Evaluating Postoperative Complication Risk in Patients with Nicotine Dependence Who Undergo Mohs Micrographic Surgery

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Introduction

- There is scant literature that evaluates postoperative outcomes in patients with nicotine dependence who undergo Mohs micrographic surgery (MMS), a tissue-sparing surgical technique commonly used to remove cutaneous neoplasms.
- Due to exceedingly low complication rates, MMS complications are often anecdotal rather than being well-characterized by large multicenter trials or evaluated by database studies.[1]
- Some of the most commonly reported MMS complications are skin infections, impaired wound healing, dehiscence, sensation loss, and bleeding.[1]
- Nicotine dependence is associated with many poor procedural outcomes, including at incision sites, yet it is not well characterized in MMS.
- This study evaluated the postoperative complication risk in MMS recipients with vs. without nicotine dependence.

Methods

- A retrospective cohort analysis was conducted using TriNetX, a federated health research network database. This report was generated on the US Collaborative Network including 56 HCOs.
- Using validated ICD-10 codes and CPT codes, the experimental group, cohort 1, identified patients with current Nicotine Dependence (ICD-10-CM:F17) who underwent Mohs Micrographic Surgery (CPT:1003602).
- The control group, cohort 2, identified patients without Nicotine Dependence who underwent MMS.
- A 1:1 matched propensity score analysis was conducted adjusting for demographics, personal history of irradiation, anticoagulant use, platelet aggregation inhibitor use, glucocorticoid use, and immunosuppressant use.
- The following postoperative outcomes were selected for analysis: cellulitis/acute lymphangitis, infection of the skin and subcutaneous tissue, wound hemorrhage, muscle weakness, anesthesia of skin, paresthesia of skin, rash eruption, localized swelling of skin, skin graft complications, and acute postprocedural pain.
- Each post-operative outcome was selected and assessed at 30-days after the initial surgery occurred.
- Adjusted Risk Ratios (RR) with 95% CI were utilized to demonstrate the significance of the increased risks of negative acute outcomes in the nicotine dependence cohort compared to those without nicotine dependence who undergo MMS.

Demographic or History	Cohort	Mean +/- SD	Patients	% of Cohort	P-Value	Std. Diff.
Age at Index	1	65.9 +/- 11.5	19,567	100	0.863	0.002
	2	65.8 +/- 11.7	19,567	100		
Male	1		11,931	61.0	0.780	0.003
	2		11,904	60.8		
Female	1		7,077	36.2	0.760	0.003
	2		7,106	36.3		
White	1		18,490	94.5	0.178	0.014
	2		18,550	94.8		
Hispanic or Latino	1		272	1.4	0.289	0.011
	2		248	1.3		
Not Hispanic or Latino	1		17,493	89.4	0.531	0.006
	2		17,531	89.6		
Black or African American	1		138	0.7	0.034	0.021
	2		105	0.5		
Unknown Race	1		876	4.5	0.572	0.006
	2		853	4.4		
Unknown Gender	1		559	2.9	0.952	0.001
	2		557	2.8		
Personal History of Irradiation	1		899	4.6	0.961	<0.001
	2		897	4.6		
Anticoagulant Use	1		8,060	41.2	0.926	0.001
	2		8,051	41.1		
Platelet Aggregation Inhibitor Use	1		10,224	52.3	0.935	0.001
	2		10,216	52.2		
Glucocorticoid Use	1		14,360	65.3	0.756	0.003
	2		14,391	65.5		
Immuno-suppressant Use	1		2,306	10.5	0.889	0.001
	2		2,315	10.5		

Table 1. Characteristics of Cohort 1 and 2 After Propensity Score Matching: Two extremely balanced cohorts of 19,567 patients each were created

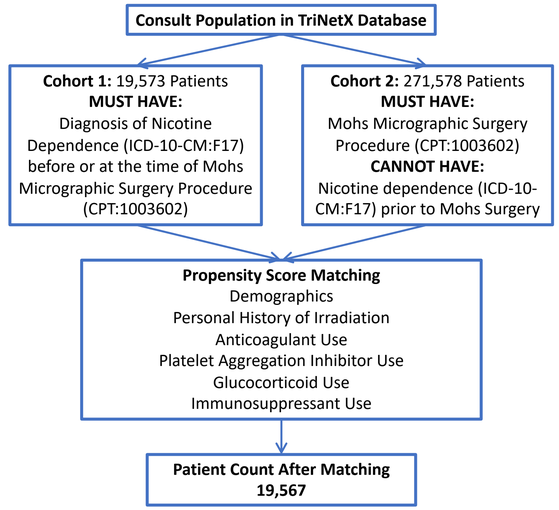

Figure 1. Flow diagram depicting the selection process in the creation of the cohorts for this retrospective cohort study

Acute Complications	UMLS Code	Risk Ratio	95% CI
Cellulitis/Acute lymphangitis	ICD-10-CM:L03	**1.56**	**(1.24-1.95)**
Infection of the skin and subcutaneous tissue	ICD-10-CM:L00-08	**1.52**	**(1.32-1.77)**
Wound hemorrhage	ICD-10-CM:R58	**4.75**	**(4.25-5.31)**
Muscle weakness	ICD-10-CM:M62.81	**2.24**	**(1.58-3.19)**
Anesthesia of skin	ICD-10-CM:R20.0	**5.74**	**(4.87-6.75)**
Paresthesia of skin	ICD-10-CM:R20.2	**2.66**	**(2.07-3.41)**
Rash eruption	ICD-10-CM:R21	**3.61**	**(3.05-4.27)**
Localized swelling of skin	ICD-10-CM:R22	**2.69**	**(2.17-3.33)**
Skin graft complications	ICD-10-CM:T86.82	**3.23**	**(1.74-6.02)**
Acute postprocedural pain	ICD-10-CM:G89.18	**2.22**	**(1.67-2.95)**

Table 2. Selected Adjusted Risk Ratios (aRR) for the risk of postoperative complications in MMS patients with nicotine dependence
Bold values indicate P < 0.05

Results

- After propensity score matching, we compared the two balanced cohorts of 19,567 patients each.
- This study found MMS patients with nicotine dependence to be at greater risk of cellulitis/lymphangitis (aRR [95% CI]) = (1.56 [1.24-1.95]), cutaneous infection (1.52 [1.32-1.77]), wound hemorrhage (4.75 [4.25-5.31]), generalized muscle weakness (2.24 [1.58-3.19]), anesthesia of skin (5.74 [4.87-6.75]), paresthesia of skin (2.66 [2.07-3.41]), rash eruption (3.61 [3.05-4.27]), localized swelling (2.69 [2.17-3.33]), skin graft complications (3.23 [1.74-6.02]), and acute post-procedural pain (2.22 [1.67-2.95]).
- All acute complications returned significantly increased risk ratios. No outcome was insignificant, nor decreased.

Discussion

- Our study overwhelmingly points to an increased risk of acute postoperative complications in patients with nicotine dependence undergoing MMS. All 10 acute complications that were analyzed returned significantly increased risk ratios.
- 8 out of 10 aRRs were over 2.0, and the highest depicted a 5.74x increased risk of anesthesia of the skin incision site.
- Smoking has numerous effects throughout the human body, including in the skin. It is thought that smoking decreases WBC chemotactic ability, tissue perfusion, bactericidal mechanisms, metabolism, fibroblast migration, and the synthesis or deposition of collagen.[2]
- Our results indicate that the side effects of nicotine dependence can significantly reduce the skin's ability to be a protective barrier, to heal, to feel, and to clot.

Conclusions

- All tested postoperative outcomes demonstrated statistically significant (P<0.05) risk ratios indicating increased risk in the nicotine dependence cohort undergoing MMS versus control.
- These results suggest that patients with nicotine dependence are at increased risk for acute post-MMS complications within 30 days vs. patients without nicotine dependence.
- For current smokers being evaluated for MMS, the results of this study may help surgeons personalize their analysis of postoperative incision sites and give patients with nicotine dependence better counseling on the risks that they must consider prior to MMS.

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