table 2. Patient reported outcome data (n=19 patients)

	Genital (n=17)			Axilla (n=2)	
	N	%	95%CI	N	%
Gender					
Male	11	64.11	38.32-85.79	1	50.00%
Female	6	35.29	14.2-61.67	1	50.00%
Pain/Discomfort					
Yes	3	17.65	3.80-43.43	0	0.00%
No	14	82.35	56.57-96.20	2	100.00%
Decreased Sensation					
Yes	5	29.41	10.31-55.96	0	0.00%
No	12	70.59	44.04-89.69	2	100.00%
Tightness					
Yes	5	29.41	10.31-55.96	0	0.00%
No	12	70.59	44.04-89.69	2	100.00%
Range of motion					
No	N/A			2	100.00%
Difficulty with Lubrication (n=6) - *Women Only*					
No	6	100	N/A	N/A	
Pain with intercourse					
No	16	94.12	71.31-99.85	N/A	
Missing	1	5.88			
Difficulty with Erection (n=11) - *Men only*					
No	10	90.9	58.72-99.78	N/A	
Missing	1	9.1			
Difficulty reaching orgasm					
No	16	87.5	71.31-99.85	N/A	
Missing	1	5.88			
Satisfaction with appearance of scar					
Strongly agree	9	52.94		2	100.00%
Somewhat Agree	6	35.29		0	0
Neutral	1	5.88		0	0
Disagree	0	0		0	0
Strongly disagree	1	5.88		0	0
Has not affected physical function					
Strongly agree	11	64.71		2	100.00%
Somewhat Agree	1	5.88		0	0
Neutral	2	11.76		0	0
Disagree	3	17.65		0	0
Strongly Disagree	0	0		0	0

22

Presenter: Ally-Khan Somani, MD, PhD

Title: Gene Expression Profiling of Cutaneous Basal Cell Carcinomas and Squamous Cell Carcinomas Reveals Distinct Transcriptomic Landscapes

Authors: Jun Wan, PhD[1]; Hongji Dai, PhD[2]; Xiaoli Zhang, BSc[1]; Yuan Lin, MD, PhD[1]; Ally-Khan Somani, MD, PhD[1]; Jingwu Xie, PhD[1]; Jiali Han, PhD[1]

Institutions: 1. Indiana University School of Medicine, Indianapolis, IN 2. Indiana University, Indianapolis, IN

Introduction & Objectives: Cutaneous basal cell carcinoma (BCC) and squamous cell carcinoma (SCC) represent non melanoma skin cancers. These tumors are also called keratinocyte carcinomas as both of them are originated from keratinocytes. The incidence of keratinocyte carcinomas is over 5 million per year, which is 3 folds higher than the total incidence of all other types of cancer combined. While The Cancer Genome Atlas (TCGA) has generated transcriptome data from many types of cancer, gene expression profiling of BCC and SCC is not publicly available. In this study we decided to analyze gene expression profiles of 25- paired specimens of BCC and the adjacent normal skin tissues as well as 10- paired specimens of SCC and matched normal skin tissues.

Study Type: In vitro gene expression profiling analysis.

Study Setting: Academic Center.

Methods: In this study, we analyzed transcriptome of 10-paired SCC and 25-paired BCC. All samples were from debulked exophytic tumors removed during micrographic surgery. Through comparison of tumor tissues with the adjacent normal skin tissues, we identified tumor-specific gene expression alterations as well as links among known signaling pathways in both BCC and SCC. We also compared BCC and SCC for gene expression patterns. We performed RNA-Seq analysis using Tophat-HTSeq. The webserver, DAVID Bioinformatics Resources 6.8 was used for GO and KEGG pathway analysis. The statistical significance of an overlap between two gene sets was evaluated by the fold enrichment and the p-value. P-value was calculated based on a hypergeometric model.

Results: In summary, we found 1884 up-regulated and 1106 down-regulated genes in BCC tumors in comparison with the matched normal specimens. In SCC tumors, on the other hand, we found 601 up-regulated and 1382 down-regulated genes. Several of these changes in gene expression profiles were confirmed by real-time PCR. Our gene expression analyses confirmed known alterations in BCC and SCC, and revealed additional novel players. We also discovered novel links between several known pathways such as the hedgehog-wnt signaling link as well as the cilium-hedgehog signaling link in BCCs. In addition, we identified distinct and similar gene expression patterns between BCC and SCC. These data will provide a useful resource for researchers in keratinocyte carcinomas and keratinocyte biology.

Conclusion: The distinct transcriptome landscapes from human BCC and SCC identified in our study, via comparison between tumors and matched normal specimens, have confirmed previous known players in BCC and SCC, but also revealed new players as well. With further studies, these results may lead to better understanding of keratinocyte carcinoma biology, or stimulate further investigation on novel therapies for BCC and SCC.

23

Presenter: Panayiota Govas, MD, MScMed

Title: Pain Anticipation and Subsequent Pain Perception with the Application of a Vibratory Stimulus: A Single-Center, Randomized Trial

Authors: Panayiota Govas, MD, MScMed[1]; Rashek Kazi, MD, PhD[1]; Rachel M. Slaugenhaupt[1]; Bryan T. Carroll, MD[1]

Institution: 1. University of Pittsburgh Medical Center, Pittsburgh, PA

Introduction & Objectives: Pain during anesthetic injection is a widespread problem extending beyond dermatology and dermatologic surgery. The anticipation of pain ≥ 4 on the 11-point Numerical Rating Scale (NRS) has been linked to an increase in a patient's perception of procedural pain. Our objective was to assess if the previously reported benefit of cutaneous non-noxious vibration during cutaneous anesthetic injection was equally beneficial in both those that anticipated greater pain (NRS ≥ 4) and those that did not (NRS < 4).

Study Type: A randomized, partially-blinded, parallel-group, single-institution trial.

Study Setting: Academic Center.

Methods: The protocol was approved by IRB, conforms to the ethical guidelines of the Declaration of Helsinki and was registered at clinicaltrials.gov. Participants were adults (18+) undergoing Mohs micrographic surgery (MMS), surgical excision, and/or other cutaneous cancer removal surgery. Participants were randomly selected using the Google Random Number Generator to have a 100-Hz vibratory anesthetic device (VAD) applied for 15s at sites prior to anesthetic injection in the on (VAD ON, n=49) or off (VAD OFF, n=52) mode. Pain score was assessed using the 11-point NRS. Consented subjects completed a pre-procedural questionnaire detailing their baseline pain, anticipated pain, and use of analgesics and/or anti-depressants. Clinical significance was defined as a previously validated decrease in NRS of ≥ 30%.

Results: 150 participants were eligible for the study; 84 consented patients were included with 101 unique events reported. 56 patients were excluded due to non-attendance, language barrier, intellectual disability, or inability to follow instruction. 63% of subjects were male with an overall median age of 66 years (Table 1). The mean anticipated NRS (aNRS) was 2.67 ± 0.64 and 2.92 ± 0.63 in the VAD ON and VAD OFF groups, respectively. The mean NRS at injection (iNRS) was 1.22 ± 0.38 and 2.03 ± 0.54 in the VAD ON vs. VAD OFF groups, respectively. Patients with an aNRS of < 4 showed a 42.5% decrease in iNRS with the application of the VAD. In patients with an aNRS of ≥ 4, there was a 35.6% reduction in iNRS with the application of the VAD (2.53 ± 0.79 vs. 1.63 ± 0.79) (Table 2).

Conclusion: Our study data aligns with the previously validated conclusion stating that patients with anticipated NRS of ≥ 4 have a higher perceived pain than those with NRS < 4. Additionally, we have shown that vibration has a clinically significant benefit, defined as a change in NRS of ≥ 30%, in all patients regardless of their anticipated pain level.

Table 1. Participant Demographics

	VAD OFF		VAD ON	
	aNRS <4	aNRS ≥ 4	aNRS <4	aNRS ≥ 4
Mean Age	69.5	63.0	66.5	60.4
Range	43-88	47-85	43-87	32-89
Male	23	9	23	8
Female	11	8	11	8

***VAD** = vibratory anesthetic device, **aNRS** = Anticipated Numerical Rating Scale*

Table 2. Reported Pain of Participants

	VAD OFF		VAD ON	
Mean aNRS	2.92 ± 0.63		2.67 ± 0.64	
Mean iNRS	2.03 ± 0.54		1.22 ± 0.38	
	aNRS <4	aNRS ≥ 4	aNRS <4	aNRS ≥ 4
Mean aNRS	1.60 ± 0.38	5.65 ± 0.70	1.39 ± 0.39	5.31 ± 0.75
Mean iNRS	1.79 ± 0.71	2.53 ± 0.79	1.03 ± 0.44	1.63 ± 0.79

***VAD** = vibratory anesthetic device, **aNRS** = Anticipated Numerical Rating Scale, **iNRS** = Numerical Rating Scale at Injection*

24

Presenter: Gaurav Singh, MPH

Title: Understanding Public Awareness of Mohs Surgery and Skin Cancer through Social Media Trends

Authors: Gaurav Singh, MPH[1]; Gaurav Singh, MD, MPH[1]; Hao Feng, MD, MHS[1,2]

Institutions: 1. NYU Langone Health, New York, NY;
2. Laser and Skin Surgery Center of New York, New York, NY

Introduction & Objectives: Most Americans utilize social media as a source of health education, and the content they find affects decision to access care. However, dermatology-related social media may contain misinformation. We aimed to describe the publishers and content of top skin-cancer and Mohs surgery-related posts on Instagram. These findings reveal aspects of skin cancer surgery that are important to our patients and the public at large. Understanding these findings can provide a basis for impactful patient education.

Study Type: Retrospective review.

Study Setting: Academic center.

Methods: Instagram selects nine top posts to showcase for each hashtag, as determined by a proprietary algorithm. This algorithm uses a combination of predicted interest, relationship, and timeliness to predict a user's engagement with a particular post, and top posts represent high likelihood of exposure to users. The nine most commonly utilized hashtags related to skin cancer and skin cancer surgery were defined a priori: including "basalcellcarcinoma," "squamouscellcarcinoma," "melanoma," "skincancer," "melanomawareness," "melanomasurvivor," "skincancerawareness," "skincancerprevention," and "mohs." The poster type and image content of each top keyword-related post was analyzed. Poster type was determined by self-report on the content creator's homepage. Posts not related to dermatology, paid advertisements, and duplicates were excluded.

Results: Analysis of nine skin cancer- and Mohs surgery-related hashtags spanned 383,029 posts. 81 top posts, defined by greatest public engagement and exposure, were included in detailed review. 70% of posts were by patients, 14% by dermatologists, 6% by mid-level providers, and 5% by companies. 89% of the Mohs surgery-related posts showcased the defect or repair. 50% of posts demonstrated the lesion, defect, repair, and/or scar. 29% of posts were a photo of the individual without specific focus on the lesion or repair process. 11% of posts showcased wound healing topicals. 6% of posts showcased non-surgical treatments, and 4% of posts were pictures of motivational text. An overwhelming majority of skin cancer- and surgery-related content is created by non-dermatologists and focuses on the defect and/or cosmetic outcome.

Conclusion: Patients, and not physicians, dominate the content and discussion related to skin cancer and surgery on social media. Over 85% of posts were by non-dermatologists, highlighting an opportunity for surgeons to drive impactful social media content on skin cancer and surgery. Half of the overall posts, and an overwhelming majority (89%) of Mohs surgery-related posts focused on cosmesis of the surgical defect or repair. These findings demonstrate that the public's interest in type of skin cancer surgery is on appearance and cosmetic outcome, and not necessarily primarily other factors such as functional outcome or cure rates. A more pronounced discussion on cosmetic outcomes of surgery compared to other treatment modalities may be required to effectively educate and connect with patients, and not doing so may lead patients to select other potentially less desirable treatment methods.

26

Presenter: Daniel Condie, MD

Title: Patient Satisfaction with Mohs Surgery for Melanoma in situ

Authors: Daniel Condie, MD[1]; Jerry Smith, MD[2]; Lindsey West[1]; Divya Srivastava, MD[1]

Institutions: 1. UT Southwestern Medical Center, Dallas, TX
2. Belle Meade Dermatology, Nashville, TN

Introduction & Objectives: Mohs micrographic surgery (MMS) has emerged as an effective surgical treatment for melanoma in situ (MIS), and its use has been deemed appropriate for high risk anatomic sites. The objective of this study was to determine overall patient satisfaction with MMS for MIS, as well as determine what pre-operative, intra-operative, and post-operative variables impact patient satisfaction.

Study Type: Prospective cohort study.

Study Setting: Academic center.

Methods: Data were obtained from a prospective cohort of patients seen at a surgical dermatology clinic. On the day of their surgery, patients were enrolled in the study and completed the appropriate questionnaires, including the Skin Cancer Index, an adapted version of the Charlson Comorbidity Index, 12-Item Short Form Health Survey, and questions regarding socioeconomic information and previous skin cancer history. One week after surgery, patients answered an 18-item version of the Patient Satisfaction Questionnaire, a global satisfaction question, as well as questions regarding post-operative bleeding and infection. Three months after surgery, patients were called and asked a single global question to assess long-term satisfaction.

Overall long-term patient satisfaction with Mohs surgery was dichotomized into satisfied (4-5) versus not satisfied (1-3). High

satisfaction was defined as significantly greater than 50% of the cases indicating satisfaction with the procedure.

Results: Patient, tumor, and operative characteristics are summarized in Table 1. Fifty-five patients were enrolled in the study, and 42 patients completed the long-term satisfaction questionnaire. Ten patients were lost to follow-up, two patients withdrew from the study, and one patient passed away from an unrelated cause. Patients had a mean age of 68.9 years, and the majority of patients were male (90.9%), white (90.9%), and married (67.3%). The majority of tumors were cleared in one stage (69.1%).

Satisfaction data are summarized in Table 2. Overall long-term satisfaction was high, with 40 of 42 patients (95.2%) rating their satisfaction at a 4 or 5. A one sample proportions test was performed to determine the significance of this finding compared to a 0.5 chance level of responding as satisfied. The two sided proportions test using a Yates correction factor resulted in the z statistic = 5.71, $p<0.0001$. Short-term satisfaction was similarly high, with 38 of 41 patients (92.7%) rating their satisfaction at a 4 or 5. Satisfaction was high across all PSQ-18 subscales with mean scores ranging from 4.15 to 4.77 on a 5-point scale.

Given the small sample size and high percentage of patients who were satisfied with MMS, we were unable to determine what pre-operative, intra-operative, and post-operative variables impacted patient satisfaction for this cohort.

Conclusion: Patient satisfaction with MMS for MIS is high. Limitations of the study include small sample size and lack of control group.

Table 1. Characteristics of the Cohort

Variable	Full Cohort (n=55)	Long-term Satisfaction Cohort (n=42)
Preoperative		
Age, mean (SD), years	68.9 (10.4)	68.1 (10.9)
Male gender, No. (%)	50 (90.9)	38 (90.5)
Race, No. (%)		
White	50 (90.9)	39 (92.9)
Other	2 (3.6)	1 (2.4)
Missing	3 (5.5)	2 (4.8)
Annual income, $, No. (%)		
0-40,000	10 (18.2)	7 (16.7)
40,000-80,000	20 (36.4)	15 (35.7)
>80,000	19 (34.5)	16 (38.1)
Missing	6 (10.9)	4 (9.5)
Marital status, No. (%)		
Married	37 (67.3)	30 (71.4)
Not married	12 (28.6)	8 (19.0)
Missing	6 (14.3)	4 (9.5)
Previous skin cancer, No. (%)	30 (54.5)	20 (47.6)
Charlson Comorbidity Index, No. (%)		
0	30 (54.5)	22 (52.4)
1-3	22 (40.0)	19 (45.2)
>3	3 (5.5)	1 (2.4)
12-Item Short-Form Health Survey, mean (SD)		
Physical Component Score	46.9 (11.2)	48.2 (11.0)
Mental Component Score	52.8 (8.8)	52.3 (8.9)
Skin Cancer Index, mean (SD)		
Emotional Subscale	68.7 (23.9)	70.4 (24.5)
Social Subscale	90.4 (13.1)	91.3 (11.1)
Appearance Subscale	81.6 (26.0)	83.1 (27.0)
Total Index	80.2 (17.0)	81.6 (17.0)
Tumor		
Diameter, mean (SD), mm	18.1 (14.9)	16.4 (14.8)
Facial location, No. (%)	41 (74.5)	32 (76.2)
Recurrence, No. (%)	2 (3.6)	1 (2.4)
Intraoperative		
No. of Mohs stages, No. (%)		
1	38 (69.1)	30 (71.4)
2	12 (21.8)	10 (23.8)
3 or more	5 (9.1)	2 (4.8)
Defect diameter, mean (SD), mm	36.9 (19.1)	34.1 (17.5)
Repair type, No. (%)		
Secondary intention	5 (9.1)	4 (9.5)
Primary closure	19 (34.5)	13 (31.0)
Flap	20 (36.4)	18 (42.9)
Graft	11 (20.0)	7 (16.7)
Postoperative		
Bother from bleeding, No. (%)		
Bothered	1 (1.8)	1 (2.4)
Not bothered	40 (72.7)	40 (95.2)
Missing	14 (25.5)	1 (2.4)
Postoperative infection, No. (%)		
Infection	0 (0)	0 (0)
No infection	41 (74.5)	41 (97.6)
Missing	14 (25.5)	1 (2.4)

Table 2. Results

Variable				
Longterm Satisfaction, No. (%)				
Satisfied	40 (95.2)			
Not satisfied	2 (4.8)			
Shortterm Satisfaction, No. (%)				
Satisfied	38 (92.7)			
Not satisfied	3 (7.3)			
Proportion satisfied at Both short and long term	38/41 (92.7)			
		N and % with average of items		
Patient Satisfaction Questionnaire Subscales	Mean (SD)	5	4 to < 5	≥ 4
General Satisfaction	4.57 (0.648)	22 (53.7)	15 (36.6)	37 (90.2)
Technical Quality	4.55 (0.522)	17 (41.5)	17 (41.5)	34 (82.9)
Interpersonal Manner	4.77 (0.355)	27 (65.9)	14 (34.1)	41 (100)
Communication	4.57 (0.608)	23 (56.1)	12 (29.3)	35 (85.4)
Financial Aspects	4.41 (0.591)	15 (36.6)	20 (48.8)	35 (85.4)
Time Spent with Doctor	4.26 (0.776)	15 (36.6)	17 (41.5)	32 (78)
Accessibility and Convenience	4.15 (0.649)	8 (19.5)	20 (48.8)	28 (68.3)

*Longterm satisfaction data available from 42 patients. Short-term satisfaction and Patient Satisfaction Questionnaire Data available from 41 patients.

27

Presenter: Patricia Richey

Title: Tumors of the Nasal Vestibule: Crucial Distinctions

Authors: Patricia Richey[1]; Brian Swick[1]; Hillary Johnson-Jahangir, MD[1]

Institution: 1. University of Iowa, Iowa City, IA

Introduction & Objectives: The diagnosis and treatment of a nasal vestibular mass is often challenging due to the anatomical features of this region. The nasal vestibule, which comprises the most anterior part of the nasal cavity, is lined with keratinizing squamous epithelium and contains vibrissae, sebaceous glands, and sweat glands, features the nasal cavity proper lacks histologically. Squamous cell carcinomas of the nasal vestibule (NV-SCC) account for <1% of all malignant tumors of the head and neck area and 3.8% of all nasal skin tumors.

NV-SCC may be misdiagnosed as squamous papillomas – benign exophytic, warty tumors without potential for malignant transformation, inverted follicular keratosis (IFK), Schneidarian papilloma, seborrheic keratosis (SK), trichilemmoma or trichofolliculoma. Consequently, a delay of the correct diagnosis is frequently observed in clinical practice, leading to a poor prognosis. Despite its similar morphologic pattern, NV□SCC is considered to be more aggressive than other nonmelanoma skin cancers of the head and neck, although there is scarce literature on outcomes.

In this retrospective analysis, we sought to examine the clinicopathological features of nasal vestibule lesions seen at our institution over a period of 23 years (1991-2014).

Study Type: Retrospective review.

Study Setting: Academic Center.

Methods: Of 122 cases of nasal vestibular lesions, 54 were reviewed by our dermatopathologist. Chart review of patients with a diagnosis of NV-SCC was performed.

Results: Of 122 cases of nasal vestibular lesions, 54 were reviewed by our dermatopathologist, revealing discordance in 8 diagnoses, a consensus rate of about 85% (Table 3). There were 22 patients with a diagnosis of NV-SCC, and their past history, treatment and clinical outcomes were noted. Of 22 patients with NV-SCC, the majority (19/22) presented to our institution with recurrence after treatment at an outside facility, consisting of combinations of radiotherapy, surgical excision and Mohs surgery, laser ablation and brachytherapy. Seven patients had >2 treatments and/or procedures with resultant recurrences. Of those who presented with recurrence and were subsequently treated at our institution, the majority (7/8) died from their disease within several years, as a result of both aggressive morphology and delayed diagnosis.

Conclusion: We discuss the outcomes in these cases to display not only the aggressive nature of NV-SCC, which is associated with worse outcomes than squamous cell carcinoma of other regions of the body, but also to show the importance of correct initial pathologic diagnosis, as well as proper initial management. Early detection and appropriate multidisciplinary management can greatly improve these patients' outcomes.

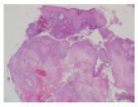
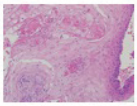
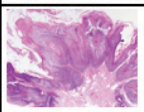
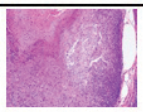
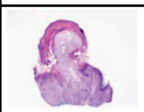
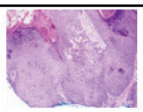
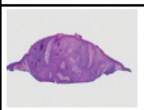
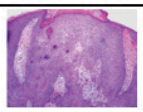
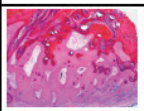
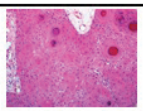
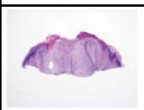
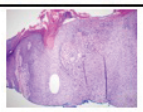
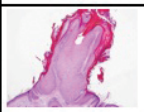
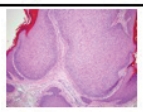
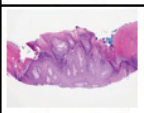
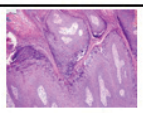
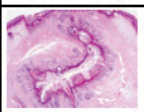
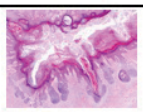
Diagnosis	Low Magnification Image	High Magnification Image	Descriptions
NV-SCC			-Inappropriate keratinization at depth (keratin pearl) with glassy epithelium eddies
Inverted Follicular Keratosis			-Rounded lobular base with papillomatous non-infiltrative silhouette -Peripheral basaloid cells -Central squamatized cells -Swirling squamous eddies
Inverted Follicular Keratosis			-Outer root sheath derivation -Papillomatous silhouette and endophytic rounded lobules -Central focus of invasive looking basal epithelium (desmoplasia), similar to trichilemmoma, desmoplastic variant
Inverted Follicular Keratosis			-Multilobulated endophytic growth -Minimal papillomatous silhouette -Peripheral basaloid cells -Abundant squamous eddies -Small central focus of desmoplasia
Seborrheic Keratosis			-Flat bottomed and confluent (versus the rounded lobular folliculocentric growth in IFK) -Abundant pseudo-horned cysts -Squamous eddies
Trichilemmoma			-Endophytic folliculocentric epithelial proliferation with pale (clear) cells -Peripheral palisading of basaloid cells without mucinous stromal retraction -Desmoplastic pattern
Papillomatous Trichilemmoma			-Rounded endophytic lobular base -Clear cell differentiation -Peripheral palisading of basaloid cells
Squamous papilloma			-Papillomatous silhouette -Hypergranulosis -Intoeing and arborization of the rete ridges -Presence of koilocytes
Trichofolliculoma			-Radiating follicular secondary and tertiary lobules -Ensheathing fibrous stroma

Table 1. Histopathological features of nasal vestibule neoplasms.

Total number of patients	122
Average age at diagnosis	63.8
Type	**Number of Diagnoses**
BCC	12
Basosquamous cells	1
Acanthosis	4
Hyperkeratosis	6
Parakeratosis	5
Chronic Inflammation	10
Acute inflammation	7
Adenosquamous cell carcinoma	2
Adenocarcinoma	1
Pleomorphic adenoma	1
Verruca Vulgaris	10
Squamous papilloma (Wart)	14
Verrucous Keratosis	3
Capillary Hemangioma	2
Foreign body	1
Trichilemmoma	2
Seborrheic Keratosis	3
Polyp (6)	6
Polypoid lesion	2
Fibroepithelial polyp	1
Inflammatory polyp	1
Granulation polyp	1
Benign hamartomatous polyp	1
Schneidarian papilloma (4)	4
Exophytic papilloma	1
Inverted papilloma	2
Fungiform papilloma	1
SCC	22
Fibrosis	4
Fibrous Papule	1
Fibrosarcoma	1
Solitary Cutaneous Neurofibroma	1
Pyogenic Granuloma	3
Papule	1
Fungal	3
Invasive fungal sinusitis	2
Invasive fungal forms	1
Necrotic tissue	4
Leiomyosarcoma	1
Spindle cell carcinoma	1
Trichoepithelioma	1
Malignant melanoma	2
Ulcer	5
Radiation reaction	2
Cautery artifact	1

Table 2. List of nasal vestibular diagnoses at our institution 1991-2014.

Initial Diagnosis	Post-review
SCC	Seborrheic Keratosis
Verrucous keratosis	IFK
Verruca vulgaris	Trichilemmoma
Squamous proliferation	BCC
Squamous papilloma	Wart
Squamous mucosa with underlying fibrosis	Fibrous papule (angiofibroma)
Leiomyosarcoma, low grade	Atypical fibroxanthoma
Fibrosis and hyperkeratosis	Angiofibroma

Table 3. Concordance rate after dermatopathologist review of nasal vestibule diagnoses 1991-2004. 54 out of 122 cases of nasal vestibule lesions diagnosed from 1991 to 2014 were reviewed by our dermatopathologist and discordance occurred in 8 diagnoses (see below), with a consensus rate of about 85%

28

Presenter: Nour Kibbi, MD

Title: Photodynamic Therapy for Primary Squamous Cell Carcinoma in situ: Impact of Anatomic Location, Tumor Diameter and Incubation Time on Efficacy

Authors: Nour Kibbi, MD[1]; Yuemei Zhang, MD[1]; David J. Leffell, MD[1]; Sean R. Christensen, MD, PhD[1]

Institution: 1. Yale University, New Haven, CT

Introduction & Objectives: Photodynamic therapy (PDT) is a reported treatment for squamous cell carcinoma in situ (SCCis) with cure rates ranging from 50 to 100%. There is limited data on the use of PDT with aminolevulinic acid (ALA) and blue light for SCCis. Our objective was to identify patient-, tumor-, and treatment-related variables that influence response.

Study Type: Retrospective study.

Study Setting: Single-institution, academic center.

Methods: We performed a retrospective study of 71 cases of biopsy-proven primary SCCis in 60 patients: 47.9% male, mean age 78.1 years (range 50-98). Forty-three cases (60.6%) were treated with a single PDT treatment and 28 (39.4%) with 2-4 PDT treatments, of which only 3 received more than 2 treatments. All cases were treated with topical ALA with incubation period ranging from 1-16.5 hours (95% between 2-5 hours) and illumination with noncoherent blue light. Complete response (CR) was determined by clinical absence of any residual lesion upon initial follow-up at 1-3 months. Recurrence of SCCis was confirmed by biopsy. P values were calculated using chi-square test or multivariate logistic regression.

Results: Upon completion of all PDT treatments, CR was 77.9% and was not significantly different for 1 versus >1 treatments. By anatomic location, CR for lesions on the face (87.5%) was greater than CR on the scalp (70.6%) or other locations (54.5%; $p<0.05$). By size, CR for lesions <2 cm versus ≥2 cm were 87.2% versus 64.3% ($p<0.05$; Fig. 1). By age, CR for patients over 85 years (52.6%) was less than CR for patients aged 50-70 or 71-85 years (80.0% and 93.1%, respectively; $p<0.05$). When grouped by longest PDT incubation time, incubations of 2-2.99, 3-3.99, and ≥4 hours exhibited CR of 53.3%, 83.3%, and 87.0% ($p<0.05$; Fig. 2).

Multivariate analysis confirmed that the following factors were significantly associated with CR ($p<0.05$): lesion size (≥ 2 cm, OR 0.200), location (face versus scalp versus all other, OR 6.25), and longest

incubation time (≥ 4, versus 3-3.99 versus 2-2.99 hours, OR 3.73). Gender, immunosuppression, and number of PDT treatments were not significantly associated with CR.

Median follow-up for the entire cohort was 5.53 months (range 0.5-42.4). Durable complete response at the last follow-up visit was present in 64.8% of cases. Among 53 cases with initial complete response, seven (13.2%) developed recurrence at a median time of 11.7 months (range 7.7-33.4). No factors (including follow-up duration) were significantly associated with recurrence.

Conclusion: PDT with ALA and blue light illumination may be a viable treatment for selected cases of SCCis. Efficacy is enhanced by longer incubation times and limited by large tumor size, location off the face, and older age. Recurrence of lesions with initial CR may occur after 12 months, and prolonged clinical surveillance after treatment is recommended.

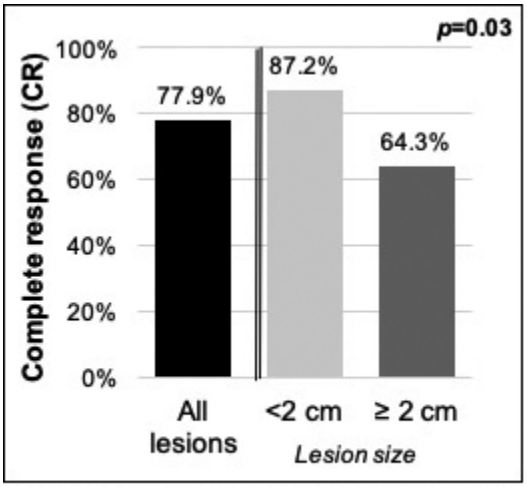


Figure 1: Lesions ≥ 2 centimeters had lower complete response (CR) (p<0.05).

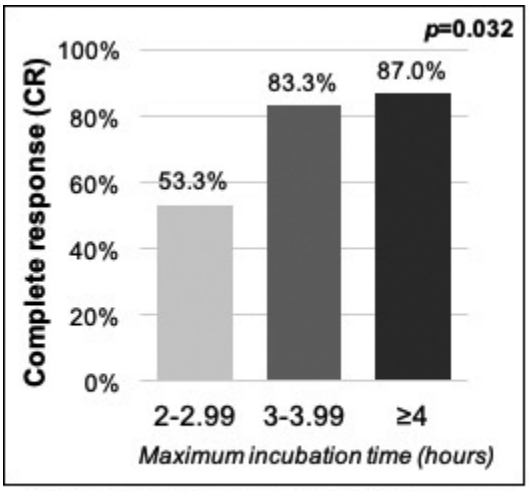


Figure 2: Longer maximum incubation times had higher CR (p<0.05).

30

Presenter: Jonathan St. Pierre Smith, DO

Title: Complication Rates of Serial Staged Excision and Delayed Reconstruction of Pigmented Cutaneous Neoplasms: A Single Institution Retrospective Review

Authors: Jonathan St. Pierre Smith, DO[1]; Brenda Young[2]; S. Brian Jiang, MD[1]

Institutions: 1. University of California-San Diego Health, San Diego, CA 2. University of California San Diego School of Medicine, La Jolla, CA

Introduction & Objectives: Traditional therapeutic excision of atypical pigmented cutaneous neoplasms and thin cutaneous melanomas continues to be the standard of care for histopathologically concerning pigmented neoplasms. However, alternative therapeutic variations are frequently employed based upon institution capabilities and surgeon clinical decision making, to include Mohs micrographic surgery and serial staged excision with delayed reconstruction. These excision variations offer the surgeon a distinct advantage of margin control prior to reconstruction, and expand the reconstructive options due to lower risk of positive margins or recurrence. Although it has been well documented that delayed reconstruction of Mohs surgical defects can be a safe reconstructive approach, there is limited data on the safety and complication rates of serial staged excision with delayed reconstruction of pigmented skin neoplasms.

Study Type: Retrospective Review.

Study Setting: Academic center.

Methods: A 7-year 10-month single institution retrospective review was conducted of patients treated for benign pigmented neoplasms, atypical pigmented neoplasms, melanoma in situ, and thin invasive melanoma (<1mm Breslow) with serial staged excision. Data was collected on patient characteristics including comorbidities (immunosuppression, DMII, radiation history, tobacco history), tumor characteristics (histopathology, tumor preoperative size, location, initial margins, final defect diameter, number of stages), and reconstruction variables (type of reconstruction, postoperative days to reconstruction). Additional data was collected on patient follow-up to include post-operative complications and days to followup. Statistical analysis will be conducted for evaluation of significance of these additional data points.

Results: Two hundred and twenty-one patients with 234 pigmented cutaneous neoplasms were treated at this institution with serial staged excision from March 15, 2010 to December 05, 2018. Of these patients, 176 (75.2%) of the cases underwent delayed reconstruction. The other 58 (24.8%) cases were allowed to heal by secondary intent or referred for reconstruction to another subspecialty and excluded from the cohort. No post-operative follow-up was available for 2 patients (1.1%) with a final cohort size of 174 patients who completed serial staged excision with delayed reconstruction. Follow-up for the cohort revealed 8 complications (4.6% complication rate), with 6 post-operative infections (3.4% infection rate) all confirmed by positive post-operative culture, and 2 full thickness skin graft complications (partial or full thickness failure). There were no cases of seroma formation, hematoma formation, dehiscence, or significant post-operative pain requiring intervention.

Conclusion: Serial staged excision of pigmented cutaneous neoplasms with delayed reconstruction is a safe therapeutic modality that can be effectively used without increase in intra-operative or post-operative complications.

31

Presenter: Rashek Kazi, MD, PhD

Title: Variable Pain Reduction with Application of Vibratory Stimulus

Authors: Rashek Kazi, MD, PhD[1]; Panayiota Govas, MD, MSCMed[1]; Rachel Slaugenhaupt[2]; Bryan Carroll, MD[1]

Institutions: 1. University of Pittsburgh Medical Center, Pittsburgh, PA 2. Emory University, Atlanta, GA

Introduction & Objectives: In 2017, approximately 12 million dermatologic procedures were performed. Injectable anesthetics provide the primary means for controlling pain. However, this process causes significant discomfort. Around 40% of the general patient population have significant needle phobia and around 5% will actively avoid treatment. Recently, applying vibration at the injection site has shown pain reduction during anesthetic and cosmetic injection. Currently, there is no understanding of how different subpopulations respond to vibratory anesthesia. Based on prior evidence of differential pain perception, we hypothesize that pain perception and reduction will differ among sexes, age groups, and anatomical treatment sites.

Study Type: Randomized, partially-blinded, parallel-group, single-institution trial.

Study Setting: Academic Center.

Methods: The protocol was approved by IRB, conforms to the ethical guidelines of the Declaration of Helsinki and registered at clinicaltrails.gov. Eligible subjects were adults (18+) presenting for Mohs micrographic surgery (MMS), or other surgical removal of skin cancer. Consented subjects completed a pre-procedural questionnaire detailing their baseline pain, anticipated pain, and medication use. Prior to the study, all subjects were trained to provide multiple pain scores, using the 11-point Numeric Rating Scale (NRS), during stimulation with the vibratory anesthetic device (VAD) in the on (VAD ON) and off (VAD OFF) mode. For either group, the VAD was applied for 15s at which point the injection of anesthetic was performed and a pain score.

Results: 101 clinical events with 84 unique subjects (150 subjects were invited to participate) were included. 63% of subjects were male with a mean age of 66 years. Overall, the NRS in the VAD ON group was 40% lower than in the VAD OFF group (Table 1). In sex analysis, female subjects (n=47) in the VAD OFF group reported an NRS 47% greater than in the male VAD OFF group. Further, for female subjects, the NRS was 47% lower in the VAD ON group than the VAD OFF compared to a reduction of 35% in male subjects. When subdividing by age, NRS was reduced by 45% for those under age 60 or over age 70 (Table 2) while those aged 60-70 have a reduction of 35%. Lastly, for subjects in the head and neck VAD OFF group (n = 78), NRS was 53% higher than in the non-head and neck VAD OFF group (Table 3). When VAD was applied, the NRS reduced by 48% in the head and neck group and by 13% in the non-head and neck group.

Conclusion: We find that pain score is higher in females and those in the head and neck group. No such difference was seen as a function of age. All subjects showed reduced pain when VAD was used. There was a greater reduction in female subjects, the youngest and oldest subjects, and for the head and neck subjects.

TABLE 1. Pain outcome measures for total subjects, female, and male cohorts.

	N	NRS at injection
Total Subjects	101	1.6 ± 0.2
VAD OFF	52	2.0 ± 0.3
VAD ON	49	1.2 ± 0.2*
Female	37	2.0 ± 0.4
VAD OFF	20	2.5 ± 0.6
VAD ON	17	1.3 ± 0.4
Male	64	1.4 ± 0.2
VAD OFF	32	1.7 ± 0.2
VAD ON	32	1.1 ± 0.2*

*Significant Reduction in NRS between VAD OFF and ON ($p < 0.05$)

TABLE 2. Pain outcome measures for age cohorts.

	N	NRS at injection
Age < 60	25	1.8 ± 0.3
VAD OFF	11	2.3 ± 0.5
VAD ON	14	1.3 ± 0.4*
Age 60-69	40	1.6 ± 0.3
VAD OFF	20	1.9 ± 0.5
VAD ON	20	1.2 ± 0.3
Age ≥ 70	36	1.6 ± 0.3
VAD OFF	21	2 ± 0.4
VAD ON	15	1.1 ± 0.4

*Significant Reduction in NRS between VAD OFF and ON ($p < 0.05$)

32

Presenter: Kirsten E. Dickinson

Title: Characterizing Recurrent Non-Melanoma Skin Cancers in a Subset of Constant Patients

Authors: Kirsten E. Dickinson[1]; Emily Weig[1]; Faraaz Zafar; Nkanyezi Ferguson, MD[1]; Marta VanBeek, MD[1]; Hillary Johnson-Jahangir, MD[1]

Institution: 1. University of Iowa, Iowa City, IA

Introduction & Objectives: The superiority of Mohs micrographic surgery (MMS) versus standard excision for non-melanoma skin cancer (NMSC) is well documented, with cure rates ranging from 96-100%. Recent consensus standards have been published defining specific criteria for local cutaneous recurrence. While published 5-year recurrence rates with MMS for NMSC remains low, more information is needed to characterize specific tumor characteristics more likely to locally recur following MMS. To our knowledge, there is no literature currently addressing these questions. The purpose of this study was to identify and characterize true MMS local recurrences among a cohort of patients who were followed across two or more visits greater than one month apart for MMS.

Study Type: Retrospective review.

Study Setting: Academic Center.

Methods: Retrospective chart review was performed at a single academic institution on patients who received multiple consecutive Mohs surgery visits between January 2008 to September 2018. Record review, clinical photographs, and pathology reports were used to identify MMS recurrences. Only those followed continuously by the same practice (where true recurrences could be confirmed) were included.

Results: During the 10-year time span, 2,735 squamous cell carcinomas (SCCs) and 7,348 basal cell carcinomas (BCCs) were treated. 402 patients with multiple consecutive Mohs surgery visits were identified for review. 55 patients were identified as having 62 local cutaneous recurrences of NMSC. Of these, 26 were BCCs, and 36 were SCCs. Thirty-nine patients were male, 16 were female. The mean time to recurrence was 17.8 months (standard deviation 18.7 months).

Of the locally recurrent SCCs, 15 were well differentiated, 7 were moderately differentiated and 6 demonstrated poorly differentiated histopathology. Of note during this time frame, 9 of 47 total patients who consecutively followed with poorly differentiated SCCs had some form of disease progression, including skin, nodal, and organ metastasis.

Of the recurrent BCCs, 21 of 26 patients had nodular histopathology, while 4 had infiltrative, and one patient had a morpheaform BCC.

The average post operative defect size of the initial lesion for all recurrent cancers was 3.63 cm in diameter (standard deviation 4.37 cm).

The most common anatomic locations of tumor recurrence were noted on the nose (14 lesions) and scalp (14 lesions). 25.4% of patients with recurrences were chronically immunosuppressed.

Conclusion: Recurrence was noted at a higher frequency in males, immunosuppressed patients, and on the nose and scalp. While a majority of the recurrent tumors in our study were well differentiated SCCs and nodular BCCs, this likely reflects that these are the most common tumor subtypes treated. While lower numbers of poorly differentiated SCCS had cutaneous recurrences in the cohort, multiple patients experienced progression of disease in other forms than cutaneous recurrence.

Table 1: Baseline Characteristics

	SCC	BCC
	36	26
Demographics		
Female	12	11
Male	24	15
Tumor Characteristics		
Type		
Nodular	NA	21
Morpheaform	NA	4
Infiltrative	NA	1
Well Differentiated	15	NA
Moderately Differentiated	7	NA
Poorly Differentiated	6	NA
In Situ	6	NA
Location		
Scalp	14	2
Nose	2	12
Ears	3	0
Eye	2	1
Cheek	3	6
Lip	2	0
Chin	0	1
Neck	2	0
Trunk/Extremities	6	3
Size	3.83 cm (+/-3.25 cm)	3.64 cm (+/- 5.72 cm)
Months to recurrence	13.84	23.34
Medical Comorbidities		
Immunocompromised	13	1

33

Presenter: Saleh Rachidi, MD, PhD

Title: Platelet Count Correlates with Stage and Predicts Survival in Melanoma

Authors: Saleh Rachidi, MD, PhD[1]; Maneet Kaur, MPH[1]; Tim Lautenschlaeger, MD[2]; Zihai Li, MD, PhD[3]

Institutions: 1. Johns Hopkins, Baltimore, MD
2. Indiana University, Indianapolis, IN
3. Medical University of South Carolina, Charleston, SC

Introduction & Objectives: Cancer is a chronic inflammatory state which is often associated with increased platelet counts. Cancer cells induce thrombopoiesis and activate platelets, which in turn facilitate cancer invasion and metastasis. In this study, we investigate the correlation between platelet counts with each of stage and overall survival in melanoma.

Study Type: This is a retrospective cohort study of 642 melanoma patients diagnosed between 2000 and 2016.

Study Setting: Tertiary care academic medical center.

Methods: Data was collected from the cancer registry and medical records. The association between thrombocytosis and stage at diagnosis, as well as thrombocytosis and overall survival was investigated. The association between platelet counts and survival was estimated as hazard ratios from Cox proportional hazards regression with time from diagnosis as the time metric. Log-binomial regression was used to estimate prevalence ratios of stage IV versus stages 0-III. Multivariable analysis adjusted for age, sex, stage and treatment modality.

Results: Using multivariable analysis, patients with thrombocytosis around time of diagnosis were more likely to present with distant metastasis (Prevalence Ratio 3.5, 95% CI 2.35-5.22). In patients with metastatic disease and in all stages combined, thrombocytosis predicted decreased 5-year overall survival in univariate and multivariable analysis, and this was most pronounced during the first year from diagnosis. Finally, in animal studies, mice with thrombocytopenia due to the lack of heat shock protein gp96 in their megakaryocytes were protected from melanoma dissemination to the lungs.

Conclusion: Thrombocytosis at time of diagnosis is associated with distant metastasis and predicts survival in stage IV melanoma. These findings are concordant with preclinical studies showing a role for platelets in cancer metastasis and suppression of antitumor immunity, further supporting targeting platelets as an adjuvant to immunotherapy in melanoma.

Table 1. Demographic and clinical characteristics of study population with platelet counts (N=642)

Variable	Overall	Platelet count <350	Platelet count ≥350	P value
Mean age (SD), years	57.7 (16.1)	58.1 (16.3)	53.0 (13.4)	0.03
Female, N (%)	270 (42.1)	237 (40.2)	33 (63.5)	0.001
Stage, N (%)				<0.001
In situ	154 (24.0)	145 (24.6)	9 (17.3)	
Stage I	158 (24.6)	148 (25.1)	10 (19.2)	
Stage II	83 (12.9)	79 (13.4)	4 (7.7)	
Stage III	159 (24.8)	148 (25.1)	11 (21.2)	
Stage IV	88 (13.7)	70 (11.9)	18 (34.6)	
Anatomical site, N (%)				0.06
Head/neck	146 (22.7)	139 (23.6)	7 (13.5)	
Trunk	175 (27.3)	163 (27.6)	12 (23.1)	
Extremities	247 (38.5)	225 (38.1)	22 (42.3)	
Other	74 (11.5)	63 (10.7)	11 (21.2)	
Diabetes mellitus, N (%)	108 (16.8)	102 (17.3)	6 (11.5)	0.29
Hypertension, N (%)	225 (35.0)	211 (35.8)	14 (26.9)	0.20
Dyslipidemia, N (%)	189 (29.4)	177 (30.0)	12 (23.1)	0.29
Cardiovascular disease, N (%)	76 (11.8)	73 (12.4)	3 (5.8)	0.16
Surgery, N (%)	563 (87.7)	528 (89.5)	35 (67.3)	<0.001
Chemotherapy, N (%)	45 (7.1)	37 (6.3)	8 (15.4)	0.02
Radiation, N (%)	49 (7.6)	45 (7.6)	4 (7.7)	0.99
Immunotherapy, N (%)	73 (11.4)	70 (11.9)	3 (5.8)	0.18
Breslow thickness ≥1mm, N (%)	236 (69.2)	219 (69.1)	17 (70.8)	0.86

Fisher's exact tests were used in place of Chi-square test when cell sizes were <10.

Table 2. Prevalence ratios and 95% confidence intervals for association between platelet counts and stage IV melanoma (versus stage 0-III, N=642)

Exposure	Platelets ≥350		Platelets[b]	
	PR (95% CI)	P	PR (95% CI)	P
Unadjusted	2.92 (1.89, 4.50)	<0.001	1.37 (1.26, 1.50)	<0.001
Adjusted[a]	3.50 (2.35, 5.22)	<0.001	1.33 (1.21, 1.47)	<0.001

[a]Adjusted for age and sex

[b]Platelets as a continuous variable was modeled for a 100-unit increase

Table 3. Hazard ratios and 95% confidence intervals for platelet counts and survival in melanoma.

Exposure	Platelets ≥350		Platelets[c]	
	HR (95% CI)	P	HR (95% CI)	P
1-year survival				
All stages combined (N=642)				
Unadjusted	3.24 (1.84, 5.69)	<0.001	1.52 (1.33, 1.72)	<0.001
Adjusted[a]	1.92 (1.08, 3.43)	0.03	1.29 (1.13, 1.48)	<0.001
Stages 0-III (N=554)				
Unadjusted	0.85 (0.11, 6.39)	0.88	1.31 (0.72, 2.38)	0.38
Adjusted[a]	1.18 (0.15, 9.03)	0.87	1.63 (0.89, 3.00)	0.12
Stage IV (N=88)				
Unadjusted	1.74 (0.95, 3.17)	0.07	1.14 (0.99, 1.30)	0.05
Adjusted[b]	1.80 (0.97, 3.34)	0.06	1.20 (1.04, 1.40)	0.01
5-year survival in patients alive at 1 year				
All stages combined (N=553)				
Unadjusted	0.63 (0.23, 1.73)	0.37	0.84 (0.62, 1.15)	0.28
Adjusted[a]	0.45 (0.16, 1.25)	0.13	0.85 (0.62, 1.16)	0.31
Stages 0-III (N=523)				
Unadjusted	0.62 (0.20, 1.98)	0.42	0.81 (0.57, 1.15)	0.24
Adjusted[a]	0.99 (0.30, 3.24)	0.98	1.05 (0.71, 1.56)	0.81
Stage IV (N=30)				
Unadjusted	0.34 (0.04, 2.56)	0.29	0.82 (0.46, 1.45)	0.49
Adjusted[b]	0.30 (0.04, 2.34)	0.25	0.74 (0.41, 1.34)	0.33

[a]Adjusted for continuous age, sex, treatment type and stage
[b]Adjusted for continuous age, sex and treatment type
[c]Platelets as a continuous variable was modeled for a 100-unit increase

34

Presenter: Robert W. Cook, PhD

Title: Meta-Analysis of the Prognostic 31-Gene Expression Profile Test in 1472 Cutaneous Melanoma Cases

Authors: Bradley N. Greenhaw, MD[1]; Kyle R. Covington, PhD[2]; Kristen M. Plasseraud, PhD[2]; Robert W. Cook, PhD[2]; Maria L. Wei, MD, PhD[3,4]

Institutions: 1. Dermatology Center of North Mississippi, Tupelo, MS
2. Castle Biosciences, Inc., Friendswood, TX
3. University of California-San Francisco, San Francisco, CA
4. San Francisco Veterans Affairs Medical Center, San Francisco, CA

Introduction & Objectives: The 31-gene expression profile (31-GEP) test for cutaneous melanoma stratifies patients by likelihood of developing metastasis within 5 years into low risk (Class 1A, lowest risk) and high risk (Class 2B, highest risk). The test has been adopted in clinical practice to inform patient management regarding clinical follow-up, specialty referral and/or interdisciplinary care, imaging, sentinel lymph node (SLN) biopsy, and adjuvant therapy consideration. While several prospective and retrospective clinical validation and performance studies on the test's accuracy have been published, the 31-GEP effect across these studies has not yet been statistically evaluated. Here we report a meta-analysis using data from three published, non-overlapping patient cohorts (Cohorts 1-3) and a newly reported cohort (Cohort 4) (n=1472 total).

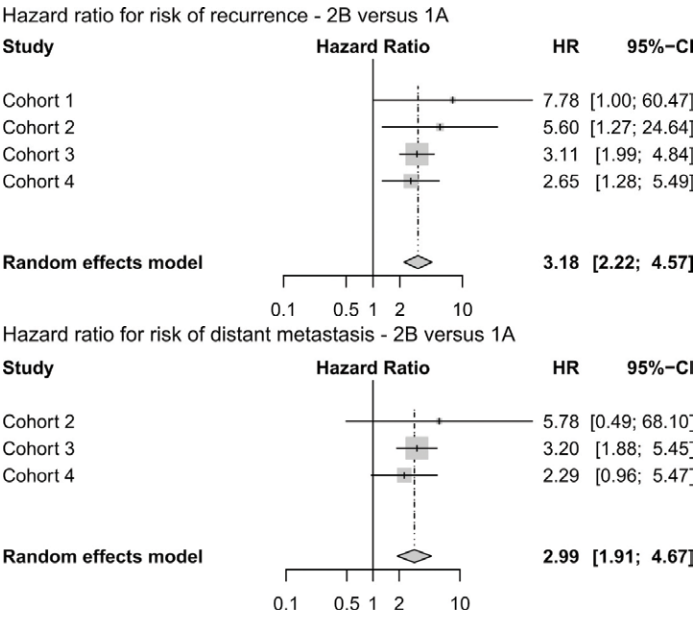
Study Type: Meta-analysis of retrospective and prospective data.

Study Setting: Cohort 1: prospectively-tested patients from a Mohs surgery practice; Cohort 2: patients from two prospective, multi-center studies; Cohort 3: multi-center retrospective patient cohort; Cohort 4: multi-center retrospective patient cohort.

Methods: The meta-analysis was performed in accordance with PRISMA guidelines. The association of 31-GEP class with recurrence-free (RFS) and distant metastasis-free (DMFS) survival was evaluated using a multivariable model including Breslow thickness, ulceration status, SLN status, and 31-GEP subclass as covariates. Reported hazard ratios (HR) are those between the contrasts of Class 1A and Class 2B, though all cases were used for multivariate analysis. The number of Class 1A cases in Cohorts 1-4 was 193, 206, 312, and 79, respectively, and the number of Class 2B cases was 16, 48, 214, and 83, respectively. The HR reported from multivariate models were analyzed using random effects models (REM).

Results: In each cohort, 31-GEP Class was an independent predictor for RFS. Comparing class 2B to Class 1A, we found HRs for recurrence risk in Cohorts 1-4 to be 7.78 (95%CI 1.00-60.47), 5.60 (95%CI 1.27-24.64), 3.11 (95%CI 1.99-4.84), and 2.65 (95%CI 1.28-5.49), respectively. Risk of distant metastasis was reported in Cohorts 2-4, and respective HRs were 5.78 (95%CI 0.49-68.10), 3.20 (95%CI 1.88-5.45), and 2.29 (95%CI 0.96-5.47) comparing Class 2B to Class 1A. In a meta-analysis of the two prospective cohorts (Cohorts 1-2), HR for recurrence risk was 6.27 (95%CI 1.89-20.83; $p<0.01$) comparing Class 2B to Class 1A. Comparing Class 2B to Class 1A, results from combining HRs using REM across studies were 3.18 (95%CI 2.22-4.57; $p<0.0001$) and 2.99 (95%CI 1.91-4.67; $p<0.0001$) for risk of recurrence and risk of distant metastasis, respectively. Tests for heterogeneity in the combined studies for RFS and DMFS were not significant using Cochran's Q statistic and I2. REM were used to control for any differences in patient mix and overall study design.

Conclusion: These results indicate that the 31-GEP test is a consistent and independent prognostic marker of RFS and DMFS as assessed by a meta-analysis of four independent study cohorts.



35

Presenter: Dong Joo Kim, MD

Title: Free Cartilage Batten Grafting with Secondary Intention Healing for Surgical Defects on the Distal Nose: Our 129 Case Experience

Authors: Dong Joo Kim, MD[1]; Joy Makdisi, MD[2]; Christina Regan, BS[3,4]; Elizabeth Chao, MD, PhD[5]; Adam M. Rotunda, MD[1,4]

Institutions: 1. University of California-Irvine, Irvine, CA
2. The University of British Columbia, Vancouver, BC, Canada
3. Cornell University, Ithaca, NY
4. Newport Skin Cancer, Newport Beach, CA
5. University of Pittsburgh, Pittsburgh, PA

Introduction & Objectives: Defects of the nasal ala can pose a reconstructive challenge due to lack of adjacent tissue reservoirs and their proximity to a free margin. A variety of approaches include secondary intention, grafts, and single- or multi-stage flap repairs. In recent years, the free cartilage batten graft (FCBG) with secondary intention healing has emerged in a number of limited reports as a relatively straightforward option for nasal reconstruction with high patient satisfaction. Herein, we present a detailed analysis of our experience using the FCBG with secondary intention healing to reconstruct a variety of nasal wounds with the aim of highlighting when this unique repair yields the most optimal outcome (Figure 1).

Study Type: Retrospective review.

Study Setting: Private practice.

Methods: A retrospective review of patients who underwent FCBG with secondary intention healing from 2011-2018 was performed. The subjects underwent Mohs micrographic surgery and repair by the same surgeon. Surgical defect (size, depth, location, distance to alar rim, percentage of nasal ala removed, surrounding rhinophyma) and cartilage graft (donor site, size) characteristics were recorded and analyzed. Digital images taken at time of reconstruction and at final follow-up were reviewed by two independent, fellowship-trained Mohs surgeons to assess ala rim retraction, healed skin surface contour and overall aesthetic outcome.

Results: 129 distal nasal surgical defects involving the ala reconstructed with the FCBG technique were reviewed (Table 1). A majority of healed wounds were deemed aesthetically excellent (24%) or very good (31%), and the remaining rated as good (31%) or poor (14%). Most patients experienced no (66%) or mild alar retraction (20%) and only 1 patient had mild ipsilateral airway obstruction. While a majority of patients had some skin surface irregularity (68%), only 8% sought dermabrasion. Alar rim retraction and surface irregularity increased with greater defect depth, size, and percentage of ala removed. Less retraction occurred for wounds farther from the alar rim and with greater cartilage coverage. The aesthetic rating was higher with greater cartilage coverage and distance from the alar rim, and was rated lower for deeper, larger defects with greater percentage of ala removed. These trends were consistent with data stratified by aesthetic ratings (Table 2). Excellent and very good outcomes were seen in repairs of relatively superficial, small- (<1cm2) to medium-sized (1-2.25cm2) defects compared to their aesthetically poorer counterparts. Of 19 repairs involving the alar lobule alone, 15 (79%) had very good or excellent aesthetic outcomes, while 4 had good outcomes, suggesting particular utility in this location.

Conclusion: Our experience highlights that the FCBG with secondary intention healing is a reproducible, minimalistic repair for a variety of small to medium-sized defects of the nasal ala. This technically straightforward repair is particularly well-suited for defects localized to the alar lobule without sacrificing aesthetic outcome or nasal function.

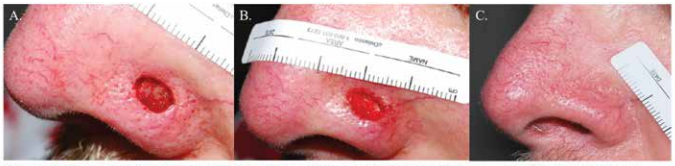


Figure 1. Free cartilage batten graft with secondary intention healing. Post-Mohs micrographic surgery defect after tumor clearance (A), placement of a free cartilage batten graft taken from the superior helical rim (B), and follow-up photo at 7 weeks post-operative (C)

Table 1. Patient Demographics and Outcome Data

Characteristic	*Value*
Total number of cases, n	129
Male:female, n (%)	73:56 (57%:43%)
Age at time of repair (years), media	70 (range 33-97)
Donor site, n (%)	
Scaphoid fossa or superior crux of antihelix	124 (96%)
Concha	5 (4%)
Percent ala removed, n (%)	
0-25	70 (54%)
26-50	47 (36%)
51-75	9 (7%)
76-100	3 (2%)
Cartilage size (%) relative to wound	
0-25	2 (2%)
26-50	11 (9%)
51-75	27 (21%)
76-100	89 (69%)
Depth, n (%)	
1 = Superficial dermis	7 (5%)
2 = Deep dermis	40 (31%)
3 = Fibrofatty	66 (51%)
4 = Bone/cartilage	14 (11%)
5 = Through and through	2 (2%)
Surgical defect size (cm^2), median	0.80 (range 0.15-11.10)
Small defects (< 1.00 cm^2) defects, n (%)	70 (54%)
Medium defects (1.00 - 2.25 cm^2), n (%)	43 (33%)
Large defects (> 2.25 cm^2), n (%)	16 (12%)
Closest distance to alar rim (mm), median	4 (range 0-11)
Surgical defect location**, n (%)	
Nasal ala	119 (92%)
Alar lobule only	19 (15%)
Alar rim	14 (11%)
Alar rim + alar lobule only	7 (5%)
Alar groove	
Medial alar groove	62 (48%)
Superior alar groove	54 (42%)
Lateral alar groove	17 (13%)
Soft triangle	12 (9%)
Nasal tip	52 (40%)
Nasal dorsum	23 (18%)
Rhinophyma, n (%)	
0 = No evidence of rhinophyma	30 (23%)
1 = Mild skin thickening	70 (54%)
2 = Moderate skin thickening	21 (16%)
3 = Strong skin thickening, small lobules	7 (5%)
4 = Lobules with fissures	1 (1%)
5 = Giant rhinophyma	0 (0%)
Alar rim retraction, n (%)	
0 = None	85 (66%)
1 = Mild	26 (20%)
2 = Moderate	13 (10%)
3 = Severe	5 (4%)
Surface contour, n (%)	
0 = Smooth	41 (32%)
1 = Irregularity	88 (68%)
Overall aesthetic rating, n (%)	
Poor	18 (14%)
Good	40 (31%)
Very good	40 (31%)
Excellent	31 (24%)
Dermabrasion, n (%)	10 (8%)
Ipsilateral airway obstruction, n (%)	1 (<1%)

** Percentages total more than 100 due to overlapping locations

Table 2. Data Stratified by Overall Aesthetic Outcome

Characteristic	*Excellent*	*Poor*
Total number of cases, n	31	18
Male:female, n (%)	11:20 (35%:65%)	10:8 (56%:44%)
Age at time of repair (years), media	64 (33-91)	79 (57-97)
Donor site, n (%)		
Scaphoid fossa or superior crux of antihelix	31 (100%)	17 (94%)
Concha	0 (0%)	1 (6%)
Percent ala removed, n (%)		
0-25	19 (61%)	8 (44%)
26-50	11 (35%)	5 (28%)
51-75	1 (3%)	2 (11%)
76-100	0 (0%)	3 (17%)
Cartilage size (%) relative to wound		
0-25	0 (0%)	2 (11%)
26-50	3 (10%)	0 (0%)
51-75	4 (13%)	6 (33%)
76-100	24 (77%)	10 (56%)
Depth, n (%)		
1 = Superficial dermis	5 (16%)	0 (0%)
2 = Deep dermis	13 (42%)	4 (22%)
3 = Fibrofatty	13 (42%)	6 (33%)
4 = Bone/cartilage	0 (0%)	7 (39%)
5 = Through and through	0 (0%)	1 (6%)
Surgical defect size (cm^2), median	0.45 (range 0.15-1.71)	2.10 (range 0.35-11.10)
Small defects (< 1.00 cm^2) defects, n (%)	24 (77%)	5 (28%)
Medium defects (1.00 - 2.25 cm^2), n (%)	7 (23%)	5 (28%)
Large defects (> 2.25 cm^2), n (%)	0 (0%)	8 (44%)
Closest distance to alar rim (mm), median	4 (range 1-10)	2 (range 0-7)
Surgical defect location**, n (%)		
Nasal ala	31 (100%)	15 (83%)
Alar lobule only	9 (30%)	0 (0%)
Alar rim	1 (3%)	4 (22%)
Alar rim + alar lobule only	0 (0%)	0 (0%)
Alar groove		
Medial alar groove	10 (32%)	12 (67%)
Superior alar groove	11 (35%)	7 (39%)
Lateral alar groove	5 (16%)	5 (28%)
Soft triangle	0 (0%)	4 (22%)
Nasal tip	6 (19%)	11 (61%)
Nasal dorsum	2 (6%)	6 (33%)
Rhinophyma, n (%)		
0 = No evidence of rhinophyma	10 (32%)	0 (0%)
1 = Mild skin thickening	17 (55%)	11 (61%)
2 = Moderate skin thickening	2 (6%)	3 (17%)
3 = Strong skin thickening, small lobules	2 (6%)	4 (22%)
4 = Lobules with fissures	0 (0%)	0 (0%)
5 = Giant rhinophyma	0 (0%)	0 (0%)
Alar rim retraction, n (%)		
0 = None	30 (97%)	5 (28%)
1 = Mild	1 (3%)	1 (6%)
2 = Moderate	0 (0%)	7 (39%)
3 = Severe	0 (0%)	5 (28%)
Surface contour, n (%)		
0 = Smooth	25 (81%)	2 (11%)
1 = Irregularity	6 (19%)	16 (89%)
Dermabrasion, n (%)	3 (10%)	1 (6%)
Ipsilateral airway obstruction, n (%)	0 (0%)	0 (0%)

** Percentages total more than 100 due to overlapping locations

36

Presenter: Julie M. Bittar, BA

Title: Local Recurrence Rates for Different Surgical Techniques to Treat Cutaneous Melanoma of the Head and Neck: A Systematic Review

Authors: Julie M. Bittar, BA[1]; Peter G. Bittar, MD[1]; Jeremy R. Etzkorn, MD[2]; Thuzar M. Shin, MD, PhD[2]; Joseph F. Sobanko, MD[2]; Renee Pride, MD[3]; Jerry Brewer, MD, MS[3]; Christopher J. Miller, MD[2]

Institutions: 1. Indiana University School of Medicine, Indianapolis, IN
2. Hospital of the University of Pennsylvania, Philadelphia, PA
3. Mayo Clinic, Rochester, MN

Introduction & Objectives: Cutaneous melanomas of the head and neck are treated with a variety of surgical techniques including conventional wide local excision (WLE), Mohs Micrographic Surgery (MMS) with and without immunohistochemistry (IHC), and variations of staged excision with permanent section microscopic margin evaluation. Differences in the methods of margin evaluation among these surgical techniques may affect local recurrence rates (LRR). We aim to perform a systematic review of published LRR for different surgical techniques to treat primary cutaneous melanoma of the head and neck.

Study Type: Systematic Review.

Study Setting: Academic Center.

Methods: A systematic review of PubMed, EMBASE, and Web of Science was performed to identify all English language case series, cohort studies and randomized control trials that included ≥10 in situ or invasive head and neck cutaneous melanomas; that specified surgical technique; and that reported local recurrence rates (LRR). No restriction was placed on publication date or follow-up length. Two investigators independently reviewed all manuscripts for inclusion and exclusion criteria (Figure 1). Cases were excluded if the melanomas originated on the mucosa; if adjuvant therapy was used after surgery; or if LRR could not be determined/extricated for head and neck melanoma. Extracted data included number of melanomas, LRR, follow-up time, and surgical technique. Categories for surgical technique included WLE; MMS, subcategorized as: "with IHC", "without IHC", and "with and without IHC" (if outcomes could not be extricated between IHC use-types); and Staged Excision, defined as techniques utilizing paraffin-embedded formalin-fixed sections for thorough microscopic margin assessment prior to reconstruction (including Mapped Serial Excision, Slow Mohs, and the "square", "perimeter", "contour", and "spaghetti" techniques). Univariate statistical analysis was used to describe study variables. Derived mean follow-up was calculated using manuscripts that reported a mean follow-up time.

Results: Of 2198 abstracts from literature search and reference review, 116 manuscripts with 17369 head and neck cutaneous melanomas met inclusion criteria (Figure 1). 58.6% (10,184) of melanomas were treated by WLE; 27.9% (4,848) by MMS; and 13.5% (2,337) by Staged Excision. Of the 17369 melanomas, 17276 specified the presence or absence of local recurrence. WLE had the highest LRR (8.3%); and MMS with IHC had the lowest LRR (0.58%). The derived mean follow-up ranged from 46.9 months for MMS to 63.0 months for staged excision. (Table 1).

Conclusion: Cutaneous melanomas of the head and neck have higher LRR after WLE compared to surgical techniques with more comprehensive microscopic margin evaluation by either frozen or permanent section pathology. MMS with IHC has the most comprehensive margin evaluation and the lowest local recurrence rates. These data may help to counsel patients about their risk for local recurrence after surgery and to develop guidelines with indications for the different surgical techniques.

Figure 1. PRISMA Diagram of Search Process

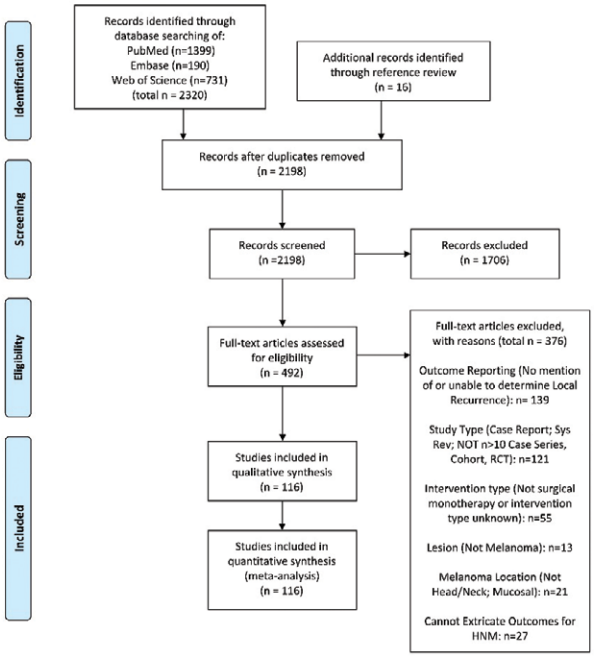


Table 1. Local Recurrence Rates Based on Surgical Technique

Surgical Technique	LRR (# of local recurrences/ total # of cases for technique)	Follow up time (months)*
WLE	8.33% (844/10,133)	58.5
Staged Excision	2.54% (59/2324)	63.0
MMS	0.93% (45/4,819)	46.9
MMS without IHC	2.76% (20/725)	40.9
MMS with & without IHC	0.65% (11/1683)	60.5
MMS with IHC	0.58% (14/2411)	38.2

*derived mean calculation based on studies that reported mean. 37/74 CWLE studies reported mean, 6/7 MMS with IHC reported mean, 7/10 MMS without IHC reported mean, 5/5 MMS with and without IHC reported mean, 21/26 SE reported mean

37

Presenter: Daihung Do, MD

Title: Evaluation of Virtual H&E-Stained Optical Sections using Nonlinear Microscopy for Recognizing BCC in Mohs Surgery—An Alternative to Frozen Sections

Authors: Daihung Do, MD[1]; Michael Giacomelli, PhD[2]; Beverly Faulkner-Jones, MD, PhD[1]; James Fujimoto, PhD[3]

Institutions: 1. Beth Israel Deaconess Medical Center, Boston, MA
2. University of Rochester, Rochester, NY
3. Massachusetts Institute of Technology, Cambridge, MA

Introduction & Objectives: To evaluate the accuracy of digitally-stained optical sections (OS) obtained from a nonlinear microscope in identifying BCC in Mohs surgery. Traditional histologic processing is time consuming because it requires physically producing thin slices of tissue for examination under a light microscope. To cut such thin slices of tissue, surgical specimens need to be frozen, embedded, positioned,

sectioned, and stained. Fluorescence nonlinear microscopy (NLM) with acridine orange (AO) and sulforhodamine 101 (SR101) exogenous stains was used to create virtual tissue slices (optical sections) by imaging a thin slice of tissue within a thicker specimen. A virtual H&E image is generated by combining the AO signal which stains nuclei with the SR101 signal which stains cytoplasm and collagen.

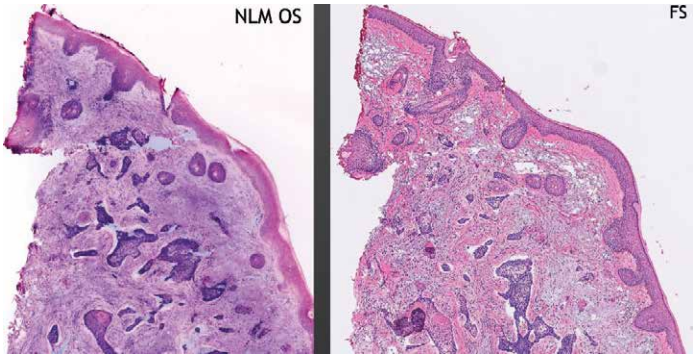
Study Type: Retrospective single-center study.

Study Setting: Academic center.

Methods: Discarded Mohs tissue blocks were used. Frozen section (FS) slides stained with H&E were obtained from the Mohs case and then scanned. OS were created from thick tissue sections obtained from discarded Mohs tissue blocks. Only stage I blocks were examined to ensure that there was enough tissue to examine with both modalities. The OS and FS images were scored for the presence or absence of BCC by a Mohs surgeon. If BCC was detected, the subtype(s) of BCC was recorded. In specimens in which concordance was not achieved, the corresponding remaining tissue was sent for permanent section analysis. Permanent sections were scored for presence/absence of BCC by a dermatopathologist.

Results: 90 Mohs sections from 51 patients were evaluated. Using FS as the gold standard, multimodal imaging resulted in 98.1% sensitivity [90.1 – 100%] and 91.7% specificity [77.5 – 98.2%]. There was an 8.3% false positive rate (3 out of 36 sections) in which tumor was seen on OS but not on FS. The remainder of the Mohs block from these 3 sections were submitted for permanent section analysis. Permanent sections confirmed the presence of BCC in all 3 sections suggesting that the false positives were not true false positives. The presence of tumor in the optical and permanent sections when tumor was absent in the FS likely results from leveling into the Mohs block (toward the central tumor) since the FS were obtained first. There was one false negative. The accuracy of multimodal imaging for detecting the three most common subtypes of BCC were examined. The sensitivity and specificity for superficial, nodular, and infiltrative BCC were 88.9% [65.3 – 98.6%] sensitivity and 94.4% [86.4 – 98.5%] specificity for superficial BCC, 97.4% sensitivity [86.2 – 99.9%] and 94.2% specificity [84.1 – 98.8%] for nodular BCC, and 93.3% sensitivity [68.1 – 99.8%] and 98.7% [92.8 – 100%] specificity for infiltrative BCC.

Conclusion: Optical sectioning with nonlinear microscopy and exogenous AO/SR101 staining correlates well with frozen sections in detecting BCC in Mohs surgery.



38

Presenter: Maggie L. Chow, MD, PhD

Title: Transient Delayed Facial Nerve Palsy After Local Anesthesia at Mandible for Mohs Surgery

Authors: Maggie L. Chow, MD, PhD[1]; Jeremy Hu, MD, MPH[1]

Institution: 1. Keck Medical Center of the University of Southern California, Los Angeles, CA

Case History: 74 year old female with atrial fibrillation, hypertension, coronary artery disease, h/o deep vein thrombosis, presented for Mohs surgery of squamous cell carcinoma of the left lower preauricular cheek. 3 cc of lidocaine 1% with epinephrine injected in area of the left mandibular jaw, cleared after one stage. One hour after additional 3 cc of local anesthesia injected for closure, patient complained of inability to close left eye with excessive tearing. Left forehead flattening, left eyebrow ptosis, and left mouth droop noted. Also with constricted pupil and blood pressure 180/80.

Workup & Diagnosis: Transferred to emergency department. CT brain with no cerebral infarction or hemorrhage. MRI not obtained as patient with pacemaker. Palsy began improving 3.5 hours after last lidocaine injection. Patient hospitalized overnight with resolution of palsy by following morning. Transient delayed facial nerve palsy.

Transient Delayed Facial Nerve Palsy (TDFNP): Reported complication of anesthesia for CO2 laser therapy (Rosmaninho et al., 2012). Important points: Inability to close ipsilateral eye = TDFNP; Forehead involvement = NOT central cause, e.g. Bell's Palsy; Total nerve involvement = main trunk of facial never before bifurcation into main branches.

Prognosis & Treatment: Can be immediate or delayed. Immediate: within minutes of injection, recovery in <3 hours. Delayed: hours-days, recovery from 24 hours to several months.

Pain at 2 weeks, complete palsy, and increasing age are poor prognostic factors. No randomized trials but prednisolone and antivirals have been tried.

39

Presenter: Shannon W. Zullo, MS

Title: High Local Recurrence Risk Features Associated with the Use of Frozen Section Cytokeratin AE1/AE3 Immunohistochemical Staining During Mohs Micrographic Surgery of 5,974 Squamous Cell Carcinomas: A Case-Control Study

Authors: Shannon W. Zullo, MS[1];Christopher J. Miller, MD[1]; Jeremy R. Etzkorn, MD[1]; Michael P. Lee, BS[1]; Nicole M. Howe, MD[1]; Thuzar M. Shin, MD[1]; Nadia Abidi, MD[2]; Joseph F. Sobanko, MD[1];

Institutions: 1. University of Pennsylvania, Philadelphia, PA
2. University of Missouri, Columbia, MO

Introduction & Objectives: Frozen section cytokeratin immunohistochemistry (IHC) stains can help to identify squamous cell carcinoma (SCC) that is difficult to detect on routine hematoxylin and eosin (H&E) stains during Mohs micrographic surgery (MMS). Standard indications for use of cytokeratin IHC during MMS do not exist. High local-recurrence risk features, as defined by the American Joint Committee on Cancer's (AJCC) 8th edition, may identify SCCs that could benefit from cytokeratin IHC during MMS.

Study Type: Retrospective case-control study.

Study Setting: Academic center.

Methods: A retrospective case-control study was performed to evaluate the association between AJCC-defined high local recurrence risk features and use of AE1/AE3 cytokeratin IHC staining during MMS of 5,974 SCCs treated between 2010 to 2018. Extracted case data related to AJCC high-risk features included characteristics related to patient (immunocompromised status); cancer (size, histologic variant); previous treatment (recurrent lesion, arising in an old scar); and surgery (number of Mohs surgical stages is indicative of subclinical spread). Descriptive statistics were used to evaluate patient demographics. Independent predictor variables associated with IHC use were determined using Pearson's chi-squared testing ($P<0.05$). Multivariable logistic regression with STATA version 15 software was used to determine statistically significant ($P<0.05$) odds of high local-recurrence features correlating with the use of AE1/AE3 cytokeratin IHC stains.

Results: Of 5,974 total SCC cases, 420 (7.03%) were supplemented with AE1/AE3 cytokeratin IHC stains. Table 1 summarizes case demographics and tumor characteristics independently associated with the use of IHC. In our statistical model, the use of frozen section IHC stain correlated with several high local-recurrence risk features defined by the AJCC 8th edition (see Table 2). IHC was associated with a higher number of MMS stages (stage 2 OR 1.61, >2 stages OR 2.31), suggesting the stains were useful to detect subclinical tumor.

Conclusion: Several AJCC-defined high local recurrence risk features are associated with the use of AE1/AE3 cytokeratin IHC. Cases with IHC were more likely to require more than one stage of MMS to remove subclinical tumor. Mohs surgeons may consider cytokeratin IHC for SCCs that have high-risk features associated with the tumor (diameter greater than 2.0cm, perineural invasion, poor histologic differentiation, high-risk anatomic location, and occurrence in an old scar) or patient (immunocompromised host, CLL).

Table 1: Case demographics and tumor features independently associated IHC use

	Non-IHC	With IHC	P-value
Number of cases (% of total)	5554 (92.9%)	420 (7.03%)	
Male Gender (%)	4192 (75.5%)	321 (76.4%)	
Mean Age (SD)	68.3 (11.0)	70.7 (12)	**<0.001**
Tumor Characteristic			
Perineural invasion*	24 (0.4%)	32 (7.6%)	**<0.001**
Recurrent tumor after previous treatment*	205 (3.7%)	29 (6.9%)	**0.001**
Occurring in old scar*	7 (0.1%)	7 (1.7%)	**<0.001**
Immunocompromised patient*	1491 (26.8%)	89 (21.2%)	**0.011**
Chronic lymphocytic leukemia diagnosis	42 (0.8%)	12 (2.9%)	**<0.001**
Anatomic Location			
Temple	275 (5.0%)	38 (9.0%)	**<0.001**
Scalp	190 (3.4%)	22 (5.2%)	**<0.001**
Perioral	190 (3.4%)	22 (5.2%)	0.052
Periocular	165 (3.0%)	7 (1.7%)	0.12
Ear	488 (8.8%)	36 (8.6%)	0.88
Nose	342 (6.2%)	29 (2.9%)	0.54
Histology			
Well-differentiated	2833 (51.0%)	253 (60.2%)	**<0.001**
In-situ	2630 (47.4%)	28 (6.7%)	
Moderate differentiation	68 (1.2%)	64 (15.2%)	
Poor differentiation*	23 (0.4%)	75 (17.9%)	
Preoperative Diameter			
0.1 - 1.9cm	3953 (71.2%)	126 (30.0%)	**<0.001**
2.0 - 3.9cm*	1228 (22.1%)	156 (37.1%)	
> 4.0cm*	373 (6.7%)	138 (32.9%)	
Mohs stages			
Stage 1	4734 (85.2%)	293 (69.8%)	**<0.001**
Stage 2	708 (12.7%)	92 (21.9%)	
> 2 Stages	112 (2.0%)	35 (8.3%)	

** Denotes AJCC high-risk SCC factor*

Table 2: Statistical model of high-risk features associated with IHC use

	Odds Ratio	P-Value	95% CI
Immunocompromised patient*	0.70	**0.019**	0.53, 0.94
Recurrent tumor after previous treatment*	1.13	0.645	0.67, 1.92
Perineural invasion*	2.88	**0.008**	1.32, 6.32
Occurring in old scar*	7.18	**0.004**	1.89, 27.23
Chronic Lymphocytic Leukemia Diagnosis	3.10	**0.016**	1.24, 7.75
Tumor Histologic Differentiation			
Well-differentiated[1]			
In-situ	0.13	**<0.001**	0.09, 0.19
Moderately differentiated	8.20	**<0.001**	5.45, 12.35
Poorly differentiated*	23.42	**<0.001**	13.75, 30.87
Anatomic Location			
Scalp	1.28	0.122	0.94, 1.76
Temple	1.90	**0.005**	1.21, 2.97
Pre-op diameter			
0.1 - 1.9 cm[1]			
2.0 - 3.9 cm*	3.05	**<0.001**	2.32, 4.00
> 4.0 cm*	8.34	**<0.001**	6.12, 11.37
Mohs Stages			
Stage 1[1]			
Stage 2	1.61	**0.002**	1.20, 2.17
> 2 Stages	2.31	**0.003**	1.32, 4.05

** Denotes AJCC high-risk SCC factor*

[1] Categorical reference group

40

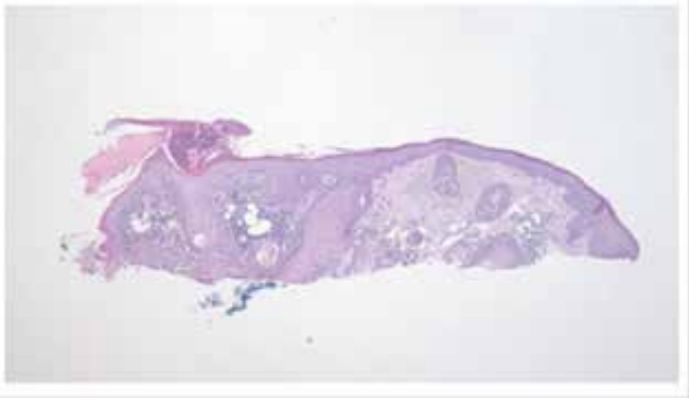
Presenter: Vanessa B. Voss, MD

Title: Don't Underestimate SCCIS!

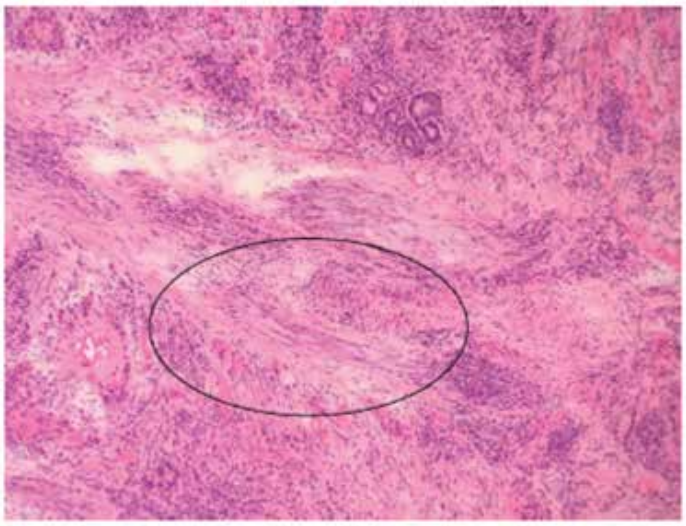
Authors: Vanessa B. Voss, MD[1]; Daniel F. Lozeau, MD[1]; Jordan B. Slutsky, MD[1]

Institution: 1. Stony Brook University Hospital, Stony Brook, NY

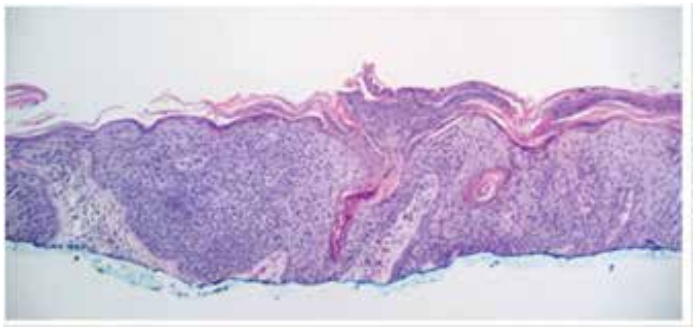
Introduction: Squamous cell carcinoma (SCC) is a common skin cancer with increasing incidence and potential for metastasis. Risk factors for aggressive course include perineural invasion (PNI), location on head and neck, large tumor diameter (>2 cm), poor differentiation, and invasion beyond subcutaneous fat. SCC is often under-staged and 16-31% of in-situ SCC (SCCIS) on biopsy are reclassified as invasive SCC during Mohs micrographic surgery (MMS). We present two cases of previously biopsy-diagnosed SCCIS found to be invasive SCC with PNI, something not yet reported in the literature.



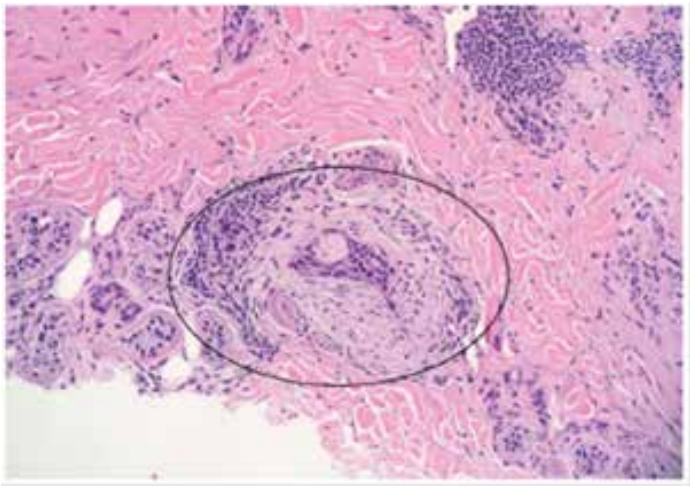
Patient 1 Biopsy: SCC – at least in situ



Patient 1: Mohs first stage with PNI



Patient 2 biopsy: SCCIS



Patient 2: Mohs first stage with PNI

Conclusion: Cutaneous SCC is a common neoplasm with increasing incidence and potential for life-threatening metastasis. Identifying SCC with more aggressive behavior is paramount in determining treatment for optimal patient care. PNI of large caliber nerves (>0.1 mm) or nerves below the dermis is included in the staging criteria of SCC in both AJCC and BWH methods because it is associated with metastasis to lymph nodes, local recurrence after wide local excision, and increased SCC-related mortality. Patients with SCC with symptomatic PNI (pain, neurological impairment) have been shown to have higher recurrence and SCC-related mortality regardless of caliber of involved nerves.

In our two patients, PNI was found on MMS sections of lesions initially classified as SCCIS. Our findings of PNI in "SCCIS" highlight the risk of under-staging SCC on partial shave biopsy, and the utility of MMS not simply as a therapeutic, but also a diagnostic modality. For biopsies identified as SCCIS, care must be taken when choosing destructive modalities in high-risk areas such as head/neck due to biopsy sampling errors. Important features, such as depth of tumor, poorly differentiated histological pattern and PNI may be missed on initial biopsy, as they were in our two cases.

41

Presenter: Mary E. Dyson, BS

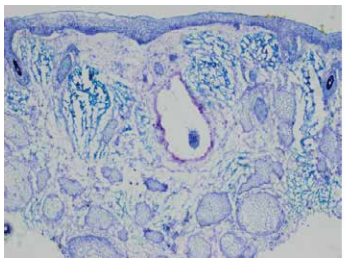
Title: The Empty Stromal Sandwich Sign: A Potential for False Negatives in Mohs Micrographic Surgery Slides when Evaluating Basal Cell Carcinoma

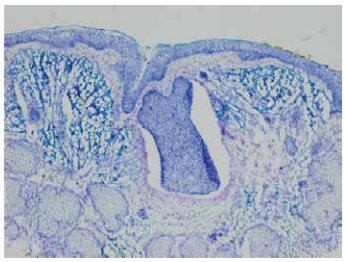
Authors: Mary E. Dyson, BS[1]; James L. Griffith, MD[1]; Leonard H. Goldberg, MD[1]; Arash Kimyai-Asadi, MD[1]

Institution: 1. DermSurgery Associates, Houston, TX

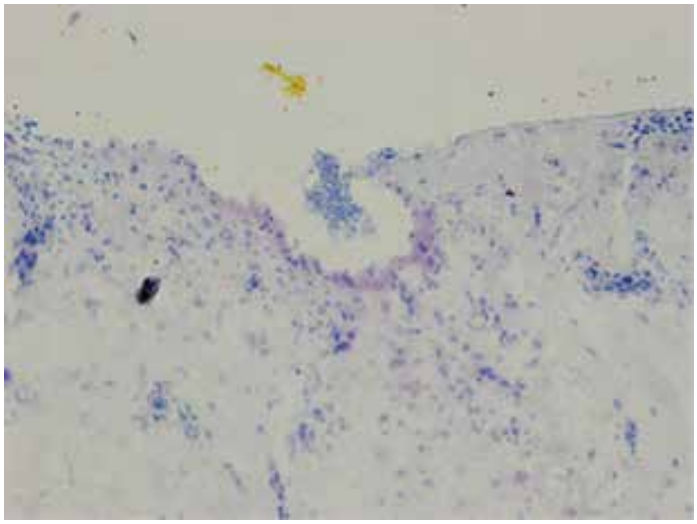
Introduction: Peri-tumor stroma and tumor-stroma clefts are among the cardinal histopathologic features of basal cell carcinoma. In some instances, tumor-stroma clefting is accentuated to the point that tumor nests completely separate from the tissue during surgical extirpation or histopathological processing, leaving behind an empty stromal sac with no residual tumor cells remaining.

The phenomenon of the basal cell carcinoma slipping out of its stroma much resembles the oft-frustrating event whereupon grabbing a sandwich, the contents extrude from the bread pocket, leaving behind a sandwich emptied of its main contents.

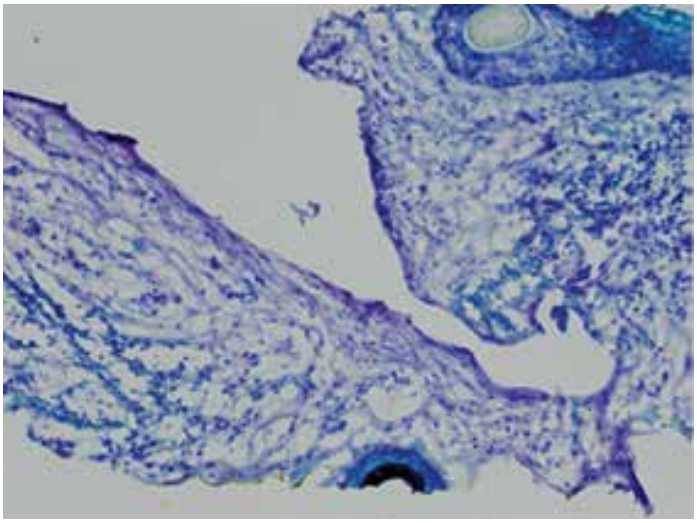




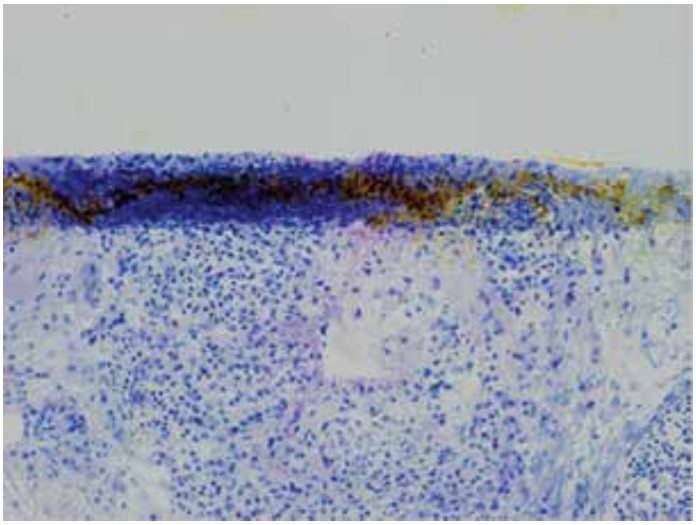
In some examples, deeper cuts can confirm the presence of tumor.



In other instances, this finding may be rather subtle, but upon closer inspection one can identify the presence of residual basal cell carcinoma cells.



In this example, the tumor was noted to extrude from the tissue during handling, leaving behind an empty stromal sac in the slide.



In some situations, the findings may be rather subtle and other than a ring of stroma and an empty space, there is no other evidence of carcinoma cells.

Conclusion: If examination of Mohs frozen section slides reveals on the presence of a stromal sac without any other tumor nests (analogous to the "empty sandwhich"), this may lead to misdiagnosis of the Mohs surgical margin as tumor-free. Since the primary goal of Mohs micrographic surgery is to minimize the risk of tumor recurrence, it is important for Mohs micrographic surgeons to identify circumstances that may lead to false negative Mohs slides. We believe that identification of the "empty stromal sandwhich sign" can reduce the risk of false negative interpretations of Mohs frozen section and the resultant risk of tumor recurrence.

42

Presenter: Erik T. Petersen, MD

Title: Superficial Basal Cell Carcinoma, the Tip of the Iceberg?

Authors: Erik T. Petersen, MD[1]; Deborah MacFarlane, MD, MPH[1]

Institution: 1. MD Anderson Cancer Center, Houston, TX

Introduction & Objectives: A recent letter in JAMA Dermatology (Steinman HK, Dixon A, Zachary CB, Reevaluating Mohs Surgery Appropriate Use Criteria for Primary Superficial Basal Cell Carcinoma, JAMA Dermatol. 2018;154(7):755-756) proposed that most superficial basal cell carcinomas (sBCC) currently scored as "appropriate" by the Mohs surgery appropriate use criteria (MAUC) should be reclassified as "uncertain" or "inappropriate". At the heart of this debate is the fact that there is limited data in the literature regarding the behavior of sBCC. Two pressing questions that currently lack significant evidence are:

1) Is sBCC more likely to invade beyond the superficial dermis on the head and neck?

2) Does sBCC behave more aggressively in immunocompromised patients and those with genetic syndromes?

We designed a study in hopes of providing empirical, evidence-based answers to these questions.

Study Type: Retrospective review.

Study Setting: Academic center.

Methods: Following IRB approval, we performed a retrospective review of Mohs cases for superficial basal cell carcinoma performed in our institution over a 2-year period (we are currently reviewing a 10-year period of cases and present a subset of the eventual data). Patients were stratified into two cohorts by chart review: healthy, and immunocompromised. Criteria for immunocompromised status included active chemotherapy, lymphoma, immunosuppressive medications, history of solid organ/stem cell transplant, or presence of a genetic syndromes such as Gorlin Syndrome. Tumors were also stratified by anatomic location into either head/neck or trunk/extremities. The Mohs slides for all cases were reviewed for the presence of mixed histology (the presence of nodular or infiltrative BCC in addition to the known sBCC).

Results: In total we analyzed 45 cases. Thirty cases were performed in healthy patients, with 20 tumors on the head/neck and 10 on the trunk/extremities. Fifteen cases were performed on immunocompromised patients or those with a genetic syndrome, with 12 tumors on the head/neck and 3 on the trunk/extremities. Across all cases (n=45), the incidence of mixed histology in tumors of the head/neck was 69% compared to 23% on the trunk/extremities ($p = 0.005$, Chi = 7.81). For all tumors in immunocompromised and genetic syndrome patients, the incidence of mixed histology was 67% compared to 50% for tumors occurring in healthy patients ($p = 0.29$, Chi = 1.13).

Conclusion: To date, 20% of the sample population has been evaluated. The results thus far indicate that sBCC located on the head/neck is significantly more likely to invade beyond the superficial dermis compared to sBCC of the trunk/extremities. We hope review of the much larger volume of remaining cases will provide more definitive evidence regarding the behavior of sBCC in immunocompromised patients. In summary, our data at this time provide empirical evidence in support of the MAUC in offering MS for the treatment of sBCC of the head and neck.

Figure 2: 4cm x 3.6cm defect of scalp vertex. Flap elevated. 3 month follow up.

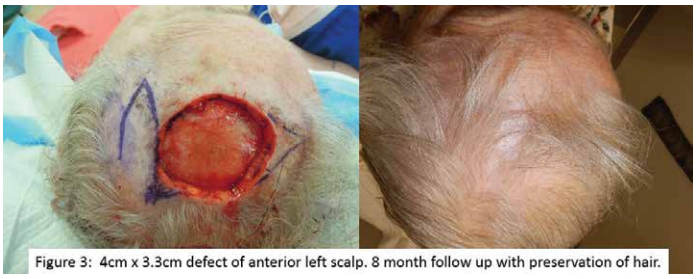


Figure 3: 4cm x 3.3cm defect of anterior left scalp. 8 month follow up with preservation of hair.

44

Presenter: Kathleen C. Suozzi, MD

Title: Clinical Factors Influencing Clearance Rate for Melanoma in Situ in a Cohort of 243 Cases at a Single Institution

Authors: Brianna Olamiju[1]; Kathleen C. Suozzi, MD[1]; Nathaniel Smith, MD[1]; Gauri Panse, MD[1]; David J. Leffell, MD[1]; Sean R. Christensen, MD, PhD[1]

Institution: 1. Yale School of Medicine, New Haven, CT

Introduction & Objectives: Surgical excision is considered the gold standard for melanoma in situ (MIS) treatment, but optimal margins remain poorly defined. The purpose of this study was to evaluate the clearance rate of melanoma in situ on the first stage in patients treated with staged excision and to determine clinical factors influencing clearance.

Study Type: Retrospective review.

Study Setting: Academic center, single institution.

Methods: We performed a retrospective analysis of all cases (N=243) of MIS treated by five surgeons at a single institution over a 5-year period. Clinical variables extracted from electronic record review included patient age, patient sex, anatomic site, lesion diameter, margin size, and recurrent status, as these variables have previously been shown to impact clearance rate. Recurrent lesions were defined as those with prior definitive treatment. Chi-square, univariate and multivariate logistic regression analyses were performed to identify factors associated with clearance. An F test was conducted to assess the relatedness of the independent variables. Statistical analyses were conducted with IBM SPSS software.

Results: Analysis of 243 cases of MIS revealed an overall clearance rate on first stage excision of 85.2% with mean margin of 0.48 centimeters [range 0.15 cm - 1 cm]. The median age of patients was 73 years old, 61% of patients were male, and 4% of lesions were recurrent. The majority of lesions were located on the head and neck (53%), followed by extremity (26%) and trunk (21%). Clearance rate varied by location ($p=0.001$) with a lower clearance rate on the head and neck of 77.3% (mean margin 0.46 cm) versus 93.8% for extremity (mean margin 0.51 cm) and 94.1% for trunk (mean margin 0.51 cm). Margin size was strongly associated with clearance rate: 57.1% clearance for margins <0.5cm versus 89.9% for margins >0.5cm ($p<0.001$). Location on the head and neck was correlated with smaller surgical margins ($p=0.001$). Notably, when the analysis was restricted to only cases with a 0.5 cm margin, there was no significant association of location with clearance rate (86.0% for head and neck versus 93.2% for trunk and extremity). Older age was significantly associated with lower clearance rate: 80.1% clearance for patients ≥70 versus 91.6% for patients <70 ($p=0.013$). In multivariate analysis, margin size and patient age independently affected clearance rate ($p<0.001$ and $p=0.003$, respectively), but location did not. Patient sex, lesion diameter and recurrent status were not associated with clearance.

Conclusion: Retrospective analysis of MIS treated with staged excision showed that surgical margin and age significantly impacted clearance rate. A lower clearance rate was noted on the head and neck, but this may be a result of smaller surgical margins. In our cohort, initial excision with 0.5 cm margins resulted in a high clearance rate in all anatomic locations.

45

Presenter: Nicole Strickland, MD

Title: Nail Unit Melanoma in situ Treated with Mohs Micrographic Surgery

Authors: Nicole Strickland, MD[1]; Rajiv Nijhawan, MD[1]; Divya Srivastava, MD[1]

Institution: 1. UT Southwestern Medical Center at Dallas, Dallas, TX

Introduction & Objectives: Importance: Mohs micrographic surgery (MMS) is often underutilized in the treatment of nail melanoma in situ (MIS) with limited studies published in the literature.

Study Type: Retrospective observational study.

Study Setting: Single academic institution.

Methods: Review of patients with a diagnosis of nail unit MIS treated with MMS and MART-1 immunostaining referred from January 1, 2006 to December 30, 2016.

The primary outcome measure was recurrence rate after MMS.

Results: 14 patients with a diagnosis of nail unit MIS treated with Mohs micrographic surgery with MART-1 immunostaining were identified. With an average follow-up of 6.0 years (71.6 months; range = 5–139 months), 1 patient developed recurrence 6.6 years after undergoing initial MMS, requiring amputation with no further treatment or recurrence thereafter.

Conclusion: MMS for nail unit MIS can offer a high cure rate and reduce the need for digital amputation. The evolution of the Mohs technique over time, namely using MART-1 immunostaining in all specimens, performing complete nail unit excision, and avoiding nail avulsion, has led to improvement in treatment outcomes.

46

Presenter: Paul R. Massey, MD

Title: Histologic Perineural Invasion Does Not Negatively Impact Patient Outcomes in a Retrospective Matched Cohort Study of Basal Cell Carcinoma

Authors: Paul R. Massey, MD[1]; Emily S. Ruiz, MD, MPH[1]; Frederick Morgan, BSPH[1]; Chrysalyne D. Schmults, MD, MSCE[1]

Institution: 1. Brigham and Women's Hospital, Jamaica Plain, MA

Introduction & Objectives: Perineural invasion (PNI) is thought to represent an aggressive tumor characteristic in basal cell carcinoma (BCC). The National Comprehensive Cancer Network recommends radiologic imaging for BCCs with suspicion for PNI and consideration of adjuvant radiation for tumors with extensive or large-nerve PNI. Nevertheless, there is limited data regarding PNI and poor patient outcomes. Ascertaining the impact of PNI on poor outcomes in BCC is challenging because PNI is often itself associated with other high-risk features, including increasing tumor diameter, aggressive histologic subtypes, increased depth of tumor invasion and location on the head and neck. The purpose of this analysis is to compare the risk of local recurrence (LR), metastasis, and death in BCCs with PNI (BCCPNI+) to those without PNI (BCCPNI-neg).

Study Type: Retrospective matched cohort study.

Study Setting: Two academic tertiary care centers.

Methods: BCC diagnosed between 2000 and 2009 at two academic tertiary care centers were identified and confirmed via operative and pathology reports. Patient and tumor characteristics as well as outcomes were abstracted by medical record review. BCCPNI+ and BCCPNI-neg were matched based on diameter, histologic subtype, presence of squamous differentiation, depth of invasion, and location. LR, metastasis or death from disease were analyzed using McNemar's test.

Results: Of 496 primary BCCs, 22 BCCPNI+ were identified in 21 patients and were matched to 22 BCCPNI-neg in 22 patients. There was no significant difference in patient and tumor characteristics between BCCPNI+ and BCCPNI-neg (Table 1). There was no difference in treatment modality, with the majority of tumors undergoing excision (BCCPNI+: 50%, BCCPNI-neg: 54.5%) followed by Mohs micrographic surgery (BCCPNI+: 22.7%, BCCPNI-neg: 36.3%) . There was no significant difference in outcomes based on PNI status: LR (BCCPNI+:16.4%, BCCPNI-neg: 9.0%), metastasis (BCCPNI+:16.4%, BCCPNI-neg: 9.0%), death (BCCPNI+: 4.5%, BCCPNI-neg: 9.0%) or any poor outcome (BCCPNI+: 18.1%, BCCPNI-neg: 22.7%) (Table 2).

Conclusion: Based on the matched data presented herein, PNI may not predict poor outcomes in BCC. Thus, additional diagnostic tests and treatments may not be indicated based on the presence of PNI alone. Additional larger prospective studies are needed to validate these results.

Table 1. Patient and Tumor Characteristics.

	PNI	No PNI	p
Patient Characteristics	**n=21**	**n=22**	
Gender			
Men	13 (61.9)	12 (54.5)	
Women	8 (38.1)	10 (45.4)	.76‡
Race			
White non-Hispanic	19 (90.5)	21 (95.4)	
Other/Unknown	2 (9.5)	1 (4.5)	1.00
Basal Cell Nevus Syndrome			
Yes	0	2 (9.0)	
No	21 (100)	20 (90.9)	.49
Immunosuppression			
Yes	3 (14.3)	1 (4.5)	
No	18 (85.7)	21 (95.4)	.61
History of Radiation at Tumor Site			
Yes	0	3 (13.6)	
No	21 (100)	19 (86.3)	.23
Tumor Characteristics	**n=22**	**n=22**	
Age at diagnosis, mean	66.4	68.4	.65†
Total follow-up, median months	67.2	75.8	.97*
Tumor Diameter, median cm	4.0	3.75	.66*
Tumor Location			
Head or neck	9 (40.9)	9 (40.9)	
Other	13 (59.1)	13 (59.1)	1.00‡
Tumor Subtype			
Any aggressive	22 (100)	22 (100)	
Infiltrative	20 (90.9)	21 (89.5)	
Morpheaform	4 (18.2)	3 (13.6)	
Basosquamous	2 (9.0)	1 (4.5)	1.00§
Squamous Differentiation			
Yes	6 (27.3)	6 (27.3)	
No	16 (72.7)	16 (72.7)	1.00‡
Tumor Depth			
Dermis or subcutaneous fat	18 (81.8)	18 (81.8)	
Beyond Fat	4 (18.2)	4 (18.2)	1.00

Table 1. Patient and Tumor Characteristics (Continued)

	PNI	No PNI	p
Treatment Modality (primary)			
Mohs surgery	5 (22.7)	8 (36.3)	
Standard excision	11 (50)	12 (54.5)	
Excision and Mohs	5 (22.7)	1 (4.5)	
XRT and Mohs	0	1 (4.5)	
ED&C	0	0	
Cryotherapy	0	0	.23
Adjuvant Therapy			
Radiation	1 (4.5)	1 (4.5)	
Chemotherapy	0	0	
None	21 (95.4)	21 (95.4)	1.00
Final margins positive			
Yes	1 (4.5)	3 (13.6)	
No	21 (95.4)	19 (86.3)	.61

p-values derived from Fisher's exact test unless otherwise noted. *Wilcoxon rank-sum; †T-test; ‡ X^2.
Abbreviations: BCC, basal cell carcinoma; ED&C, Electrodessication and Curettage; XRT, radiation therapy. §Composite "aggresssive histology," comprising infiltrative, morpheaform, metatypical, basosquamous subtypes.

Table 2. McNemar's Test.

	PNI, n (%)	No PNI, n (%)	p
Local Recurrence	3 (16.4)	2 (9.0)	.65
Metastasis	3 (16.4)	2 (9.0)	.65
Disease Specific Death	1 (4.5)	2 (9.0)	.56
Local Recurrence, Metastasis or Disease Specific Death	4 (18.1)	5 (22.7)	.74

47

Presenter: Rebecca K. Jacobson, MD

Title: Changing Anatomy and Histologic Trends in an Academic Mohs Surgery Program

Authors: Rebecca K. Jacobson, MD[1]; Jake Fagan, MD[1]; Michael L. Ramsey, MD[1]

Institution: 1. Geisinger Medical Center, Danville, PA

Introduction & Objectives: Mohs Micrographic surgery (MMS) treats both highly aggressive and less histologically aggressive tumors in various anatomic locations. The Mohs surgery Appropriate Use Criteria (AUC), provides a frame-work for the use of MMS based on tumor histology, clinical scenario, and anatomic location. This study analyzed changes in histologic and anatomic trends in MMS as guidelines for the appropriate use of Mohs surgery have become better defined.

Study Type: Retrospective chart review.

Study Setting: Academic center.

Methods: This was a retrospective review involving 50,921 Mohs surgery cases between 2006 and 2018 at an academic Mohs surgery center. Forty-four tumor types were categorized as having aggressive (AH) or non-aggressive histology (NH). Tumor location was subdivided into high (H), moderate (M) and low (L) risk anatomic areas as defined by the Mohs AUC.

Results: Over a 13-year period, SCC's increased from 24.6% in 2006 to 30.0% in 2018 ($p < 0.0001$). Melanomas increased from 0.1% to 1.4% (($p < 0.0001$)), which were predominantly melanoma in-situ and lentigo maligna.

In terms of treatment sites, most tumors were from H followed by M and L-risk areas. Over time, M-risk area tumors increased (79.2% to 84.6%, ($p < 0.0001$) while H-risk area tumors remained constant when compared to L-risk area tumors.

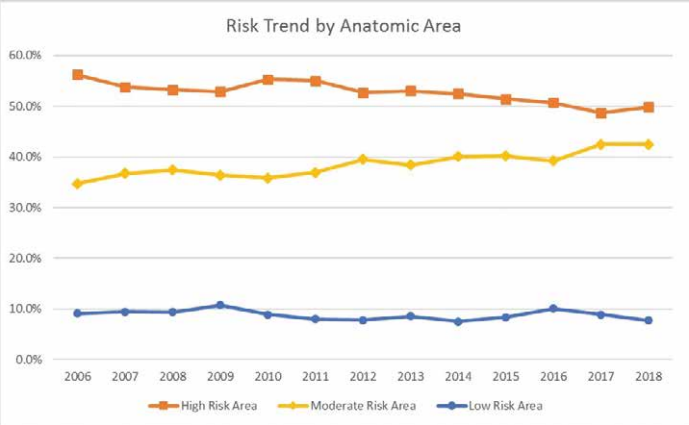
When comparing higher (combined H and M) versus lower (L) risk area tumors, H and M-risk area tumors increased from 90.9% to 92.3% ($p = 0.0047$). Among non-aggressive tumors, H and M-risk areas were also more frequent. NH/H-risk area tumors were the most common followed by NH/M-risk areas.

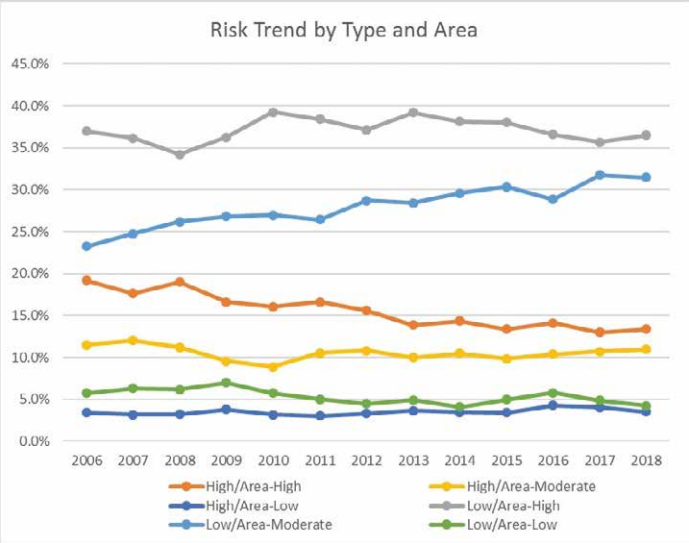
Over time, the proportion of non-aggressive tumors in H-risk areas were similar while those in M-risk areas increased (23.2% to 31.5% ($p < 0.0001$)) and L- risk areas decreased (5.7% to 4.2% ($p < 0.0001$)). Additionally, more non-aggressive tumors were treated compared to aggressive tumors with a decline in aggressive tumors treated by MMS (34.1% to 27.8%, ($p < 0.0001$)).

Conclusion: Among the 50,921 cases treated with MMS during a 13-year period, there has been an increase in the treatment of SCC's and melanomas consistent with the increased incidence of both cancers nationally.

While there has been a decrease in high-risk (H-risk) area tumors, there has been a slight increase in the proportion of tumors in high and moderate risk areas combined. Still, the majority of tumors that are treated by MMS are from higher risk areas despite these trends. Amongst non-aggressive tumors, there was a decrease in low-risk areas that were treated.

These findings suggest that referral practices are in-line with those outlined in the Mohs AUC, including treatment of tumors in higher risk areas. Moreover, the increased number of melanoma in-situ and lentigo maligna cases reflects increased utilization of MMS for melanoma in-situ.





48

Presenter: Julia Baltz, MD

Title: Anatomic Study of Forehead Lines: 4 Distinct Patterns and Implications for Reconstruction

Authors: Julia Baltz, MD[1]; Amanda Foy[1]; Alyssa Findley[1]; Sue Sweeney, MD[1]; Nathaniel Jellinek, MD[1,2]

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

Introduction & Objectives: Introduction: Static and dynamic forehead lines have traditionally been divided into two groups: horizontal on the forehead perpendicular to the frontalis muscle and vertical overlying the glabella and nasal root secondary to movement of the procerus and corrugator supercilii muscles. Accordingly, reconstructive options have largely been binary; vertical reconstruction favored in the central forehead/glabella and horizontal closures favored laterally. Wounds larger than 1 centimeter are often closed vertically to avoid elevating the brow, although this dogma has been challenged. We have identified several distinct patterns of forehead lines that have not been studied in depth. A more thorough understanding of the patterns of forehead lines will allow for more diverse reconstructive options.

Objective: To better characterize and define normal forehead lines in adults.

Study Type: Prospective cohort study.

Study Setting: Private practice.

Methods: IRB approval was obtained for a prospective observational cohort study between 8/18 and 11/18. Consecutive patients presenting for Mohs surgery were photographed at rest, with maximal brow elevation, and frowning. Lines were subdivided into coarse or fine, with coarse lines defined as those that were palpable while fine lines were defined as visible but not palpable. These were then assigned a primary pattern: straight, seagull, diagonal, or a highly sebaceous nasal-type forehead skin. Oblique lines were characterized as present/not present, and were induced in patients who had difficulty frowning. (Figures 1-2).

Results: 250 consecutive patients were included. 94.8% demonstrated forehead lines at rest. Four distinct pattern of forehead lines were appreciated, with 39.2% changing pattern during brow elevation. The most common pattern was diagonal. 23.2% were straight at rest and with brow elevation. (Table)

96% also demonstrated oblique lines, nearly vertical in the midline, fanning out obliquely moving medially to laterally. Half were coarse.

9.6% showed a nasal-type pattern of forehead skin, which exhibited overly sebaceous, thick skin, minimal tissue movement, a deficit of coarse lines, and variable fine lines.

Conclusion: This study demonstrates that "horizontal" forehead lines can be subdivided into four distinct subtypes: diagonal, straight, seagull, and nasal. This categorization has not been reported to our knowledge. Half of the forehead lines are coarse, present at rest, but only a minority are truly and typically straight horizontal. In addition, 96.4% of patients have oblique lines. These may therefore be considered normal relaxed skin tension lines (RSTLs).

This has reconstructive implications. For those patients with straight lines at rest and elevation (23.2%), horizontal closures are appropriate. For those patients with discordant lines at rest and elevated, the majority of our patients, a vertical or oblique closure will hide in RSTLs, result in less brow lift, and decreased sensory disturbance. Nasal type skin affords minimal tissue movement and features few lines. This represents the most difficult type of forehead skin for reconstruction.

Table: Forehead line characteristics and distribution

Horizontal Line Data

Pattern at Rest	Number	Percentage Total
Diagonal	109	43.6%
Straight	76	30.4%
Seagull	40	16%
Nasal type	24	9.6%
No lines	1	0.4%

Pattern with Brow Elevation	Number	Percentage Total
Diagonal	60	24%
Straight	89	35.6%
Seagull	90	36%
Nasal Type	11	4.4%
No lines	0	0%

Line Characteristics at Rest	Number	Percentage Total
Fine	22	8.8%
Coarse	215	86%
Nasal no lines	13	5.2%
No lines	1	0.4%

Line Characteristics with Brow Elevation	Number	Percentage Total
Fine	13	5.2%
Coarse	235	94%
Nasal no lines	2	0.8%
No lines	0	0%

49

Presenter: Tatyana Petukhova, MD, MS

Title: Utilization of Keratinocyte Carcinoma Internet-Based Support and Education Groups on Facebook

Authors: Tatyana Petukhova, MD, MS[1]; Mariam Gtadjiko[1]; Britney Wilson, BA[2]; Jennifer Wang[2]; Erica Lee, MD[2]; Anthony Rossi, MD[2]; Kishwer Nehal, MD[2]

Institutions: 1. Weill Cornell Medicine, New York, NY
2. MSKCC, New York, NY

Introduction & Objectives: A subset of skin cancer patients experience significant physical and psychosocial morbidity. Given rising rates of social media use in dermatology, skin cancer patients are increasingly seeking direct information for prevention, treatment, and emotional support on the Internet.1-3 The goal of this study was to systematically review and categorize available patient-driven support and education resources focused on keratinocyte carcinoma on Facebook.

Study Type: Retrospective Review.

Study Setting: Academic Center.

Methods: Facebook groups were searched with key terms, including: skin cancer, skin carcinoma, basal cell, squamous cell, BCC, SCC, skin cancer treatment, skin cancer therapy, skin cancer support, and Mohs surgery. Selection criteria were limited to groups that were in English, patient-driven, had at least 50 members, and excluded groups focused on broad cutaneous disorders or metastatic disease. Of the 14 closed groups meeting criteria, requests to join were granted by 7. In a retrospective review from January to June 2018, consecutive posts (until n=500), were analyzed in each group by an independent reviewer. A second reviewer re-analyzed the data for verification, where inter-reviewer concordance rates averaged 0.99 per group.4 The posts were categorized according to content as initial forum posts (sharing experiences, seeking support, asking medical advice) and comments responding to posts (providing support, offering advice, advertising products).

Results: A total of 3,130 posts were catalogued with 444 posts initiating a conversation thread and an average of 6 comments (Table 1). 40% of posts had an attached photo, frequently of skin lesions pending, or recently receiving treatment. 50% of initiating posts were of patient experiences seeking support and 42% were seeking medical advice. Of the responses, 28% were sharing personal experiences, 37% expressing motivation and prayers, and 35% offering medical advice. Of the medical advice provided, 87% were unsupported claims, including medical misinformation and non-evidence based alternative therapies.

Limitations: The study was limited by selection bias of closed Facebook groups limiting access of medical professionals.

Conclusion: Highlighting the need for psychosocial and educational support, patients have taken it upon themselves to create their own grassroots online communities in closed Facebook groups with over 15,000 members worldwide. While the groups offer messages of solidarity, understanding, and positive support, there is also a significant level of medical misinformation and a lack of security of personal health information.

An advantage of Internet-based support groups is the ability to reach a large, geographically diverse, group of people who may have limited access to care.5 However, further research is warranted as to whether skin cancer patients would benefit from an Internet-based support group that is secure, anonymous, and moderated by a medical professional to provide emotional support, improve patients' sense of community, and to offer education beyond the limited time allotted in clinical visits.

Initiating Posts	N	Image
Sharing personal experience (i.e. expressing fear, anxiety, awaiting results)	222	126
Expressing distrust in medical community (i.e. cancer scam, profiting)	13	0
Seeking Medical Advice (i.e. posting photo of lesion for diagnosis, seeking "before and after photos", skincare products, alternative therapy)	187	45
Seeking Financial Advice (i.e. charges for specific procedures)	3	0
Lifestyle questions (i.e. advice on sun protection and behavior)	19	5
Comments in Response		
Sharing personal experience (i.e. stories of post-procedure course, "before and after" photos)	740	94
Words of motivation prayer	996	6
Giving medical Advice		
Supported (i.e. from a medical professional, citing research literature, citing Skin Cancer Foundation)	122	6
Unsupported (i.e. biopsy spreads cancer, toxic sunscreen causes cancer, anti-vaccine, diagnosing lesions from photos)	372	9
Alternative Product Recommendations (i.e. black salve, gumby gumby, blood root, canabis, coconut oil, apple cider vinegar, colloidal silver, diet)	431	37
Alternative Product Advertising (i.e. where to buy specific products)	25	0
Total	3130	328

50

Presenter: Christine N. Schafer, MD

Title: Endocrine Mucin-Producing Sweat Gland Carcinoma Treated with Mohs Micrographic Surgery

Authors: Christine N. Schafer, MD[1]; Jessica B. Dietert, MD[1]; Philip L. Custer, MD[1]; Steven M. Couch[1]; Ilana S. Rosman, MD[1]; Eva A. Hurst, MD[1]; M. Laurin Council, MD[1]

Institution: 1. Washington University School of Medicine, St. Louis, MO

Introduction & Objectives: Endocrine mucin-producing sweat gland carcinoma (EMPSGC) is a rare low-grade cutaneous adnexal tumor with a strong predilection for the eyelid.

It is considered a precursor of invasive mucinous carcinoma and should be treated with complete excision. Further, the histologic and immunohistochemical findings are nearly identical to those seen in forms of breast carcinoma, therefore, patients should be evaluated to exclude the possibility of underlying disease. Currently, no standard guidelines exist regarding work-up.

OBJECTIVE: To evaluate the patient and tumor characteristics, the incidence of local recurrence, metastasis, disease-specific mortality, and all-cause mortality and to identify work-up approaches.

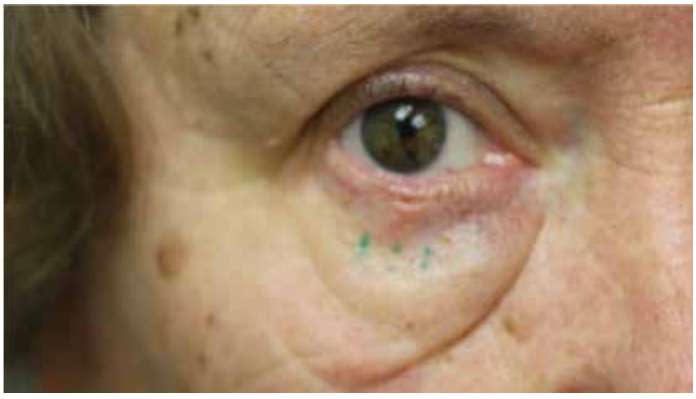
Study Type: Retrospective chart review.

Study Setting: Academic center.

Methods: Retrospective chart review of all patients with a biopsy-proven EMPSGC treated with Mohs micrographic surgery between 2000 and 2018 at one institution.

Results: Eight patients presented with EMPSGC located on the lower eyelid (7) and cheek (1). The mean age was 64.1 years, and 6 (75%) patients were female. All tumors were completely cleared by Mohs micrographic surgery, requiring an average of 2.7 Mohs stages. No local recurrences, metastases, or disease-specific deaths occurred during an average follow up period of 14 months. The most common work up for underlying breast cancer included bilateral mammogram and CT scan of the head, neck and chest, or whole body PET/CT.

Conclusion: Here, we present eight cases of EMPSGC treated effectively with Mohs micrographic surgery at one institution. This series supports the notion that EMPSGC may be under-reported in the literature. The authors recommend screening patients for underlying breast cancer by performing diagnostic mammogram, as well as CT head, neck and chest or whole body PET/CT. While some data suggest that EMPSGC is a precursor of invasive mucinous carcinoma, this series demonstrates that the overall prognosis after complete excision with Mohs micrographic surgery is excellent.



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555 East Wells Street, Suite 1100
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Website: www.MohsCollege.org
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