

Wound dehiscence

- ▶ Failure to heal in apposition
- ▶ Tensile strength (collagen deposition & remodeling)
 - ▶ Reepithelization 2 days
 - ▶ Fibroplasia 5 days
 - ▶ 3-5% original strength 2 weeks
 - ▶ 15% original strength 3 weeks
 - ▶ 35% original strength 4 weeks
 - ▶ 80% original strength several months

Wound dehiscence II

- ▶ Sutures removed too early
- ▶ Inadequate buried sutures (choose PDS II if prolonged wound support is needed)
- ▶ Trauma to the wound in the postoperative period
 - ▶ Dressing and Steri-Strips – PATIENT REMINDER
- ▶ Improper surgical technique (crushing of the tissue, excessive electrocautery, ineffective hemostasis, dead space, wound tension, tight sutures)
- ▶ Resuture the wound (trauma or premature suture removal, or allow healing by secondary intention if dehiscence occurs later or the wound is infected)
- ▶ **ROUTINE FRESHENING OF THE WOUND EDGES SHOULD BE AVOIDED (active fibroblasts will be removed)!!!**



Wound dehiscence III

▶ SYSTEMIC FACTORS

- ▶ Old age, obesity, uremia, hypoalbuminemia
- ▶ Malignancy, systemic infection, hypertension
- ▶ Thyroid disease, CHF, liver disease
- ▶ Tobacco
- ▶ Medication (anticoagulants, aspirin, steroids, penicillamine, CyA, metronidazole, chemotherapy)



NECROSIS

- ▶ ISCHEMIA – decrease of oxygenated blood flow – mostly to distal wound margins
- ▶ Intraoperative damage of the tissue most common
 - ▶ Wound tension at the edges
 - ▶ Excessive suturing and undermining
 - ▶ Superficial undermining
- ▶ Expanding hematoma – free radical mechanism – deferoxamine
- ▶ RANDOM PATTERN FLAPS AND GRAFTS WITH LENGTH-TO-BASE RATIO OF GREATER THAN 4:1 – precarious nature of the circulation

NECROSIS II

▶ CIGARETTE SMOKING

- ▶ Increased vasoconstriction, hypoxia, platelet aggregation, microthrombosis
- ▶ > 1 pack/day risk of necrosis ↑3x
- ▶ Stopping or decreasing smoking 2 days before and 1 week postoperatively can increase flap survival
- ▶ Pentoxifylline or topical nitroglycerin may be helpful
- ▶ Conservative treatment, allow the area to demarcate completely, debride in the last stage, and allow second intention healing
- ▶ Consider antibiotics

Association of Smoking and Other Factors With the Outcome of Mohs Reconstruction Using Flaps or Grafts

JAMA Facial Plast Surg. 2019;21(5):407-413

Table 2. Multivariate Logistic Regression of Eligible Covariates for Acute Complications

Acute Complication	Iteration 1		Iteration 2	
	OR (95% CI)	P Value	OR (95% CI)	P Value
Former smoker	3.15 (1.19-8.33)	.02	3.64 (1.41-9.38)	.007
Current smoker	9.12 (3.40-24.4)	<.001	9.58 (3.63-25.3)	<.001
Defect size (Ln) ^a	2.10 (1.46-3.03)	<.001	2.25 (1.58-3.20)	<.001
Free cartilage graft	7.04 (1.67-29.6)	.008	8.19 (2.02-33.1)	.003
Other antiplatelet	2.2 (0.85-5.6)	.11	NA	NA
Location	1.7 (0.63-4.6)	.30	NA	NA
Male sex	1.4 (0.64-3.2)	.38	NA	NA

Table 3. Multivariate Logistic Regression of Eligible Covariates for Long-term Complications

Long-term Complication	Iteration 1		Iteration 2	
	OR (95% CI)	P Value	OR (95% CI)	P Value
Former smoker	0.88 (0.49-1.6)	.65	NA	NA
Current smoker	0.94 (0.44-2.0)	.88	NA	NA
Central face location	24.7 (5.94-103.1)	<.001	25.4 (6.16-106.5)	<.001
Interpolation or combined flap-graft	3.44 (1.77-6.68)	<.001	3.49 (1.81-6.74)	<.001
Older age, per each 10-y increase	0.67 (0.55-0.81)	<.001	0.66 (0.54-0.80)	<.001
Larger flap or graft size (Ln) ^a	1.44 (1.03-1.90)	.01	1.42 (1.09-1.87)	.01
BCC or other basaloid tumor	3.54 (1.05-11.9)	.04	3.43 (1.03-11.5)	.045
Female sex	1.2 (0.73-2.1)	.43	NA	NA

1008 patients
(396 women, 612 men)
Age 70 years (21-90)
Current smokers 128 (12.7%)
Former smokers 385 (38.2%)
Never smokers 495 (49.1%)

Smokers increased risk for acute postsurgical complications with flaps and grafts in post Mohs surgery reconstruction

Smoking does not increase the risk for long term complications



Nitroglycerin: A Review of Its Use in the Treatment of Vascular Occlusion After Soft Tissue Augmentation

KATE KLEYDMAN, DO,* JOEL L. COHEN, MD,[†] AND ELLEN MARMUR, MD*



Mean forehead flow increase 365% higher after 2% NG paste application; vasodilatory effect on arterioles!



Risk of necrosis with fillers:

1. Altered vascular supply and scarring (previous surgery)
2. Anatomic variations'
3. High volume/viscosity filler
4. Intra-arterial injection





Nerve injury

- ▶ Motor nerve damage is possible during Mohs surgery
- ▶ Thorough knowledge of anatomy is mandatory
- ▶ Dissection plane should be carefully controlled during surgery
- ▶ SMAS (superficial musculoaponeurotic system) should be identified
- ▶ The surgeons should always stay above this plane
- ▶ Danger zones should be identified, including nerves and associated vessels and carefully handled to avoid potentially disfiguring damage of resulting from transection, or excessive manipulation and stretching which can result in neuropraxia.

FACIAL NERVE INJURY

▶ **TEMPORAL BRANCH**

- ▶ Superficial, crosses zygomatic arch, thin skin in elderly patients
- ▶ Unilateral brow ptosis and loss of the normal forehead furrows; orbicularis oculi – ptosis and difficulties in closing the eye – incomplete (additional supply from zygomatic)

▶ **ZYGOMATIC BRANCH**

- ▶ Rare, deep plane
- ▶ Ectropion and unilateral inability to close the eye

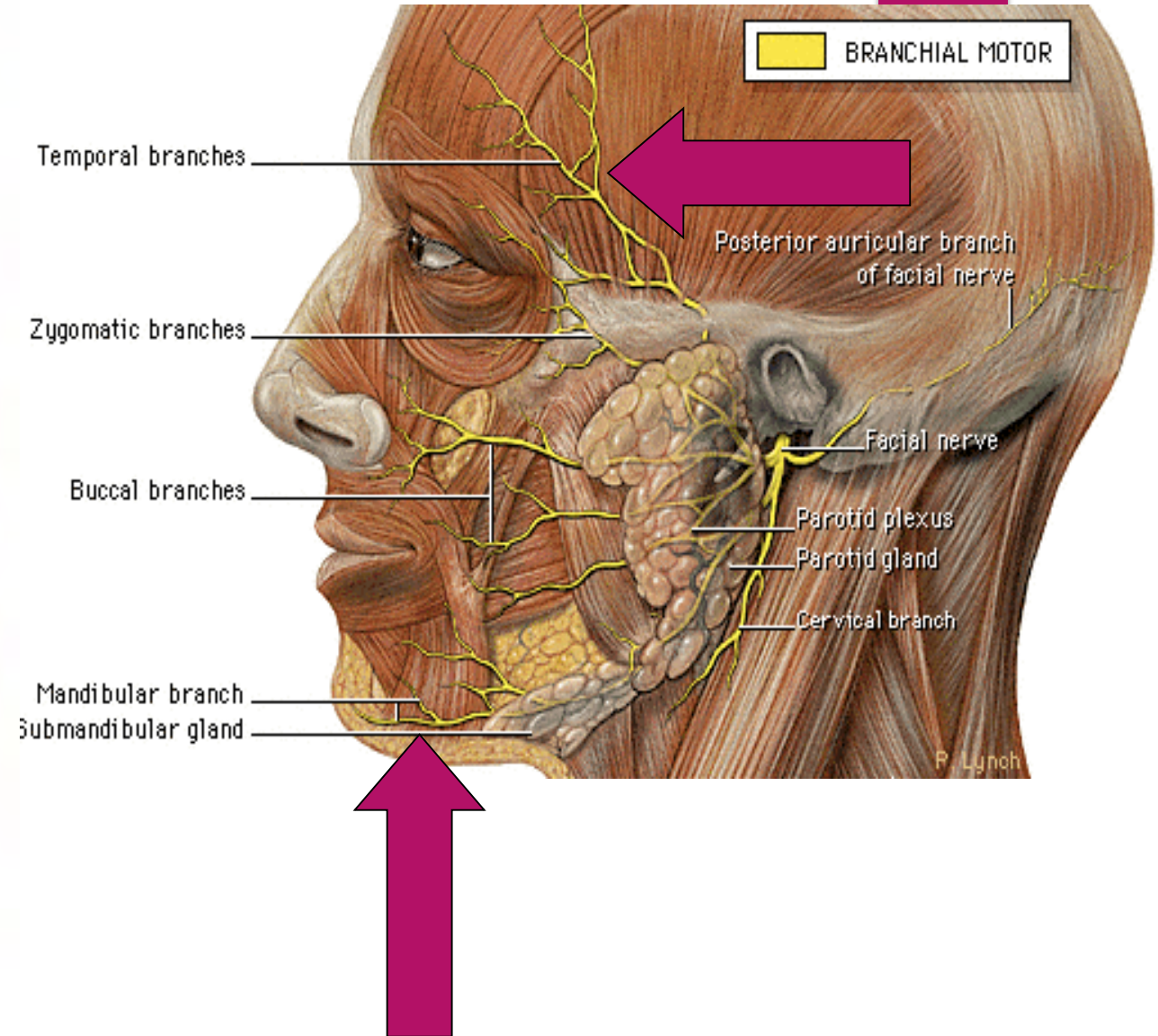
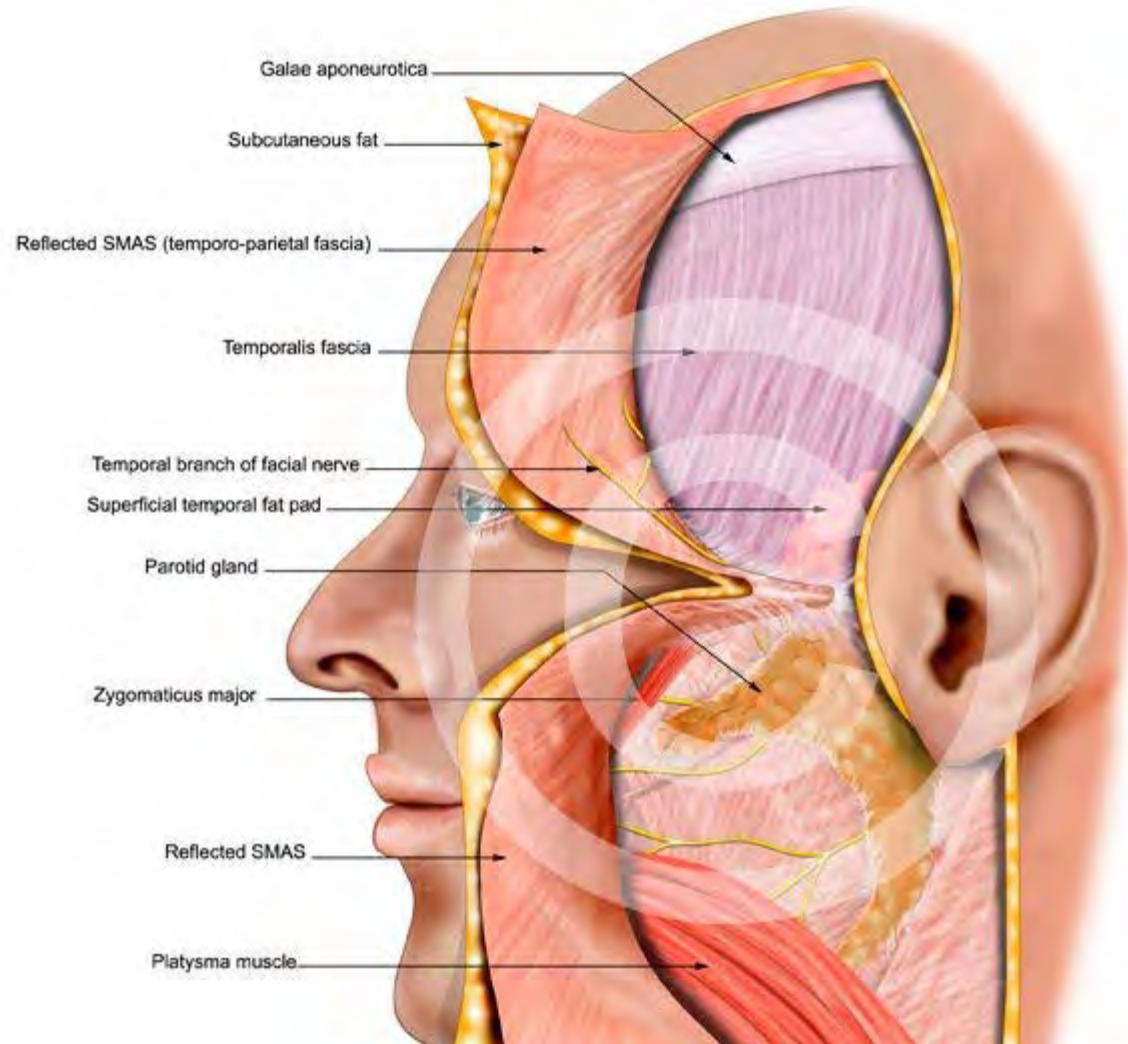
▶ **BUCCAL BRANCH**

- ▶ Facial asymmetry and inability to pucker the lips

▶ **MARGINAL MANDIBULAR BRANCH**

- ▶ Vulnerable at the angle of the jaw
- ▶ Facial asymmetry and weakness of the lips

SMAS



Anatomical landmarks

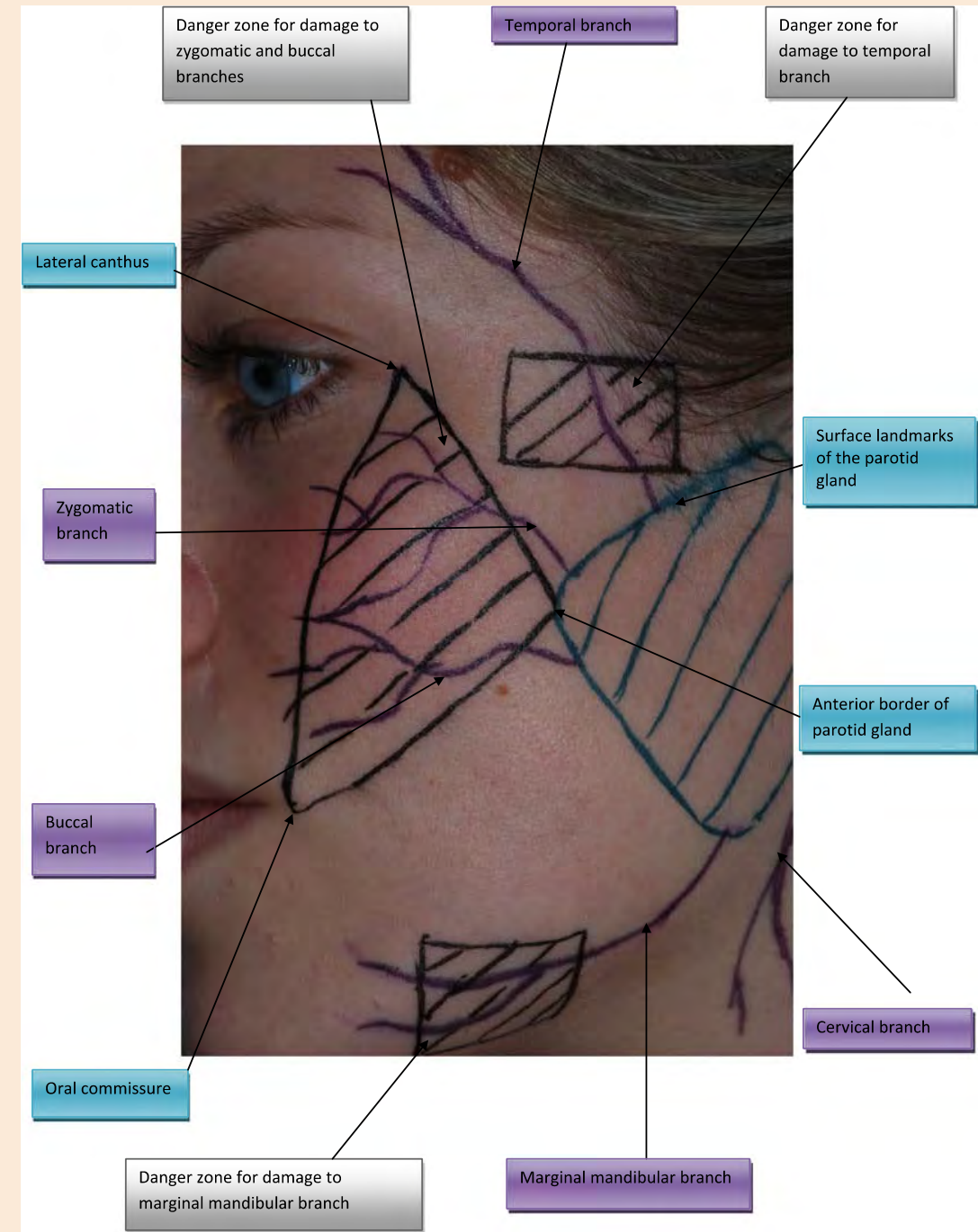
ANATOMICAL DANGER ZONE

1.5 cm above the lateral eyebrow

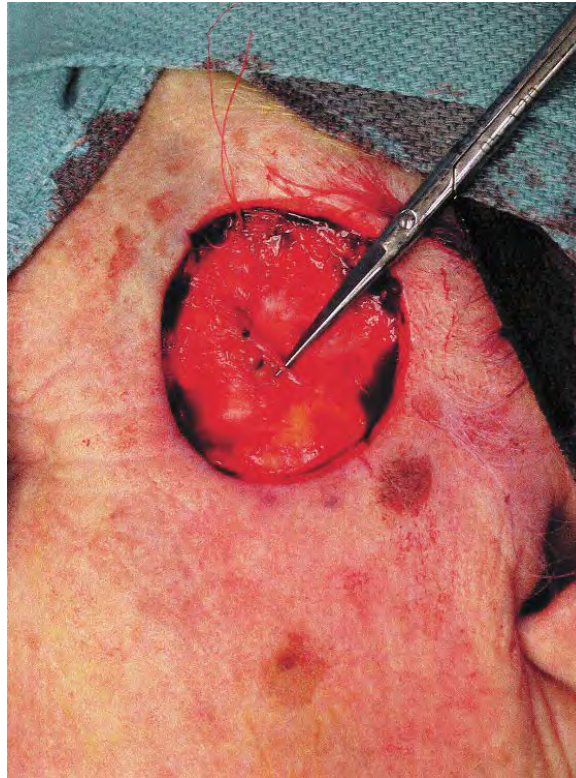
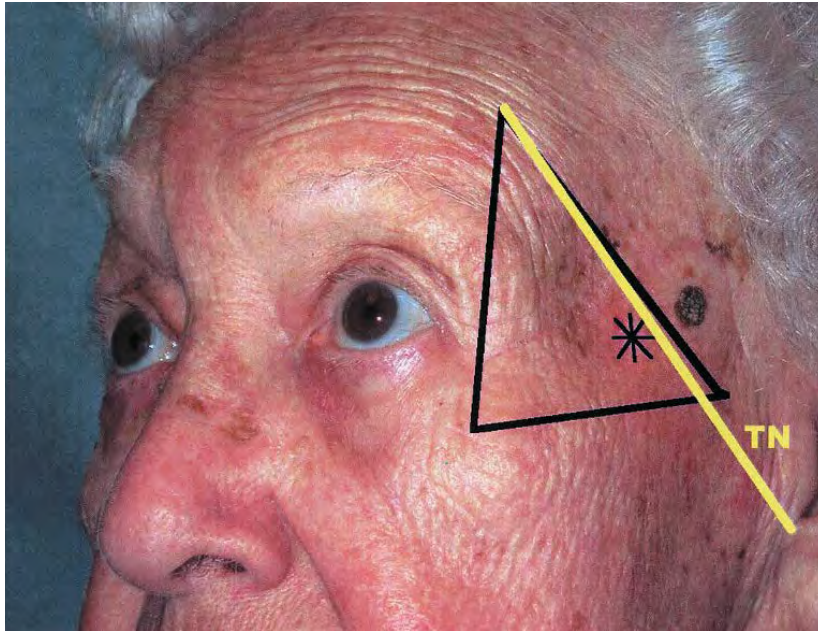


0.5 cm below tragus

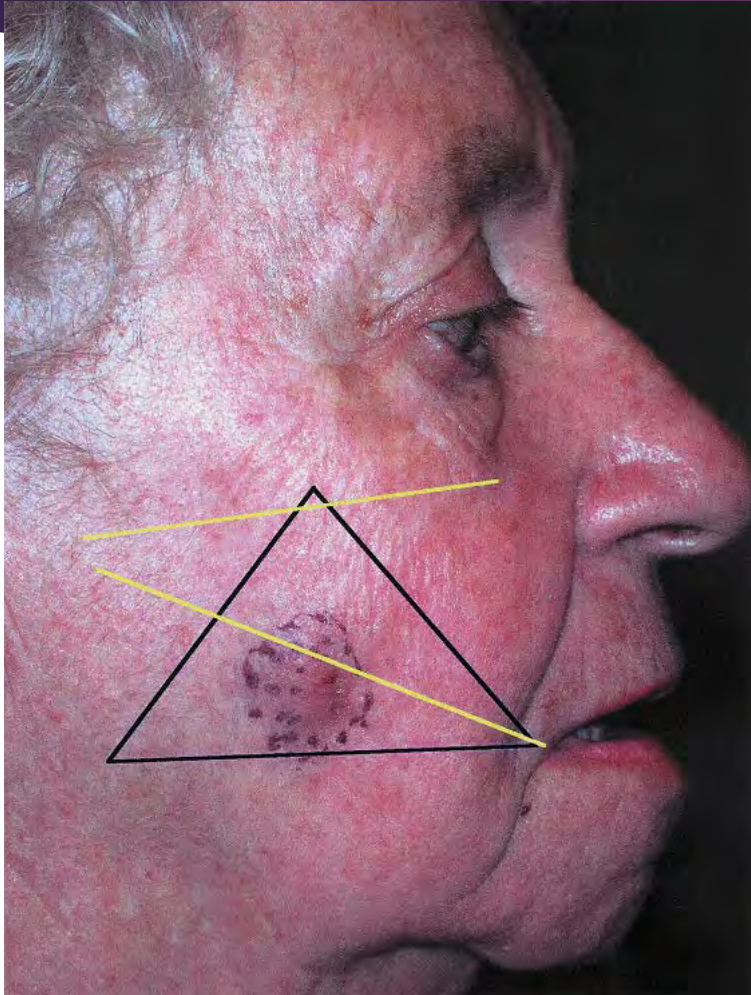
Approximate course of the temporal branch of facial nerve



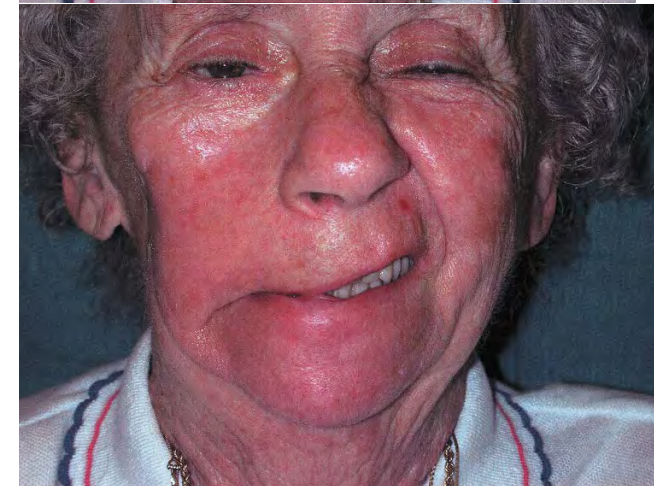
Danger zone I – temporal nerve injury



Danger zone II zygomatic and buccal nerve injury



Parotid duct also exposed



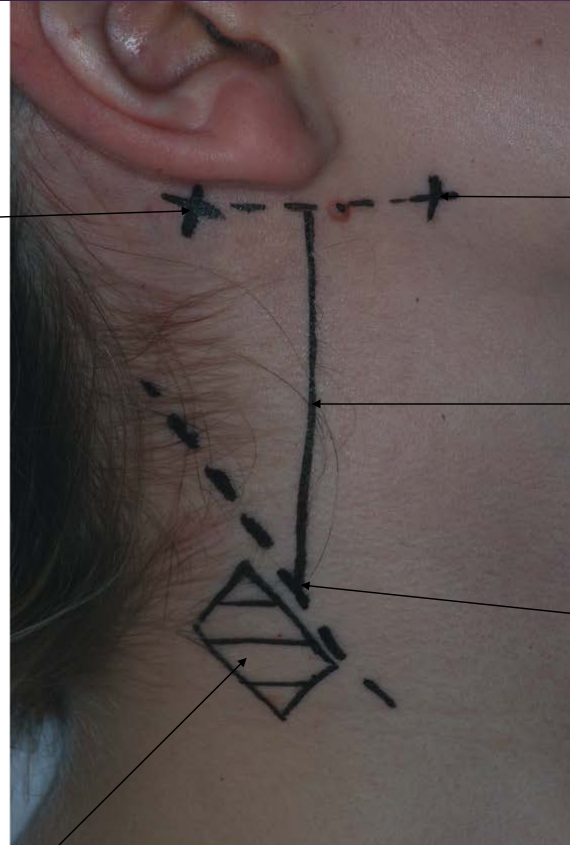
Danger zone III – marginal mandibular nerve injury (MMN)



Facial artery in the intimate
relationship with the MMN



Danger zone IV – spinal accessory nerve



Mastoid process

Angle of jaw

Vertical line

Erb's point

Danger zone for damage to transverse cervical, lesser occipital and great auricular nerves.

Also point at which the spinal accessory nerve emerges from behind sternocleidomastoid



Pic.1. Neck and shoulder girdle asymmetry, drooping of the shoulder.



Pic. 2. Shoulder girdle atrophy. Positional kyphosis.



Pic. 3. Shoulder girdle atrophy. Weakness of sternocleidomastoid muscle causes head turning to the weaker side.



Pic. 4. Unilateral atrophy of trapezius muscle causes weakness in shoulder retraction, elevation, protraction.

Summary

Nerve injury

- ▶ **Thorough anatomy knowledge necessary to avoid unnecessary nerve injury**
- ▶ **Keep plane of dissection above SMAS whenever possible**
- ▶ **Temporal and marginal mandibular branches are most commonly injured**
- ▶ **Many will improve spontaneously after 6 months period**
- ▶ **If still present after 1-2 years, recovery is unlikely and alternative procedures should be considered (plastic surgery referral)**

Tumor recurrence



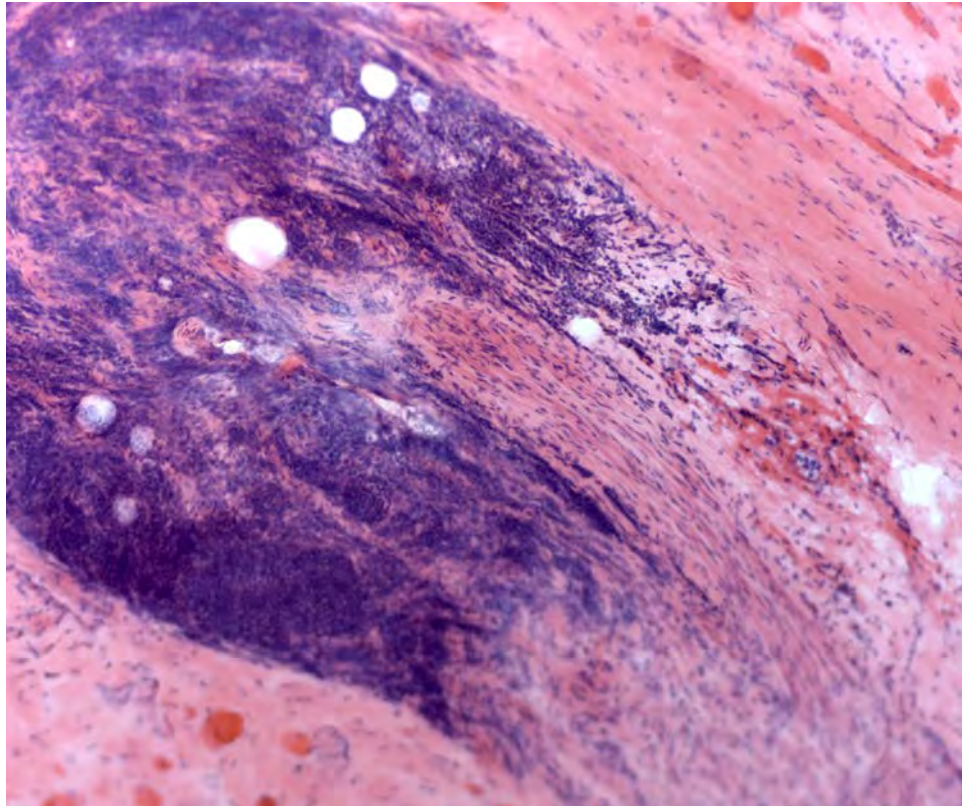
- ▶ Lowest possible recurrence rates for non melanoma skin cancer
- ▶ 5 year recurrence rate for BCC 1-3% primary tumors, and 5-7% recurrent tumors
- ▶ 5 year recurrence rate for SCC 3-5% primary tumors, and 6-10% recurrent tumors
- ▶ Factors contributing to highest rate of BCC recurrence: prior recurrence, long time before surgery and more Mohs stages for initial clearance, large size, aggressive histology, and H-zone location
- ▶ Factors contributing to highest rate of SCC recurrence: prior recurrence, larger size, and poor differentiation, depth > 4 mm (Clark IV), tumor locations in areas treated with radiation, chronic ulcers, burns, as well as ears, lips, and genital area.

Chronic lymphatic leukemia (CLL)

- ▶ 7x higher risk of recurrence for SCC
- ▶ 14x higher risk of recurrence for BCC
- ▶ Impaired host immune response
- ▶ Positive Mohs margins obscured by dense lymphocytic infiltrate
- ▶ Peritumoral dense Ly infiltrates could be marker for undiagnosed CLL



CLL Infiltrates



- ▶ Camouflage tumor
- ▶ Compromise host immunity
- ▶ Consider wide Mohs
- ▶ Special stains (CK-SCC; Ber- H4 BCC)
- ▶ Adjuvant Rx
- ▶ Close surveillance (q 3 mos f/u)

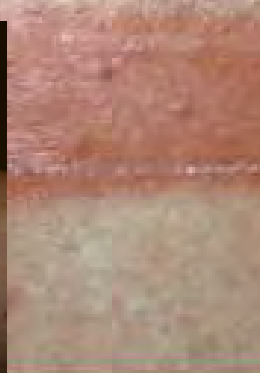
Summary

Tumor recurrence

- ▶ **Lowest possible recurrence rates for non melanoma skin cancer (BCC and SCC)**
- ▶ **Factors increasing tumor recurrence include large size, poor differentiation, delay in treatment, H-zone location, and presence of CLL**

Medication complications

- ▶ Lidocaine
 - ▶ True allergy exceptional
 - ▶ 4.5 mg/kg and 7 mg/kg (w epi) maximal dose
 - ▶ Blood levels in Mohs surgery (0.3 µg/ml), way below toxicity (5.0 µg/ml) (Alam M et al, JAAD 2010)
- ▶ Epinephrine in 1:100000 dilution safe for digital anesthesia (Krunic et al, JAAD 2005), pregnancy category C, plain lidocaine category B
- ▶ Most toxicities described with accidental injection of 1:1000 epinephrine for the therapy of anaphylaxis
- ▶ Topical antiseptics
 - ▶ Chlorhexidine toxic for inner ear and cornea
 - ▶ Hexachlorophene neurotoxicity in children (should be avoided)
 - ▶ Povidone-iodine rarely contact dermatitis
 - ▶ Some studies showed chlorhexidine alcohol superior to povidone-iodine in preventing wound infection
- ▶ Topical antibiotics (neomycin (5th), bacitracin (6th) common allergens
 - ▶ Contact dermatitis
 - ▶ Anaphylactic reactions – bacitracin
 - ▶ Use plain petrolatum, avoid topical antibiotics



Summary

Medications complications

- ▶ Rarely encountered
- ▶ True lidocaine allergy very rare
- ▶ Lidocaine with epinephrine can be used safely on digits
- ▶ Allergic contact dermatitis is very common to topical antibiotics and they should be avoided

SUTURE REACTIONS – RISK FACTORS

- ▶ PRIMARY FACTORS (SUTURE TYPE RELATED)
 - ▶ The longer time – more reactivity
 - ▶ Larger caliber (2-3 times for one size ↑)
 - ▶ Natural vs. synthetic
 - ▶ Multifilament (braided) vs. monofilament
- ▶ SECONDARY FACTORS (NON-SUTURE TYPE RELATED)
 - ▶ Anatomical sites (chest, back, extremities, sebaceous areas of the face)
 - ▶ Male sex
 - ▶ Advancing age
 - ▶ Surgeon inexperience

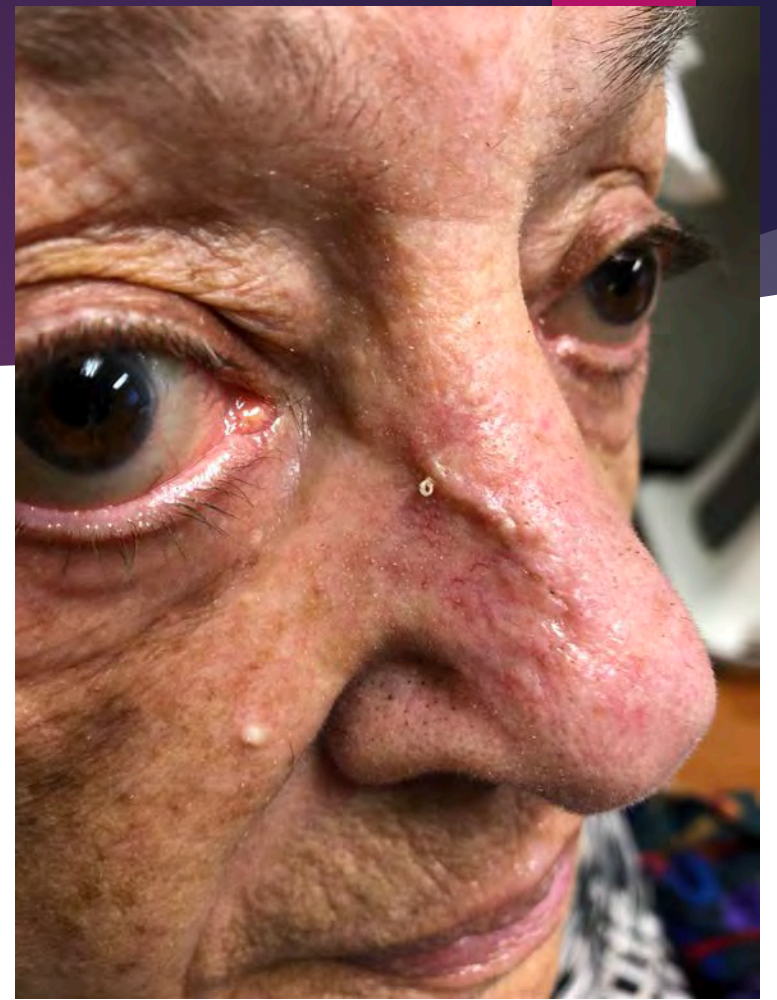
BIOLOGY OF WOUND REPAIR Edlich, Friehman, Haines, Rockswold



Suture reactions - TYPES

- ▶ STITCH PAPULE
 - ▶ Foreign body reaction due to incomplete regression of epithelial track - erythematous
- ▶ STITCH ABSCESS
 - ▶ Sterile pustule – foreign body reaction to keratinizing epithelial cells in the tracks
- ▶ SUTURE SPITTING
 - ▶ Non-inflammatory papule – subcutaneous sutures placed too superficially – extrusion of the sutures occurs from several weeks to months
- ▶ SUTURE TRACKING
 - ▶ Sutures left too long or placed too tight – puncture scars along the sides of linear scar
- ▶ SUTURE ALLERGY
 - ▶ Rare – chromic catgut; silk, nylon exceptional







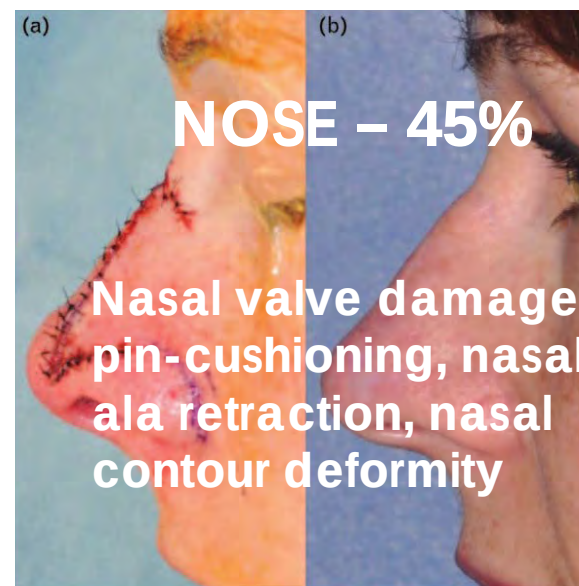
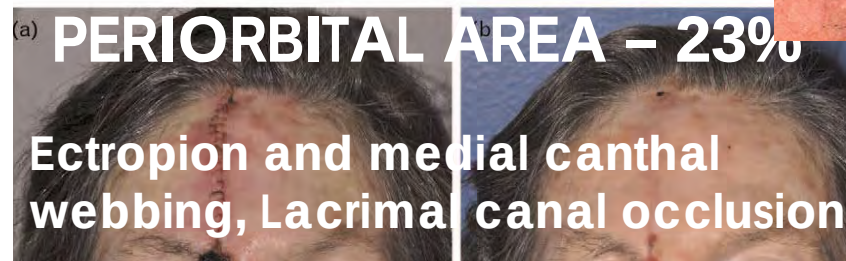
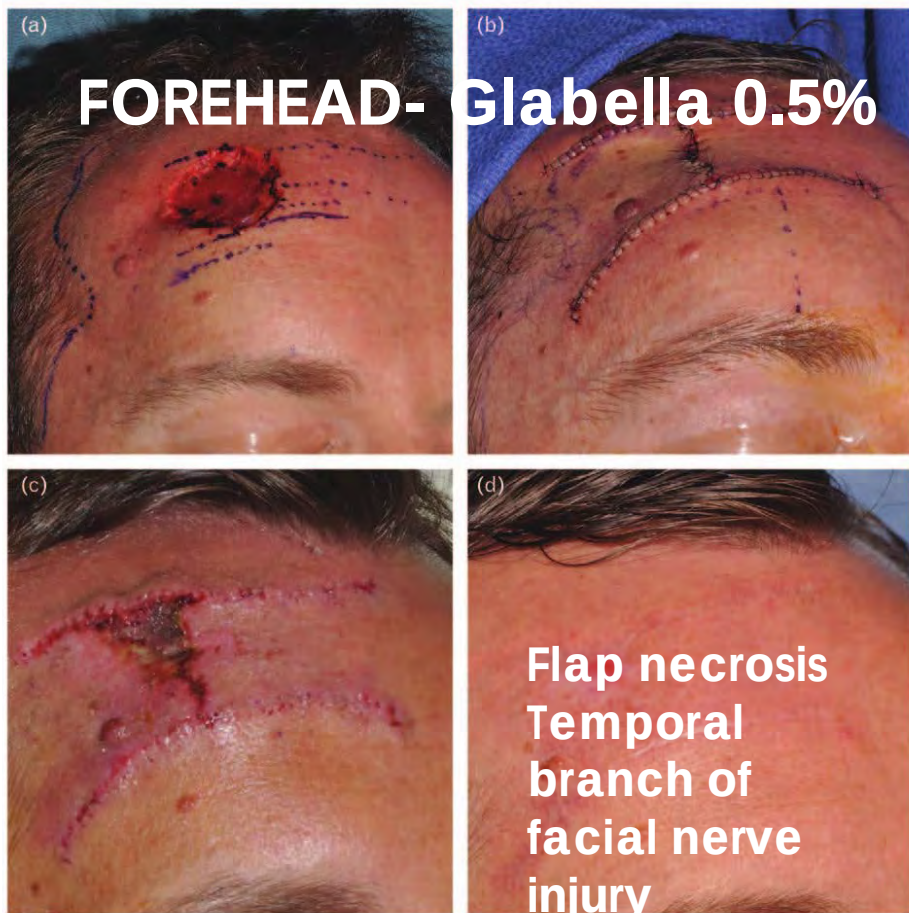
Summary

Suture reactions

- ▶ Tying tightly enough just to obtain approximation
- ▶ Use sutures which stretch – Prolene
- ▶ Use loop technique
 - ▶ Loose first knot
 - ▶ Secure second knot
 - ▶ Squared third knot
- ▶ Restore the normal contour of the skin with laser abrasion, dermabrasion or dermasanding

Complications in facial Mohs defect reconstruction

Angelique M. Berens^a, Sarah R. Akkina^a, and Sapna A. Patel^{a,b,c,d}



Transposition flaps – pin-cushioning
Rotational flaps – tip necrosis
Primary closure – 0.5%, flap 27%

SCAR REVISION PROCEDURES

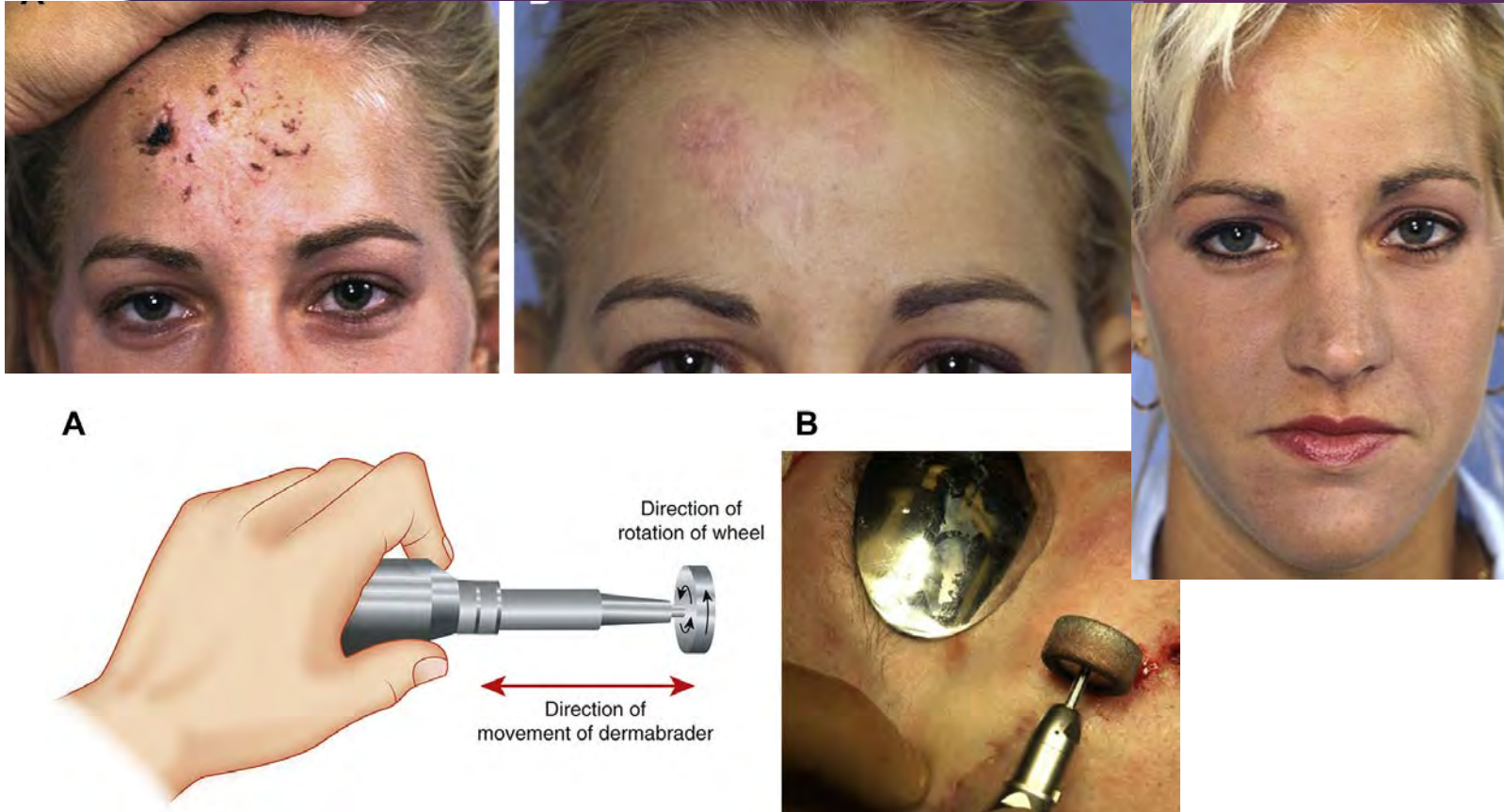
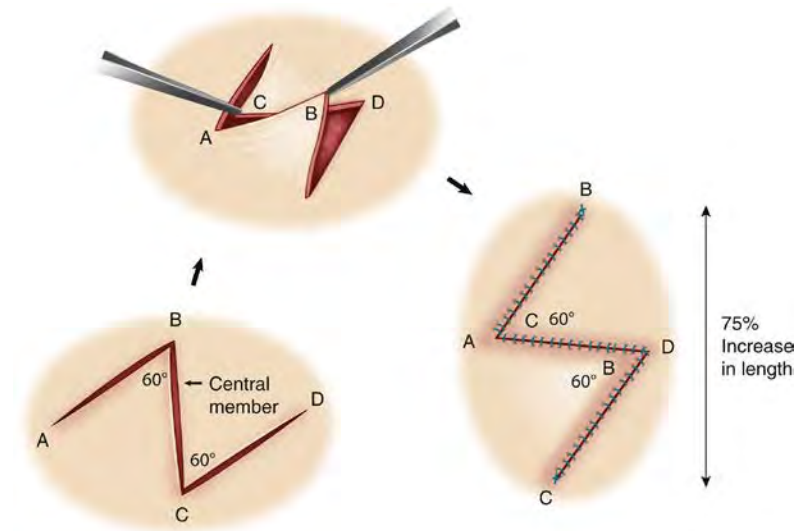


Fig. 2. (A) Dermabrasion technique. (B) The area is typically dermabraded at a 45° angle to the scar line.

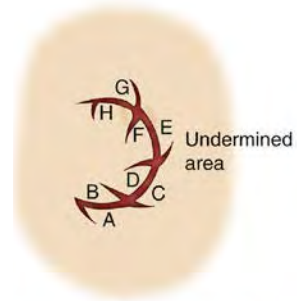


SCAR REVISION PROCEDURES

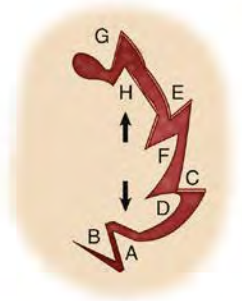
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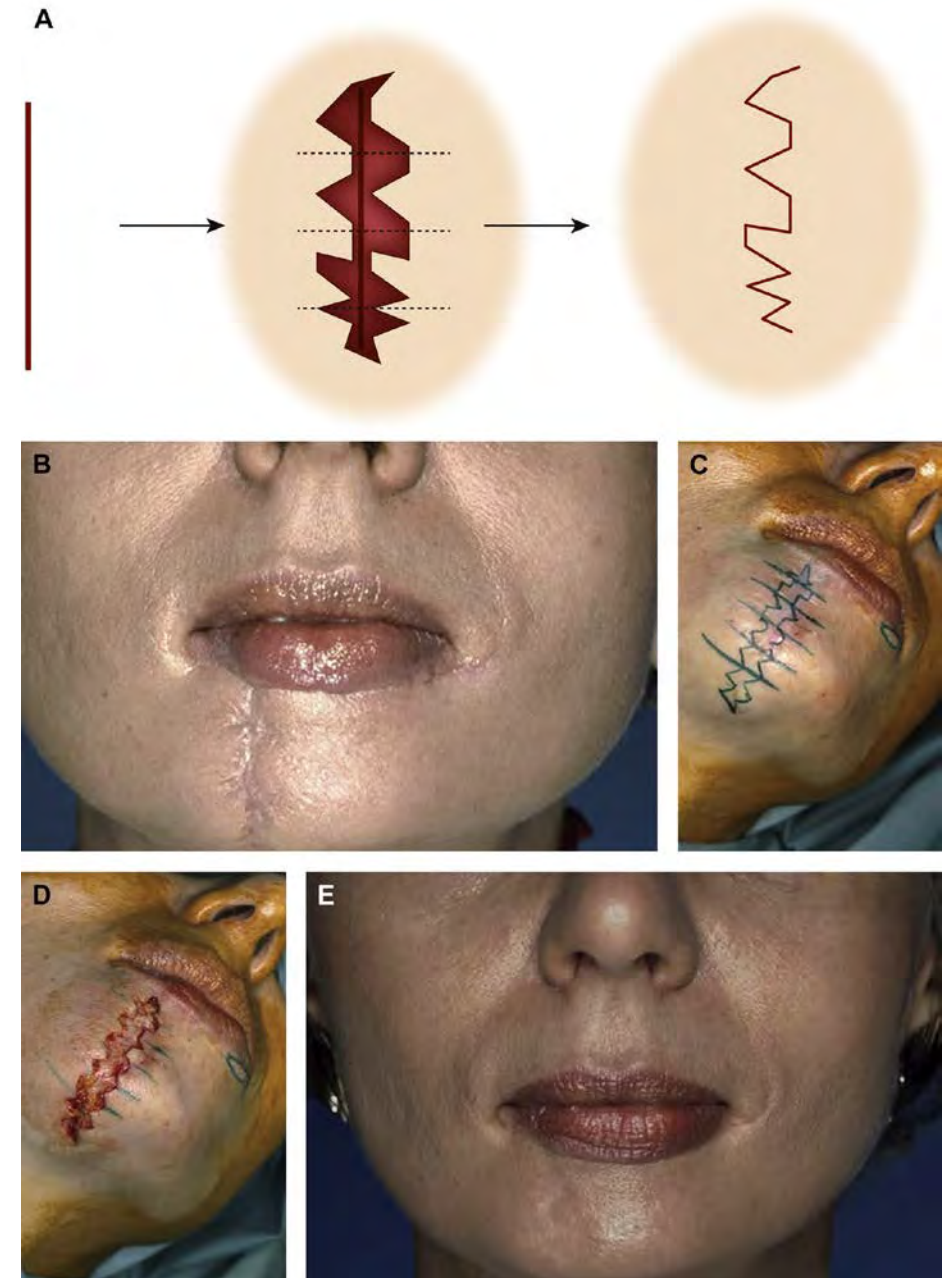
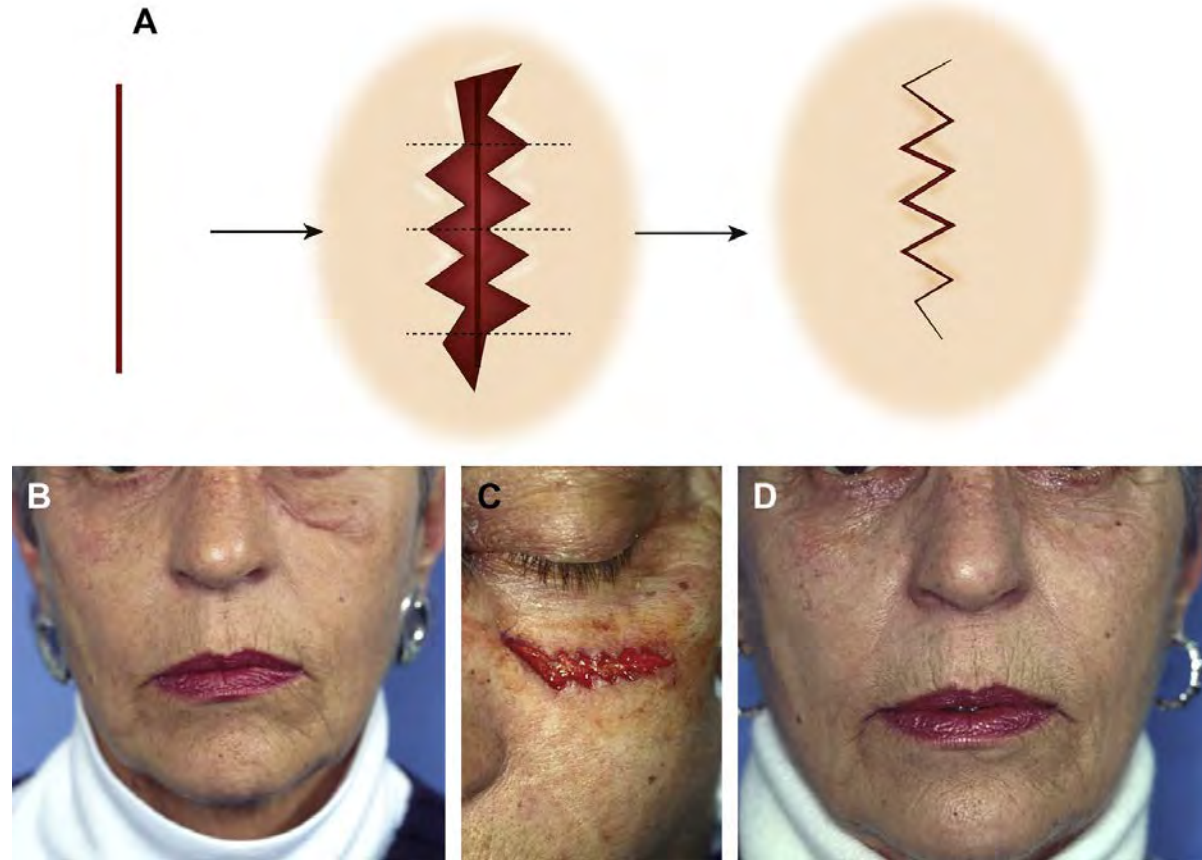
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1.



W-PLASTY AND GBLC (GEOMETRIC BROKEN LINE CLOSURE)

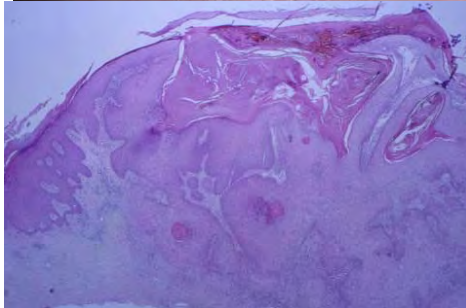


RARE COMPLICATIONS – ERUPTIVE KERATOACANTHOMAS AND SCCs

- ▶ Rapid development of keratotic nodules and plaques on the surgical site 3-6 weeks post complete clearance of the tumor by MMS
- ▶ Pathergy-type of reaction – mechanism not clear
- ▶ Field cancerization
- ▶ Postsurgical wound healing stimulus may be sufficient to drive the development of subsequent tumors in an area of mutated epithelium
- ▶ Avoid surgical approach, treat conservatively with isotretinoin, acitretin, intralesional methotrexate, or 5-FU

Sutured wounds, or 2nd intention healing; upper and lower extremities common;

Bangash SJ, JAAD 2009;61:892-7



Tumor before original Mohs micrographic surgery, with corresponding defect, design and final repair



Suture removal and one month follow-up you can see that the wound was healing fine



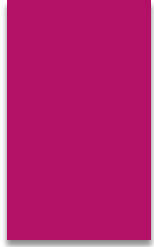
2 months after the whole wound becomes thicker, and nodules appear total of 5 all around the scar



Comparison of the clinical images before and after injection



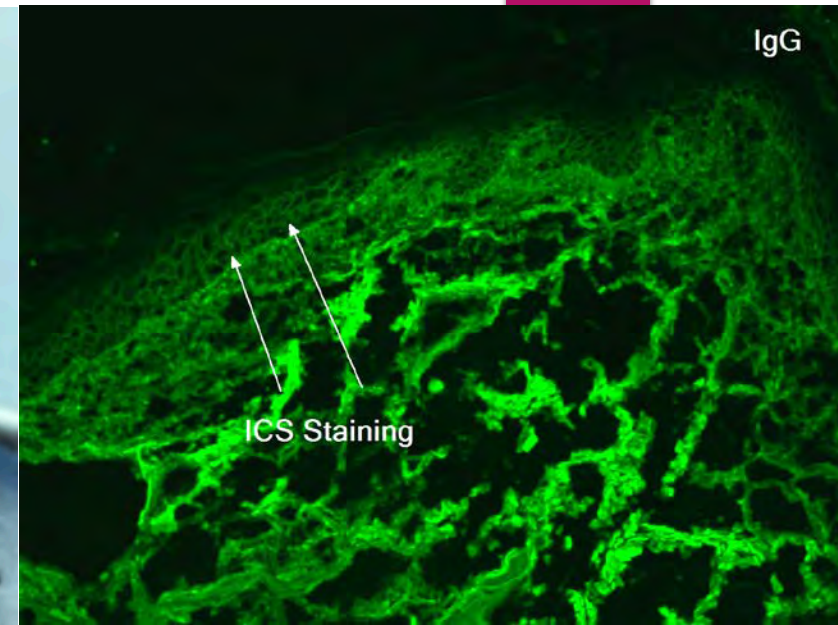
5-FU injected intralesionally 2 sessions 3 weeks apart



CHALLENGES:

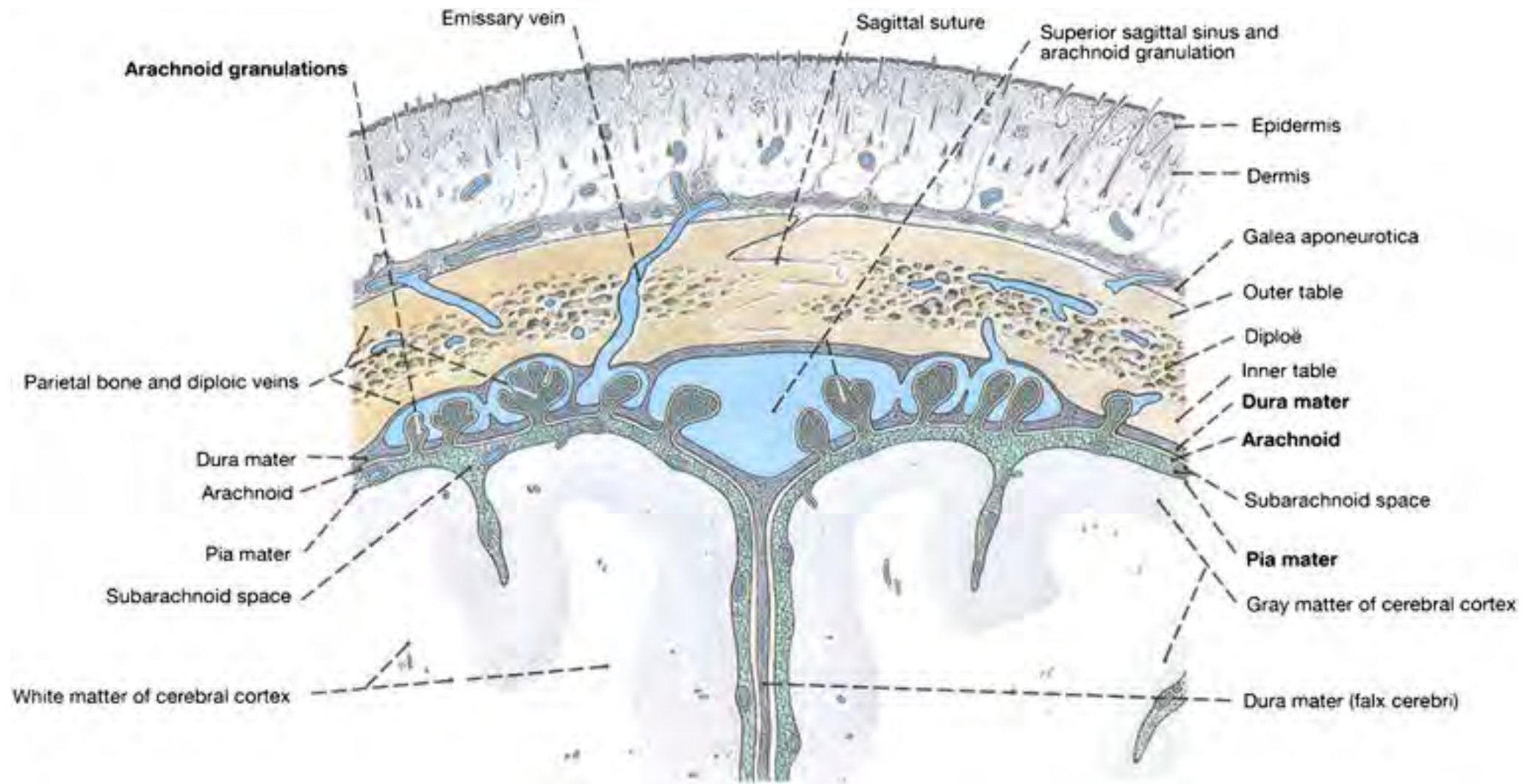
1. PEH vs. SCC
2. Dermopath consult before Mohs
3. Non-healing postoperative wound infection with negative cultures
4. Consider simple closure or 2nd intention healing to avoid further trauma

2 weeks after cryodestruction
AKs (field cancerization)
forehead



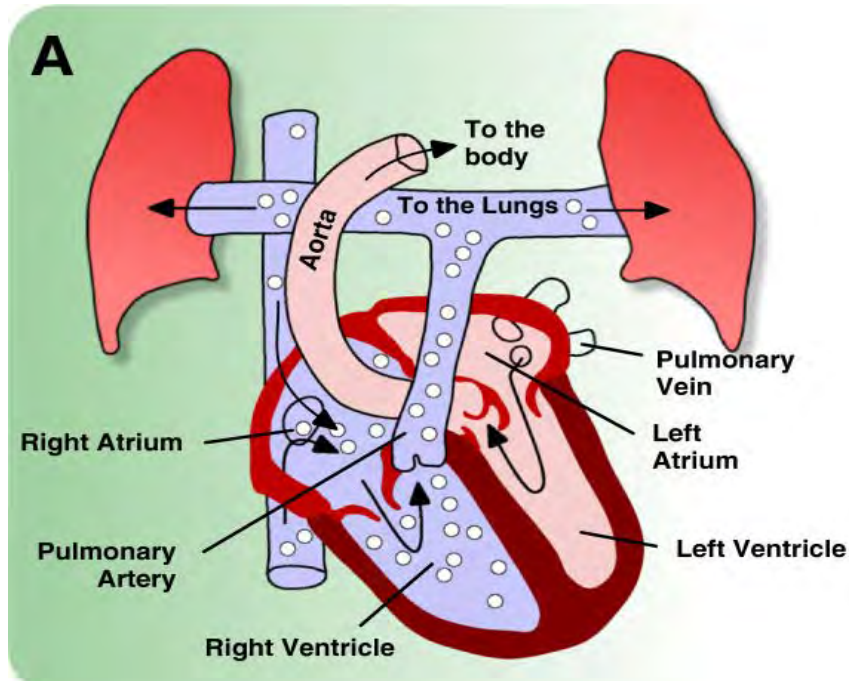
RARE COMPLICATIONS – CEREBRAL AIR EMBOLI POST MOHS SURGERY

- ▶ 2 patients (Goldman G et al, Dermatol Surg 2009;35(9):1414-21)
- ▶ Extensive BCC or SCC of scalp, including resection of periosteum
- ▶ Procedure performed in seated position
- ▶ Both developed neurological dysfunction, and were transported immediately to emergency service
- ▶ One fully recovered, other died after developing left-side hemiplegia and speech impairment
- ▶ Seated position lowers the hydrostatic pressure within the cerebral veins and contributes to air embolism.
- ▶ Placing the patient in the recumbent position during surgery of the scalp is mandatory when resection involves the outer layers of the skull.

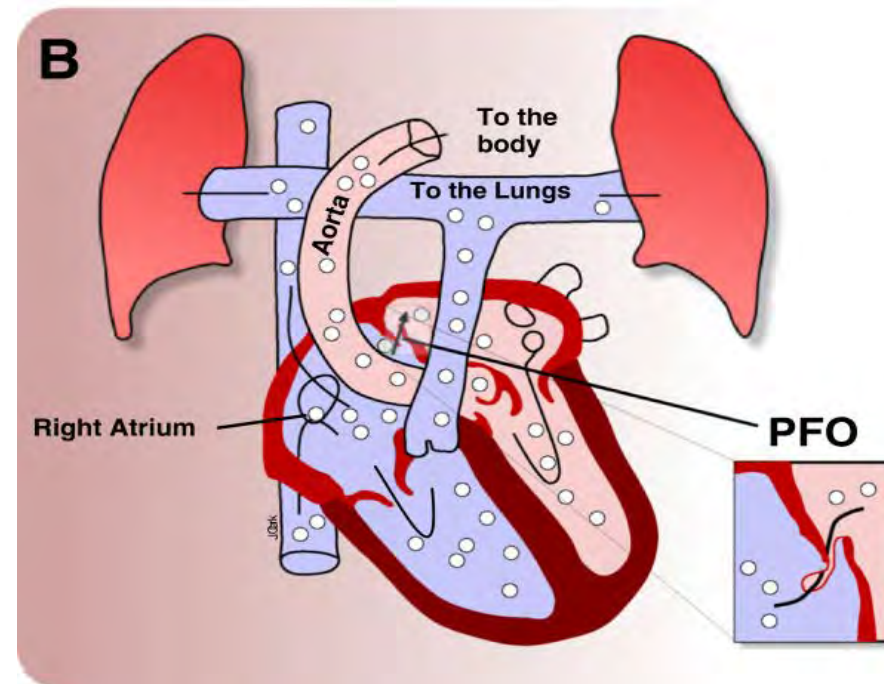


Venous vs arterial embolism (paradoxical – 30% patients persistent foramen ovale)

Lethal dose of air 200-300 cc or 3-5 ml/kg



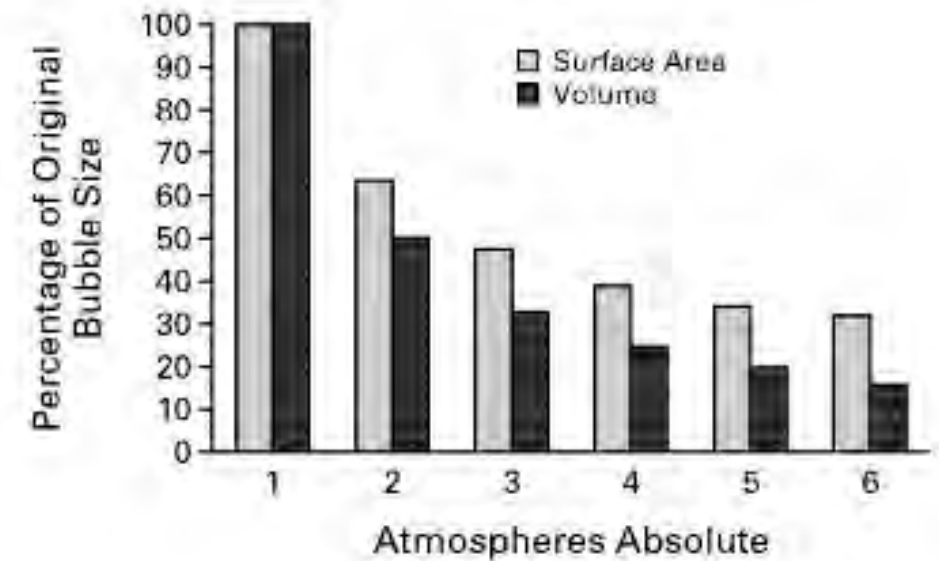
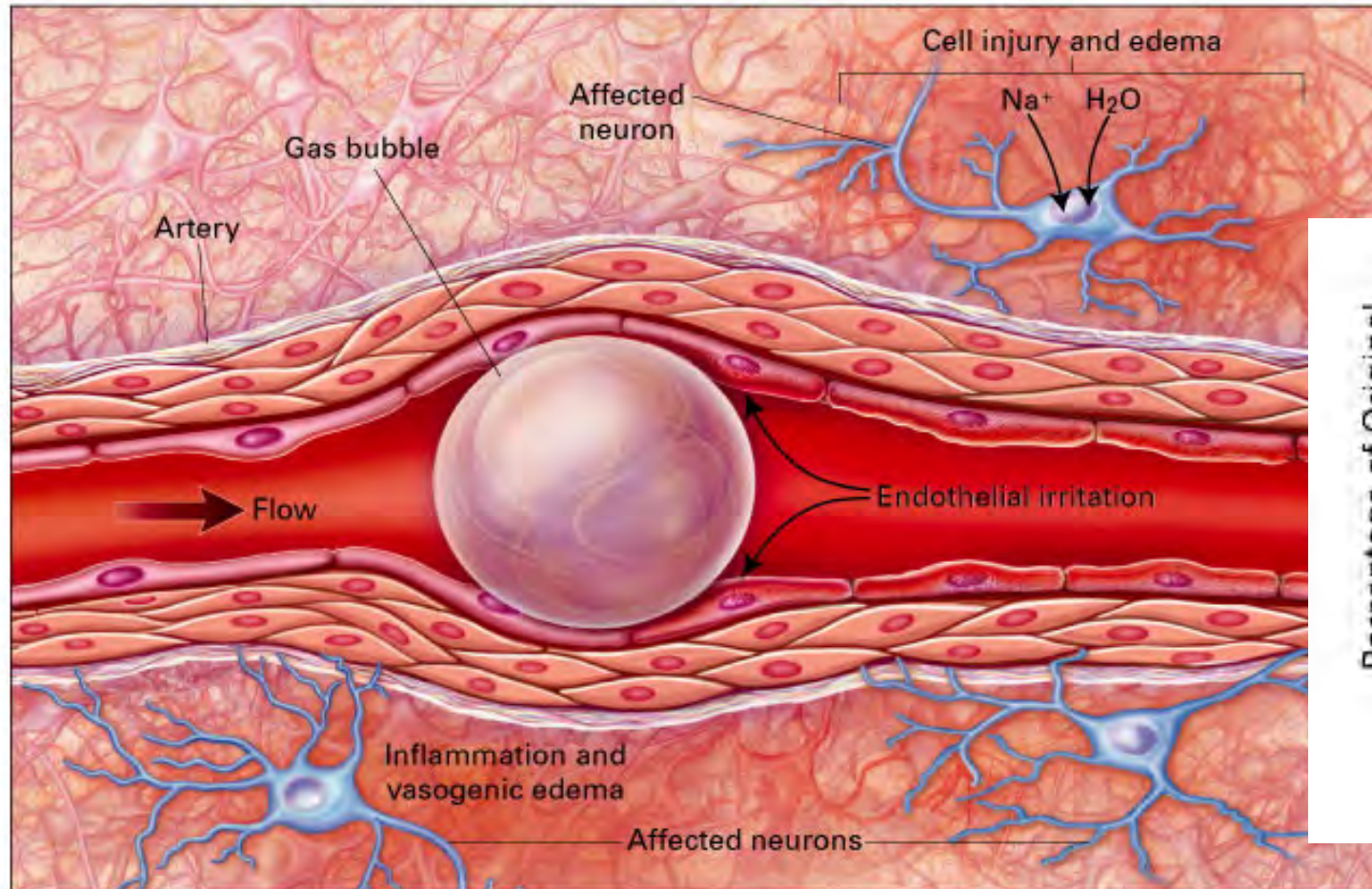
Chest pain, cough, SOB, circulatory collapse



Neurological and coronary symptoms

Bubble Obstructing End-Arterial Flow in a Cerebral Vessel with a Diameter of 30 to 60 μm , Causing Distal Ischemia.

Muth CM, Shank ES. N Engl J Med 2000;342:476-482.



Treatment of Gas Embolism.

TABLE 2. TREATMENT OF GAS EMBOLISM.

TYPE OF TREATMENT

Prevention of
of gas

Primary therapy

Supportive therapy

Positioning of
Evacuation of

Adjunctive therapy

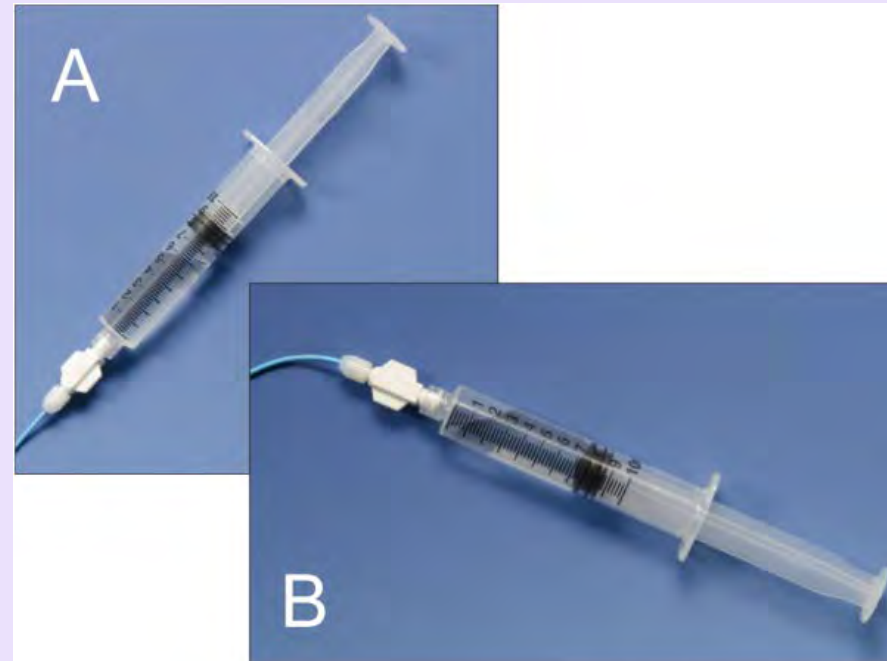


Figure 7. By ensuring the syringe is held with the plunger upright (A), there is a significant decrease in the risk of inadvertent injection of any air that may be contained within the syringe (B).

STUDY

A Prospective Evaluation of the Incidence of Complications Associated With Mohs Micrographic Surgery



Jonathan L. Cook, MD; Jennifer B. Perone, MD

Table 1. Locations and Types of Treated Tumors

Tumor Location or Type	No. of Cases
Location	
Face (not nose, ear, lip, eyelid)	422
Nose	385
Ear	151
Lip	72
Eyelid	60
Scalp	47
Neck	35
Trunk	82
Extremity (not hand or foot)	73
Hand	26
Genitalia	4
Foot	1
Tumor type*	
Basal cell carcinoma	927
Squamous cell carcinoma	391
Basosquamous cell carcinoma	16
Keratoacanthoma	5
Lentigo maligna	4
Dermatofibrosarcoma protuberans	3
Atypical fibroxanthoma	2
Appendageal tumor	2
Extramammary Paget disease	2
Sebaceous carcinoma	2
Cutaneous leiomyosarcoma	1
Malignant granular cell tumor	1
Merkel cell carcinoma	1
Trichilemmal carcinoma	1

Table 2. Flap Types Used in Reconstruction

Type of Flap	No. of Cases
Advancement	80
Rhombic transposition	79
Island pedicle	46
Bilobed transposition	40
Rotation	39
Dorsal nasal rotation (Rieger)	13
Nasolabial transposition	10
Perialar crescentic advancement	10
Dog-ear rotation	9
Chondrocutaneous advancement	7
Pedicled nasolabial interpolation	6
Nasolabial transposition with cartilage graft	5
O-T rotation	5
Pedicled mastoid advancement	4
O-Z rotation	3
Mucosal advancement	2
Paramedian forehead	2
Bilateral advancement	1
Bipedicled advancement	1

Table 3. Complications on the Day of Surgery and Delayed Complications

Complication	No. (%) of Cases
Day of Surgery	
Hematoma formation	3/1343 (0.22)
Postoperative hemorrhage	1/1343 (0.07)
Total	4/1343 (0.30)
Delayed	
Graft necrosis	6/216 (2.78)
Flap necrosis	5/361 (1.40)
Hematoma formation	4/1343 (0.30)
Postoperative hemorrhage	1/1343 (0.07)
Postoperative infection	1/1343 (0.07)
Wound dehiscence	1/1007 (0.10)
Total	18/1343 (1.34)

MOHS surgery complications

Table I. Major and minor complications

Major	Minor
Death	Active bleeding requiring health care provider intervention
Shortness of breath	Infection
Asthma exacerbation	Flap/graft/skin edge necrosis (at least 10%)
Hypertensive crisis	Hematoma
Arrhythmia	Dehiscence (at least 2 mm by 2 mm)
Cardiac arrest	
Angina	
Transient ischemic attack	
Cerebrovascular accident	
Pacemaker/defibrillator malfunction	
Emergency medical intervention for any reason	
Transfer to ED	
Hospitalization	
Adverse reaction to anesthetic	

ED, Emergency department.

Only minor complications occurred

2.96% (bleeding most common) in 1709 tumors treated with MOHS

Murad Alam et al, JAMA Arch Dermatol, September 2013

Original Investigation

Adverse Events Associated With Mohs Micrographic Surgery Multicenter Prospective Cohort Study of 20 821 Cases at 23 Centers

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- **0.72% Minor postop complications (bleeding, infections, impaired wound healing)**
- **0.02% Serious adverse events (hospitalizations)**
- **0% Death rate or permanent disability**
- **Flaps, grafts, anticoagulants/antithrombotics, ?Infection in young/female?**
- **MOHS IS EXCEEDINGLY SAFE!!!**

Dermatologic surgery safety in the ambulatory basis, in the office-based procedure room settings

x

ORIGINAL RESEARCH

Office based dermatological surgery and Mohs surgery:
A prospective audit of surgical procedures and
complications in a procedural dermatology practice

Timothy G Elliott, Graham A Thom and Kelly A Litterick

2370 procedures; 934Mohs; 56 complications in 51 patients (2.2%); 13 (0.7%) infections; 5 (0.3%) bleeding

Table 1 Frequency of the types of procedures performed during the audit period

Procedure	Number (%) performed
Excision and suture	449 (18.9)
Excision and flap repair	77 (3.2)
Excision and full thickness skin graft	6 (0.3)
Excision and split thickness skin graft	29 (1.2)
Mohs micrographic surgery	934 (39.4)
Mapped serial excision (stage)	26 (1.1)
Mapped serial excision (repair)	15 (0.6)
Biopsy (incisional or punch)	103 (4.3)
Shave/saucerisation	264 (11.1)
Snip excision	9 (0.4)
Simple curettage	15 (0.6)
Serial curettage/electrodesiccation of skin malignancy	366 (15.4)
Serial curettage/electrodesiccation of skin malignancy (>10 lesions)	12 (0.5)
Carbon dioxide laser (including carbon dioxide vermillionectomy, full nasal laser resurfacing and localised ablative laser treatments)	61 (2.6)
Delayed full thickness skin graft	1 (0.04)
2 nd stage of 2-stage flap	3 (0.1)
Total	2370

Table 2 Complications recorded

Complication	Number of cases recorded
Suture reaction	8
Wound infection (bacterial)	13
Herpes simplex virus reactivation	2
Postoperative bleeding	4
Haematoma formation	1
Wound dehiscence	5
Necrosis of flap	4
Graft: necrosis, loss or failure	6
Severe vomiting (during procedure)	1
Contact dermatitis	1
Diathermy fire (hair gel)	1
Hypergranulation	1
Hypertrophic scar	1
Stretched scar	1
Ectropion	1
Complex regional pain syndrome	1
Incorrect lesion excised	1
Patient unhappy with surgical result	3
Hairy graft	1
Total	56

130 patients with 149 complications of total 20821 MMS cases
(0.72%) minor postoperative complications
(0.02%) serious adverse events (one day hospitalizations)
(0%) of death or permanent disability.
Most bleeding complications with pts on anticoagulants or antithrombotics,
Most patients receiving blood thinners do not develop complications.
Infectious complications are more common in younger and female patients.
Flaps and grafts are more likely than other repairs to be associated with complications.
Overall, MMS is exceedingly safe, with even lower overall complication rates than before

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Multicenter Prospective Cohort Study of 20 821 Cases at 23 Centers

Table 2. Demographic Associations and Frequencies of Major Adverse Event Subtypes

Adverse Event	No. of Patients	Mean Patient Age, y	Male Patients, No. (%)	Most Common Tumor Type	Most Common Anatomic Site of Tumor	Complication Subtype (Incidence)
Infection	83	70.8	51 (61)	Basal cell carcinoma	Face excluding lips, eyes, ears, nose	Culture positive for infection (61); signs and symptoms of infection (30)
Impaired wound healing	30	75.7	25 (83)	Basal cell carcinoma	Nose	Partial necrosis (18); dehiscence (11); full necrosis (1)
Bleeding	22	76.8	19 (86)	Basal cell carcinoma	Face excluding lips, eyes, ears, nose	Persistent postoperative bleeding (12); hematoma (11)
Functional loss	1	83.0	0	Basal cell carcinoma	Face excluding lips, eyes, ears, nose	Motor nerve injury (1)
Serious event	4	72.5	2 (50)	Basal cell carcinoma	Face excluding lips, eyes, ears, nose	Hospitalization (4)
All patients ^a	130	72.9	91 (70)	Basal cell carcinoma	Face excluding lips, eyes, ears, nose	All (149)

^a Number of patients in each subtype do not total 130 because several patients had multiple adverse events.

JAMA Dermatol. 2013;149(12):1378-1385.

Table 1. Demographics of Study Institutions and Types of Tumors Treated^a

Demographic Factor	Data
Institution data	
Type	
Private practice	21 (91)
Academic practice	2 (9)
Setting	
Urban	11 (48)
Suburban	12 (52)
Region	
Western	3 (13)
Midwestern	5 (22)
Southern	10 (43)
Northeastern	5 (22)
Physician experience, y	
Mean (SEM)	12.6 (1.7)
Median (range)	10 (4-32)
Tumor type	
All	20 821
Basal cell carcinoma	13 111 (63.0)
Squamous cell carcinoma	7215 (34.7)
Melanoma in situ	331 (1.6)
Invasive melanoma	49 (0.2)
Rare nonmelanoma skin cancer	115 (0.6)

Retrospective Evaluation of the Safety of Large Skin Flap, Large Skin Graft, and Interpolation Flap Surgery in the Outpatient Setting

ADAM SCHMITT, MD,* JENNIFER DePRY, DO,[†] SHEENA TSAI, MD,[‡] AND JEREMY BORDEAUX, MD, MPH[‡]

Dermatol Surg 2018;44:1537–1546

2.7% (9 PTS) BLEEDING
5% (17 PTS) INFECTION
3 % (10 PTS) NECROSIS
<1 % (3 PTS) WOUND DEHISCENCE

CONCLUSION:
INCIDENCE LOW, SURGERY OF LARGE FLAPS/GRAFTS AND INTERPOLATION FLAPS IS SAFE IN THE OFFICE SETTINGS

TABLE 5. Multivariate Complication Analysis

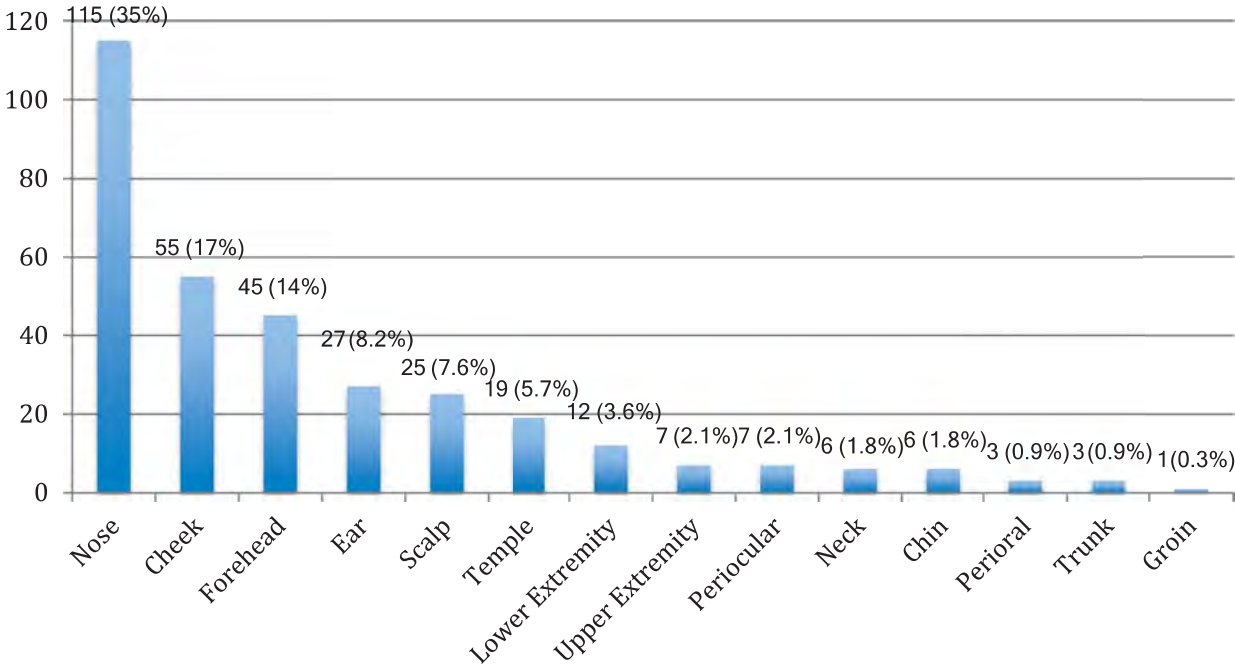
	Bleeding		Infection		Necrosis		Dehiscence	
	Odds Ratio (95% CI)	p	Odds Ratio (95% CI)	p	Odds Ratio (95% CI)	p	Odds Ratio (95% CI)	p
Closure								
Large flap	4.96 (0.60–40.83)	.14	2.36 (0.64–8.77)	.20	0.19 (0.038–0.92)	.039		
Large graft	5.39 (0.33–89.31)	.24	8.13 (1.69–39.09)	.009	0.73 (0.086–6.24)	.78		
Interpolation flap	0.20 (0.025–1.62)	.13	0.34 (0.095–1.20)	.093	4.01 (1.02–15.82)	.047		
Flap size								
30 to 50 cm ²	2.30 (0.38–14.00)	.37	0.63 (0.16–2.51)	.52	0.36 (0.076–1.75)	.21		
>50 to 70 cm ²	5.07 (0.69–37.46)	.11	0.68 (0.08–5.70)	.72				
>70 cm ²	2.94 (0.40–21.42)	.29	2.65 (0.85–8.27)	.09				
Site								
Nose			0.24 (0.053–1.06)	.059	2.92 (0.81–10.56)	.10		
Cheek	4.25 (1.10–16.37)	.035	0.66 (0.15–2.96)	.58	0.55 (0.068–4.43)	.57		
Forehead	1.85 (0.37–9.22)	.45	1.39 (0.38–5.03)	.62	0.70 (0.086–5.66)	.74		
Temple			2.33 (0.49–11.02)	.29				
Scalp	3.71 (0.73–18.91)	.11	2.84 (0.76–10.65)	.12				
Ear	1.42 (0.17–11.82)	.74	0.69 (0.088–5.43)	.73	1.26 (0.15–10.34)	.83		
Lower extremity			1.72 (0.21–14.17)	.61	3.13 (0.36–26.93)	.30		
Upper extremity			16.61 (3.39–81.43)	.001				
Neck								
Periocular								
Chin								
Perioral								
Trunk								
Groin								
Antithrombotics								
Warfarin	5.80 (1.11–30.37)	.037			1.06 (0.12–9.43)	.96		
Warfarin + aspirin	9.67 (0.85–110.07)	.07						
Warfarin + clopidogrel								
Aspirin	0.39 (0.04–3.76)	.41	0.64 (0.21–1.96)	.43	0.46 (0.088–2.42)	.36		
Aspirin + clopidogrel	4.03 (0.39–41.75)	.24			2.38 (0.26–22.08)	.45		
Clopidogrel			5.15 (0.91–29.23)	.064				
Aspirin-dipyridamole								
Antibiotics	2.00 (0.53–7.61)	0.31	.74 (.24–2.34)	0.61	2.53 (0.72–8.94)	.15		

Statistically significant values in bold.

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TABLE 2. Closure Frequency and Size		
Closure Type	Number (%)	Median Size (cm ²)
Large flaps	182 (55)	50
Large grafts	24 (7)	31
Interpolation flaps	125 (38)	
Forehead	63 (19)	
Cheek	41 (12)	
Ear	20 (6)	
Cutler Beard	1 (1)	



Dermatol Surg 2018;44:1537–1546

Table II. Results of studies that compared length of hospital stay after LA and GA

Reference	Length of hospital stay after LA, d	Length of hospital stay after GA, d	Difference in hospital stay, d
Bettex et al (2001) ⁷	3	5.5	−2.5
Dehédin et al (2011) ¹¹	8.5	15.5	−7
Ellard et al (2011) ¹²	8	8	0
Gabelman et al (1983) ⁴⁵	7.1	9.2	−2.1
Gürer et al (2003) ¹⁷	2.4	4.1	−1.7
Macquet et al (2011) ²²	0	1.4	−1.4
Mineo et al (2014) ²³	3.1	4.9	−1.8
Peiper et al (1994) ³ (retrospective)	5.1	6.4	−1.3
Wax et al (2010) ⁴¹	1.7	11	−9.3

Table I. Results of studies that directly examined costs of procedures under LA and GA

Reference	Procedure cost with LA	Procedure cost with GA	Significance*	Cost increase using GA
Covarelli et al (2012) ⁹	\$71.68	\$248.35	+	246%
Cox et al (1991) ¹⁰	\$1,172.00	\$1,488.00	+	27%
Gabelman et al (1983) ⁴⁵	\$3,611.00	\$5,115.00	+	42%
Gürer et al (2003) ¹⁷	\$885.71	\$1,007.14	+	14%
Ibañez et al (2011) ¹⁸	3,270.37	\$7,318.44	+	124%
Lintner et al (1996) ⁴⁸	\$230.00	\$654.00	+	184%
Lipscomb et al (1996) ⁵⁰	\$200.00	\$729.00	+	265%
Mineo et al (2014) ²³	\$6090.00	\$9660.00	+	59%
Mitchell et al (2011) ²⁴	\$613.00	\$743.00	+	21%
Schuld et al (2009) ⁵¹	\$400.72	\$482.86	+	20%
Sivalingam et al (2013) ³⁵	\$7,770.00	\$30,060.00	+	287%
Stoffels et al (2011) ³⁷	\$30.64	\$326.14	+	964%
Stoffels et al (2012) ⁴⁷	\$67.26	\$676.20	+	905%

Table III. Results of studies comparing total operating times associated with LA and GA

Reference	LA operating time, min	GA operating time, min	Difference in operating time, min
Bettex et al (2001) ⁷	100	172.5	−72.5
Covarelli et al (2012) ⁹	51	73	−22
Cox et al (1991) ¹⁰	54	56	−2
Dehédin et al (2011) ¹¹	80	120	−40
Fedok et al (2000) ¹³	89	108	−19
Gabelman et al (1983) ⁴⁵	162	186	−24
Gürer et al (2012) ¹⁷	104.5	122	−17.5
Inabnet et al (2008) ¹⁹	71	101	−30
Lintner et al (1996) ⁴⁸	96	134	−38
Macquet et al (2011) ²²	37	57	−20
Mineo et al (2014) ²³	65.8	84.9	−19.1
Motloch et al (2012) ²⁵	112	167	−55
Schuld et al (2009) ⁵¹	95.9	105.92	−10
Stoffels et al (2012) ³⁸	139	157	−18
Wax et al (2010) ¹¹	188	245	−57

41 STUIDES – CUTANEOUS SURGERY PROCEDURES (OR time, length of stay, cost)

DERMATOLOGIC SURGERY

Assessing the outcomes, risks, and costs of local versus general anesthesia: A review with implications for cutaneous surgery



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Cleveland, Ohio; Los Angeles, California; and Concord, Salisbury, and Lake Norman, North Carolina

Criterion	LA is superior	GA is superior	No difference
Outcome	15	2	24
Complication	15	3	20
Cost	13	0	0

Conclusion: Local anesthesia techniques provide outcomes equal to or better than general anesthesia and with significantly lower costs. (J Am Acad Dermatol 2018;78:983-8.)

Rates of Postoperative Complication by Tumor Type			
	ASE N=892 (%)	Clinically large N=586 (%)	Control* N=2821 (%)
Any complication ¹	60 (6.7)	62 (10.6)	95 (3.4)
Stroke	0 (0)	0 (0)	1 (0.04)
Bleeding	16 (1.8)	5 (0.9)	20 (0.7)
Surgical site infection	19 (2.1)	31 (5.3)	42 (1.5)
Swelling	4 (0.4)	0 (0)	3 (0.1)
Necrosis	6 (0.7)	9 (1.5)	4 (0.1)
Hypertrophic scar	6 (0.7)	4 (0.7)	4 (0.1)
Bruising	1 (0.1)	1 (0.2)	1 (0.04)
Spitting sutures	1 (0.1)	0 (0)	6 (0.2)
Dehiscence	3 (0.3)	3 (0.5)	3 (0.1)
Ulceration	3 (0.3)	3 (0.5)	3 (0.1)
Granuloma	0 (0)	0 (0)	6 (0.2)
Pruritus	0 (0)	0 (0)	1 (0.04)
Non-healing wound	1 (0.1)	1 (0.2)	1 (0.04)

Patient Demographics and Predictors of Postoperative Complication after MMS					
		Any complication (N=198)	No complication (N=2853)	OR (95% CI)	P-value
Age	Mean (SD)	70.7 (13.3)	67.8 (13.87)	-	0.005
	F	58 (29.3)	1398 (35.3)	-	-
Gender	M	140 (70.7)	2557(64.7)	3	0.093
Location ¹	Zone 1	74 (37.4)	1800 (45.5)	5.1	0.028
	Zone 2	84 (42.4)	1579 (39.9)	0.483	0.504
	Zone 3	40 (20.2)	575 (14.5)	4.79	0.04
	BCC (ref) (all) ²	103 (52)	2535 (64.1)	-	-
Subtype	Subtype 1 (ref)	47 (50)	716 (52)	-	-
	Subtype 2	47 (40)	645 (46.8)	1.1	0.624
	Subtype 3	0	3 (0.2)	0	0.99
	Subtype 4	0	13 (0.9)	0	0.99
Preop Size x	Mean (SD)	13.86 (9.28)	9.45 (8.853)	-	<0.001
Preop Size y	Mean (SD)	14.91 (9.7)	10.48 (7.29)	-	<0.001
Post-op Size x	Mean (SD)	25.31 (15.79)	17.46 (10.41)	-	<0.001
Post-op Size y	Mean (SD)	27.14 (15.98)	19.47 (10.95)	-	<0.001
Margin 1 ^a	Mean (SD)	11.2 (9.05)	8.10 (7.27)	-	<0.001
Margin 2 ^b	Mean (SD)	12.05 (9.66)	9 (7.06)	-	<0.001
Mohs Stages	Mean (SD)	2.43 (1.183)	2.18 (1.016)	-	0.005
Surgeon Type	Attending	78 (39.4)	1900 (48.1)	-	-
	Fellow	120 (60.6)	2053 (51.9)	5.683	0.019
Closure Type	Granulation	13 (6.6)	48 (1.2)	6.67	<0.001
	Linear (ref)	86 (44.3)	2120 (53.6)	-	-
	Flap	48 (24.2)	947 (24)	1.248	0.229
	Graft	47 (23.7)	615 (15.6)	1.884	0.001
ASE		60 (30.3)	832 (21.1)	9.562	0.003
Clinically Large		62 (31.3)	524 (13.3)	50	<0.001

Large tumors 50 times the odds for postoperative complications
Large size > 2 cm in diameter; ASE (>3 Mohs stages; > 1 cm beyond the margins

Adverse Events Resulting in After-Hours Calls After Mohs Micrographic Surgery

- 2. O'Neill JL, Lee YS, Solomon JA, Patel N, et al. Quantifying and characterizing adverse events in dermatologic surgery. *Dermatol Surg* 2013;39:872–8.
- 3. Bordeaux JS, Martires KJ, Goldberg D, Pattee SF, et al. Prospective evaluation of dermatologic surgery complications including patients on multiple antiplatelet and anticoagulant medications. *J Am Acad Dermatol* 2011;65:576–83.

Infection (1.3% -1.32%)
Bleeding (0.41-% - 0.89%)

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16 questions survey
1400 Mohs College Members
Dermatol Surg 2018; 44(3):455-459

TABLE 3. Survey Responses Regarding Adverse Events	
Question	Result
Most common emergency	
Adverse reaction medication	4 (2%)
Bleeding	124 (73%)
Infection	21 (12%)
Pain	19 (11%)
Wound dehiscence	2 (1%)
Most common site of AE	
Ears	51 (30%)
Nose	49 (29%)
Scalp	33 (19%)
Extremities	13 (8%)
Forehead	9 (5%)
Cheek	4 (2%)
Trunk	3 (2%)
Periorbital	3 (2%)
Other	2 (1%)
Lips	2 (1%)
Neck	1 (1%)
Most common procedure associated with AE	
Mohs w/flap	75 (44%)
Secondary intent	49 (29%)
Mohs w/complex closure	19 (11%)
Large excision (>3 cm)	12 (7%)
Mohs w/graft	6 (4%)
Mohs w/simple closure	4 (2%)
Small excision (<3 cm)	2 (1%)
Other	3 (2%)
Most common flap or graft associated with AE	
Advancement	24 (14%)
FTSG	18 (11%)
Interpolation	67 (39%)
Rotation	21 (12%)
Transposition	40 (24%)

TABLE 2. Survey Responses Regarding Provider Demographics	
Question	Result
Do you have a surgical fellow?	28 (17%)
No. of excisions per week	
None	7 (4%)
1–15	139 (82%)
16–30	21 (12%)
31–45	2 (1%)
46–60	1 (1%)
No. of MMS procedures per week	
1–15	35 (21%)
16–30	83 (49%)
31–45	36 (21%)
46–60	12 (7%)
60+	4 (2%)
Who answers call about adverse events	
Answering service	14 (8%)
Attending surgeon	99 (58%)
Combination/other	34 (20%)
Fellow	9 (5%)
Office staff	14 (8%)
No. of calls per week about adverse events (w/i 7 d)	
None	82 (48%)
1–5	86 (51%)
6–10	2 (1%)
No. of calls per week about AE requiring intervention	
None	25 (28%)
1–3	63 (72%)
Normal time of patient calls	
5–10 PM	151 (89%)
10 PM–4 AM	16 (9%)
4 AM–8 AM	3 (2%)
After-hours meeting place	
Your office	139 (82%)
Nearest hospital ER	26 (15%)
Nearest hospital	5 (3%)
Who accompanies you on after-hours visits	
No one	123 (72%)
Nursing staff	21 (12%)
Fellow	16 (9%)
Resident	10 (6%)
Do you share calls with other dermatologists/groups	71 (42%)
Do you give out your personal phone number	108 (64%)
Abuse the privilege of personal phone number	3 (3%)

Process of Post-operative Telephone Follow-up Implementation for Mohs Micrographic Surgery: A Pilot Study

J Clin Aesthet Dermatol. 2018;11(7):36–39

263 patients responded

24-48h

62 (23.6%) reported complications:

18 (6.8%) with bleeding issues,

17 (6.5%) with bruising, and

27 (10.3%) with swelling issues.

17 reported spontaneous resolution

one (0.4%) returned to the office

for intervention (cautery).

PAIN CONTROL

97% SUCCESSFUL

PAIN LEVEL 3.6, vs 1.9 at the 24 to 48 h f/u

167 [63.5%]) NSAIDS or paracetamol

30 (18%) prescription opioid alone +/- NSAID;

57 % opioids not prescribed by Mohs surgeon.

TABLE 1. Twenty-four to forty-eight hour post-operative telephone encounter follow-up template.

BLEEDING/HEMATOMA/ECCHYMOSIS	RESPONSE TYPE
Have you had any of the following problems at your surgical site?	
Bleeding?*	Yes or No
Bruising?	Yes or No
Swelling?	Yes or No
*If patient indicates bleeding	
Did the bleeding soak through your dressing?	Yes or No
How did you stop the bleeding?	Free response
Did you contact the office about these issues?	Yes or No
Did one of the following health care providers assess your wound:	
In-office assessment by surgeon?	Yes or No
Urgent care or PCP?	Yes or No
On-call resident?	Yes or No
PAIN CONTROL	RESPONSE TYPE
Do you feel your pain was adequately controlled?	Yes or No
If no, did you contact the office about your pain?	Yes or No
If patient did not contact office, explain why:	Free Response
How would you rank your pain today on a scale of 0–10?	Scale of 0–10
How you would rank your worst pain following the surgery?	Scale of 0–10
Did you take any of the following medications for pain control:	
Acetaminophen	Yes or No
NSAID	Yes or No
Tramadol	Yes or No
Opioid	Yes or No
Were these medications prescribed the surgeon?	Yes or No

Process of Post-operative Telephone Follow-up Implementation for Mohs Micrographic Surgery: A Pilot Study

J Clin Aesthet Dermatol. 2018;11(7):36–39

TABLE 3. Other concerns reported during 1-week follow-up

Not enough pain medications
Allergic reaction to adhesive
Increased pain at surgical site
Irritation from bandage
Flap of skin present
Headaches
Blisters formed from clothes rubbing
Seroma
Pressure against corner of eye
Bump developed at edge of incision
Opening of incision site (2)

BE PROACTIVE AND ASSESS THE PROBLEM EARLY

One week follow-up phone call

5 of 232 (2.2%) dressing fell off
 12 (5.2%) had difficulty redressing the wound
 4 (1.7%) limited access to dressing material
 53 (23%) itching, and irritation at the wound site
 18 (7.8%) infection – Only 1 (0.4%) prescribed AB
 7 (3%) other concerns (Table 3.)

TABLE 2. One-week post-operative telephone encounter follow-up template

DRESSING/WOUND MANAGEMENT	RESPONSE TYPE
Did you have any of the following problems with your bandage after leaving the physician:	
Dressing prematurely came undone?	Yes or No
Difficulty re-dressing wound after takedown?	Yes or No
Limited access to dressing materials?	Yes or No
Other?	Free Response
Did you have any problems with itching or irritation around the wound?	Yes or No
INFECTION	RESPONSE TYPE
Have you experienced any of the following symptoms of infection at the site of your surgery:	
Redness	Yes or No
Swelling	Yes or No
Pain	Scale between 0-10
Pus or drainage	Yes or No
Fever	Yes or No
If yes to any of the above:	
Did you contact the office about your wound?	Yes or No
Did a health care provider assess your wound?	Yes or No
Were cultures of the wound performed?	Yes or No
Were you prescribed oral antibiotics?	Yes or No
Were you prescribed topical antibiotics?	Yes or No
WRAP UP	RESPONSE TYPE
Did you contact any of the following health care providers for any of your problems:	
Office where surgery was performed?	Yes or No
Resident on call?	Yes or No
Provider outside of dermatology (ER, PCP, urgent care)?	Yes or No
If you had a problem but did not contact us please explain why?	Free Response
Were there any other problems with the surgery or wound?	Free Response

DERMATOLOGIC SURGERY

Identifying and defining complications of dermatologic surgery to be tracked in the American College of Mohs Surgery (ACMS) Registry

Conclusion: The ACMS Registry aims to gather data to monitor the safety and value of dermatologic surgery. Determining and defining the outcomes to be included in the registry is an important foundation toward this endeavor. (J Am Acad Dermatol 2016;74:739-45.)

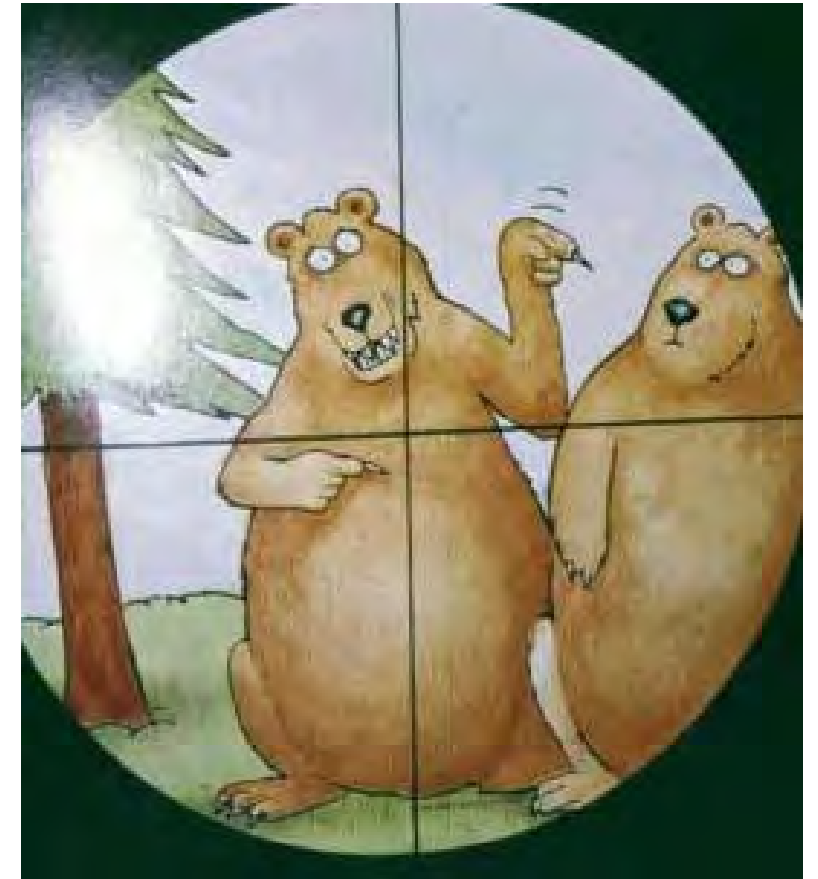
Conclusion

- ▶ Mohs surgery is very safe outpatients procedure performed under local anesthesia
- ▶ Clean procedure, low risk of infection, does not require classical OR settings
- ▶ Serious complications are very rare and can be avoided by a careful and conscientious approach to the individual patient.
- ▶ Anticoagulants can be safely continued to avoid thrombotic complications
- ▶ Antibiotic prophylaxis is rarely required
- ▶ Nerve damage can usually be avoided by a detailed knowledge of facial anatomy, and when it does occur spontaneous improvement can often be expected
- ▶ Tumor recurrence is rare after Mohs surgery.
- ▶ Increased surveillance indicated for large, poorly differentiated and long neglected tumors and patients with CLL



How to avoid complications

- ▶ ANTICIPATE THE OCCURRENCE
- ▶ TAKE PREVENTIVE ACTIONS
- ▶ EARLY RECOGNITION
- ▶ PROMPT INTERVENTION
- ▶ PATIENT EDUCATION
- ▶ CLOSE FOLLOW-UP CARE



THANK YOU FOR YOUR ATTENTION



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