

# Reconstructive Surgery: Conundrums Conundrums

**Mark K Wax MD FACS FRCS(C)**  
 Professor Otolaryngology  
 Professor Maxillo-Facial Surgery  
 Director Microvascular Surgery  
 Program Director  
 Oregon Health Sciences University

1

## DISCLOSURE

I Mark K Wax MD have no relevant financial relationships with pharmaceutical, devices companies or the Educational Committee of this activity.

Nonfinancial: The presenter has no relevant nonfinancial relationships to disclose



2

## MUSC & OHSU





3

## UK & OHSU





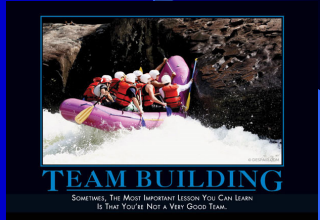
4

## Suggested Topics From Judith

- Head and neck cancer
- Thyroid disease
- Fibula flaps
- How to do fibula flaps fast
- How to have your fibula flaps live
- How to have your fibula flaps not with
- Why is there always a second flap
- What is the best way to prevent a second flap
- What the chyle leak
- When is a chyle leak
- Can I do that flap
- Scalp reconstruction
- Free scalp flaps
- Scapula flaps
- Latisimus dorsi flaps
- Leg flaps
- Belly flaps
- Rectus flaps
- How not to do a flap
- When not to do a flap
- Who not to do a flap on
- Why would you not want to do a flap
- Craniofacial resection
- Craniofacial reconstruction
- ALT flaps and craniofacial reconstruction
- LAD flaps and craniofacial reconstruction
- Total rhinectomy
- The use of free flaps for total rhinectomy reconstruction
- Delayed free tissue transfer
- Orthopedic free tissue transfer
- Dome and chond U affect life
- Free omentum flaps and their role in head and neck reconstruction
- The use of papaverine and vasospasm
- The use of heparin as a routine in vasospasm
- Free flaps as an outpatient
- Claypelt flaps for facial reanimation
- To vector gracilis flaps
- 3 factor gracilis flaps
- Crossing or fascial grafting
- Maxillary reconstruction
- Dental rehabilitation
- Placement of jaw in a day
- Subperiosteal implants
- Utilization of oral maxillofacial surgeons

5

## AAFPRS Keynote

6

## Goals & Objectives

- What keeps us in the game
- Flap compromise and salvage
  - Detection
    - Intra-op
    - Post op
  - How do we get back
  - When do we toss the flap and what do we do???
  - 3D modeling Computer simulaton

7

## What Do Otolaryngologists Do Well



8

## What Makes Us Obsolete



- Ezrin C, Briant TD, Firestone G, Rosen F. The endocrine aspects of trans-sphenoidal hypophysectomy. Can Med Assoc J. 1967 Jul 8;97(2):72-5. PMID: 6029240; PMCID: PMC1923109.

9

## Introduction

- Corneal anesthesia can be a devastating problem.
- Result in Neurotropic keropathy.
- Corneal ulceration, infections loss of the eye.



10

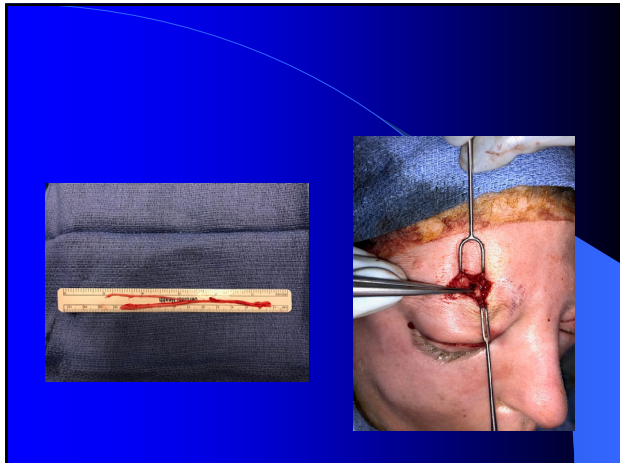
## Innovation: Corneal Neurotization



11



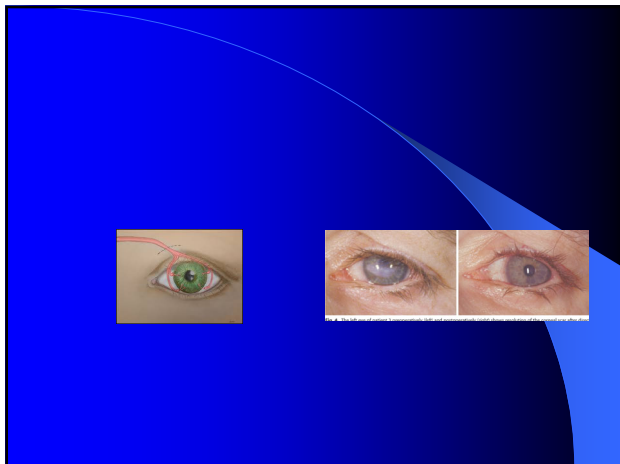
12



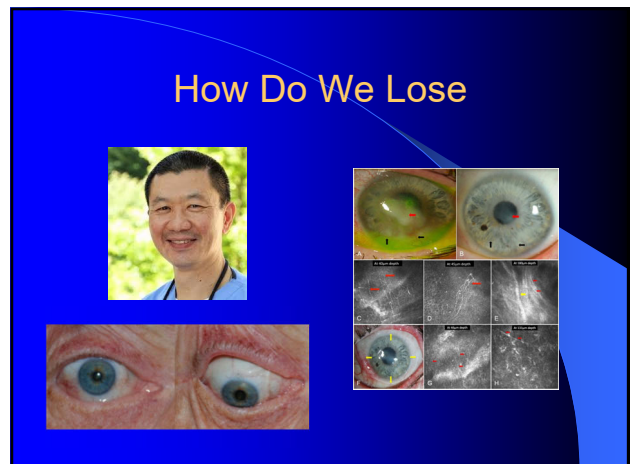
13



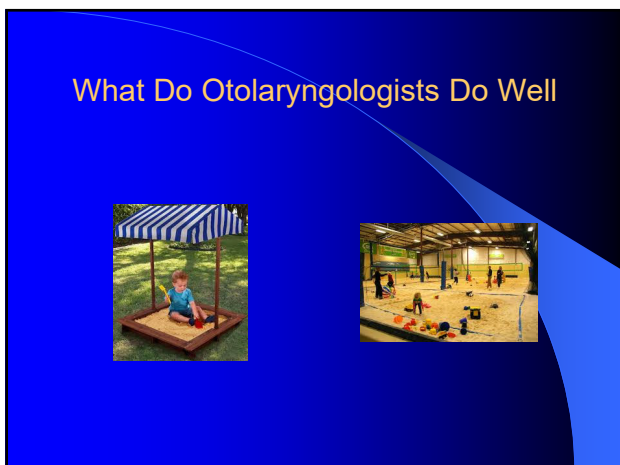
14



15



16

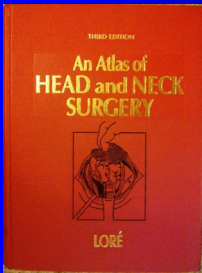


17



18

## How Do We Win: Be Better



19

## How Do We Win: Skill

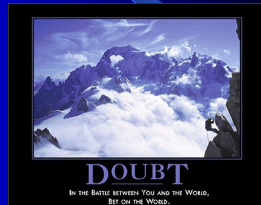


20

## How Do We Win

Better care for the system

- ERAS
- Post Op ICU
  - OHSU 25 yrs send Pts to floor
  - 13K—10K—9K



21

## Ward-Level Care for Free Tissue Reconstruction in the Head and Neck: Determinants of ICU Admission

Elliott Morse, MD, MHS

William W. Thomas, MD Alia Mowery James  
E. Azzi, MD

Mark K. Wax, MD

AAO-HNSF 2019 ANNUAL MEETING & OTO EXPERIENCE  
NEW ORLEANS, LA | SEPTEMBER 15-18 | #OTOMT19 | WE ARE ONE

22

## Results - Demographics

|                              | No. Patients | %   |
|------------------------------|--------------|-----|
| <b>Gender</b>                |              |     |
| Male                         | 598          | 69% |
| Female                       | 266          | 31% |
| <b>Medical Comorbidities</b> |              |     |
| Cardiac                      | 460          | 53% |
| Pulmonary                    | 22           | 3%  |
| Prior Radiation              | 246          | 40% |
| <b>Site</b>                  |              |     |
| Larynx                       | 176          | 20% |
| OC (w/ Mandible)             | 186          | 22% |
| OC (w/o Mandible)            | 190          | 22% |
| Other                        | 312          | 36% |

|                         | No. Patients | %    |
|-------------------------|--------------|------|
| <b>Flap</b>             |              |      |
| ALT                     | 162          | 19%  |
| Fibula                  | 108          | 13%  |
| RFFF                    | 436          | 50%  |
| Other                   | 158          | 18%  |
| <b>Mean OR Duration</b> | 7.4 hours    | SD=2 |

AAO-HNSF 2019 ANNUAL MEETING & OTO EXPERIENCE  
NEW ORLEANS, LA | SEPTEMBER 15-18 | #OTOMT19 | WE ARE ONE

23

## Results –Ward to ICU Transfer

|                        | No. of Patients | Percentage |
|------------------------|-----------------|------------|
| <b>Total Patients</b>  | 864             |            |
| <b>Transfer to ICU</b> | 90              | 10%        |
| Post return to OR      | 44              | 5%         |
| Flap Salvage           | 26              | 3%         |
| Bleeding/Hematoma      | 14              | 2%         |
| Washout                | 2               | 0%         |
| PEG placement          | 2               | 0%         |
| <b>Non-OR Related</b>  | 46              | 5%         |
| Cardiac                | 16              | 2%         |
| Respiratory            | 22              | 3%         |
| Sepsis                 | 4               | 0%         |
| Altered Mental Status  | 4               | 0%         |

| Day of Transfer | No. of Patients |
|-----------------|-----------------|
| POD 1           | 12              |
| POD 2           | 12              |
| POD 3           | 18              |
| POD 4-7         | 24              |
| POD 8-14        | 14              |
| > POD 14        | 10              |

AAO-HNSF 2019 ANNUAL MEETING & OTO EXPERIENCE  
NEW ORLEANS, LA | SEPTEMBER 15-18 | #OTOMT19 | WE ARE ONE

24

## Results – Ward to ICU Transfer

|                         |            | Odds Ratio (95% CI) |
|-------------------------|------------|---------------------|
| Cardiac Comorbidities   | No         | 1 (REF)             |
|                         | Yes        | 2.7 (1.3 to 5.7)    |
| Pulmonary Comorbidities | No         | 1 (REF)             |
|                         | Yes        | 4.7 (2.3 to 9.8)    |
| OR Duration             | <5 hours   | 1 (REF)             |
|                         | 5-10 hours | 3.7 (0.5 to 29.0)   |
|                         | >=10 hours | 12.5 (1.4 to 109.8) |
|                         |            |                     |

AAO-HNSF 2010 ANNUAL MEETING & OTO EXPERIENCE  
NEW ORLEANS, LA | SEPTEMBER 15-19 | #OTOHNSF | WE ARE ONE

25

## Conclusions

- 10% rate of ICU transfer
- Half due to return to the operating room
- Half due to medical complications
- Floor monitoring is safe
- Patients with certain characteristics could be considered for direct admission to ICU
- So?????
- Extubated in the OR
  - Fluids
  - Pressors
- Rare Airway issue
- Anesthesia listens
- We are a financial driver
- All our flaps get done
  - No ICU beds... Who cares

26

## How Do We Win: System

- Counting during the "Micro"
- Angst in the OR
- We are calm in the storm



27

## Flap Compromise & Salvage

- Big topic
- Need to address
  - Detection
    - In the OR
      - This is big
    - Post OP
  - Get back to the OR
  - Management in the OR
  - When do you give up
    - In the operating room
    - Primary failure
    - Secondary failure



28

## Flap Compromise & Salvage

### Detection

- In Operating Room
  - **Doppler**
  - Capillary refill
  - Poke the flap
  - **Spy**
  - Feel the pulse
    - Old age
    - Vasopressors
    - Sleep at night



29

## Free Tissue Transfer

- When it works it great
- When it doesn't
  - Sigh
- Can we detect those partial necrosis?
- Can we identify dead flap intra op?



30

## SPY Technology

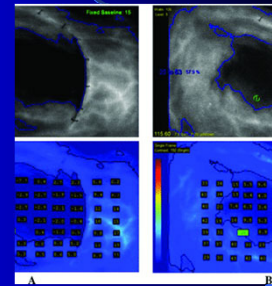
- Fluorescent Angiography
  - Indocyanine Green (ICG)
  - Inject 5 cc
  - Point Camera and watch
  - See the perfusion of the tissue
- Plastics
  - Cost
  - Collaborate/Breast



31

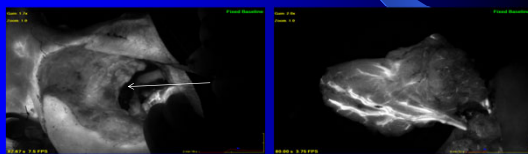
## Spy Technology

- Able to reliably discern dead tissue
- Revolutionize breast reconstruction

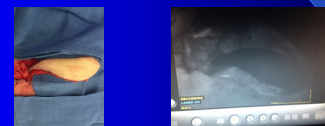


32

## Bony Evaluation: Spy



33



34

## Spy Equipement



35

## SPY in Facial Plastic Surgery

- Forehead flaps
  - Re-vascularize
  - Cut pedicle 6 weeks
- Most et al 2012
  - Demonstrated vascular ingrowth 1 week
- Most et al 2015
  - 10 patients
  - Perfusion good when clamped at 2 weeks
  - Flaps survived



36

## How Can We Expand This

- Flaps are 100%
- Occasionally not true
  - Extended
  - Composite



37

## Spy System



38

## Spy Technology

- 1316 Flaps since SPY arrived
  - 8yrs
- Used in 73 cases (<6%)
  - 25 During harvest
    - 10 extended flap
      - Needed to trim 5
    - 6 Viability was questioned
      - 2 dead and replaced
    - 3 “Skin pale”
      - 1 Skin dead
      - 1 Flap dead
    - 6 Funky
      - Perforators, anatomy, trimming
        - 2 skin tossed, bone good

39

## Spy Technology

- 39 Post anastomosis
  - 10 large flaps
    - 5 interventions
  - 11 Concern re viability
    - 6 viable
      - Spasm
    - 2 skin dead bone good
    - 1 partial necrosis
    - 2 dead flap
    - 2 died eventually
- 18 assorted
  - Pale skin
  - Spasm
  - Perforators not seen
  - Doppler funky
- 9 Post op
  - Composite tissue
  - 5 interventions

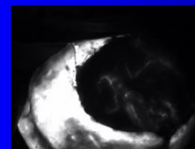
40

## Outcome of SPY

- 39 viable
  - Proceeded
  - 2 flaps died
- 10 skin paddle not viable, but bone or muscle is viable
  - 1 died
- 10 areas of non-perfusion which were trimmed
  - All lived
- 7 nonviable flap..... new flap harvested
- 4 no good flow.....eventually restored after some modification
- 1 skin paddle removed

41

Evaluation POD #0:  
After repeat arterial spasm



42

## Spy Technology

- Post operative evaluation
- Skin dead
- Muscle alive



43

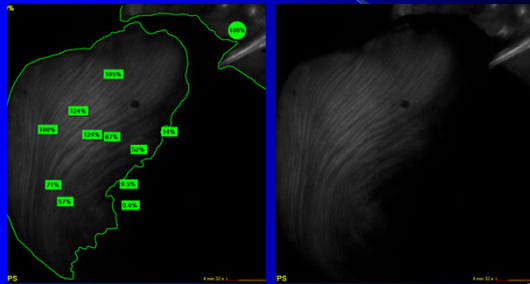
## Translational

- Extended flaps
  - Cervico facial
  - Septal
  - Pericranial
- Forehead
  - Extent
  - Divide pedicle
- Temporal Bone
  - Ear



44

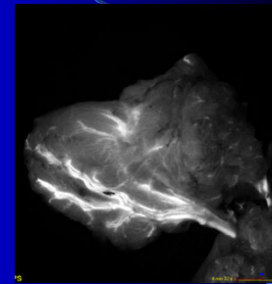
## Spy: Big Flap



45

## Take Away Message

- Learn from others
- Keep an open mind
- Technology is translatable



46

## Flap Compromise & Salvage

### Detection

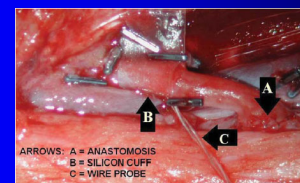
- In Operating Room
  - Doppler
  - Capillary refill
  - Poke the flap
- Spy
  - Old age
  - Vasopressors
  - Sleep at night
- Feel the pulse



47

## Implantable Cook-Swartz Doppler

- Implantable device



ARROWS: A = ANASTOMOSIS  
B = SILICON CUFF  
C = WIRE PROBE

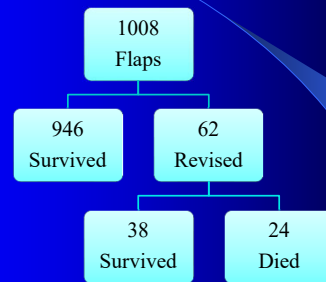
48

## Outcomes in 1142 Flaps

|             | Total Flaps | Post<br>Operative<br>Revision | Post<br>Operative<br>Revision (%) | Salvaged | Salvaged<br>(%) | Overall<br>Survival (%) |
|-------------|-------------|-------------------------------|-----------------------------------|----------|-----------------|-------------------------|
| Not Revised | 1008        | 62                            | 6.2                               | 38       | 61.3            | 97.6                    |
| Revised     | 134         | 15                            | 11.2                              | 5        | 33.3            | 92.5                    |
| Total       | 1142        | 77                            | 6.7                               | 43       | 55.8            | 97.0                    |

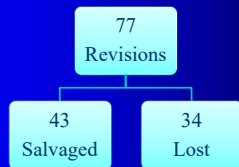
49

## No Intra Operative Issues



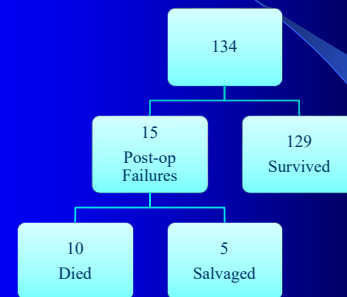
50

## Overall Salvage Outcomes



51

## Intra-Operative revisions



52

## Conclusions

- Doppler may shift detection to operating room
- Issue in the operating room may mean issue post op

53

## Venous Flow Coupler



54

## Flow Coupler: Recent Literature

120 Patients with Flow couplers and Cook Schwartz doppler

Takeback 9.2% (11/120)

- 10 venous thrombosis
- 1 Arterial thrombosis

Salvage Rate 81.8%

Flow:

- Sensitivity: 100%
- Specificity: 86.4%
- FPR: 13.6%

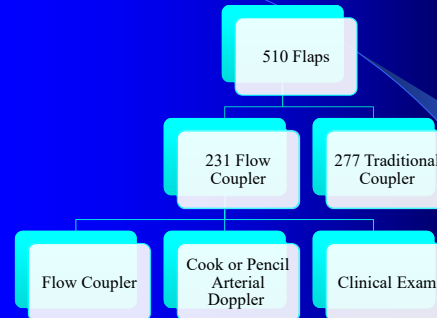
Arterial Doppler:

- Sensitivity: 9.1%
- Specificity: 97.1%
- FPR: 2.9%

Rance et al. Outcomes and reliability of the flow coupler in postoperative monitoring of head and neck free flaps. *Laryngoscopy*. 2018; 148(4): 812-817

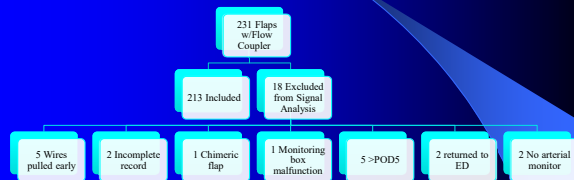
55

## Cases

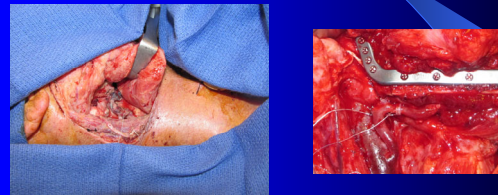


56

## Signal Analysis: Cases Excluded

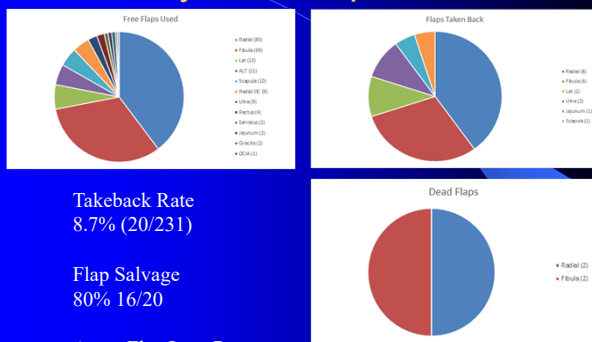


57



58

## Analysis of Flaps Used



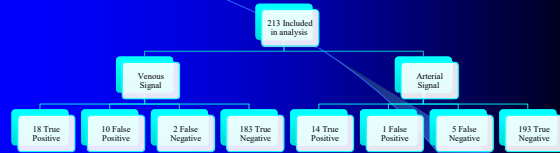
59

## Operative Takeback Findings

| Finding           | Flow Coupler Signal | Arterial Signal |
|-------------------|---------------------|-----------------|
| Not Recorded      | Absent              | Absent          |
| A/V Thrombus      | Absent              | Absent          |
| Venous Thrombus   | Absent              | Present         |
| Arterial Thrombus | Absent              | Absent          |
| Venous Thrombus   | Absent              | Absent          |
| Venous Thrombus   | Absent              | Weak            |
| Arterial Thrombus | Absent              | Absent          |
| Arterial Thrombus | Absent              | Absent          |
| Vein Thrombus     | Absent              | Absent          |
| Arterial Thrombus | Absent              | Absent          |
| Vein Thrombus     | Absent              | Present         |
| A/V Thrombus      | Absent              | Absent          |
| Dead              | Present             | Present         |
| Venous Thrombus   | Absent              | Present         |
| Dead              | Absent              | Absent          |
| A/V Thrombus      | Absent              | Absent          |
| Artery Thrombus   | Present             | Absent          |
| Dead              | Absent              | Absent          |
| A/V Thrombus      | Absent              | Absent          |
| Dead              | Absent              | Absent          |

60

## Accuracy of Total Signal Loss



### Venous Flow Coupler

- PPV Signal loss: 64.3%
- NPV Stable signal: 94.8%
- Sensitivity: 90%
- Specificity: 94.8%
- FPR: 5.2%

### Arterial Doppler

- PPV Signal loss: 93.3%
- NPV Stable signal: 99.5%
- Sensitivity: 73.7%
- Specificity: 99.9%
- FPR 0.1%

61

## Ancillary Findings

- 24.1% (7/29) of cases where 2x flow couplers were used had 1 loose signal and the flap was never taken back.
- 3.4% (1/29) were taken back after the second flow went silent with intra-op finding of venous thrombosis

RAIN: 09/20/2012

62

## Conclusions

Flow Couplers identified compromised flaps before arterial signal 30% (6/20)

83.5% (5/6) Salvage rate

Use of flow coupler alone insufficient to positively predict flap

- Flow FPR 5.8% compared to Arterial FPR 0.1%
- 5.8% compared to 0.1% was lower in our study compared to the literature (5.8% compared to 13.6%)

Together, Arterial Doppler and Venous Flow Coupler predict flap compromise.

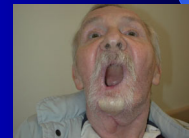
- 95% identified (19/20)
- No unnecessary take backs

Recommend against using multiple Flow Couplers in a single flap

- 24.1% associated with a non-significant loss of signal
- Only 1.4% picking up a clinically significant change

63

## All My Flaps Look Like This



64

## Horror Upon Horror

- When do you stop and admit flap is dead
  - Intra Op
    - When do you toss the flap
  - Post Op
    - When do you pray
- When do you wait



65

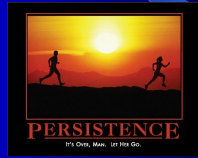
## When is it Time To Call it a Day?

- Hmmmm there is no perforator....
- I've been sewing and sewing and sewing

66

## Intra Operative: Toss The Flap

- When do you give up
- Multi Institutional
  - 7423 flaps
  - 46 intra op loss
    - Half anastomotic
    - 23 (.3%) perforators
  - That's every 333 flaps
- Go to second choice



67

## Tossing The Flap

- Institutions
  - OHSU
  - WashU
  - Fort Worth
  - UAB
  - MYSC
  - Thomas Jefferson
  - U of Kentucky
- 7,423 flaps
- 46 Intra-op tossed
  - 35 total
    - 15 ALT
    - 7 Fibula
    - 4 Radial forearm
    - 4 Lat dorsi
    - 5 Other
  - 11 partial (skin paddle)
    - 3 ALT
    - 8 Fibula

68

## Tossed Flaps

- 46 Intra-op tossed
  - 35 total
    - 15 ALT
    - 7 Fibula
    - 4 Radial forearm
    - 4 Lat dorsi
    - 5 Other
- Etiology
  - 12 Clotting
  - 11 Perforator
  - 8 spasm/intimal issue
  - 4 Karma
- Half detected at donor site
- Half in head and neck

69

## Tossed Flaps

- 46 Intra-op tossed
  - 11 partial
    - 4 ALT
    - 7 Fibula
- ALT
  - 4 muscle
- Fibula
  - 4 radial forearm
  - 2 pec
  - 1 muscle

70

## Tossed Flaps

- 46 flaps Management
  - 28 Second flap
  - 11 local tissue flaps
    - Scalp
  - 6 Regional flap
  - 1 Primary closure
- Bone with bone
- Scalp with rotation
- Oral cavity pec flap

71

## Incidence of Inadequate Perforators and Salvage Options for Anterior Lateral Thigh Flaps (ALT): A Multi-Institutional Retrospective Review of Over 1000 Flaps.



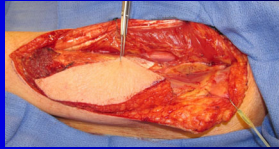
Haley E Calcagno MS<sup>1</sup>, W. Walsh Thomas MD<sup>1</sup>, Brett A Miles DDS MD<sup>2</sup>, Steven B Cannady MD<sup>3</sup>, Matthew M Hanasono MD<sup>4</sup>, Mark K Wax MD<sup>1</sup>.

<sup>1</sup>Oregon Health & Science University, Portland, OR; <sup>2</sup>Mount Sinai, New York, NY; <sup>3</sup>University of Pennsylvania, Philadelphia, PA; <sup>4</sup>University of Texas-MD Anderson, Houston, TX

72

## The ALT Flap in H&N Reconstruction

- ALT flap is a popular option for soft tissue reconstruction
- Variability of dominant ALT flap blood supply
  - Inadequate perforators range from <1% to 5.5%.



73

## Study Design

- Multi-institutional retrospective review of head & neck reconstruction with ALT free flaps (2000-2018)
- Review of patients with non-viable primary ALT free flap
  - No bleeding of skin edges, no perforator identified, no perfusion on fluorescence perfusion imaging
- Exclusion criteria:
  - Intraoperative iatrogenic perforator injury
  - Problematic vessel anastomosis contributing to free flap failure
- Senior surgeons surveyed as to timing of inadequacy of ALT free flap
  - Early vs Late
    - Transition - Performance of posterior/lateral ALT incision to complete the skin incision
  - Alternative reconstructive techniques and flap survival reported.

74

## Cohort & Results

- 1079 ALT free flaps harvested
- 28 Non-viable – 2.6%

| Patient Demographics |            |          |
|----------------------|------------|----------|
| Age                  | 58.5 years |          |
| Gender               | 20 (71%)   | 8 (29%)  |
|                      | Male       |          |
| Laterality of ALT    | 15 (54%)   | 13 (46%) |
|                      | Left       |          |

- Bilateral absence of ALT perforators – 2 patients
  - No uniform protocol to explore opposite side

| Surgical Demographics |               |                          |
|-----------------------|---------------|--------------------------|
| Timing                | 12 (43%)      | 16 (57%)                 |
|                       | Early         | Late                     |
| Salvage Site          | 12 (34%)      | 23 (66%) New Donor Site* |
|                       | Existing Site |                          |

\* - 6 Patients underwent further reconstruction for flap loss

75

## Salvage Flaps

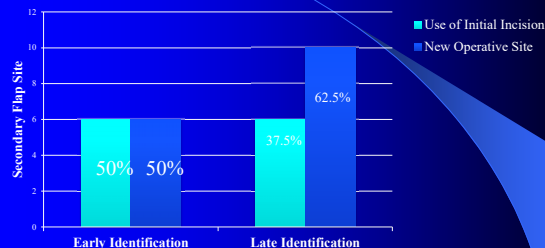
### Same Initial Incision: 34%

| Flap Type          | # |
|--------------------|---|
| Anteromedial thigh | 7 |
| Vastus lateralis   | 3 |
| Rectus femoris     | 1 |
| Tensor fascia lata | 1 |

| New Operative Donor Site: 66%   |   |
|---------------------------------|---|
| Flap Type                       | # |
| Radial forearm                  | 6 |
| Contralateral ALT               | 5 |
| Rectus abdominus                | 4 |
| Profunda artery perforator flap | 3 |
| Pectoralis major                | 2 |
| Contralateral Tensor fascia     | 1 |
| Fibula                          | 1 |
| Cervicofacial rotation          | 1 |

**Table 1a&b.** Salvage flap harvest site after non-viable primary ALT flap.

76



**Figure 2.** Impact of early and late identification of non-viable ALT flap on salvage flap harvest site.

77

## Discussion

- Constraints of the defect & timing of identification of non-viable ALT dictate optimal alternative flap
  - What is your next Best choice.
  - Early vs late identification of perforator adequacy impacts salvage options
- Anteromedial thigh flap
  - Reciprocal dominance<sup>6</sup>
  - De-novo non-usability 49%<sup>6</sup>



Cutaneous perforator from rectus femoris branch of dCFA



Continuation of RF branch of dCFA

78

## Discussion

- Rectus Femoris, Vastus Lateralis, Tensor fascia lata flaps
  - Vascularized myofascial flaps
- Transverse branch
  - Short pedicle
  - Transverse branch of lateral circumflex femoral artery may be source of ALT cutaneous perforators in 4-35% of thighs<sup>10</sup>
- Profunda Artery Peforator flap –
  - Confines donor site to ipsilateral thigh
  - Initial uses in H&N reconstruction as primary flap.<sup>11</sup>
- No routine use of fluorescent imaging technology or Doppler ultrasound
  - Across all 4 institutions

79

## Conclusion

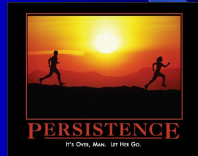
- Use your next best option to reconstruct the defect for these rare events
  - Defect constraints dictate available options
  - Early identification of a non-viable ALT free flap allows for many options for salvage with comparable flap characteristics and minimal additional morbidity.

80

## Intra Operative Anastomosis WAH

When do you give up

- Genden/Cannady/Curry/Rosenthal
  - Pick a number
  - Pick a time
- Do a second flap



81

## Flap May Live.....

- Trouble with anastomosis
- It's a revision
- Great inflow
  - Sucky outflow
- Flap still blueish
- Maybe it 3 or 4 am
- Let it be
  - Go home
  - Sleep
  - Plan number 2
- Living on hope
  - How often.....
  - Couple times a year



82

## This flap was alive yesterday..

- This is a biologic dressing
  - Intra oral good 5-7 days
- Now we can stabilize
- Now we can plan
- Can schedule



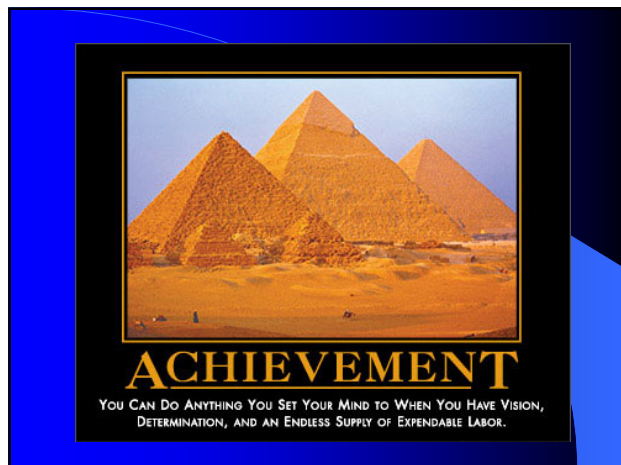
83

## What is the Cost of Leaving a Dead Flap

- Boney Flap
  - Needs another boney flap
  - Come back in a few days
- Is it just the skin???
- Pt is better if they have a few days



84



85

## Flap Compromise & Salvage

### Detection Post Op

- Critical on many fronts
- Early is best?
- Who detects?
- What do you do?
- Retrospective review
- 2010-2023
- 1959 flaps
- 173 flaps (8.8%)
  - 131 to OR (6.6%)
    - 61% Salvage
  - 42 Pronounced

86

## Background

- Hematomas are a frequent cause of re-exploration after micro-vascular free flaps
- Thought to cause compression of pedicle with or without associated vascular thrombosis
  - Little clinical literature exists regarding the effect of hematomas on vascular pedicle



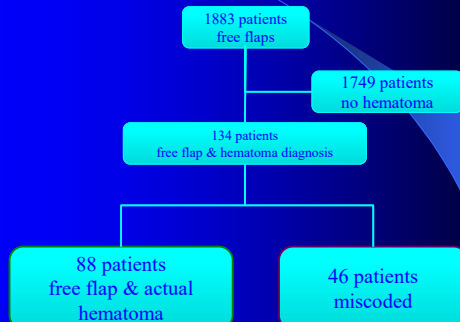
87

## Study Design

- Retrospective chart review of all patients undergoing free tissue transfer for head and neck reconstruction
  - July 1998 to June 2014
  - All patients were from a single tertiary referral center
- Coding database was queried for all ICD-9 diagnoses associated with hematomas
- Free tissue transfer and hematoma lists were cross-referenced for matches

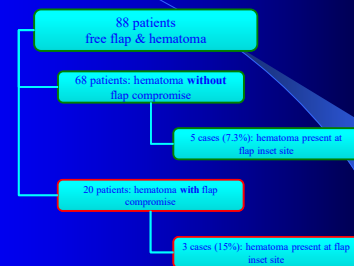
88

## Patients



89

## Results



- Remainder of cases: hematoma found near pedicle anastomosis

90

## Results

### Hematomas with Flap Compromise

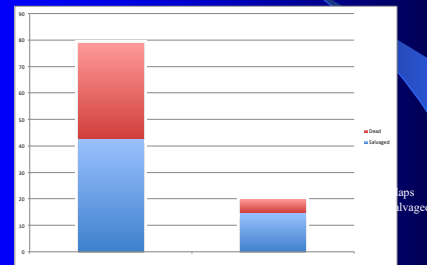
- Salvage rate: 75%
- 5 out of 20 flaps could not be salvaged

91

## Results

### Flap Compromise from Other Causes

### Flap Compromise from Hematomas



- Flap salvage rate from hematomas: 75% versus 54% for other causes ( $p = 0.12$ )

92

## Results

### Time to Detection

- Salvageable: 35.3 hrs  
(3 – 139 hrs)
- Unsalvageable: 91.6 hrs  
(14 – 161 hrs)

### Time to OR from Detection

- Salvageable: 2.8 hrs  
(1 – 7 hrs)
- Unsalvageable: 12.4 hrs  
(1 – 38 hrs)

❖  $p = 0.052$

93

## Results

### < 72 hours

- Time to hematoma detection
- < 72 hours: 90% salvage rate

### > 72 hours

- > 72 hours: 71% salvage rate

❖  $p = 0.07$

### < 5 hours

- Time to OR from detection
- < 5 hours: 93.3% salvage rate

### > 5 hours

- > 5 hours: 20% salvage rate

❖  $p = 0.005$

94

## Conclusions

- Incidence of hematomas 4.7%
  - Most hematomas occur adjacent to pedicle
- Compromise from hematomas: 25%
  - Higher rate of flap salvage after hematomas
    - Prompt return to OR is important for flap salvage
  - Presence of vascular thrombosis portends a poor prognosis

95

## Flap Compromise & Salvage

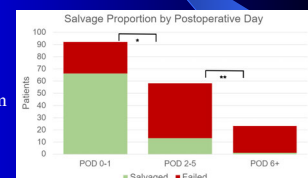
### Detection Post Op

- Why does time matter

- Sells to residents
  - Tid flap checks
- Sells to nurses
  - QI
- Sells to Operating room
  - Time to get back

\*(66/92) vs. (13/58), (OR=8.64,  $p<0.0001$ )

\*\*\*(13/58) vs (1/23), (OR=6.36,  $p=0.045$ )



96

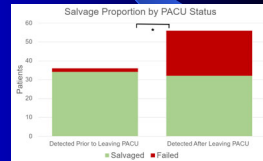
## Flap Compromise & Salvage

### Detection Post Op

#### • PACU

- Doppler runs continuous
- Gets buy in
- I can find the patient
- We get back to the OR FAST

\* (34/36) vs. (32/56), (OR=12.75,  $p<0.0001$ )



97

## Flap Compromise & Salvage

#### • Detection by who???

#### • Nurses do great

- 77% salvage
- Sells big time

#### • Residents suck

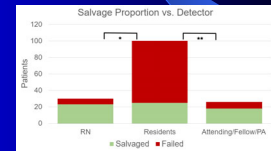
- 25% salvage
- Okay

#### • Fellows/Attendings

- We get the one offs
  - Second check
  - They look funny

\*(23/30) vs. (25/75), (OR=9.86,  $p<0.0001$ )

\*\* (18/26) vs. (25/75), (OR=6.75,  $p<0.0001$ )

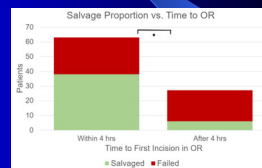


98

## Flap Compromise & Salvage

- Return to the OR
- Does speed matter
- Sells the OR
- Sells Anesthesia

\*(38/63) vs. (0/27), (OR=5.32,  $p=0.0009$ )



99

## What are the outcomes for free flaps undergoing second revascularization attempts?

- Incidence of perioperative free flap compromise is low
  - 10-15%
- Initial flap salvage rates
- 60-80%
- Outcomes of second episodes of compromise
  - ?????



100

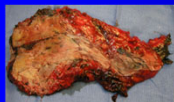
100

## Multi-institutional retrospective study

- Flaps initial compromise and successful revascularization ..... second compromise
- **Objective:** assess the outcomes
- **Design:** 6 institutions, 2000-2020

#### Variables

- Cause of second episode of compromise
- Heparin drips
- Salvage rates
- Management of flap death
- Post-operative complications



101

101

## Multi-institutional retrospective study: results

- 3,510 Flaps
- 350 initial revisions:
- 79 second compromise



102

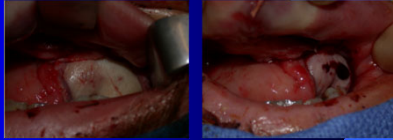
102

## Multi-institutional retrospective study: results

### Etiology

- Venous thrombosis 30%
- Arterial & venous thrombosis 30%
- Unknown causes 19%
- Arterial thrombosis 18%
- Infection 2.5%

Flap outcomes 30% survived



103

103

## Multi-institutional retrospective study: results

### Arterial or venous thrombectomy

- Flaps survived: 17/24 (71%)
  - Flaps with necrosis: 23/55 (42%)
- OR 3.38 (95% CI 1.21 to 9.47)

### Vein revision to an alternative branch vein associated with flap necrosis:

- Flaps survived: 1/24 (5%)
  - Flaps with necrosis: 19/55 (35%)
- OR 0.13 (95% CI 0.01 to 1.2)

104

104

## Multi-institutional retrospective study: results

### Heparin drip, ptt goal 65

- Given to 30% following initial successful salvages

### Second salvage

- Given to 54% following second salvage
- No diff

### Variables not associated with flap survival

- Patient demographics
- PMH, smoking, radiation
- Post-operative complications
- Head and neck cancer site
- Free flap type
- Reconstruction site



105

105

## Multi-institutional retrospective study: results

### Secondary reconstructions for flaps with necrosis

- Second free flaps 44%
- Regional flaps 38%
- Other 13%
- Conservative care 5%

106

106

## Second salvage: discussion

### Second salvage outcomes

- 30% salvaged
- Thrombectomy associated with successful revascularization
- Flap with history of arterial/venous thrombosis, second salvage has a greater likelihood of success
- Arterial thrombosis good prognostic indicator
- Generalized venous congestion poor prognostic indicator

107

107

## Second salvage: Discussion

### Consider second salvage:

- Preserve optimal reconstruction
- Flap is otherwise healthy aside from isolated thrombus
- Native anatomy provides vessels for revascularization

108

108

## Salvage And The Art of Medicine

### Flaps that did not survive initial salvage

- 80 flaps that did not survive initial salvage
- Unknown medical decision making
- Unknown management of reconstruction

109

109

## Perks of Fellowship



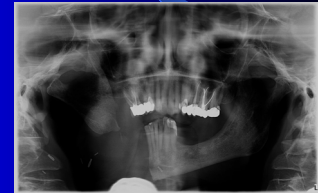
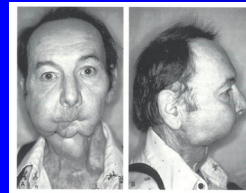
110

## 3-D Modeling and PSP Plates

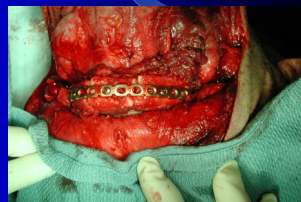
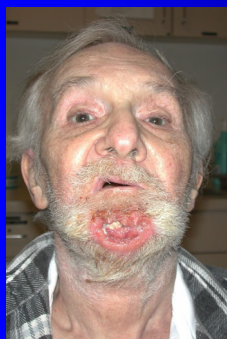
Oral Surgery  
Recon Team  
Lisa!!

111

## Mandible Reconstruction: None

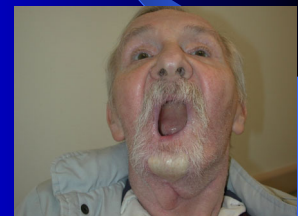


112



113

## Fibula Flap Reconstruction



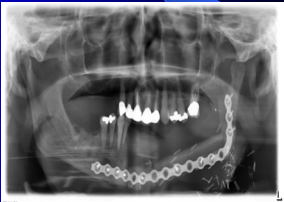
114



115

## Issues

- Hard to line up teeth
- Osteotomies are “art”
- Take a long time
- Plate has curve fibula does not
- No implants
- No teeth



116

## Oral Surgery

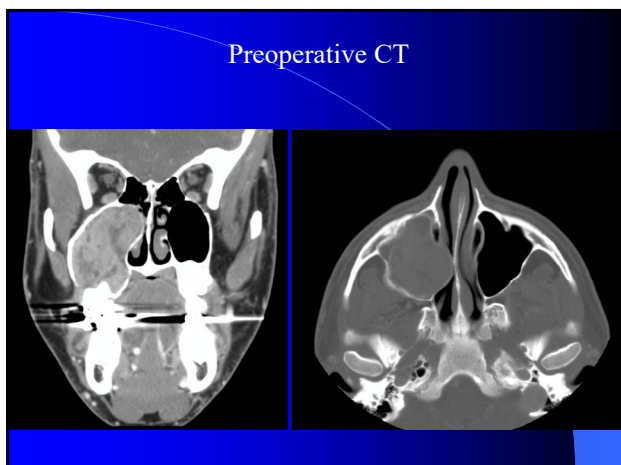
- Do we compete?
- Portland is unique
- They have cases
- They know teeth
- They know benign pathology
- 3D modeling
  - Evolution
  - PSP
  - 3D Printer in the OR

117

36 yr male, ameloblastoma right maxilla



118

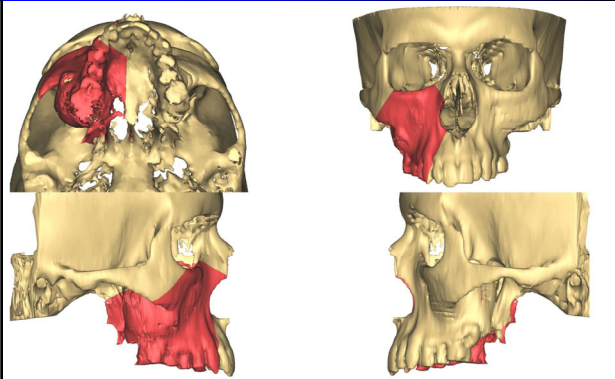


119

## Hood To Coast: You Could Be Here

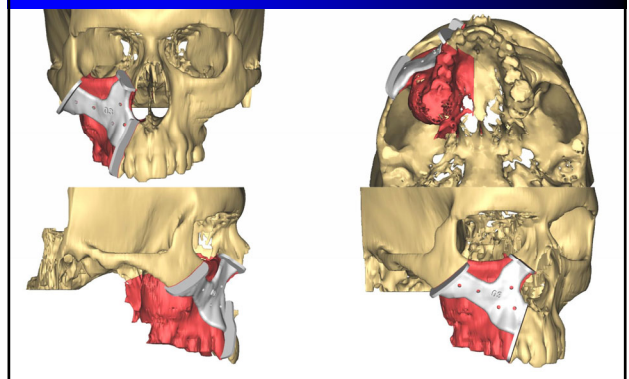
120

## Planned Resection



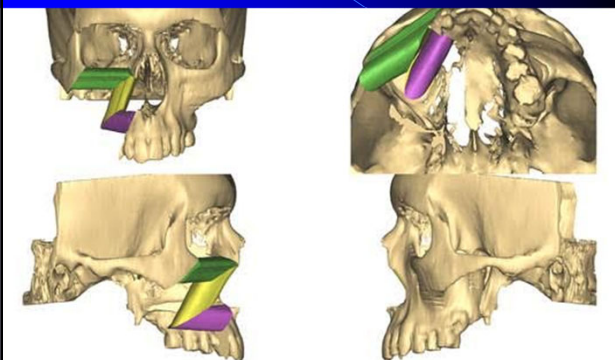
121

## Patient Specific Maxillary Guide



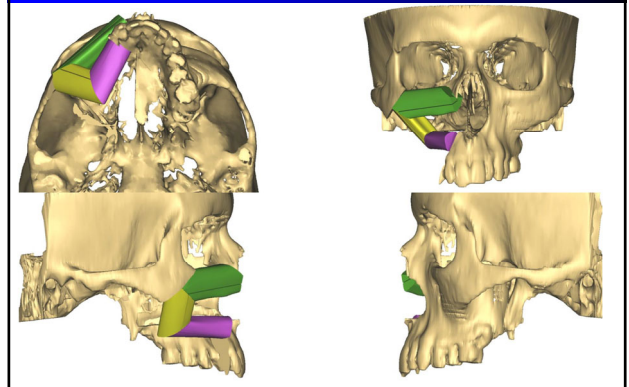
122

## Plan A

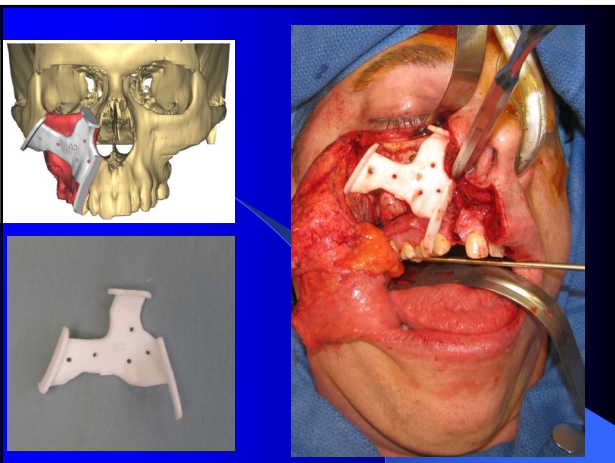


123

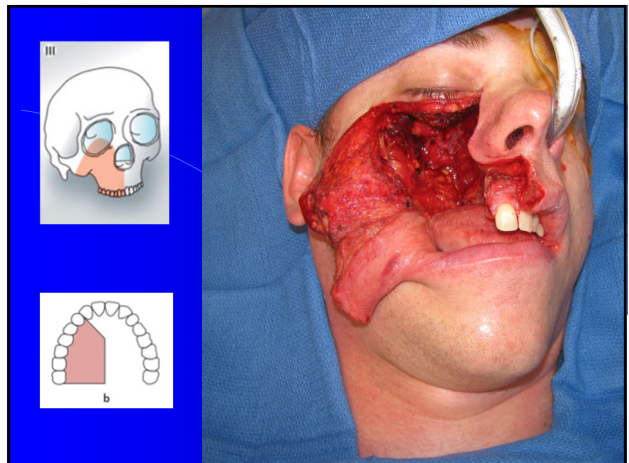
## Plan B



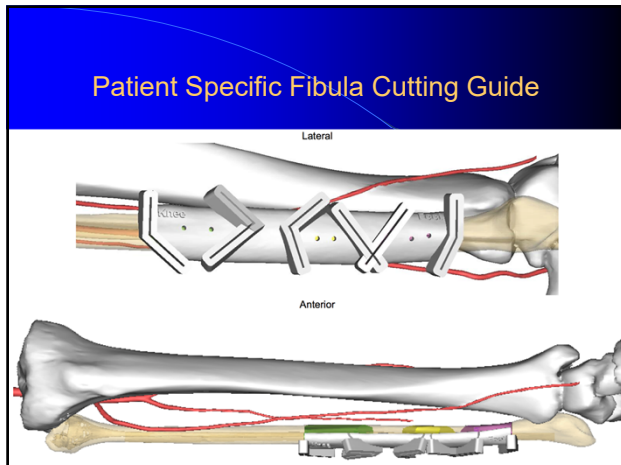
124



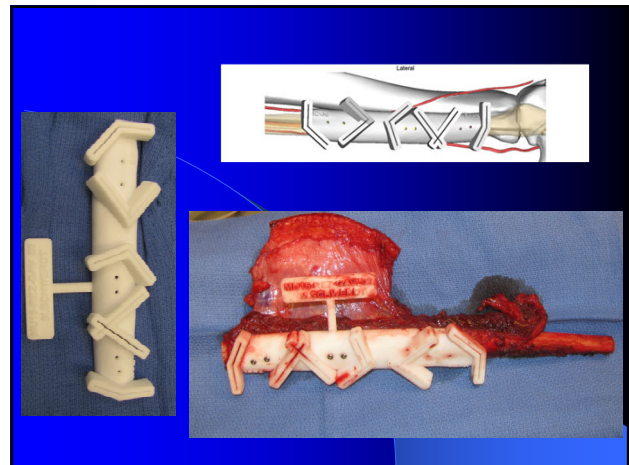
125



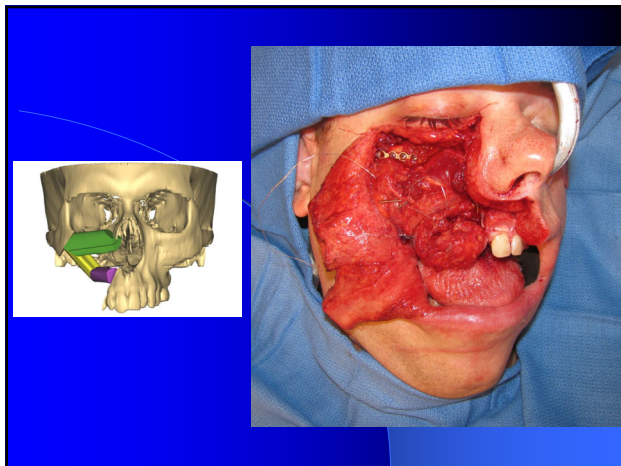
126



127



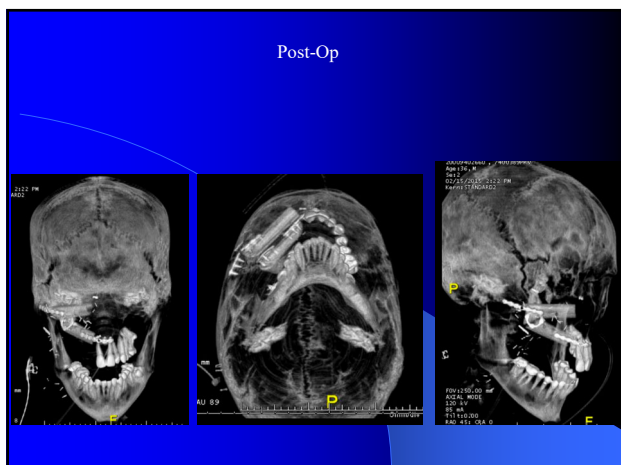
128



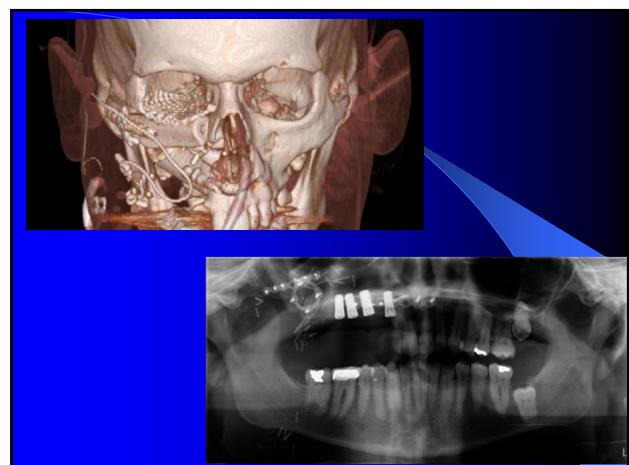
129



130



131



132

## Fellowship



133



## ACHIEVEMENT

YOU CAN DO ANYTHING YOU SET YOUR MIND TO WHEN YOU HAVE VISION, DETERMINATION, AND AN ENDLESS SUPPLY OF EXPENDABLE LABOR.

134

## What did they bring

- Case
- Ability to converse with another expert
- Great ideas
- Crappy ideas
- Implants

135

## 3D Modeling

- Initial experience
  - PSP
  - 3D Modeling
  - CTA of fibula or other bone
- >60 cases
- Time
  - Learning curve
- Now do carving in leg
  - 15-30 min in leg
  - 5 min in mouth
- When not work is a pain

136

## City Wide Conference

Elizabeth Shepard, MD  
 April 15th, 2025  
 Plastic Surgery Resident, PGY 5  
 Presenting on Behalf of OHSU Otolaryngology

137

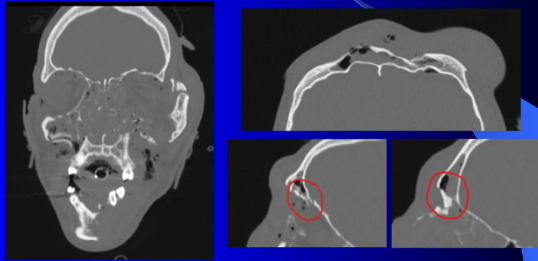
## Panfacial Fracture: 32 yo M, Unhelmeted MCC



- **History:**
  - Dirt bike v motorcycle
  - Intubated on scene for airway protection
  - OSH interventions: oropharyngeal packing, L lateral canthotomy
- **Injuries:**
  - Left globe rupture
  - SAH
  - Extensive upper, middle and lower third facial fractures

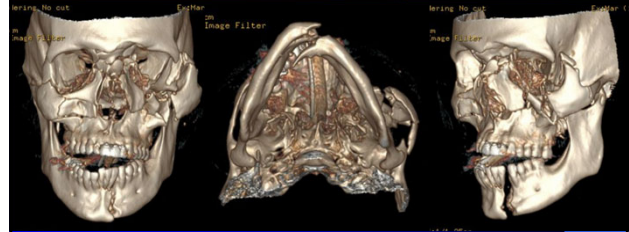
138

## Upper Third



139

## Middle and Lower Thirds



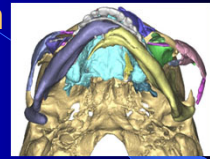
140

## Initial Events and Surgical Plan

- **3-2-25:** OR with ophthalmology for ruptured globe repair
- Interdisciplinary discussion: Delay left midface and orbital manipulation to avoid further globe injury
- Surgical plan via staged approach:
  - Temporize with fixation of R midface and mandible now
  - Return to OR in 2 weeks once cleared by oculoplastic team
- **3-4-25:** IMF placement, ORIF mandible and ORIF right midface fractures
  - IMF screws x 6 for MMF
  - Lower gingivobuccal approach to the mandible parasymphysis fracture – recon plate fixation
  - Rowe dis impaction forceps for midface mobilization – ZM and NF buttresses plated

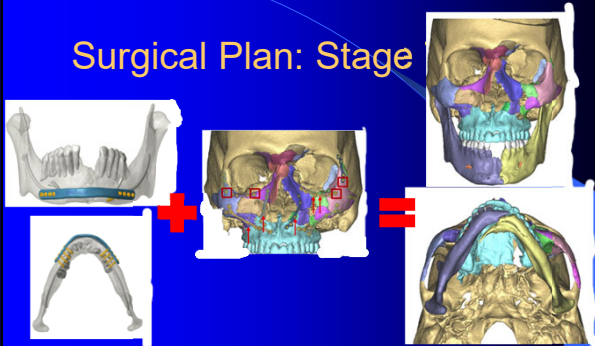
141

## Post Operative from Stage One



142

## Surgical Plan: Stage



143

## MMF, Mandible and Midface: Intraoperative



144



## How Do I Get On The Program

### Scientific Program:

#### Abstract

- Takes experience
- Read journals
- Read other abstracts
- Have others read them
- Listen to others

### Try not to:

- Preliminary study more data to come
- Ongoing
- Spelling errors
- Overblow the results

151

## How Do I Get On The Program

### Expert Lectures

- Need experience
- Find a mentor
  - People know who are active
- Nothing wrong with being a junior presenter
  - Do the work
  - It needs to go well the first time



152

## How Do I Get On The Program

### Expert Lecture

- What's interesting
  - Look at the program
  - Look at other meetings
- **Go to meetings**
  - You see the same people presenting at meetings
  - There is a reason



153

## How Do I Get On The Program

### Expert Lectures

- Practice
- Make sure the talk works
  - Videos.....
- What do others do that you can try
- Make sure the talk works



154

## How Do I Get On The Program

### Panels

- Ah the controversy, the fame, the .....
- Why do people come
  - Topic
  - The **People**
- If you are one of the **People** then why are you

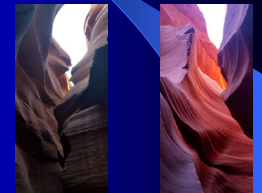


155

## How Do I Get On The Program

### Panel

- Find a topic in your niche
- Look at what's hot
  - What others want to hear
- Be a junior
  - It's work
  - It's a lot of work



156

## How Do I Get On The Program

### Getting on the circuit

- Be present
- Attend meetings
- Volunteer, volunteer, volunteer
- Do what you say you are going to do
- Everyone that has a say in these matters has a list of their go to lackeys that get the job done
  - Get on that list



157

## How Do I Get On The Program

- Go to meetings
  - Meet the players
    - Lucente
    - Jonas
- Volunteer
- Do the work
- We all want to help



158

## How Do I Get On The Program

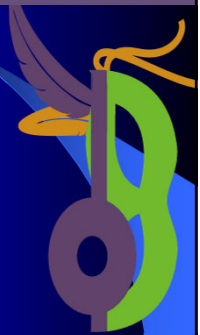
DO NOT GIVE UP



159

## Pearls from Dr. Wax

- Start small
- Show up
- Do the work
- Volunteer
- Get a mentor
- Talk to those that you want to help you
- Follow through



160

## Facial Plastics

- We are all colleagues
- Two team approach is best
- Mutually beneficial
- Actually really good for me



161