The International Federation of Head and Neck Oncologic Societies

Current Concepts in Head and Neck Surgery and Oncology 2018

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Reconstructive Surgery

Ian J. Witterick MD
University of Toronto

Disclosures

- Proteocyte Diagnostics Inc.
  - Ownership interest

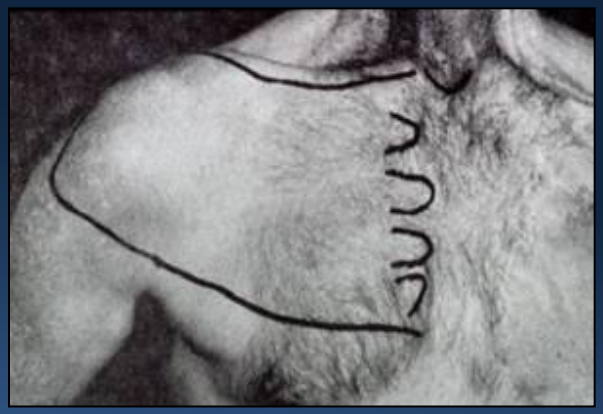
Goals of Reconstruction

1. Ensure primary wound closure and healing
2. Restoration of lip-seal and oral continence
3. Maintenance of oral pharyngeal swallowing mechanisms
4. Protection of the airway
5. Maintain speech
6. Protect important neurovascular structures
7. Conserve appearance

Reconstructive Principles

- Simplest to complex – KISS principle
- Careful planning
- Flap and vessel selection
- Anticipate your complications and avoid them
- Attention to detail

The Good Old Days…



Delto-pectoral Flap
and it's extensions

Problems and Limitations in Reconstruction

- Colour match
- Hostile wound/ irradiated tissue
- Cosmesis
- Donor site defect
- Patient age/ physiologic status

What can go wrong?
Intra-operative decision making
Questions you should ask yourself

- Is this the best flap for the job?
  - If not, why am I using it?
- Will my pedicle reach?
  - If not what do I need to do about it?
- Are there adequate donor vessels?
  - If not, what strategy will I use?

What is Plan B?

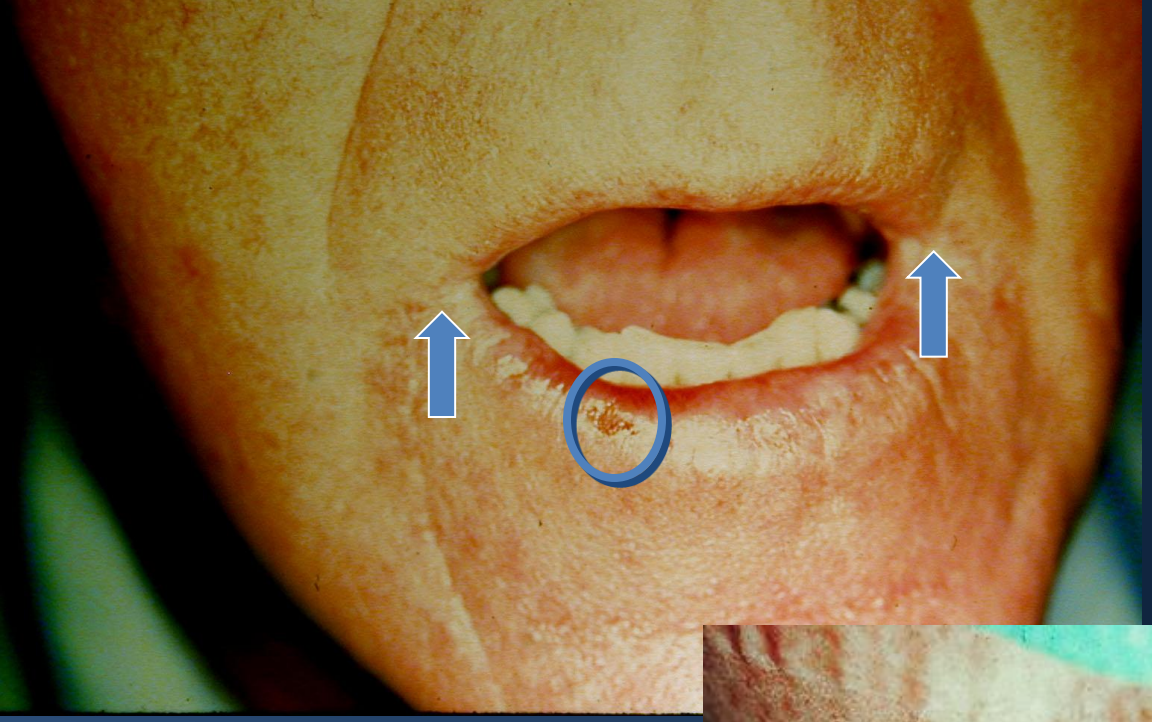
Sequence

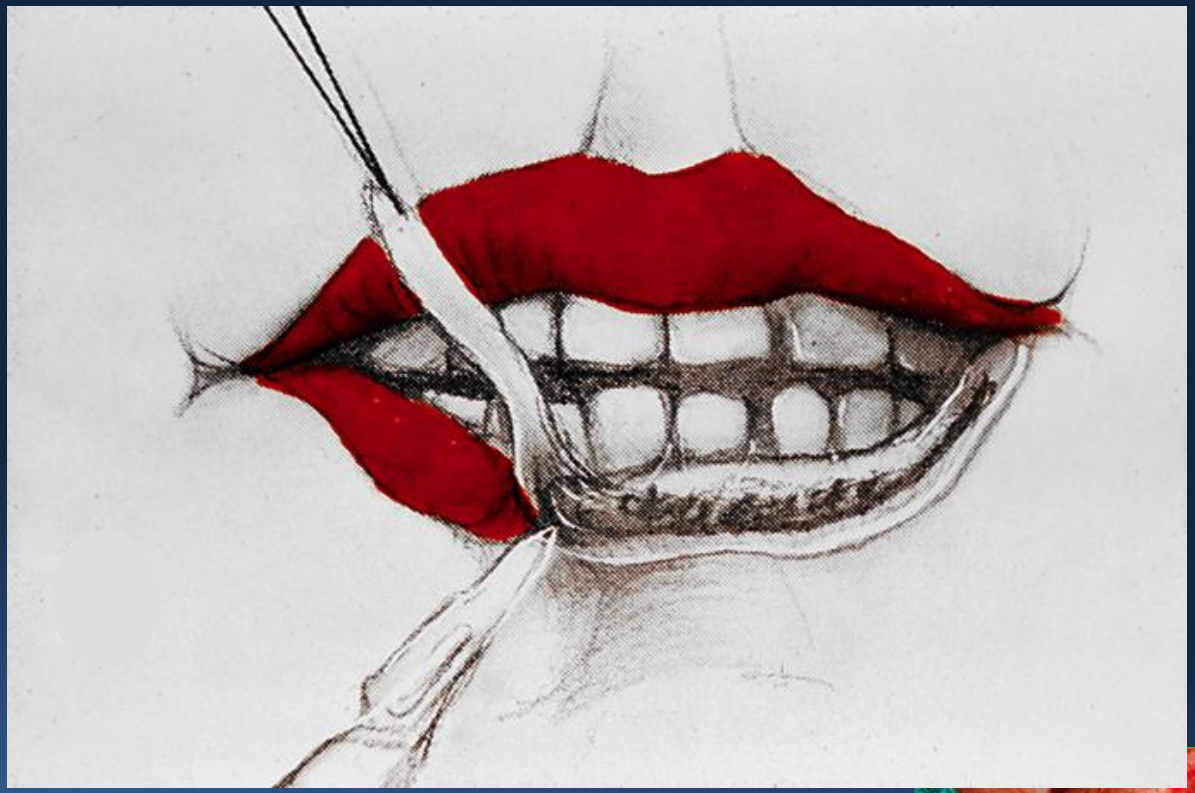
1. Lip
2. Oral cavity
3. Larynx and hypopharynx
4. Major soft tissue defects

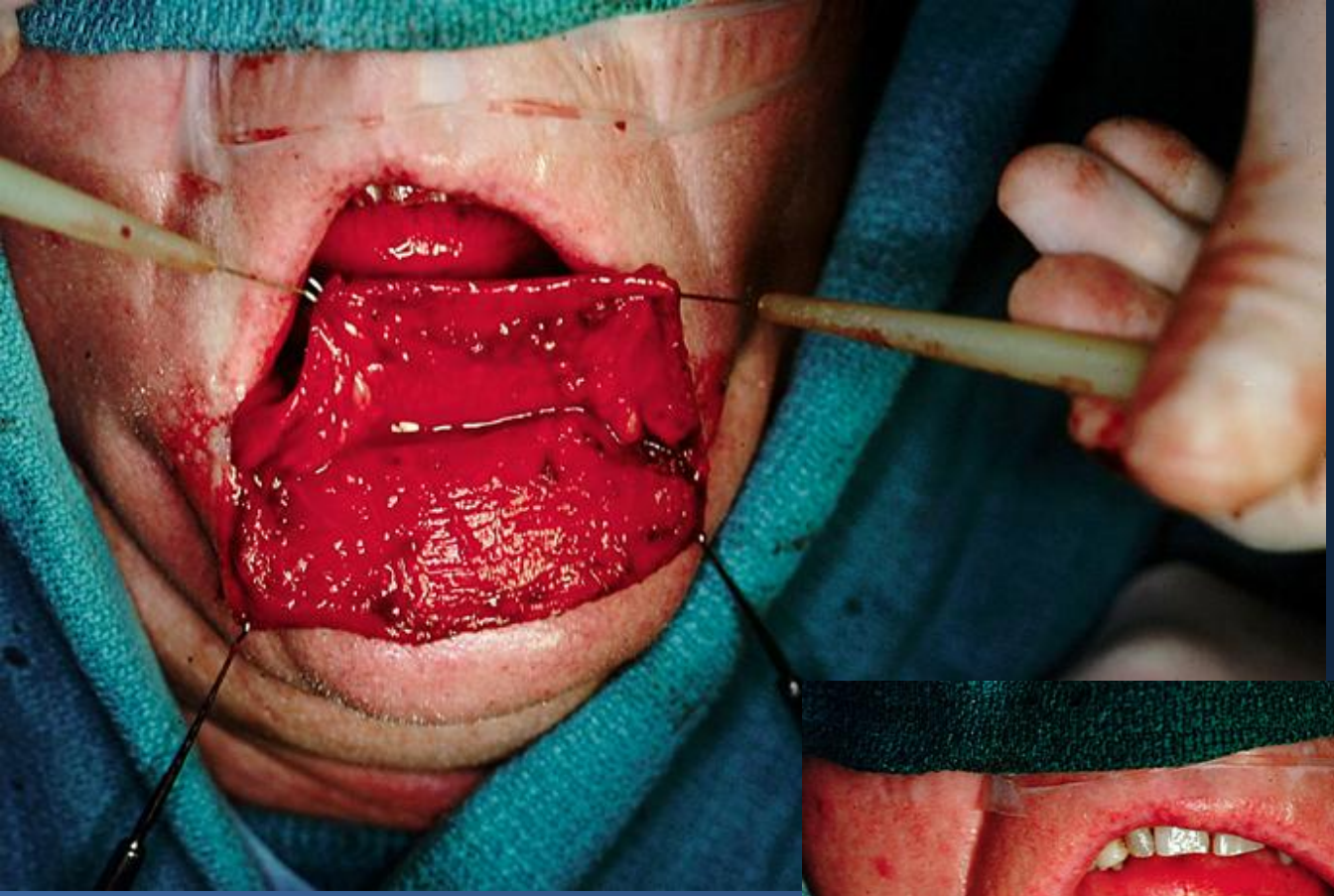
Lip Reconstruction

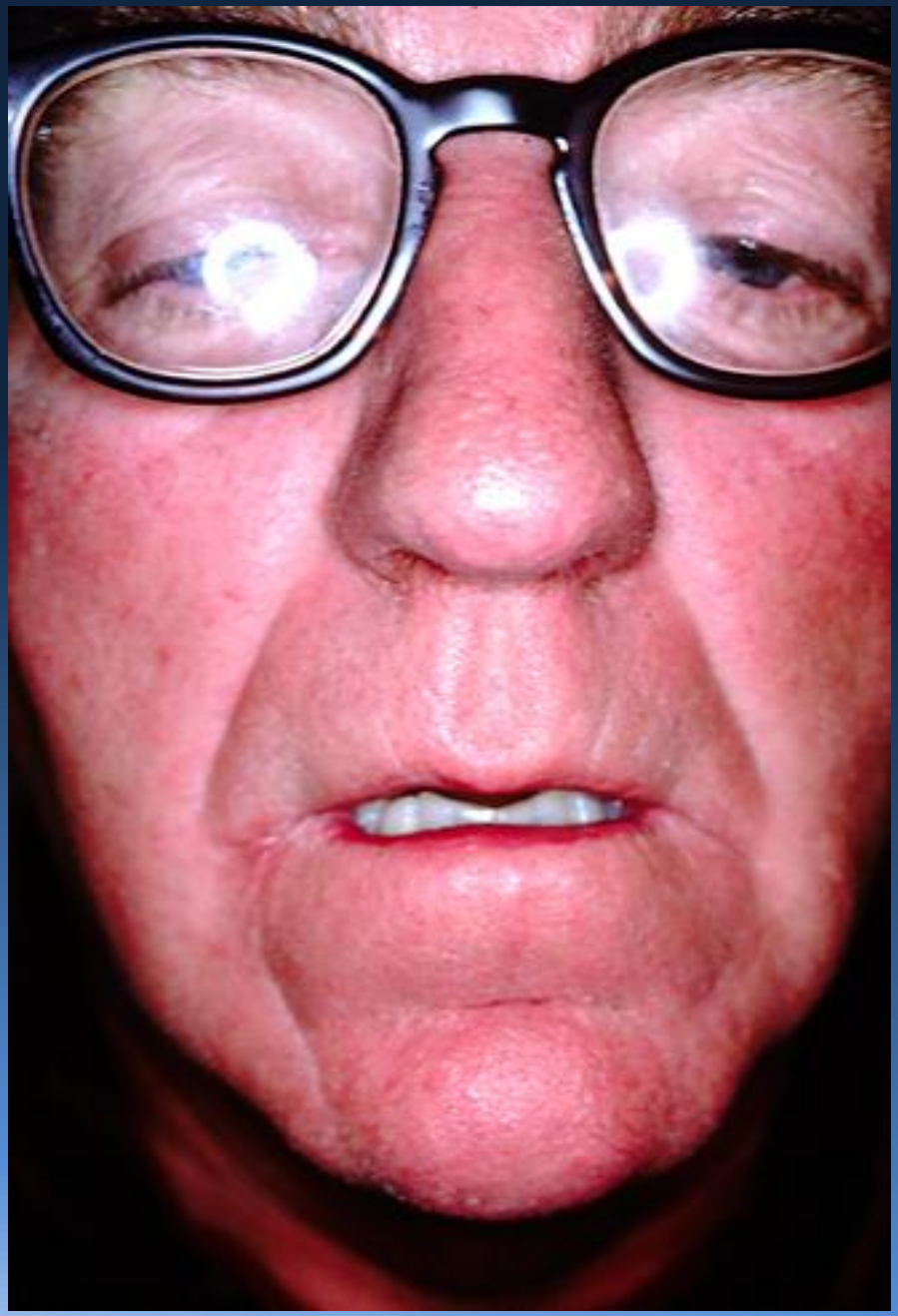
- Minor Reconstruction
- Medium Reconstruction
  - small: up to 30%
  - large: 30 - 80%
- Total Reconstruction

Lip Shave





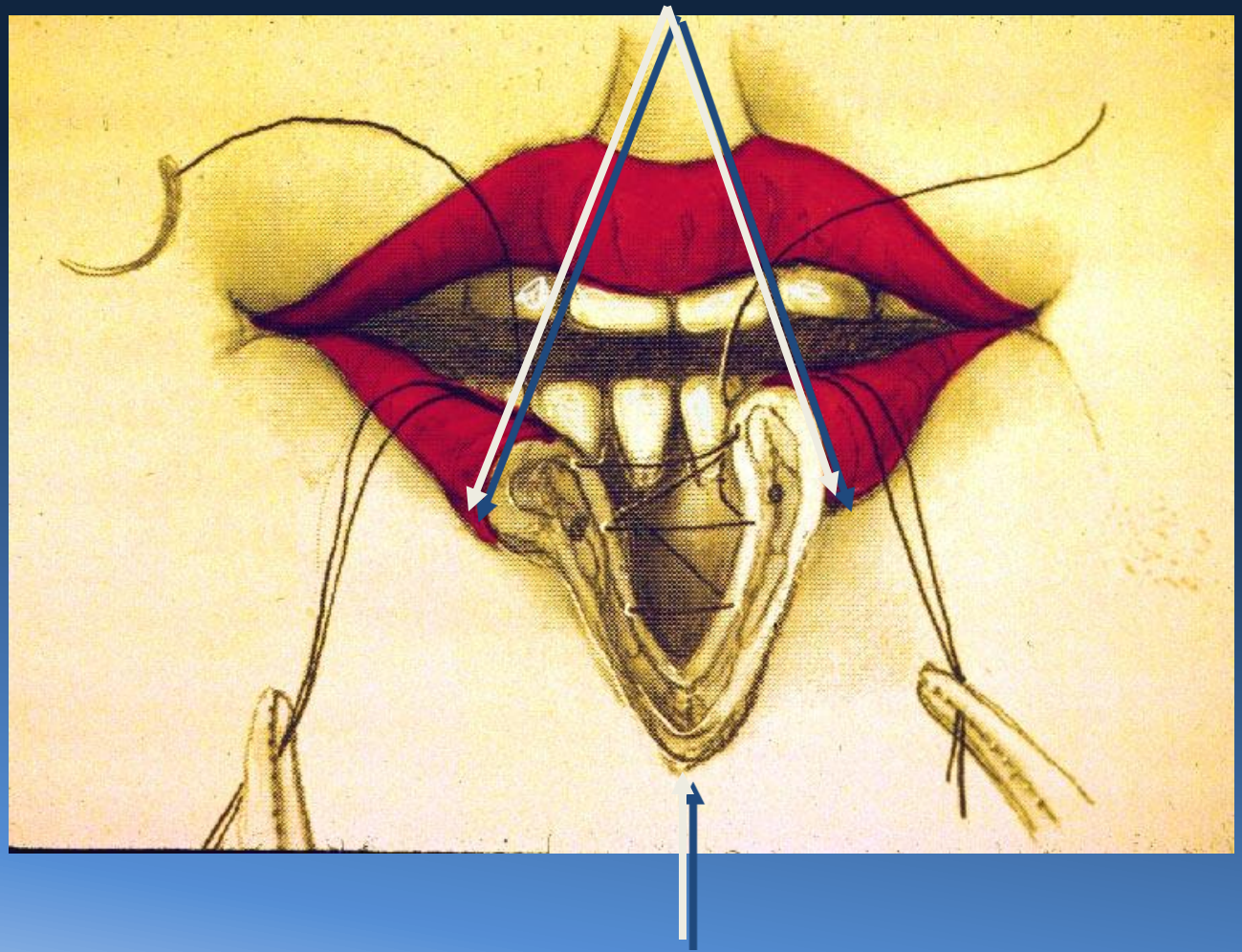




3 years Post-Op

Wedge Excision

Careful Approximation of Vermillion

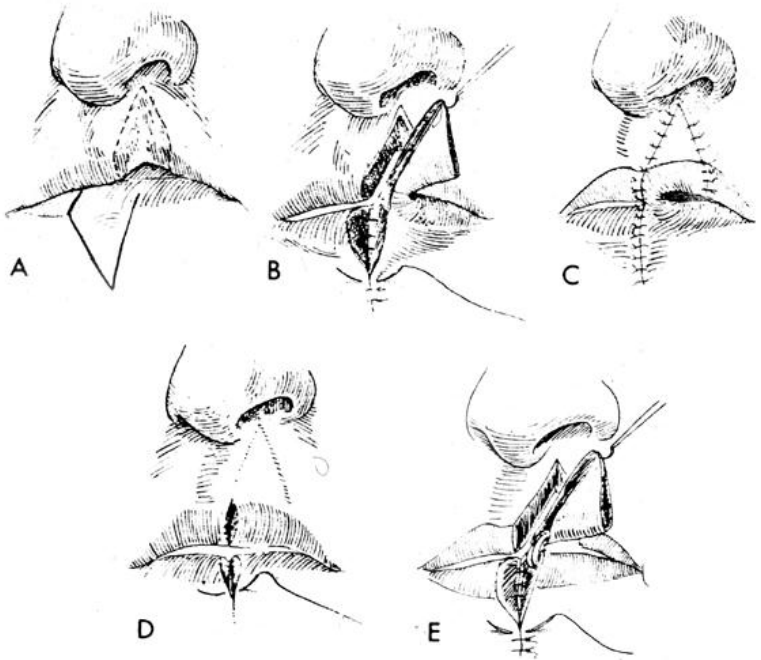


Layered Closure

0 - 25% of upper lip
0 - 33% of lower lip
} *Primary closure*

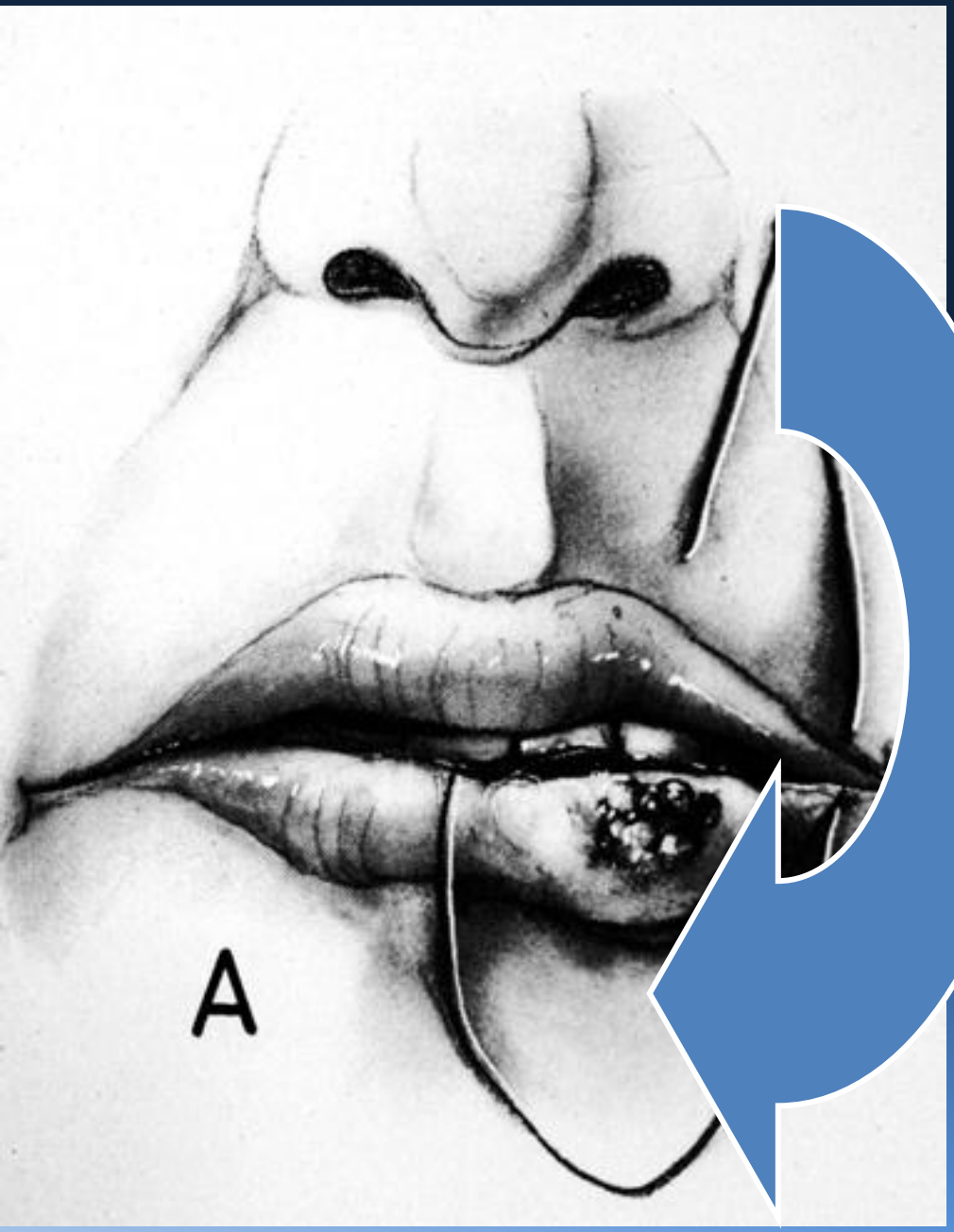
33 - 66% - Lip swith or local advancement flaps
>66% - Local flaps or distant tissue

1. *Lip switch flaps (Stein, Abbé, Estlander)*
2. *Tissue rotated around the corner (Gillies, Karapanzic)*
3. *Sliding horizontal cheek flaps (Bernard, Burow, Johanson)*



Estlander

2 Years Post Op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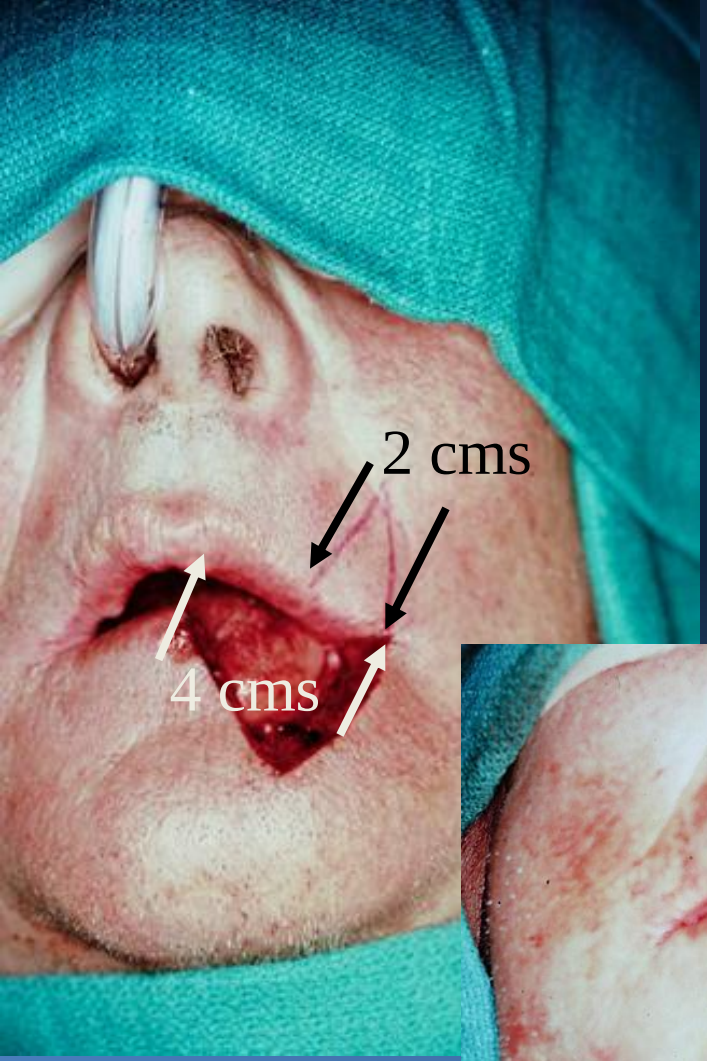
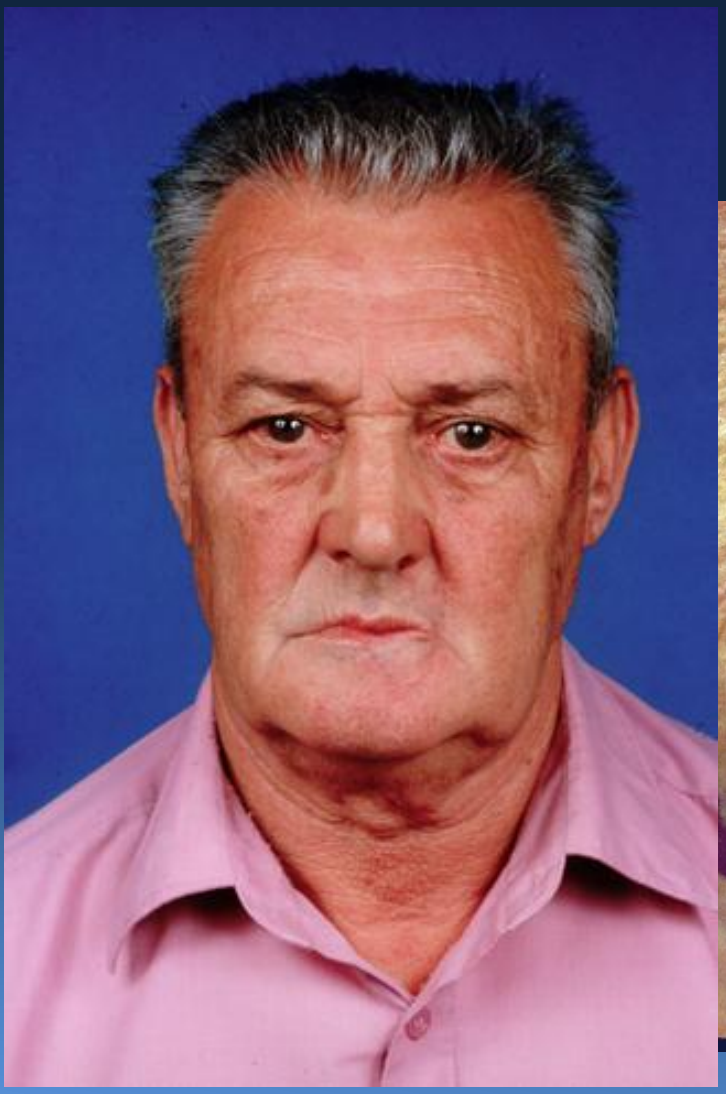
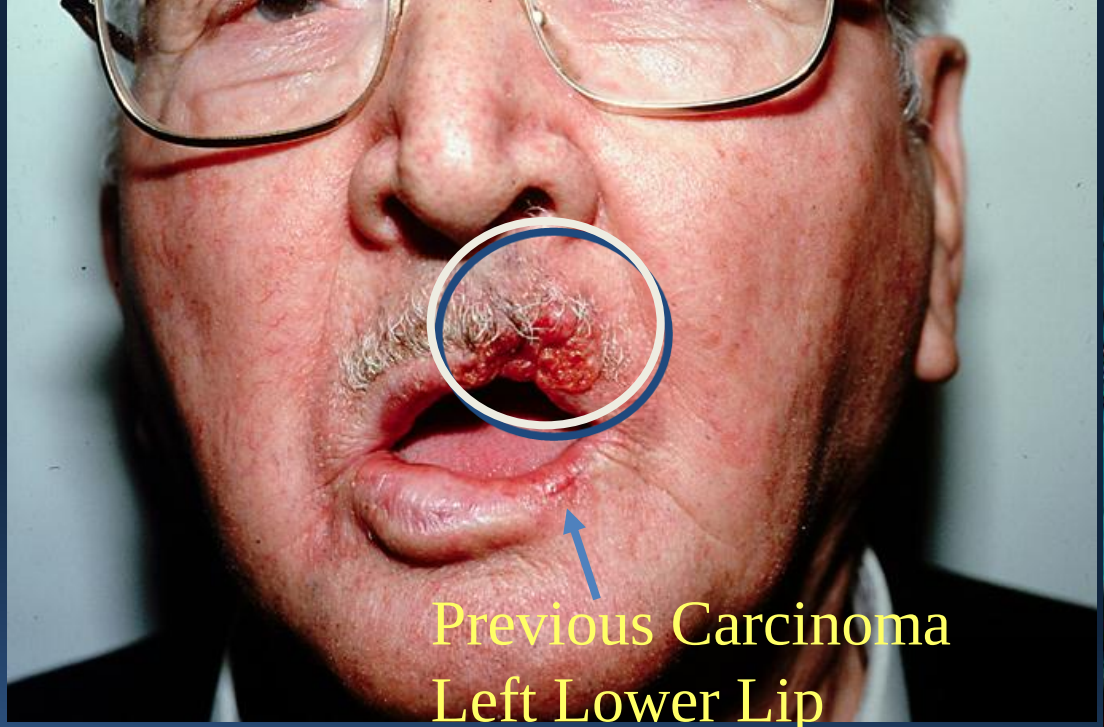
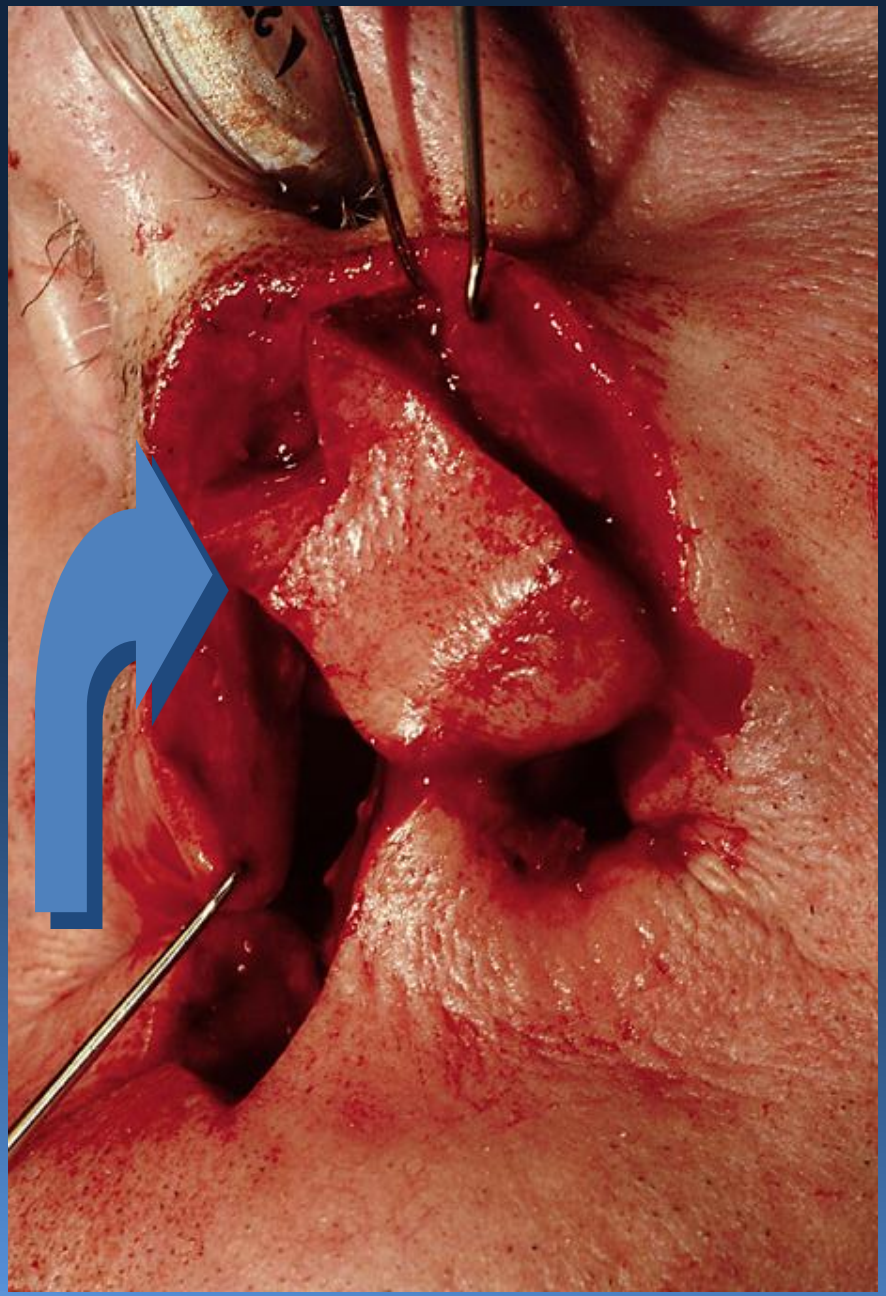

2 cms
4 cms

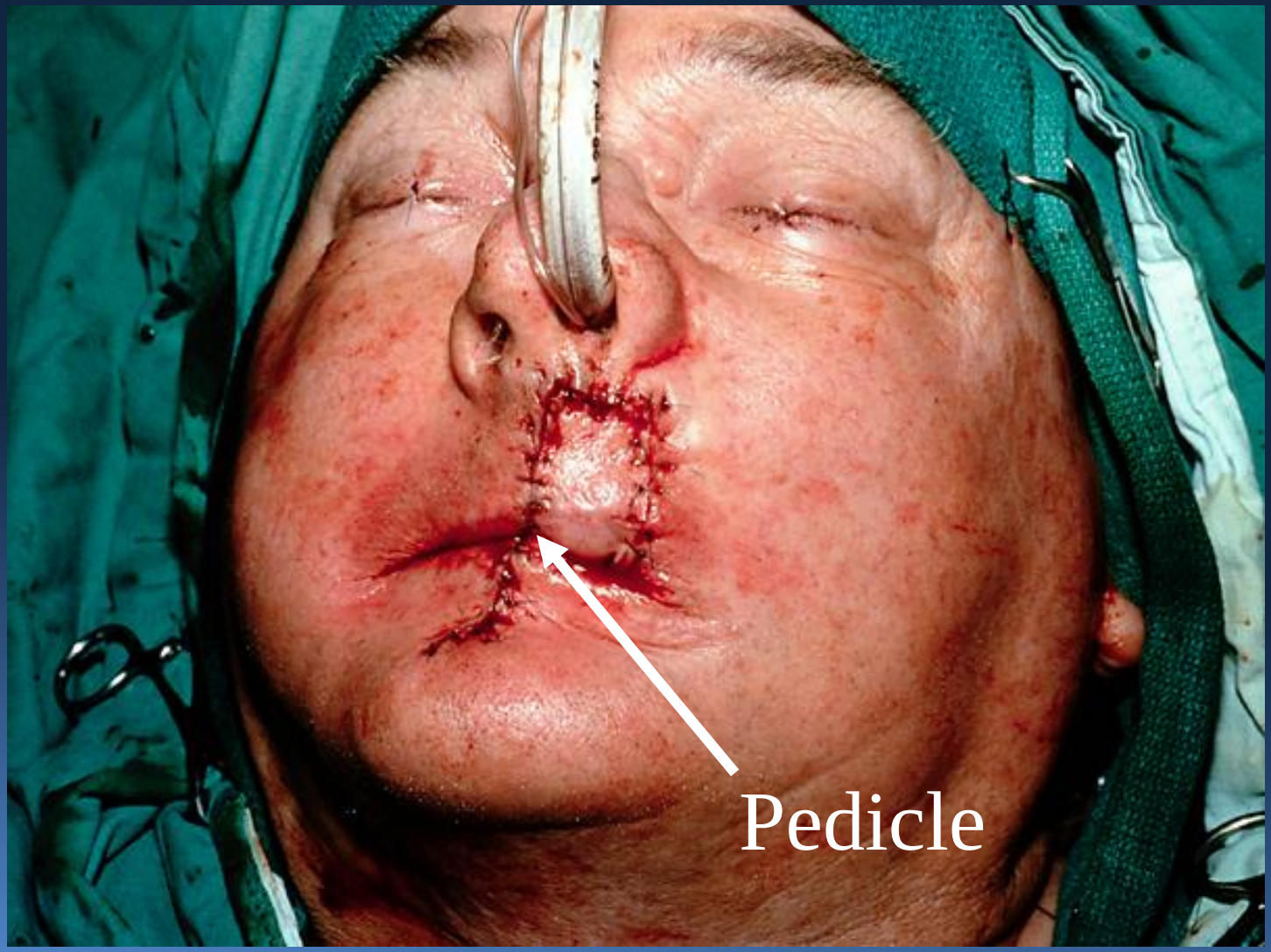



Blunting of commissure



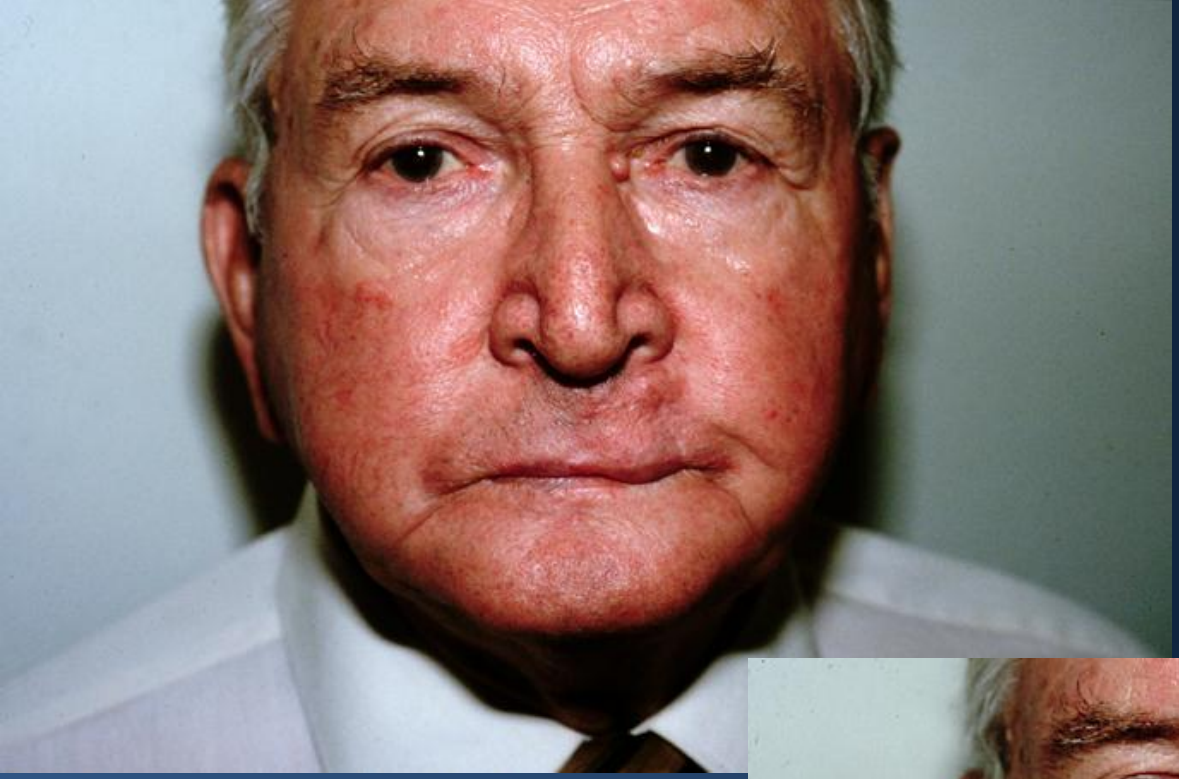
Abbe Flap



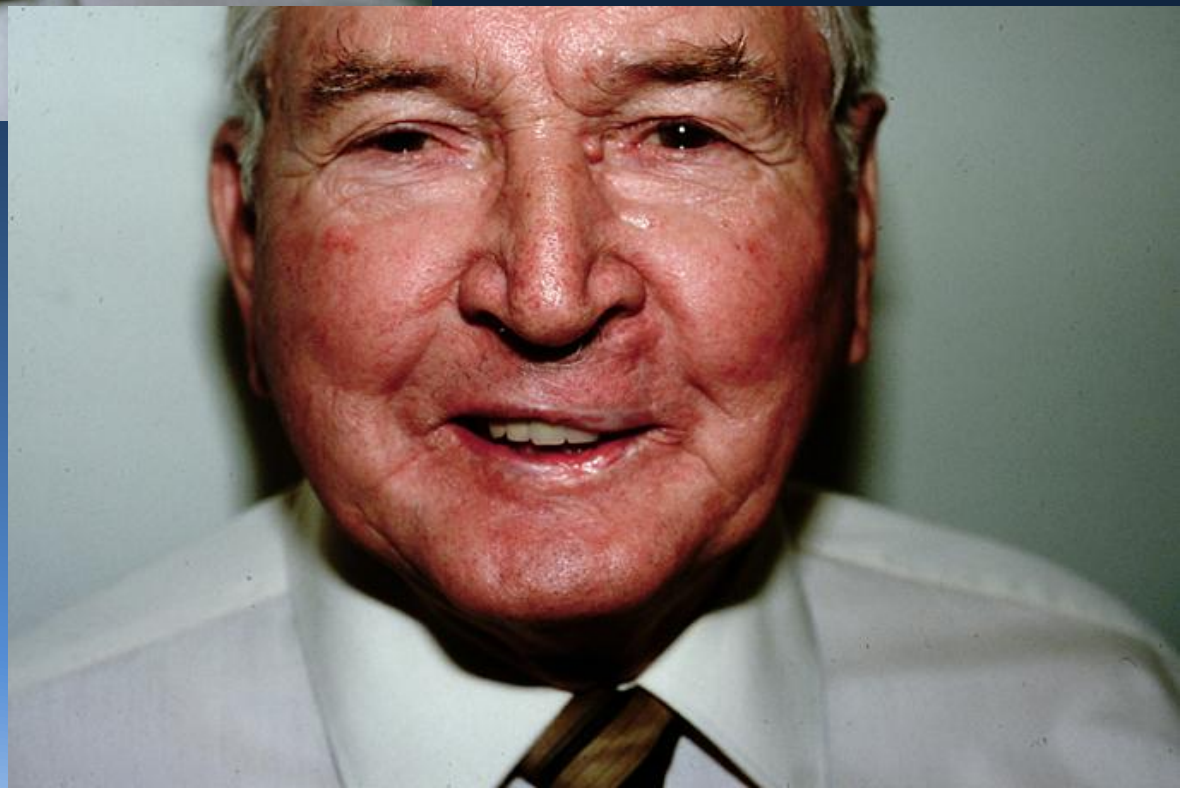

Pedicle

Pedicle Division

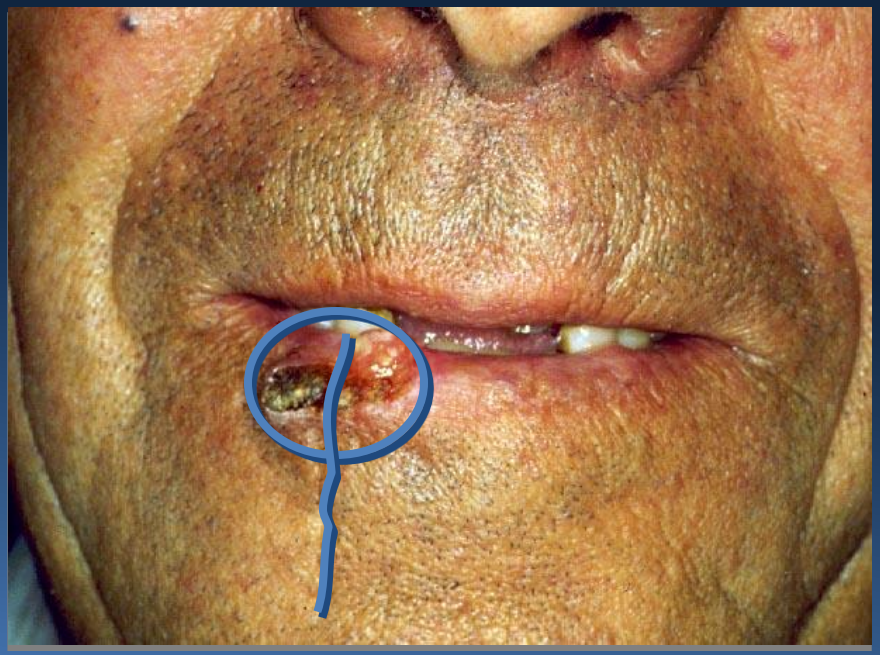
3 weeks

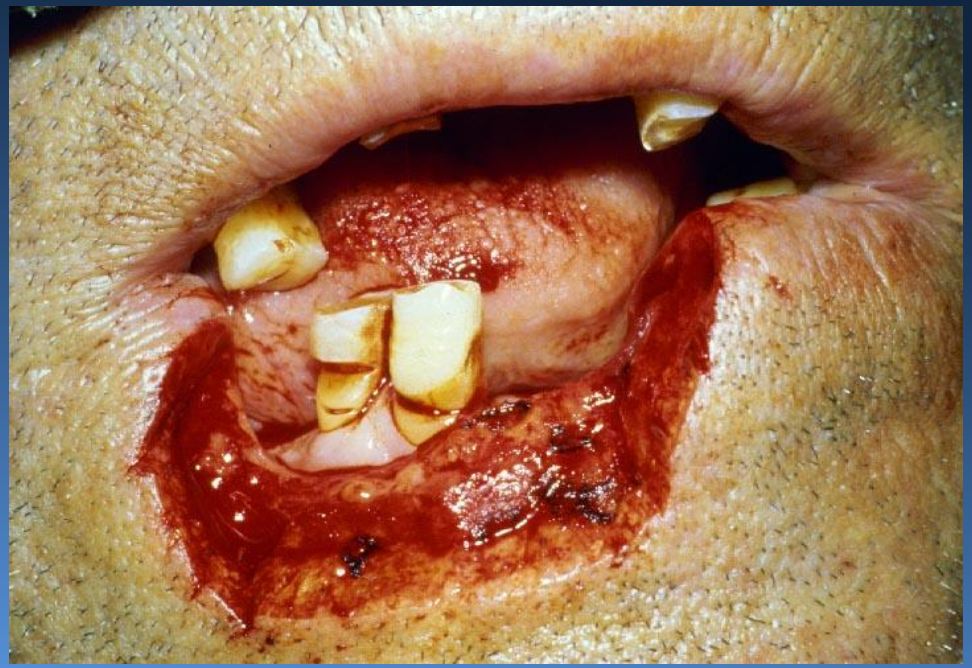


4 years post-op

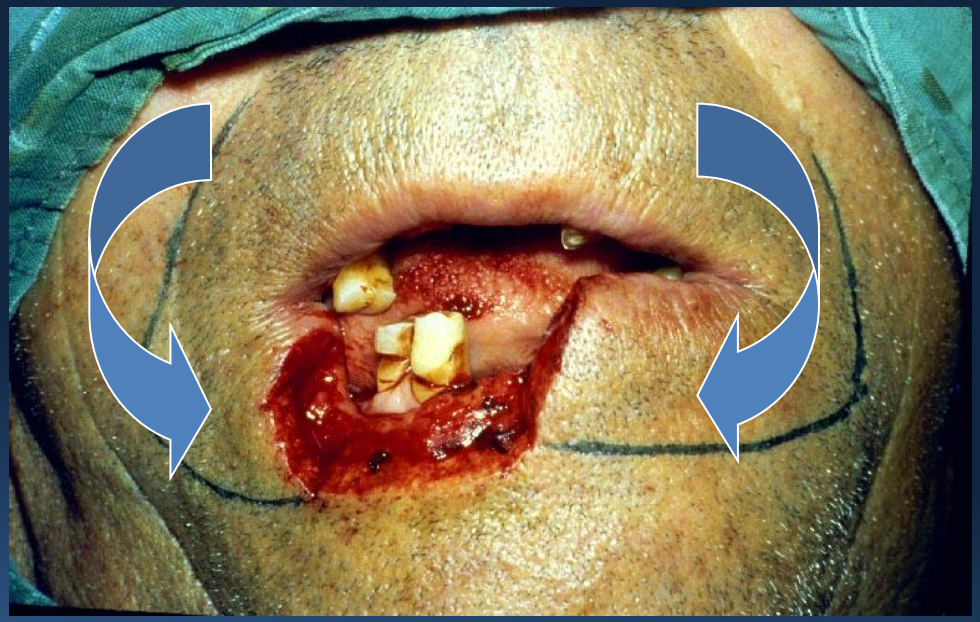


Karapanzic Flap

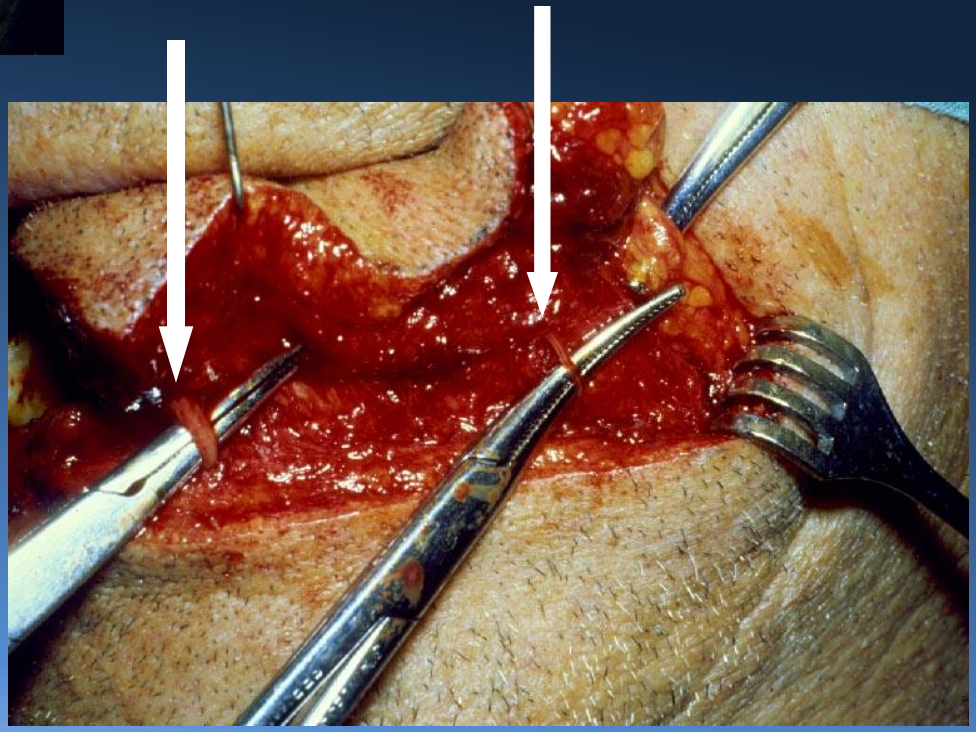


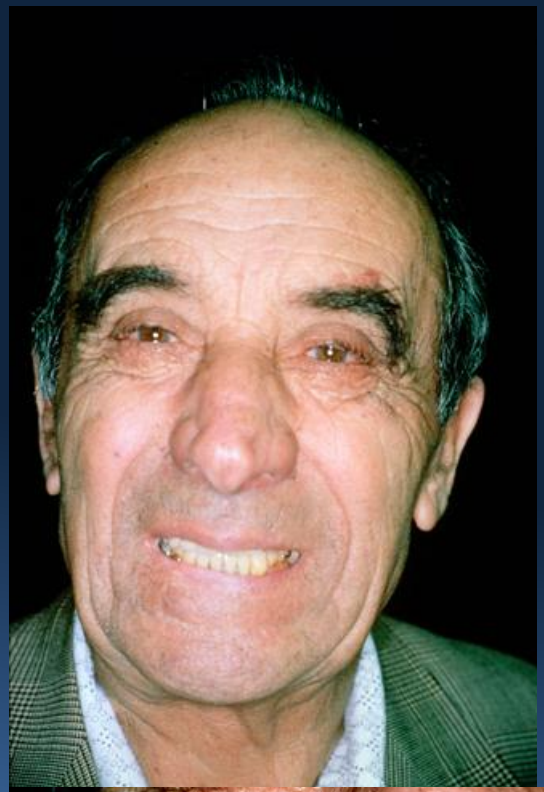


Technique

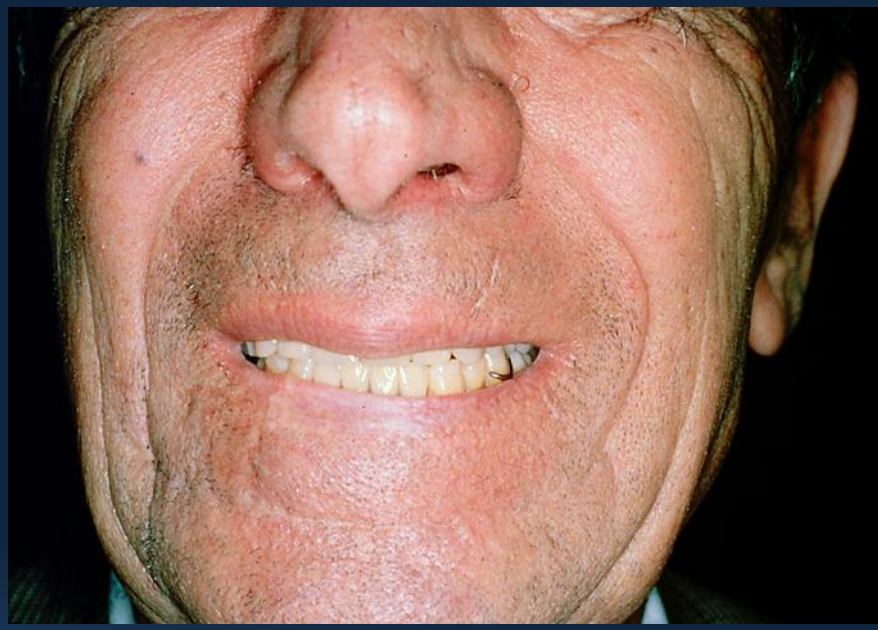


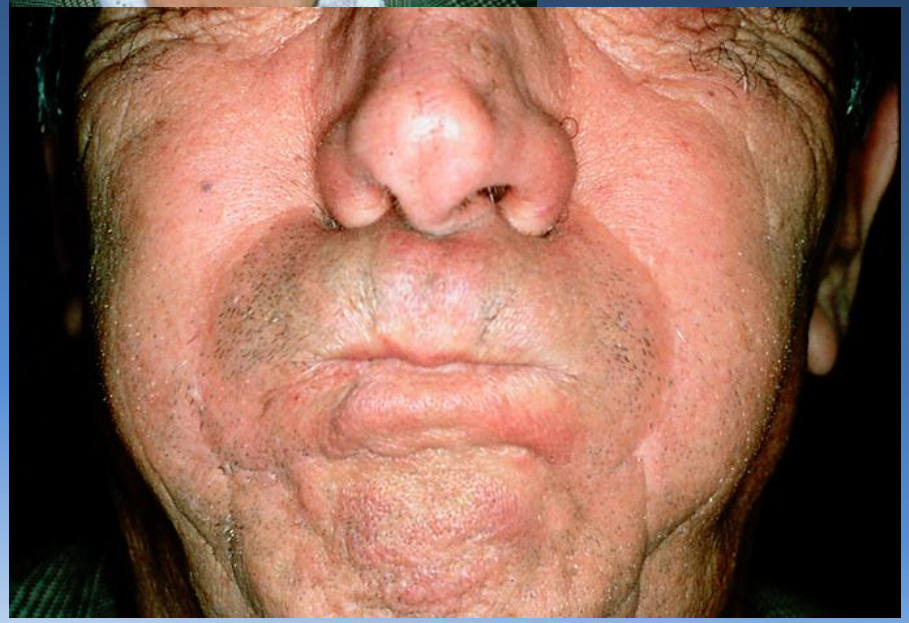
- Partial thickness dissection
- Preserve neurovascular bundles
- Gradually advance flaps

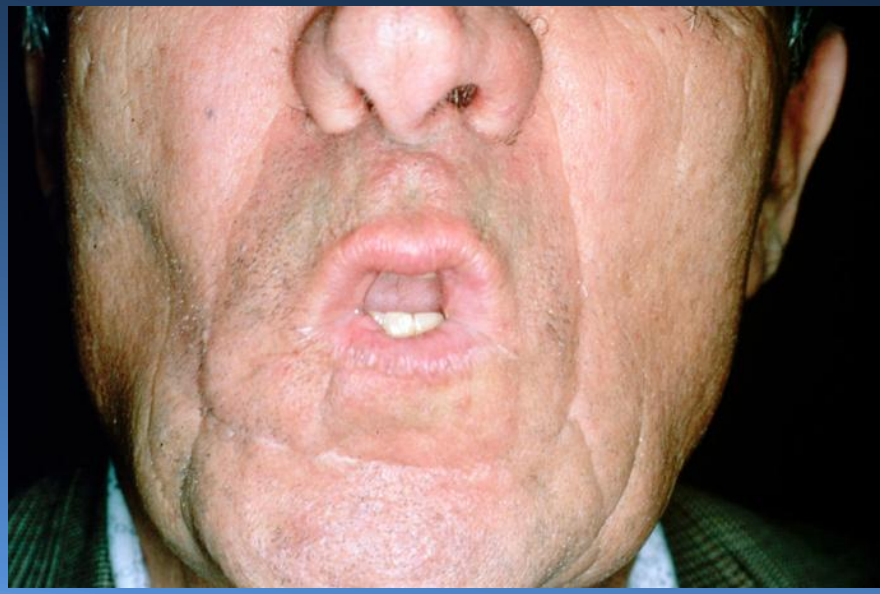




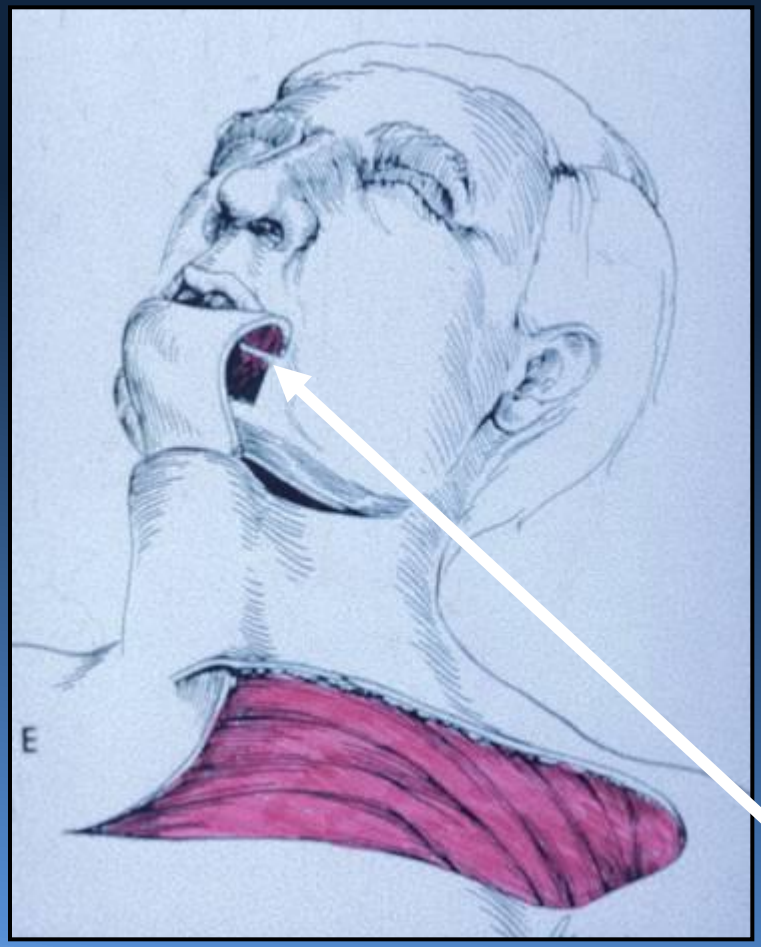
3 years post-op



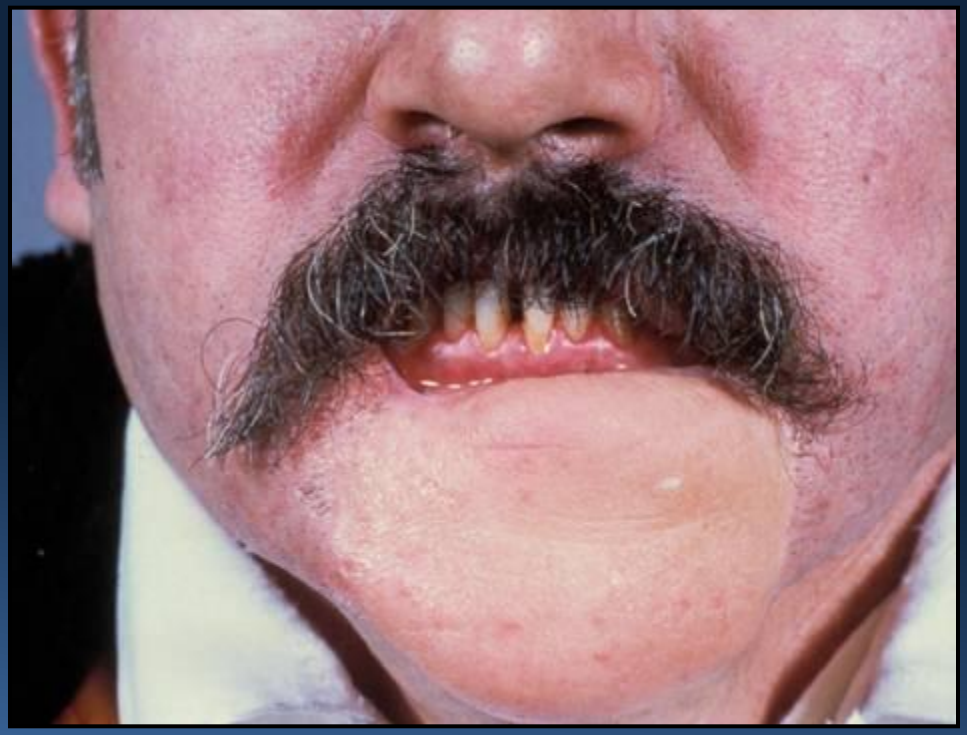




Total Lip Reconstruction – The Past



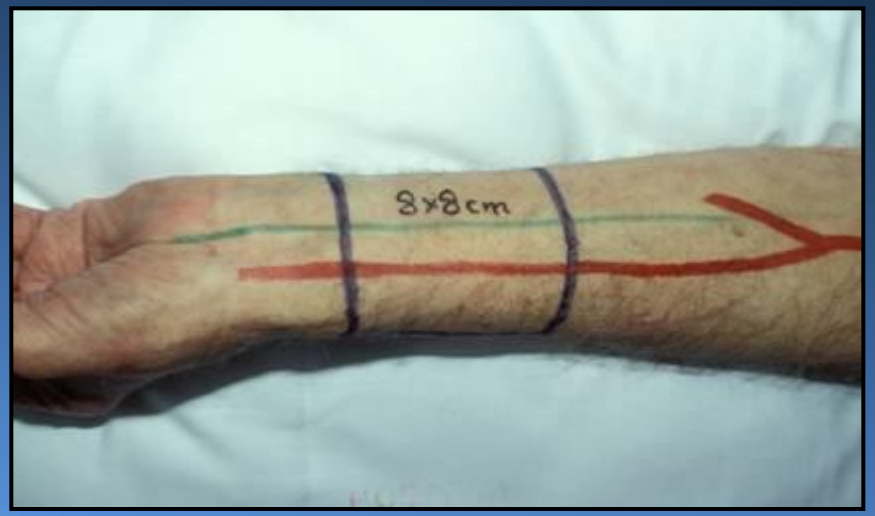
Deltopectoral Flap

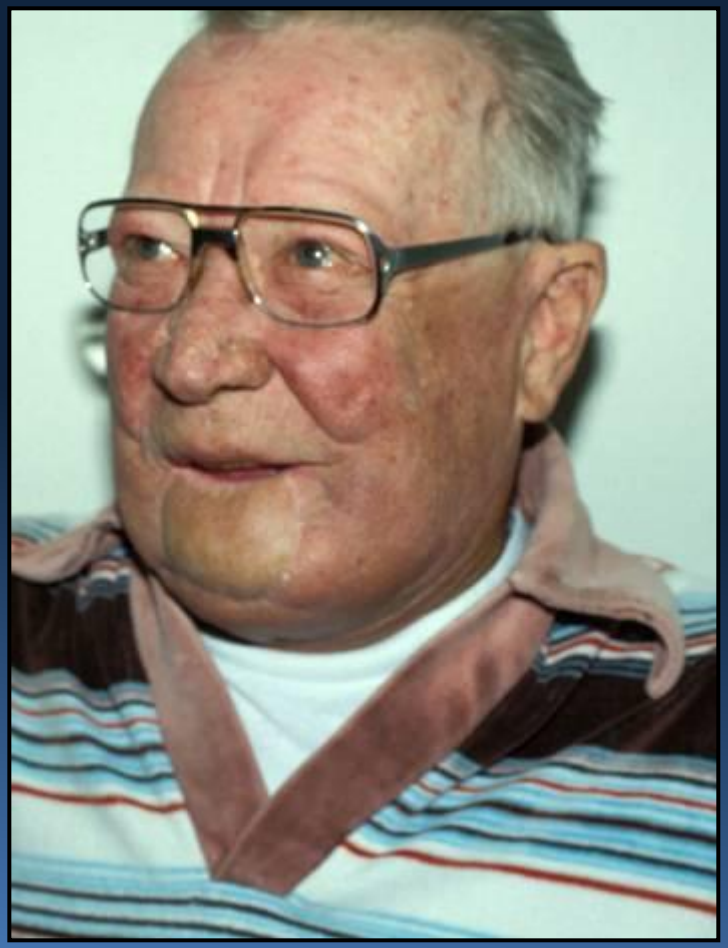


1981

Failed to recognize need for suspension

Total Lip Reconstruction – The Present





2 years post op

Carroll, CMA et al. Reconstruction of Total Lower Lip and Chin Defects Using the Composite Radial Forearm-Palmaris Longus Tendon Free Flap. Arch Fac Plast Surg 2(1):53-56, 2000

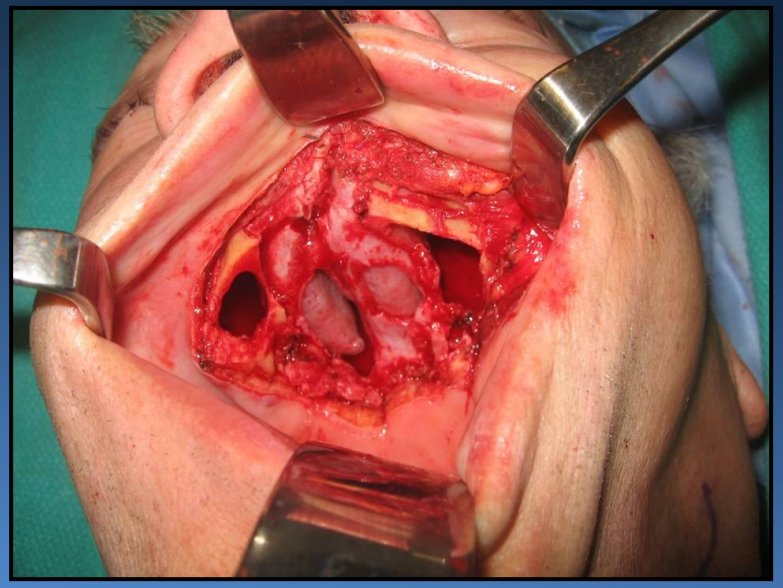
Oral Cavity

Then

Now

Defects of the Oral Cavity

- Soft tissue only
- Soft tissue + bone
- Total palatal reconstruction



Oral Cavity Reconstruction

Forearm
Anterolateral thigh
Lateral arm
Fibula skin
Scapula skin

Tongue
Nasolabial
Submental island
FAMM
Suprascapular

Lateral Tongue

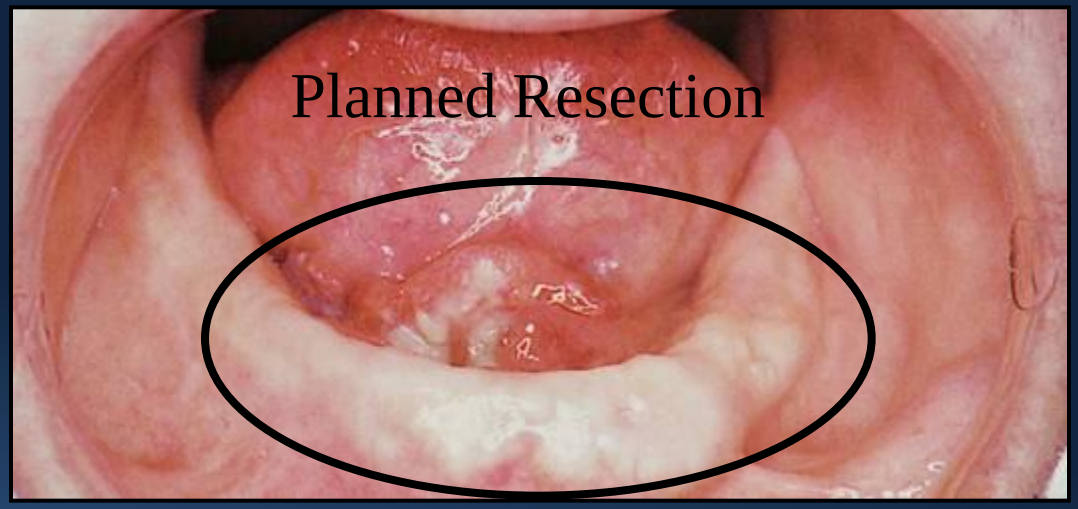
Secondary intention vs.
Primary closure vs.
Local flap/graft

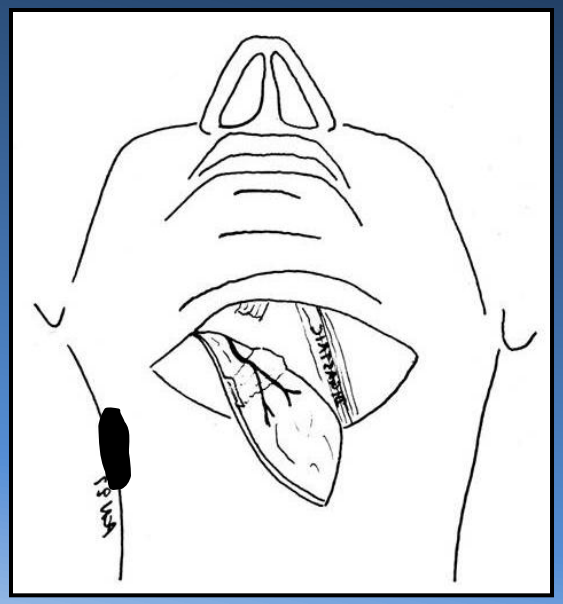
Nasolabial Flap Repair When Mandible Exposed

Nasolabial Flap

Must be edentulous patient

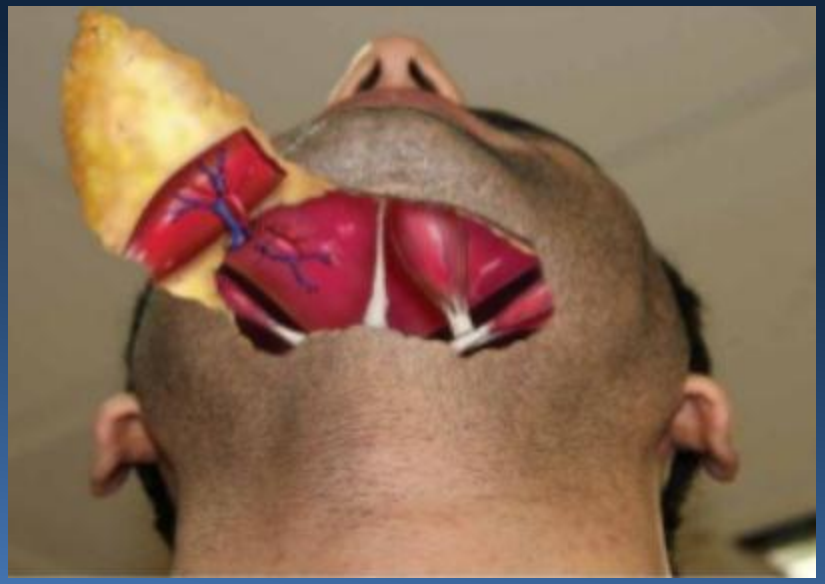
Submental Island Flap
Repair anterior floor of mouth, lip or cheek





Curran AJ, Neligan PC, Gullane PJ: "Submental Artery Island Flap" Laryngoscope 107:1545-1549, Nov 1997

Submental Island

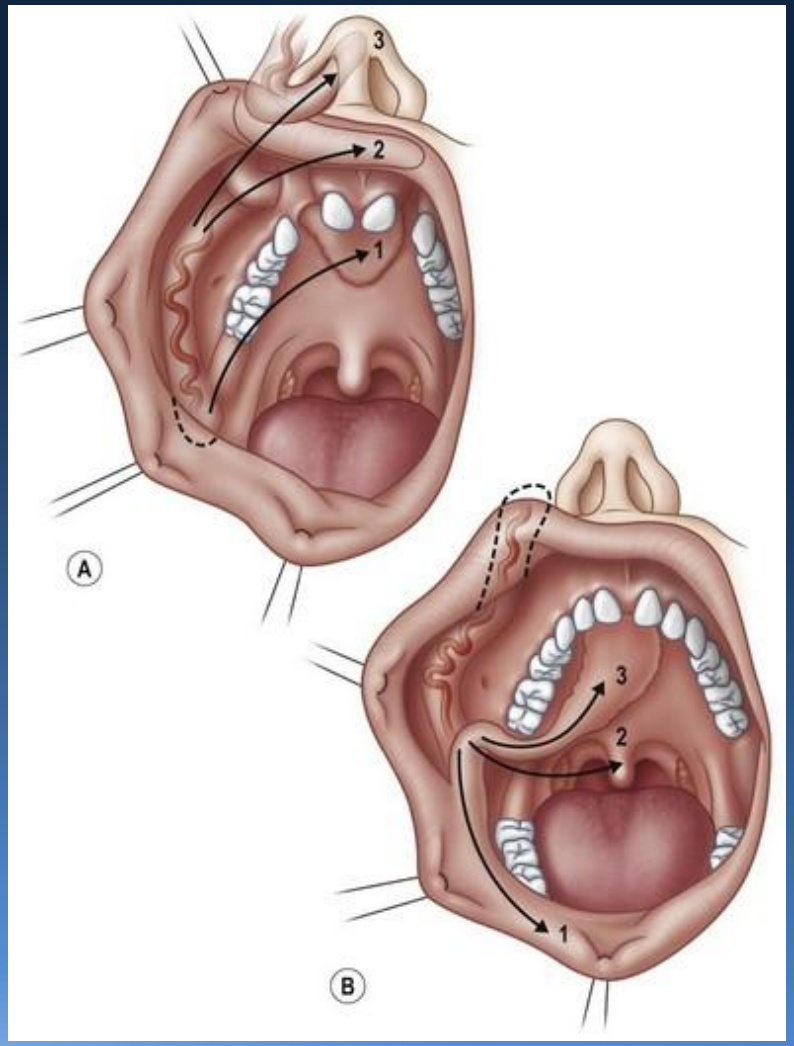


Cheng A, Bui T. J Oral Maxillofac Surg Clin North Am 2014;26(3):371-9

Submental Island

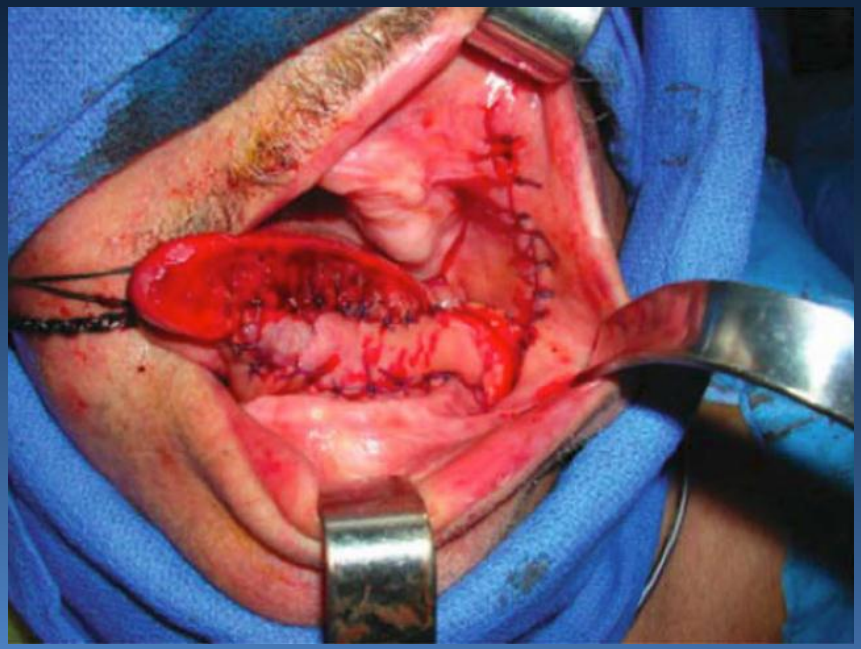
Chan HC, Chung JL. J Oral Maxillofac Surgery, Med, Path 2015;27(3):348-52

Facial Artery Musculomucosal (FAMM) Flap



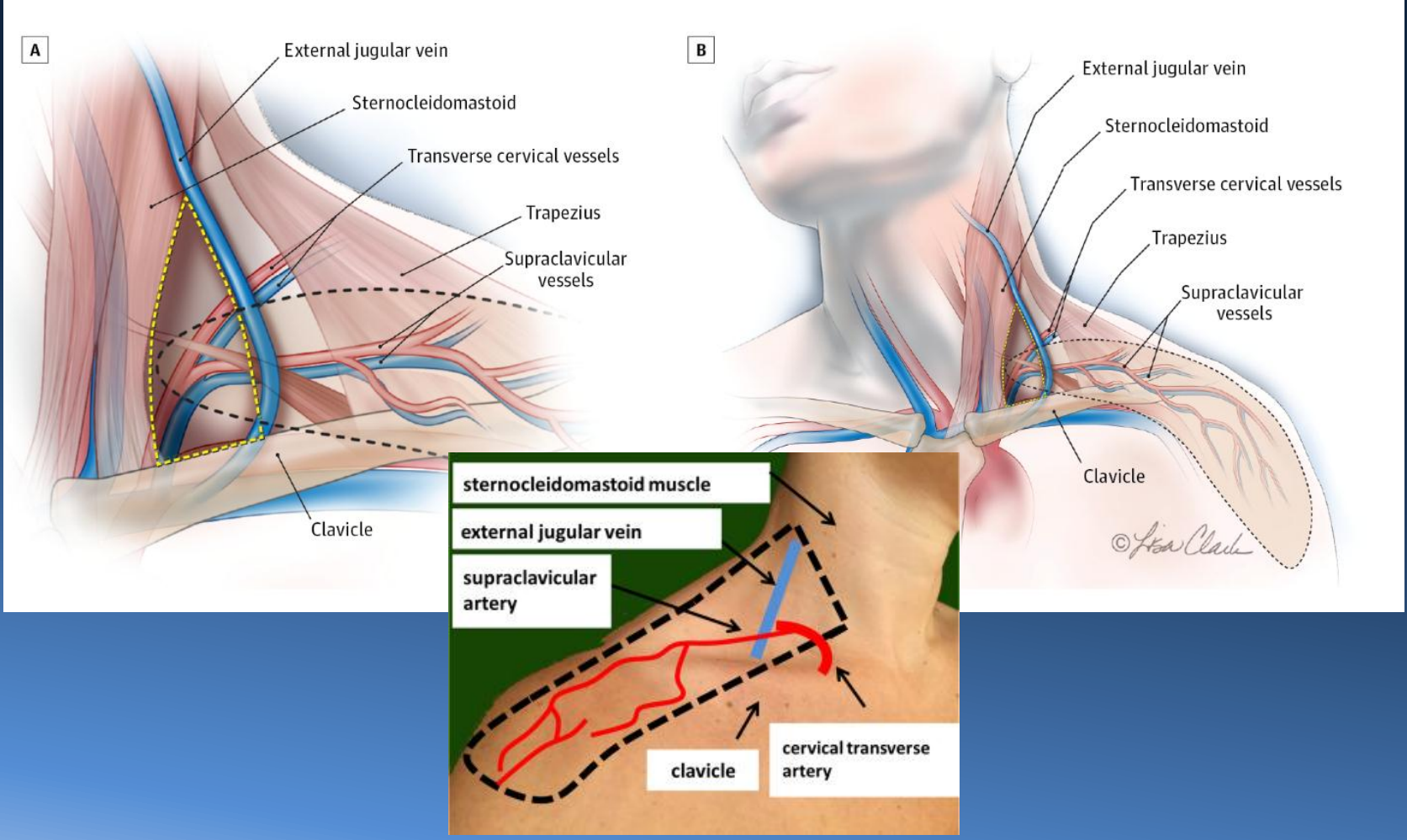
From https://plasticsurgerykey.com/secondary-facial-reconstruction/#bib10

FAMM Flap



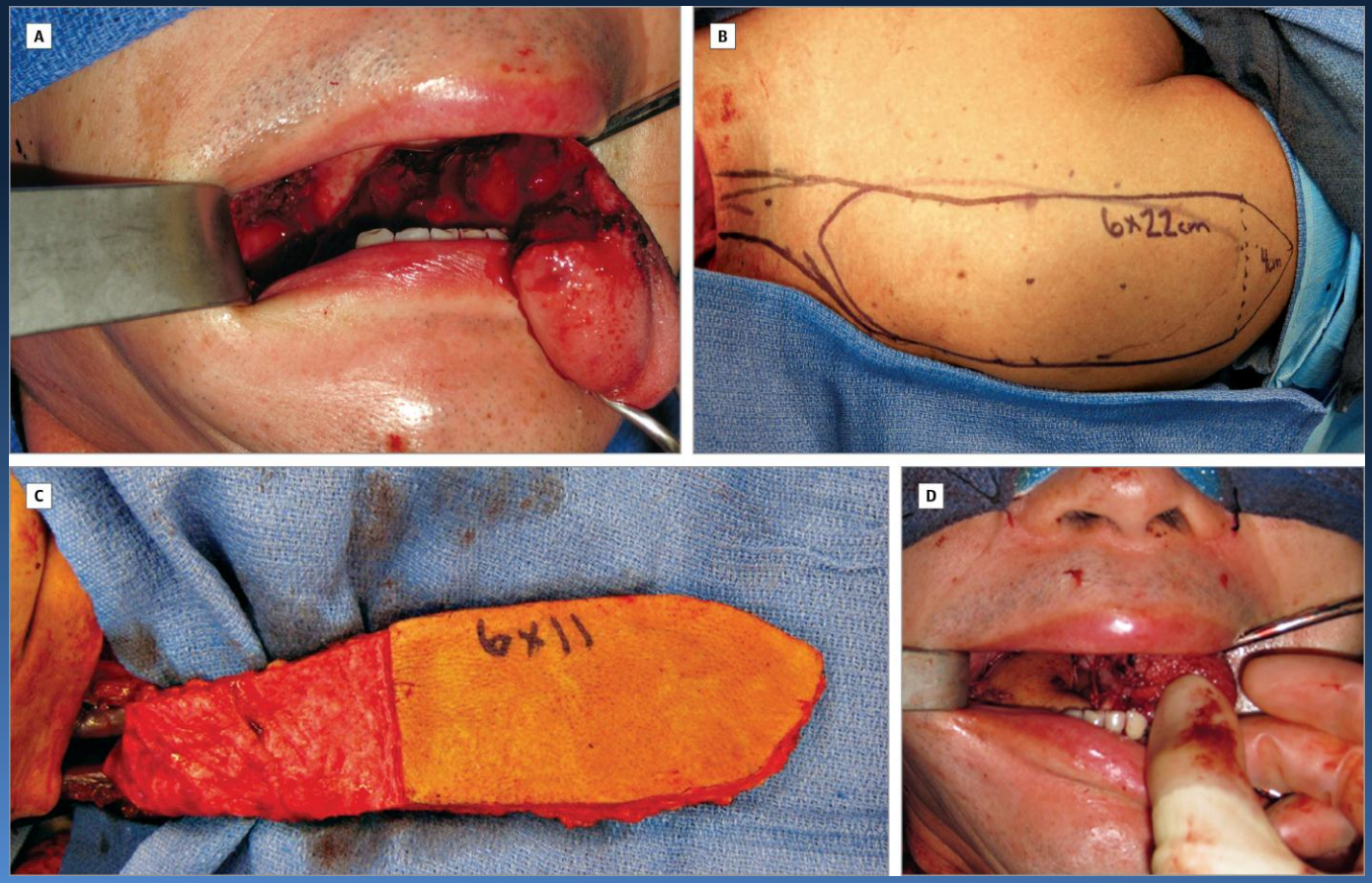
Ayad T, Xie L. Facial artery musculomucosal flap in head and neck reconstruction: A systematic review. Head Neck 2015; 37:1375-86.

Supraclavicular Island Flap



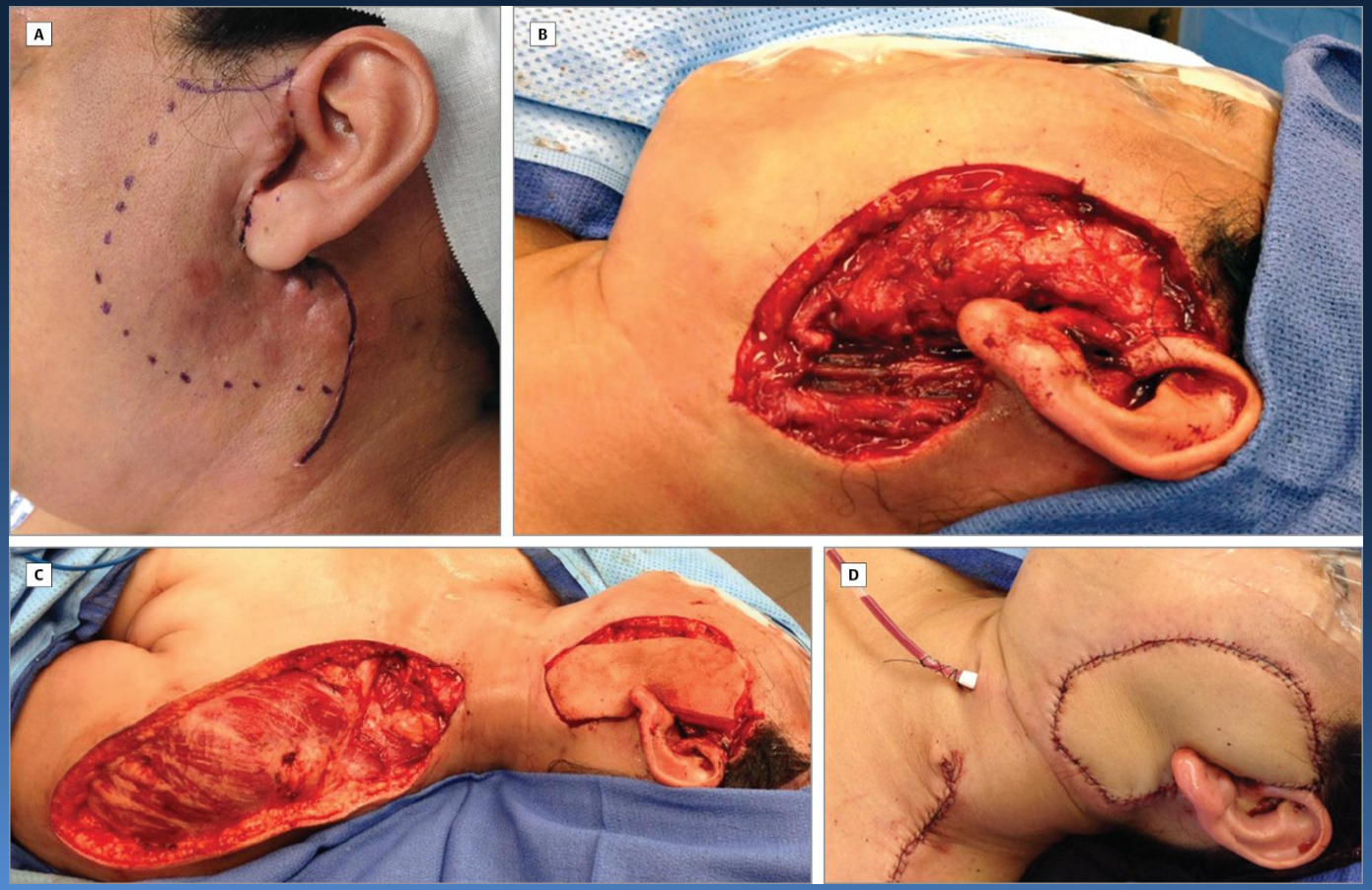
Almas D et al, Pak Armed Forces Med J 2015; 65(3):410-14
Atallah S et al, Eurp Ann Otorhinolaryngol Head Neck Dis 2015; 132(5):291-4

Supraclavicular Island Flap



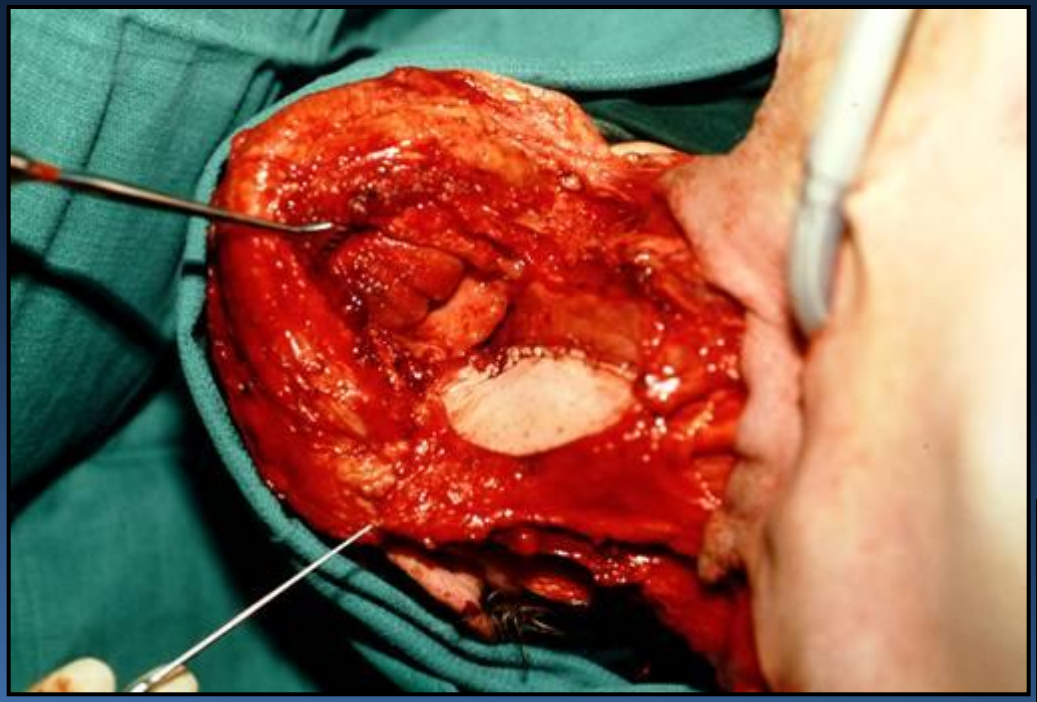
Kokot N et al, JAMA Otolaryngol Head Neck Surg 2013; 139(11):1247-1255

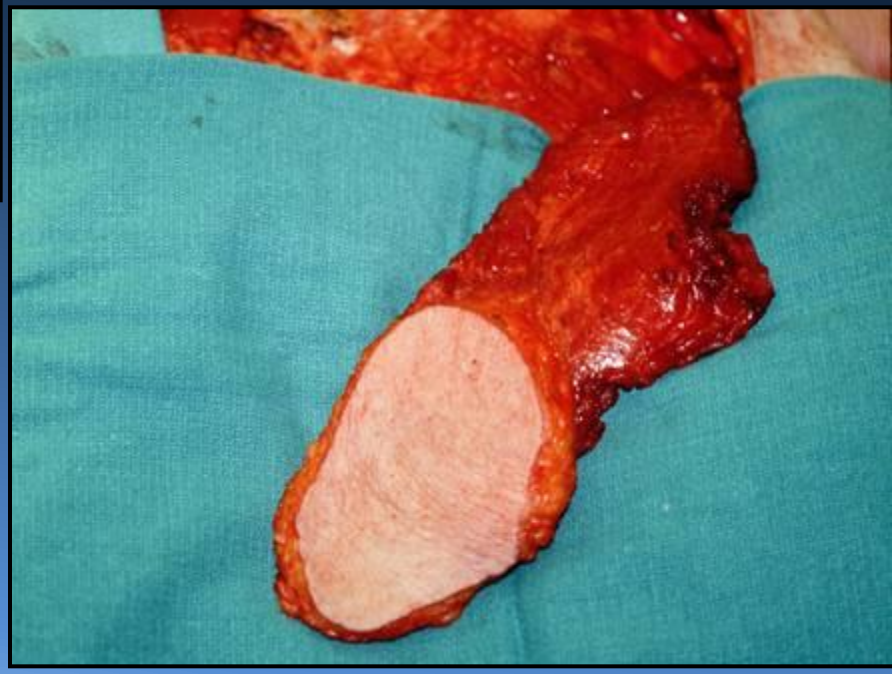
Supraclavicular Island Flap



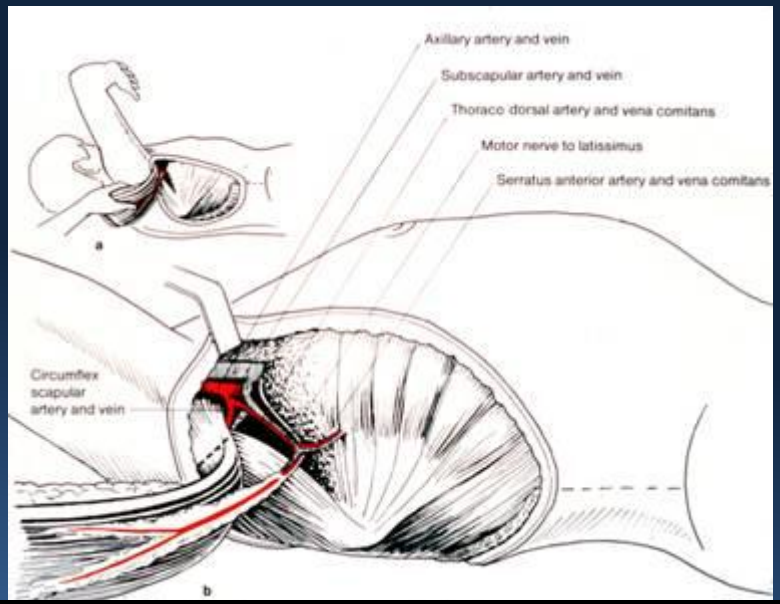
Kokot N et al, JAMA Otolaryngol Head Neck Surg 2013; 139(11):1247-1255

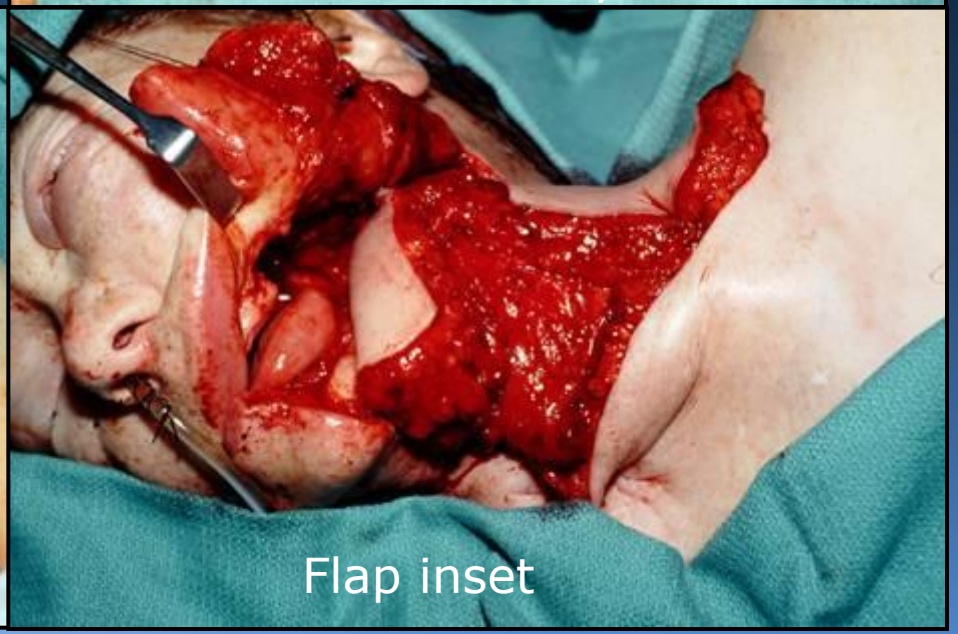
Pedicled Pectoralis Major Flap





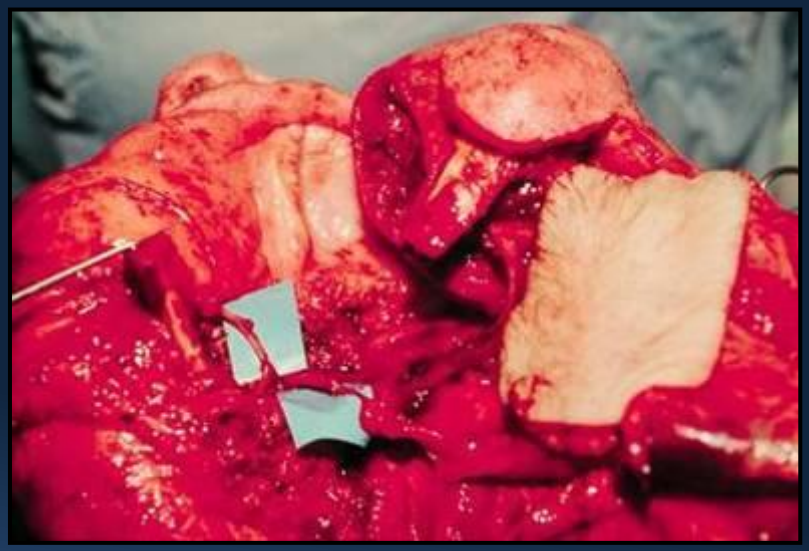
Latissimus Dorsi Pedicled Flap for Oral Cavity and Neck Resurfacing





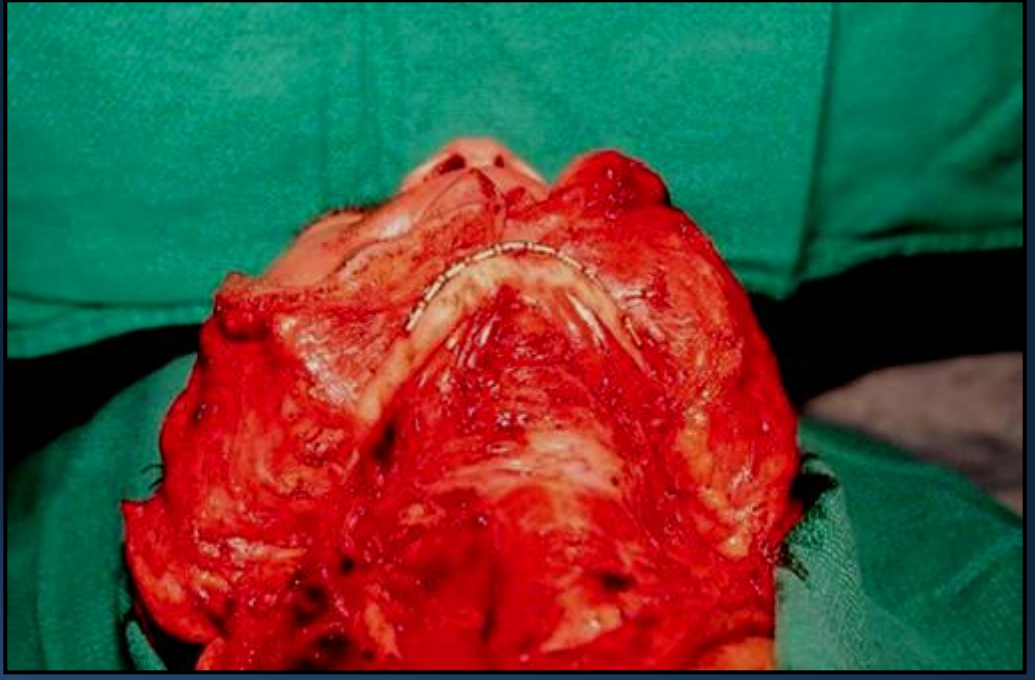
2 years post-op

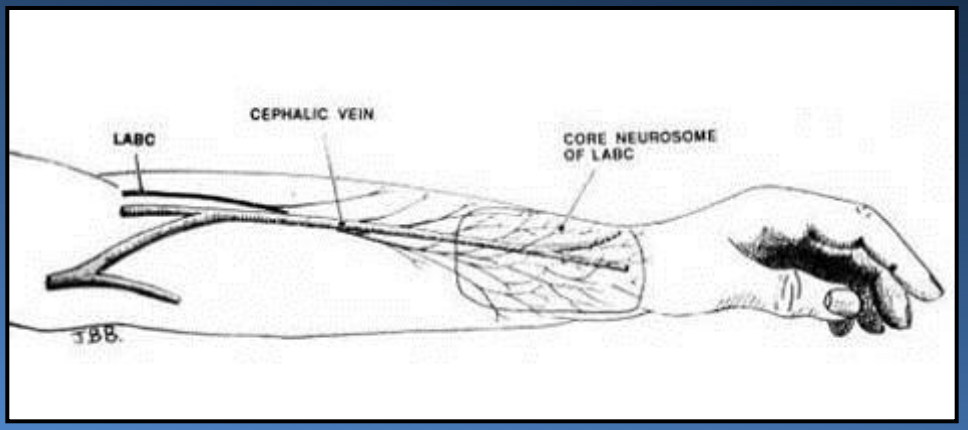
Radial Forearm Flap



What About Sensation?

Boyd B et al. Re-innervated Lateral Antebrachial Cutaneous Neurosome Flaps in Oral Reconstruction: Are we making Sense? Plastic Reconstr Surgery 93(7):1350-1359, 1994



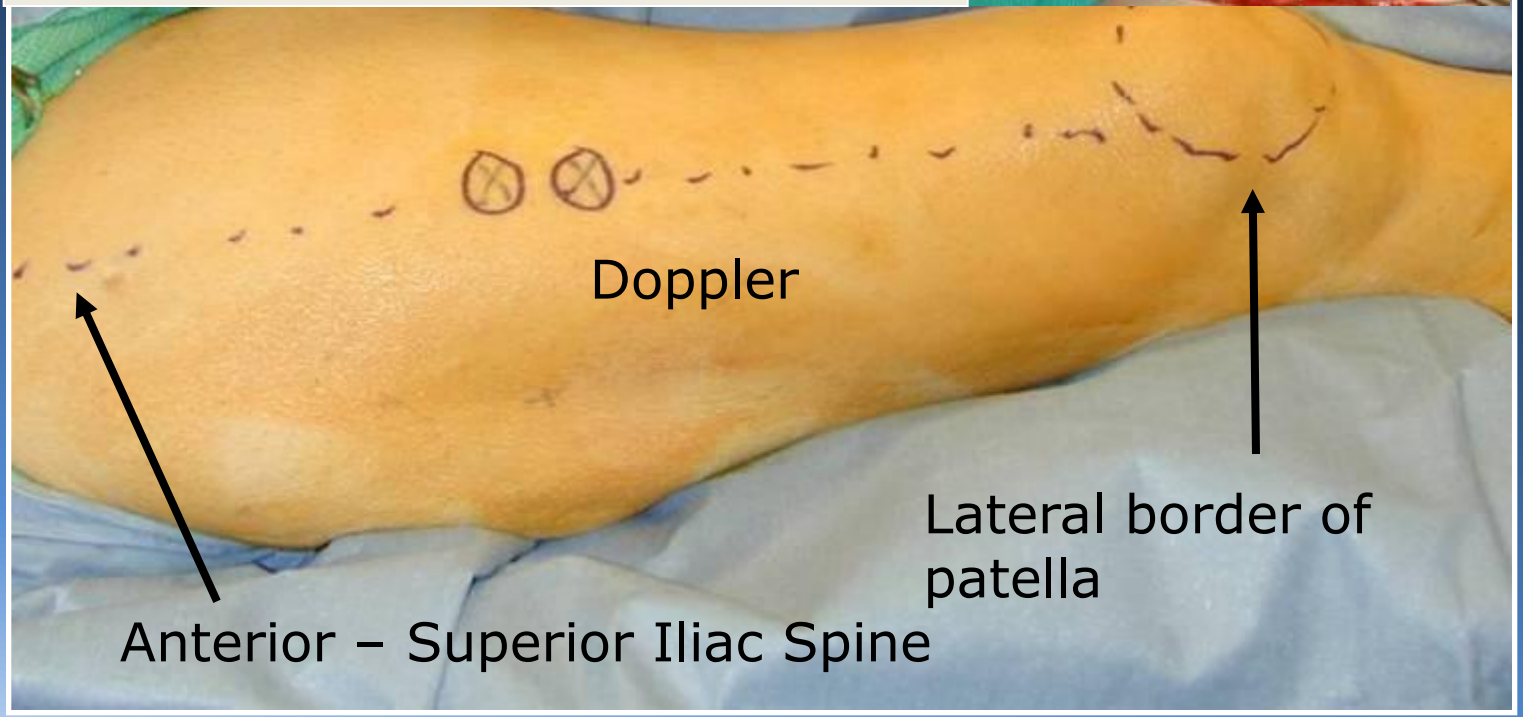


Returned to full-time employment as high school teacher

Three Years Post-Op

Where We Are Now?
Shifting Paradigm

- Radial Forearm
- Anterolateral thigh
- Rectus abdominis
- DIEP



Defects of the Oral Cavity

- Soft tissue and bone

Andy Gump Deformity

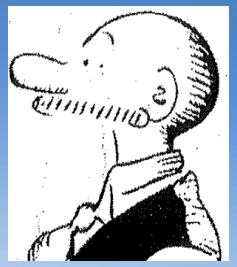
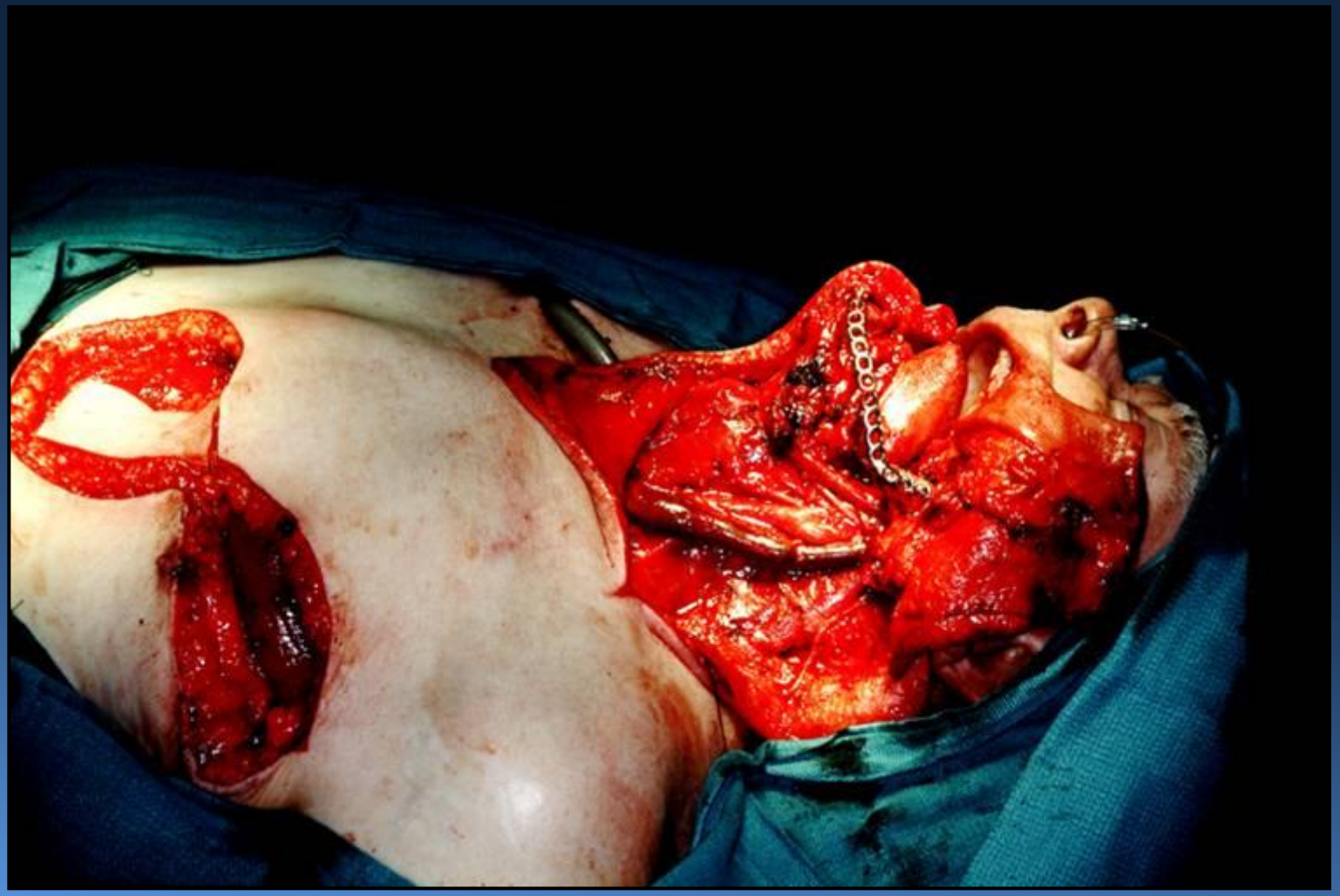


Plate and Pectoralis Major Flap



Gullane, PJ; Primary Mandibular Reconstruction: Analysis of 64 Cases and Evaluation of Interface Radiation Dosimetry on Bridging Plates. Laryngoscope 101(6):1-24, 1991

Plate Failure/Success

Irish JC et al, Primary mandibular reconstruction with the titanium hollow screw reconstruction plate: evaluation of 51 cases. Plast Reconstr Surg. 1995 Jul;96(1):93-9.

Composite Flaps

Good bone

Menu

Radial forearm*
Scapula
Fibula*
Iliac crest

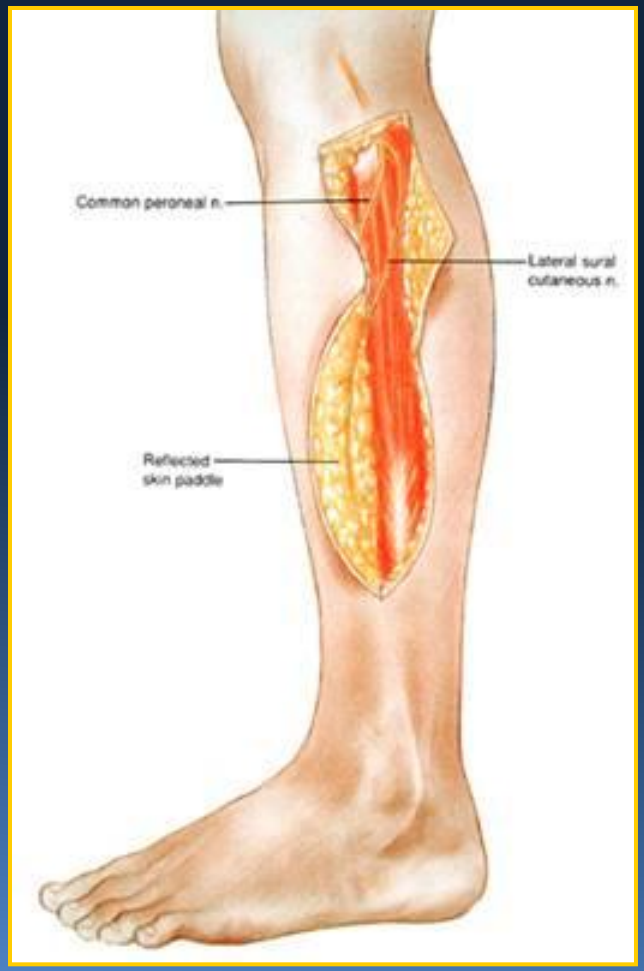
Good skin

* May be reinnervated

Fibula Osseocutaneous Flap

Advantages

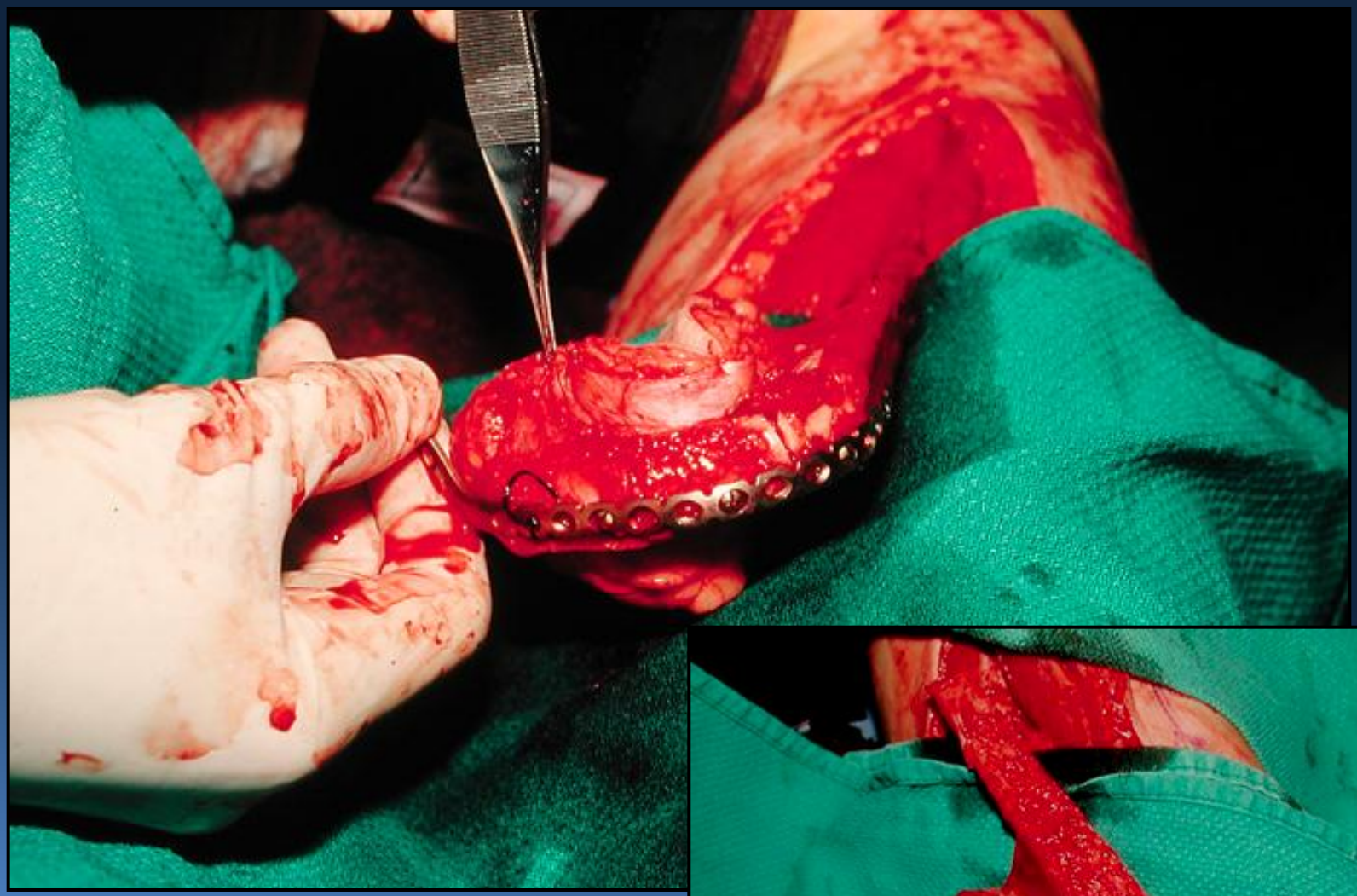
- Harvest in supine position
- Two team simultaneous approach
- Osseointegrated implants
- Minimal donor morbidity
- Up to 25cm bone length
- Pedicle of good caliber and length
- Periosteal blood supply – osteotomies
- Skin paddle
- Innervation potential

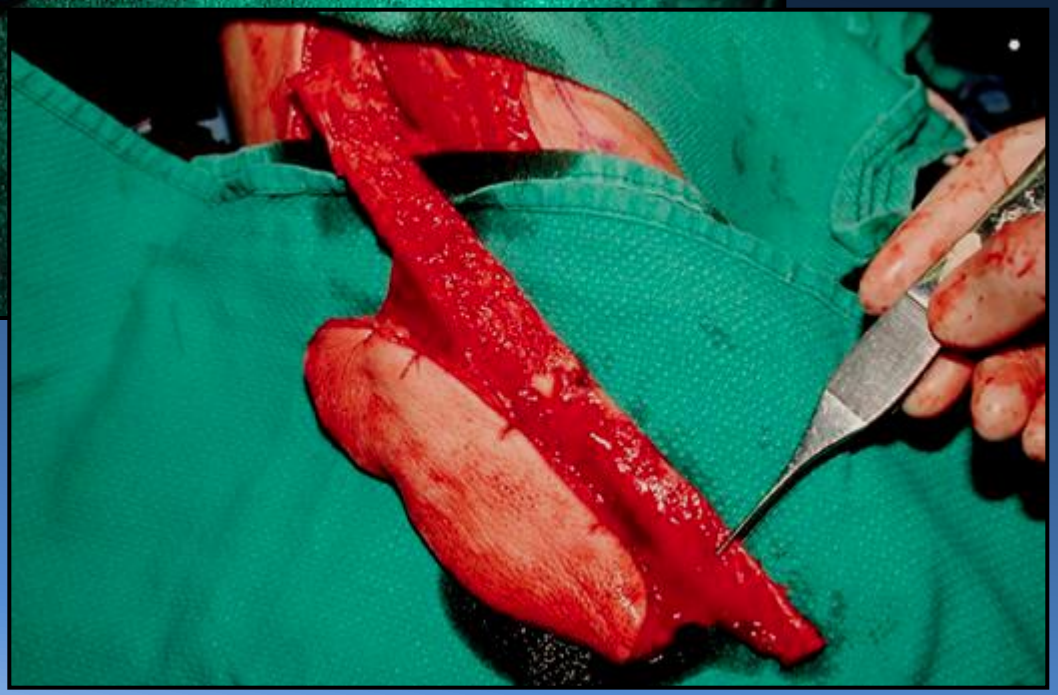


Mandibular Reconstruction

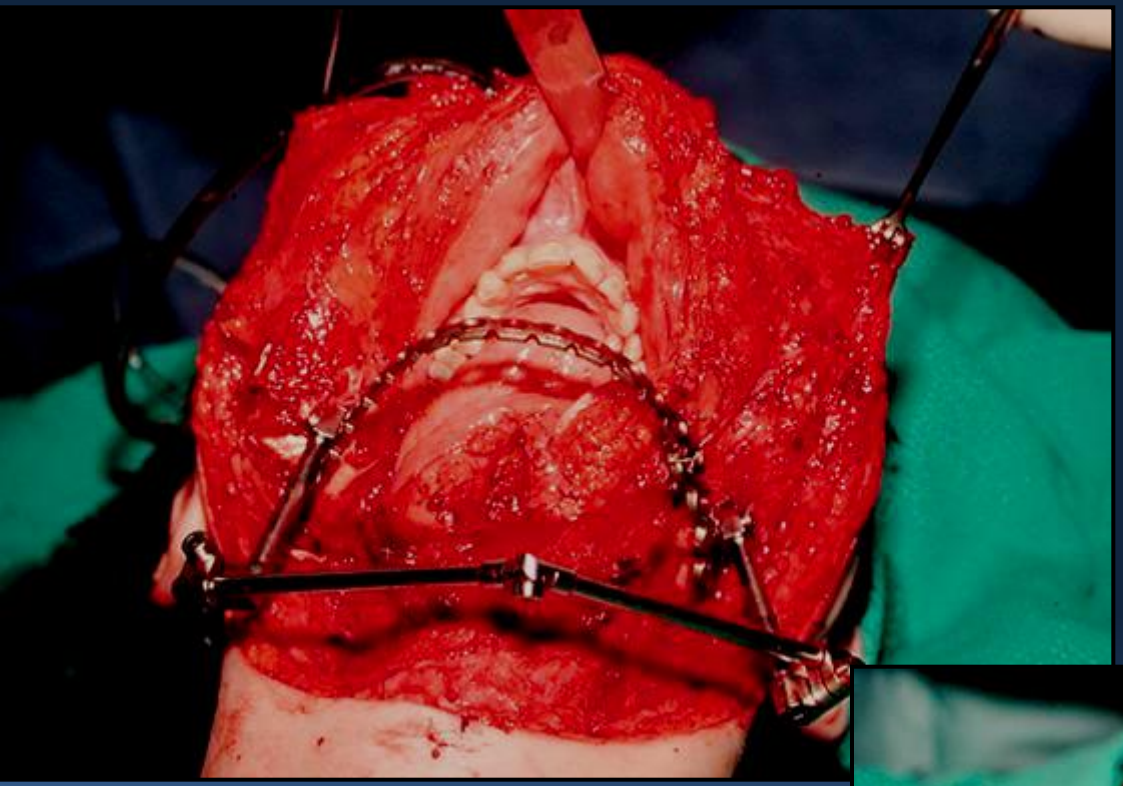
Template

- Pre-bending and pre-drilling of mandible
- Osteotomies to bent plate
- Osteotomies done while flap still vascularized
- Bone gap carefully measured
- Final trimming of bone ends in situ

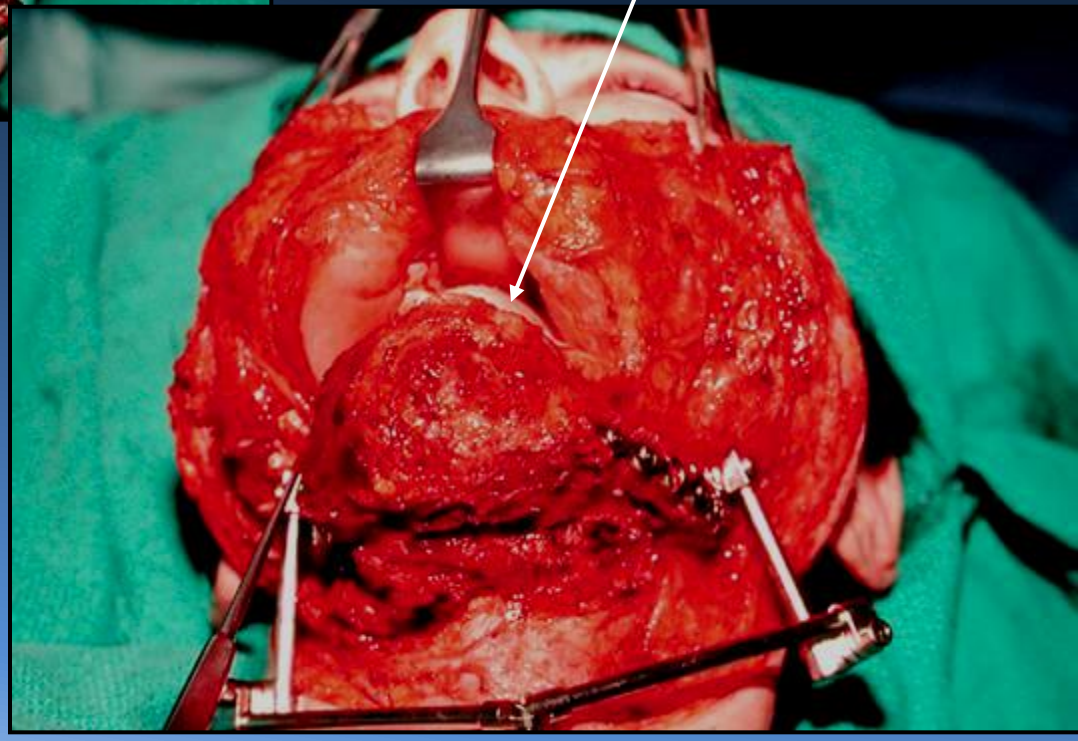




Contouring of bone around plate



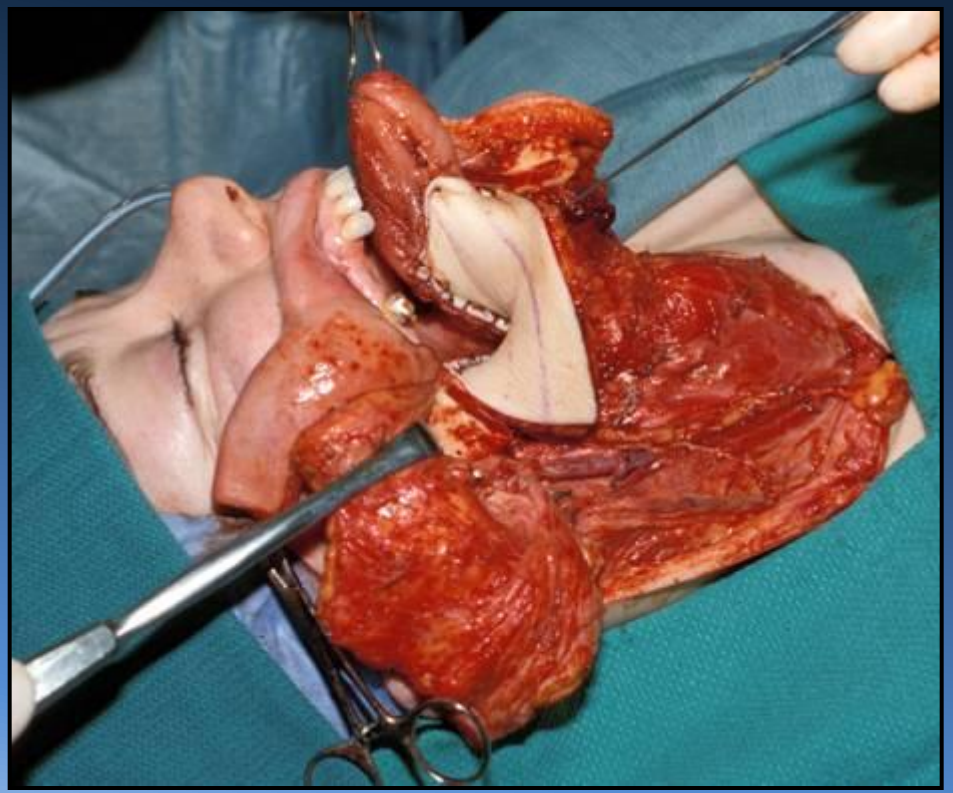
Flap Inset



Maintenance of mandibular segments with arch bar

Fibula
2 years post-op

Double Flap: Radial Forearm and Fibula



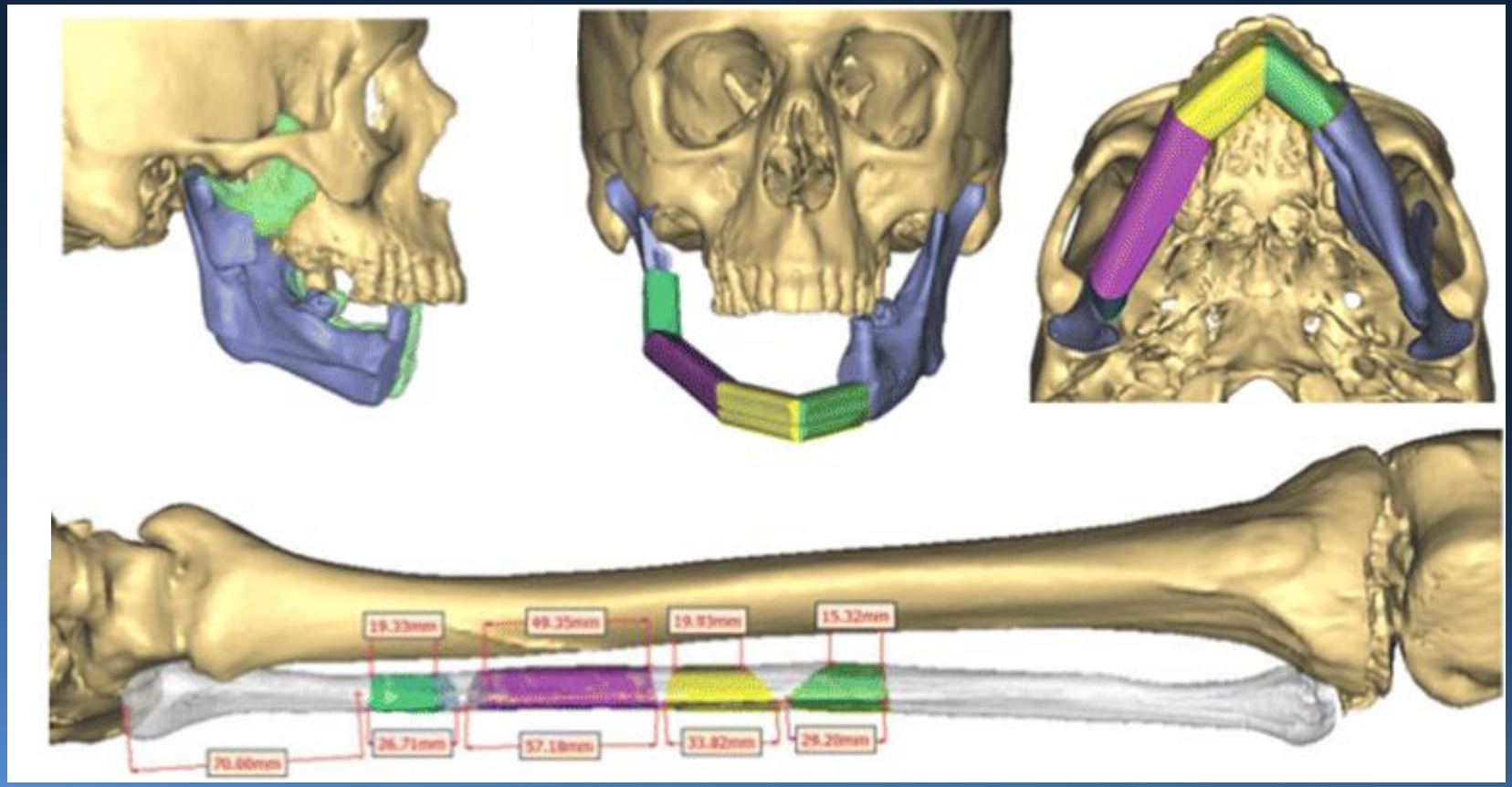
2 years post-op

Implants?

- Same time?
- How long to wait?
- OK with radiation?

https://plasticsurgerykey.com/oral-cavity-reconstruction/

3D Planning

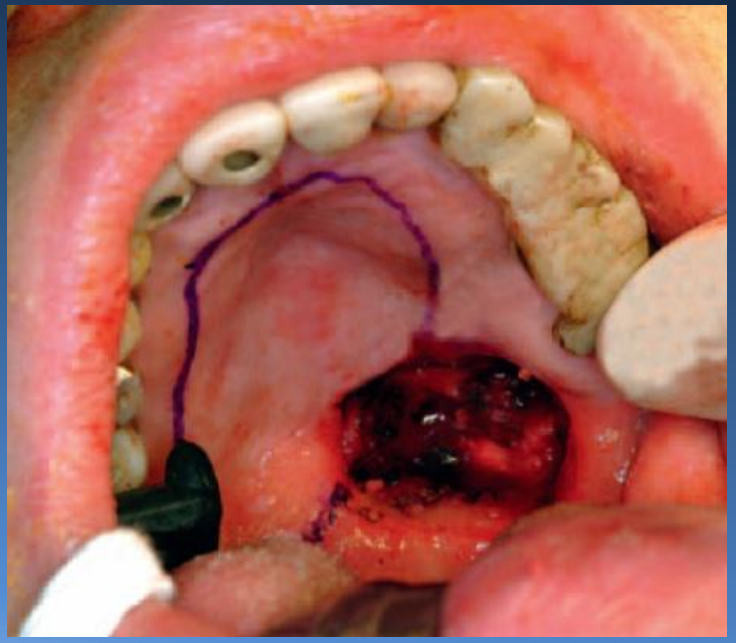


Kirke DN et al, Using 3D computer planning for complex reconstruction of mandibular defects. Cancers of the Head & Neck 2016; 1:17 https://doi.org/10.1186/s41199-016-0019-4

3D Planning

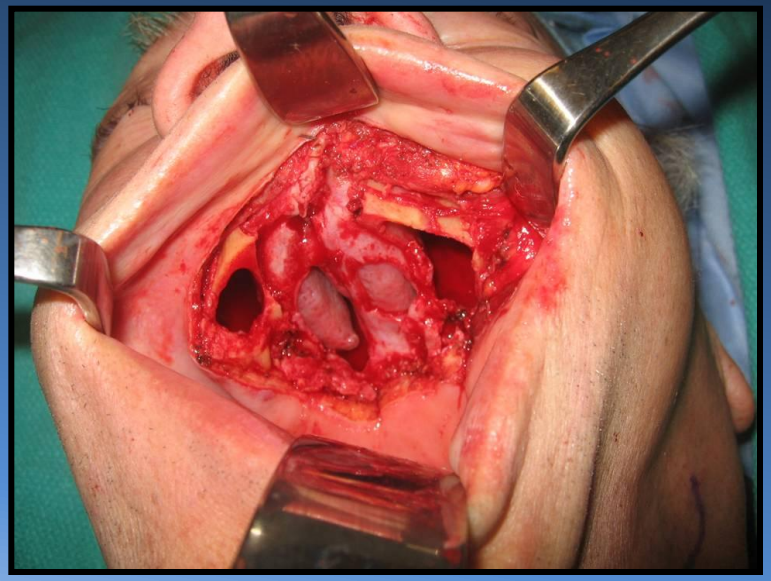
Kirke DN et al, Using 3D computer planning for complex reconstruction of mandibular defects. Cancers of the Head & Neck 2016; 1:17 https://doi.org/10.1186/s41199-016-0019-4

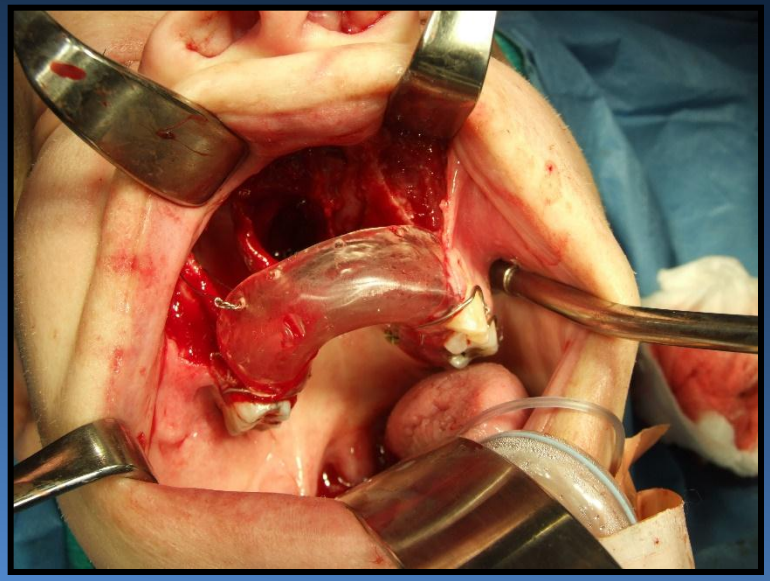
Palate



Defects of the Oral Cavity

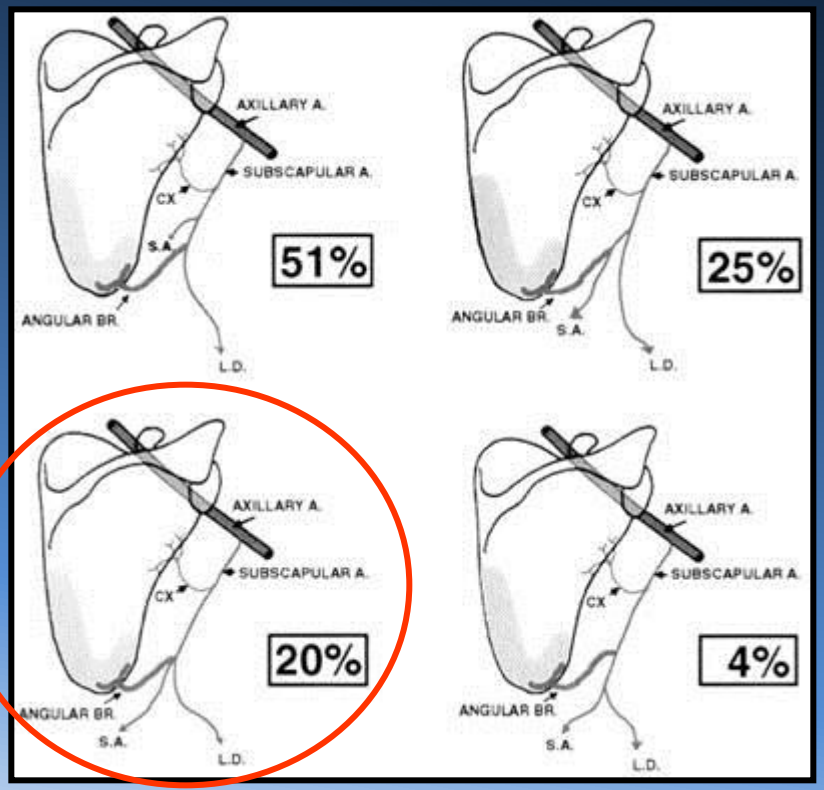
- Total Palatal Reconstruction



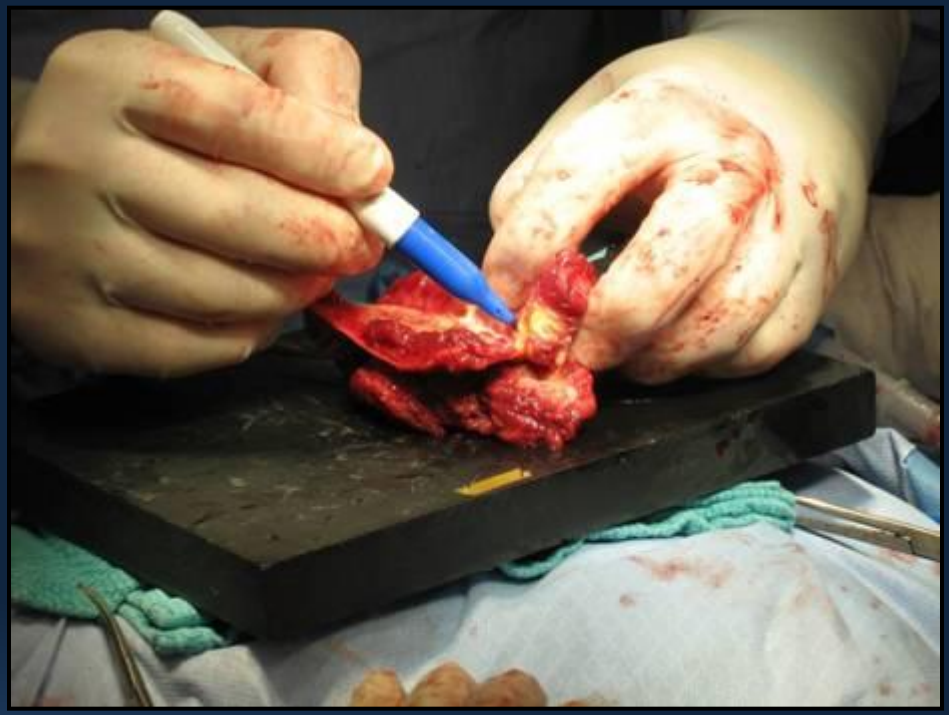


Larger Defect Options for Maxillary Reconstruction?

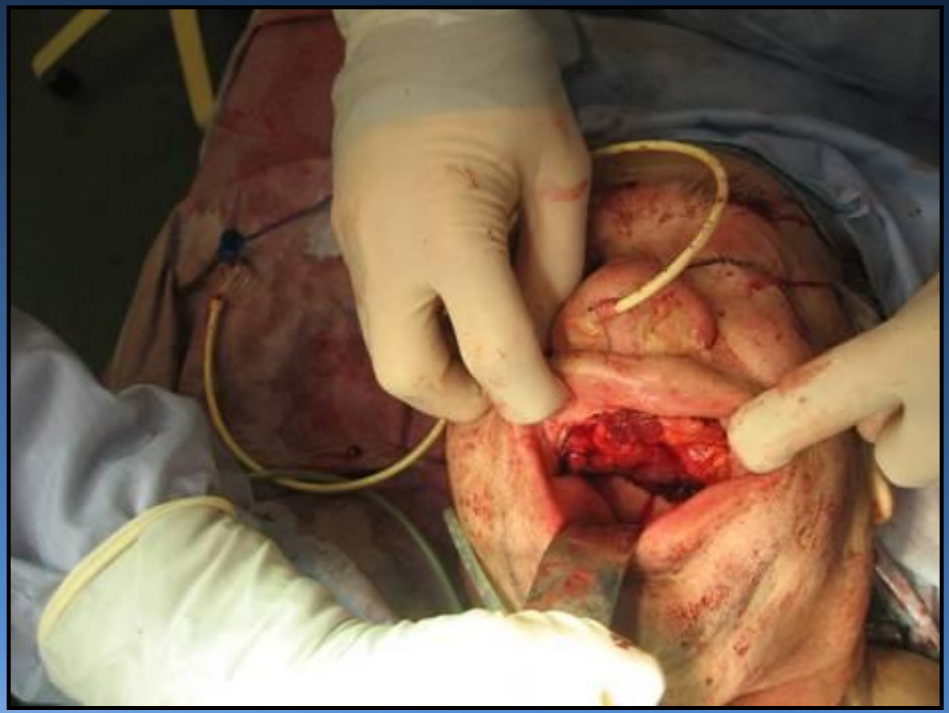
- Free Forearm Flap
- Free Fibular Transfer
- Free Iliac Crest Transfer
- Free Angular artery tip of scapular flap

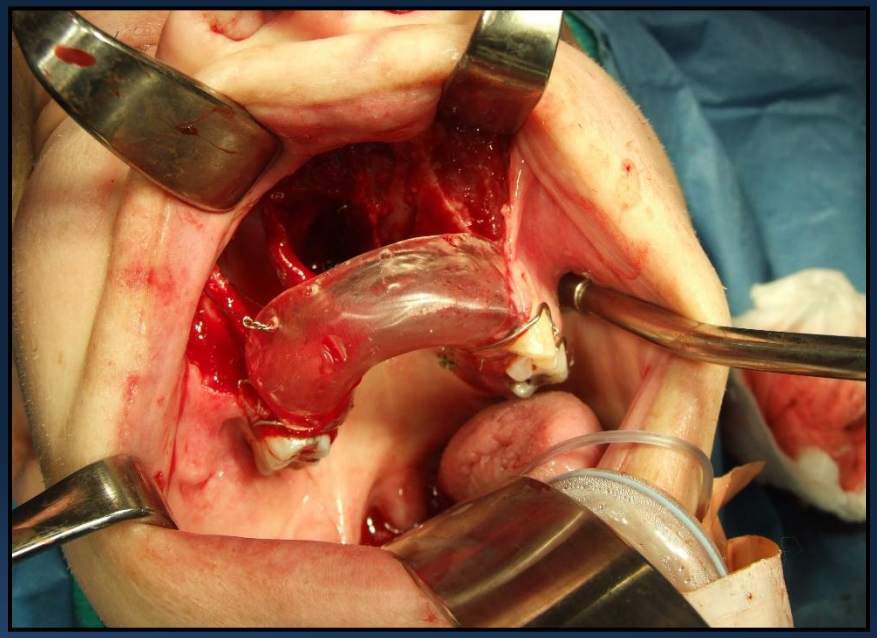

AXILLARY A.
SUBSCAPULAR A.
CX
S.A.
ANGULAR BR.
L.D.
51%
25%
20%
4%


A
B



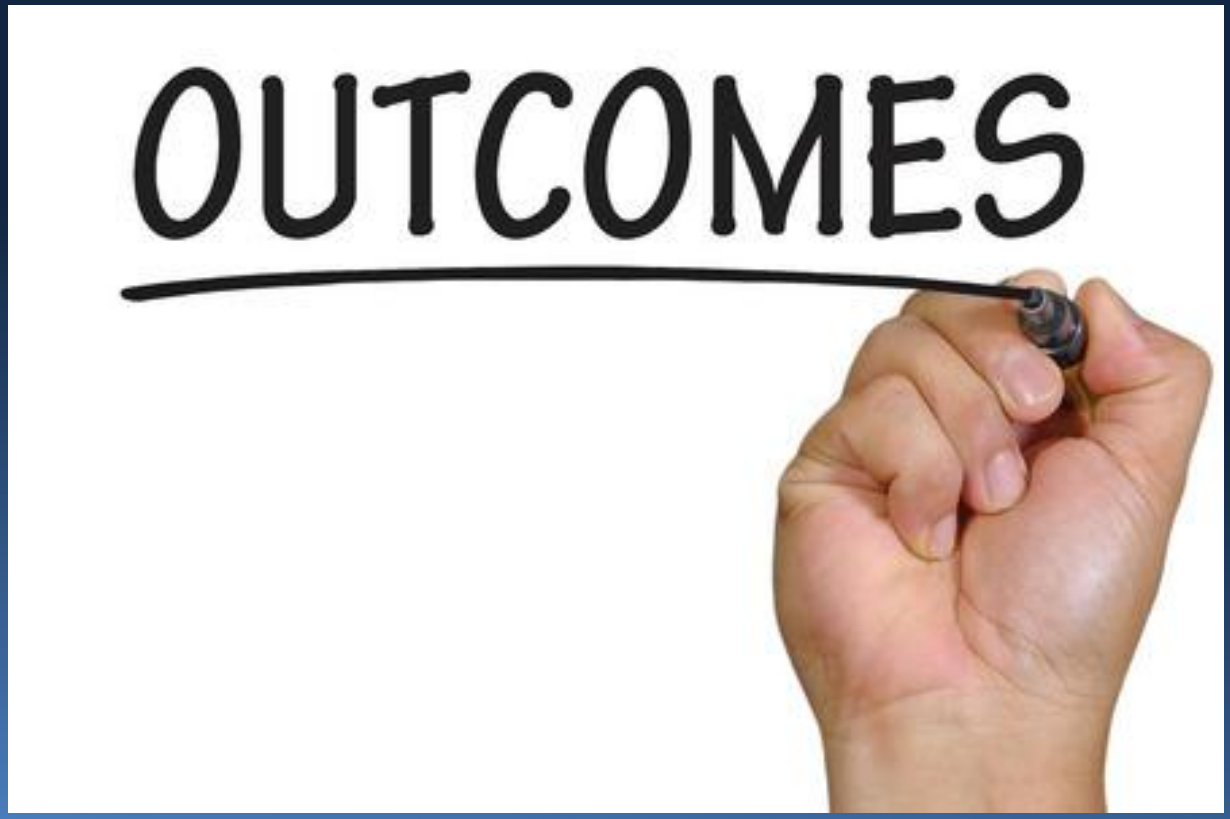

Accu-line





Free Scapular Osseomyogenous Flap

Clark J, Vesely M, Gilbert R: Head and Neck Jan 2008


OUTCOMES

Swallowing Following Surgery and Radiotherapy for Intraoral Cancer n=255

Difficulties in swallowing	22%
Return to solid foods	54%
Semisolid food	30%
Liquids only	16%
Weight loss	33 - 66%

Correlated with:

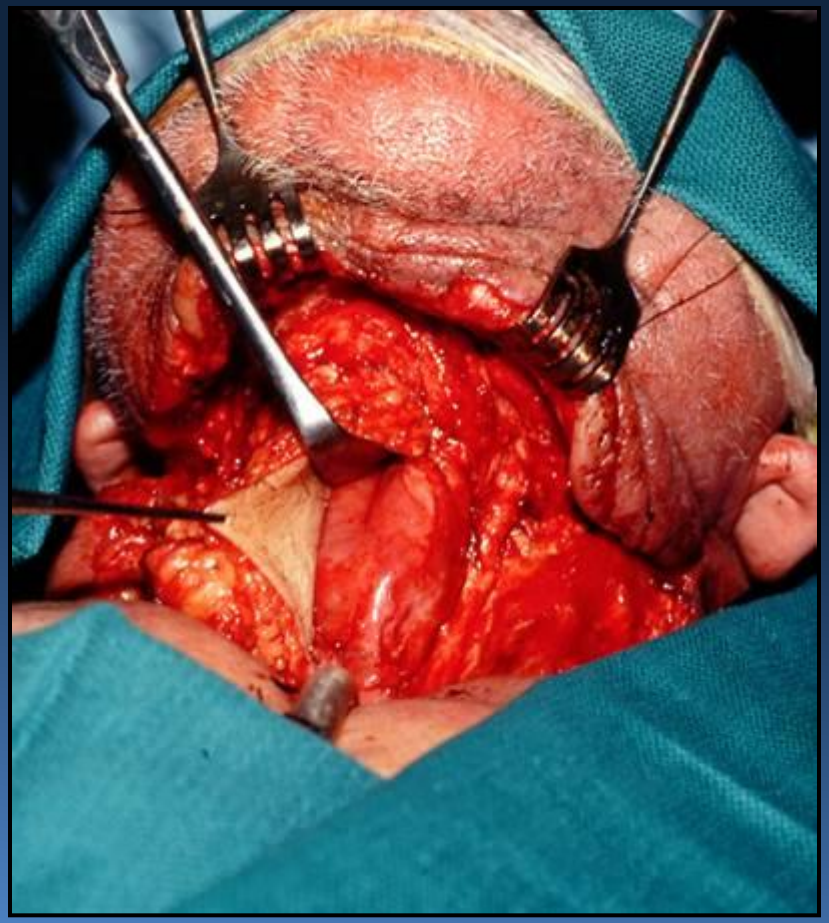
- Extent of resection – T-Stage
- Site of defect
- No correlation with type of repair

David Soutar, Canniesburn Plastic Surgery Unit, Glasgow

Swallowing Outcomes Following Microvascular Reconstruction

- N = 66, > 70 yo
- Functional Oral Intake Scale (FOIS)
  - Oral cavity 67%
  - Most common flap – anterolateral thigh
  - 3 year f/u – 75% good swallowing
  - Multivariate analysis – worse swallowing
    - pT4
    - Glossectomy

Worley et al, Swallowing outcomes in elderly patients following microvascular reconstruction of the head and neck. Otolaryngol Head Neck Surgery 2018; Mar 1



Phases in Development of Pharyngeal Reconstruction

Regional Flaps	
Cutaneous	1877 - Czerny
	1942 - Wookey
	1965 - Bakamjian
Myocutaneous	1979 - Ariyan
Viscus	
Gastric Pull Up	1912 - Jianu
	1949 - Ong & Lee
	1998 - Wei et al
Colonic Interposition	1954 - Goligher
Free Flap	
Jejunal graft	1956 - Seidenberg
Tube Radial Forearm	1979 - Yang
Anterolateral Thigh	1984 - Song
Gastro-omental	1979 - Baudet

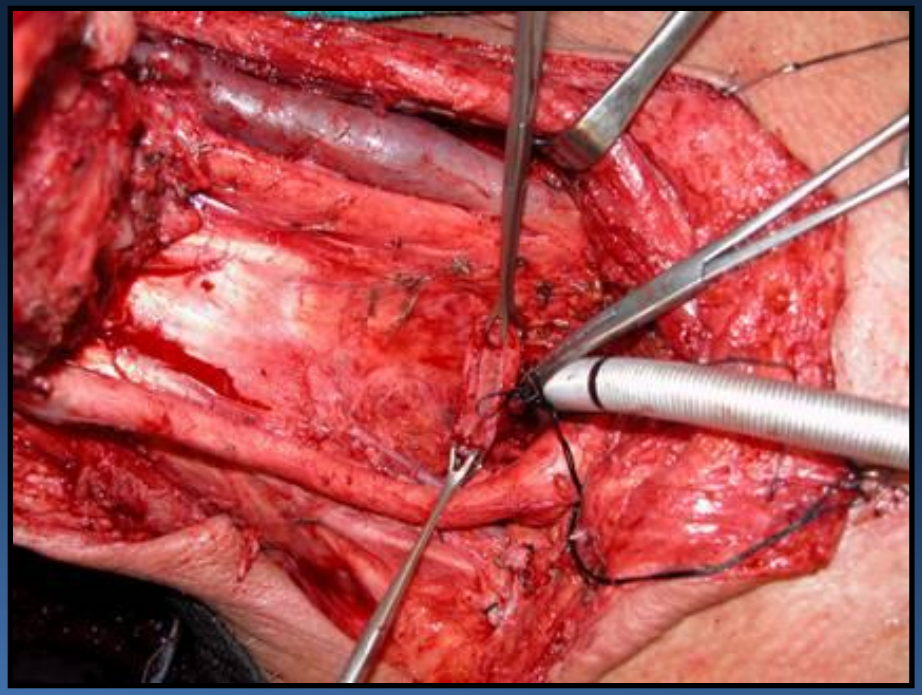
The Evolution of Pharyngeal Reconstruction

1970s - multiple operations

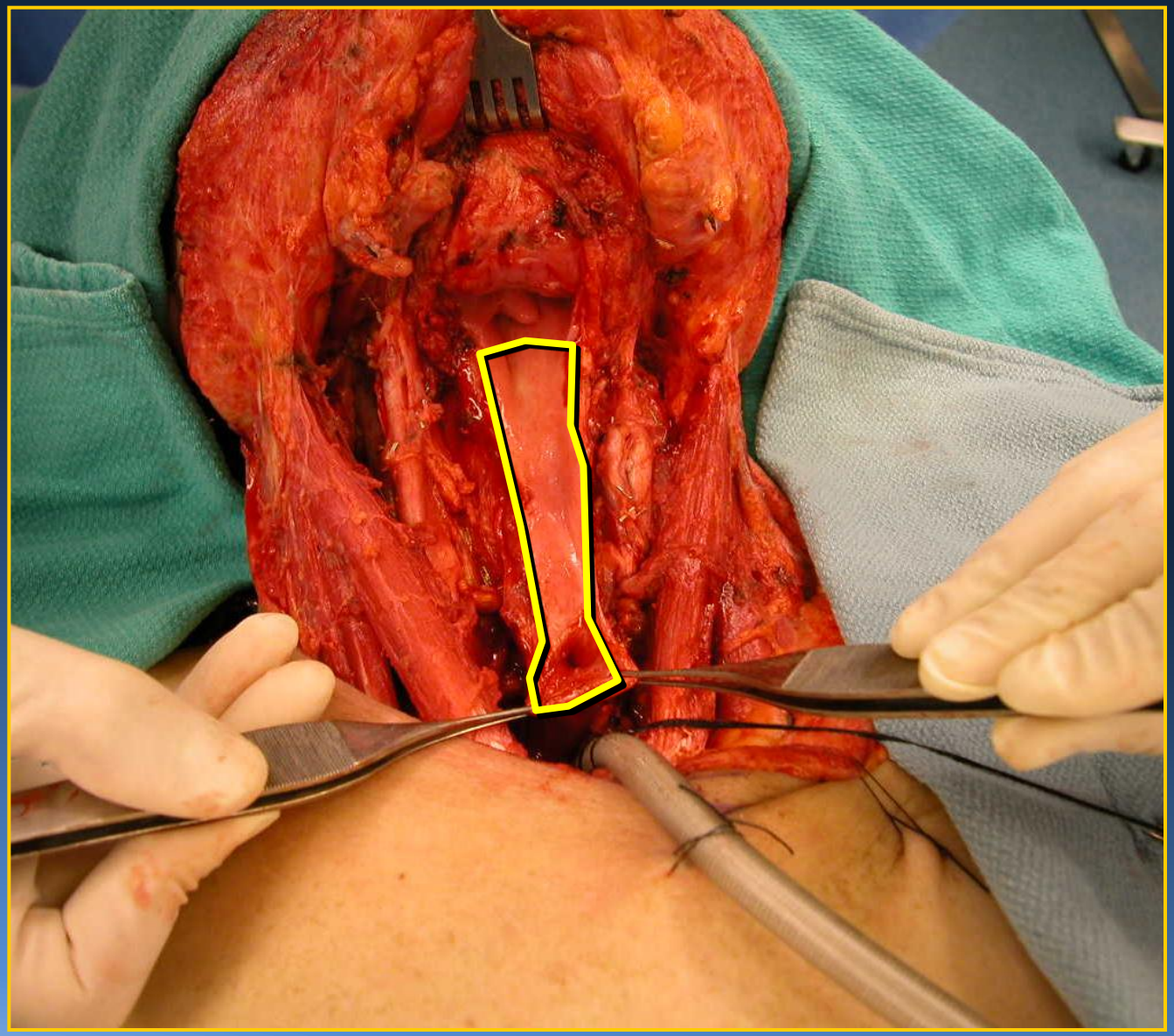
Now - one stage procedure

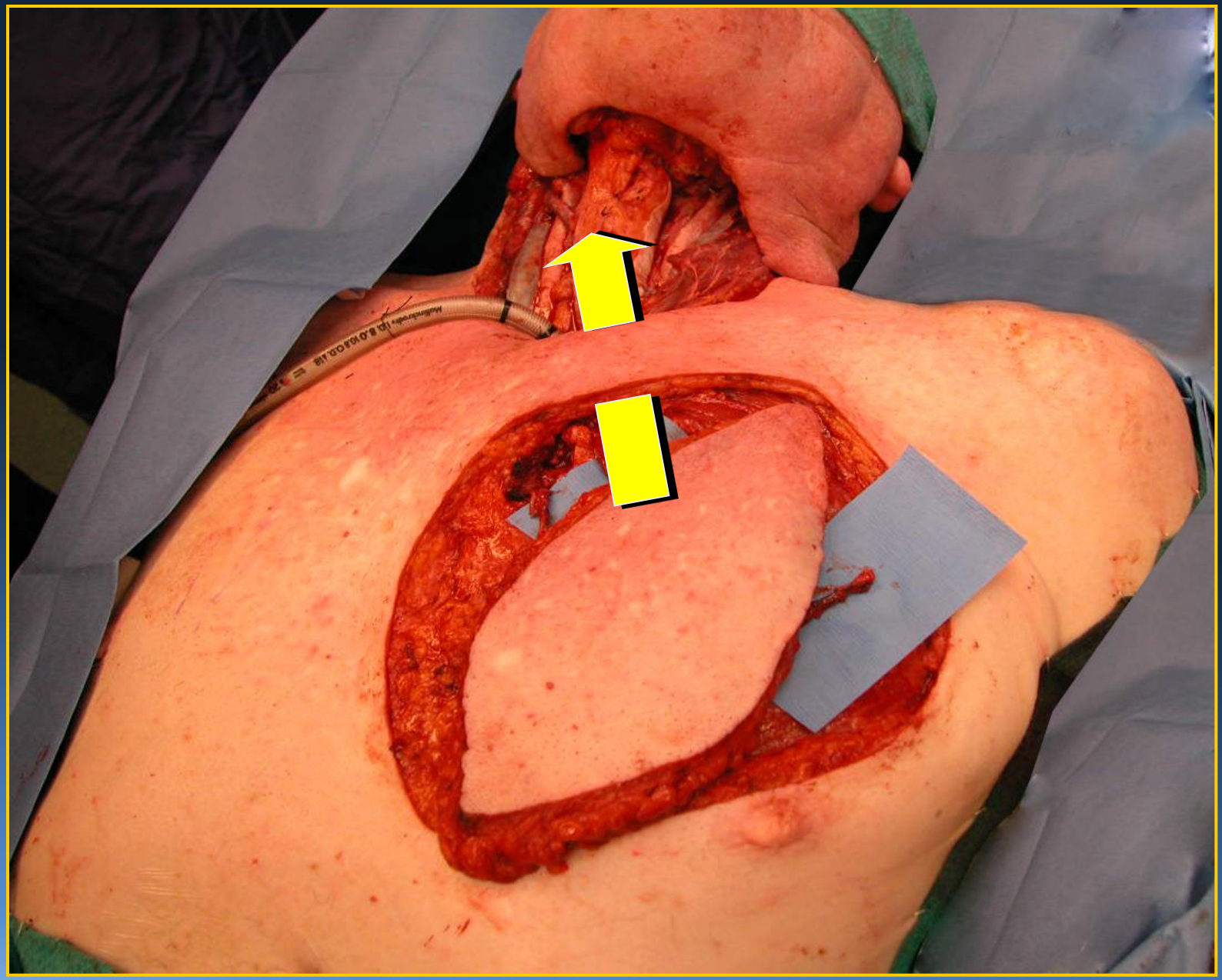
Reconstructive Options Following Salvage Laryngopharyngectomy

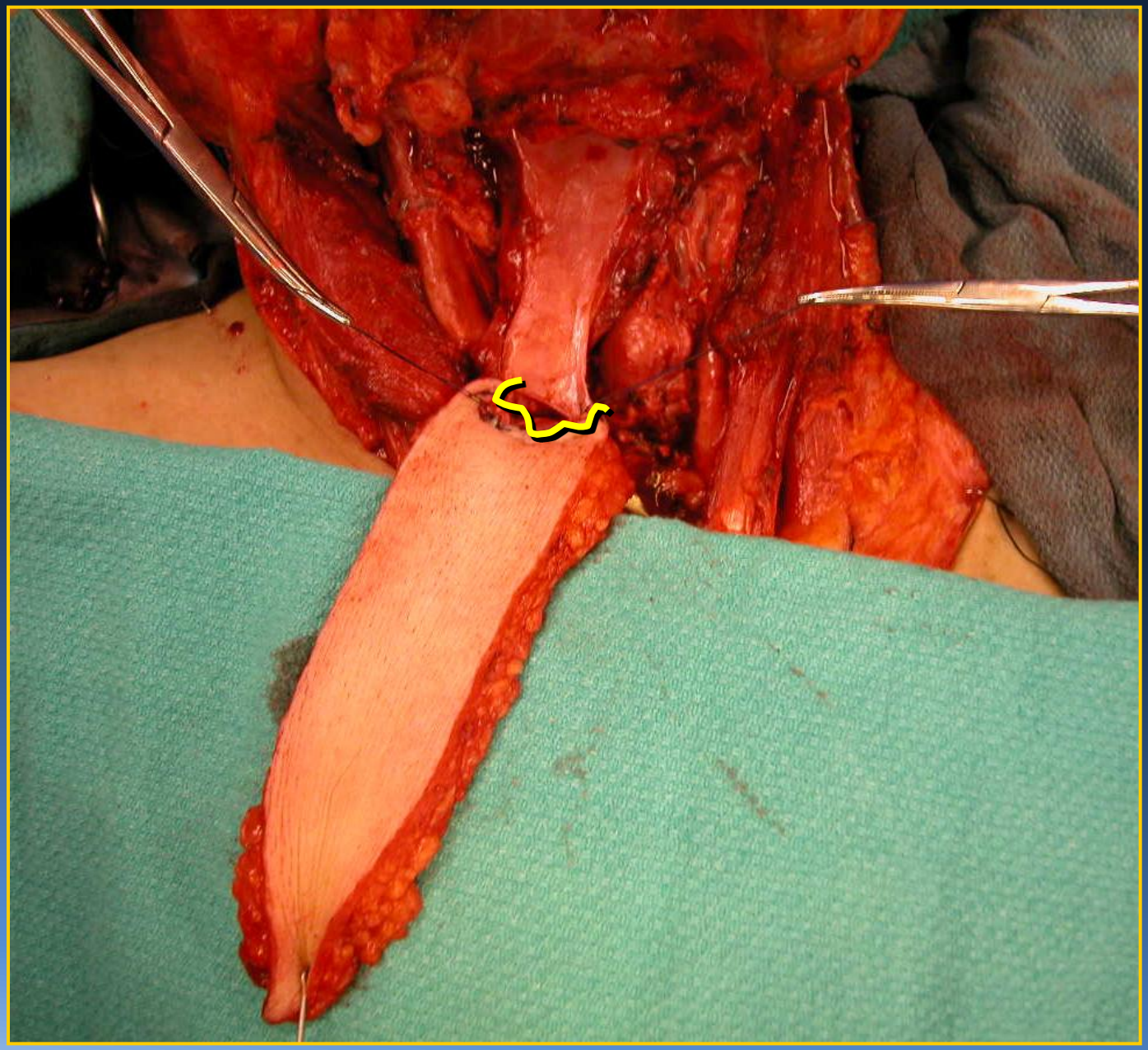
- Pectoralis Major
- Radial Forearm
- Free Jejunum
- Anterolateral Thigh
- Gastro-omental
- Gastric Transposition



How do we decide?

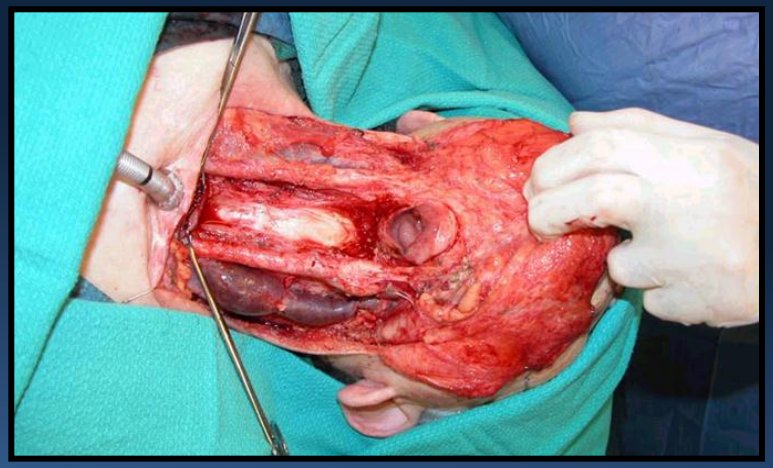






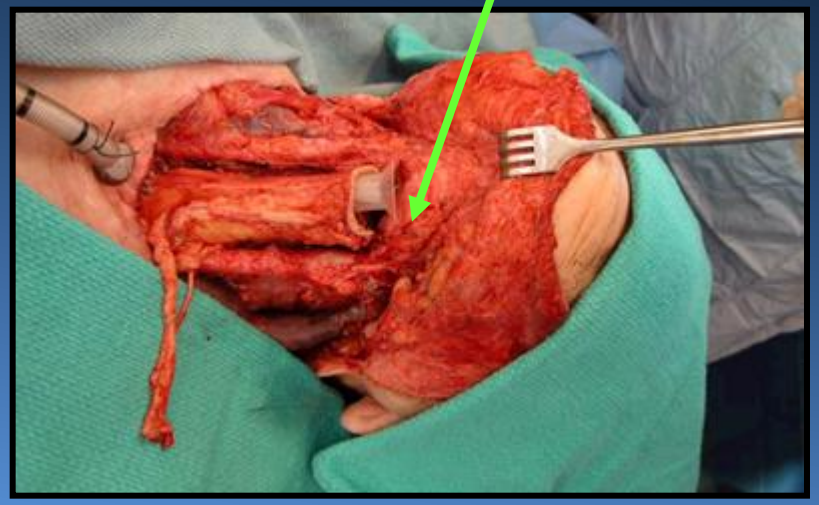
6 weeks post op

When Should We Use A Anterolateral Thigh Flap?



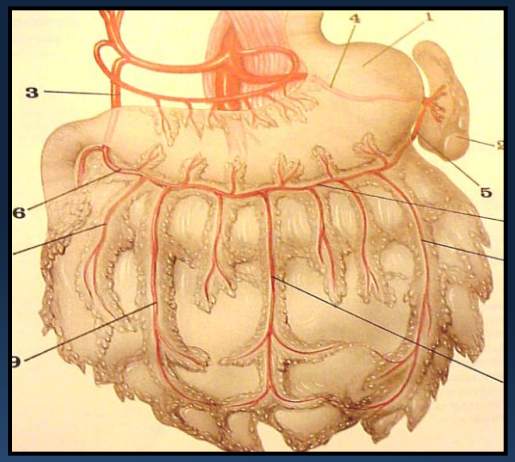
Stricture rate

- No stent 33%
- Stent < 10% (p=0.571)

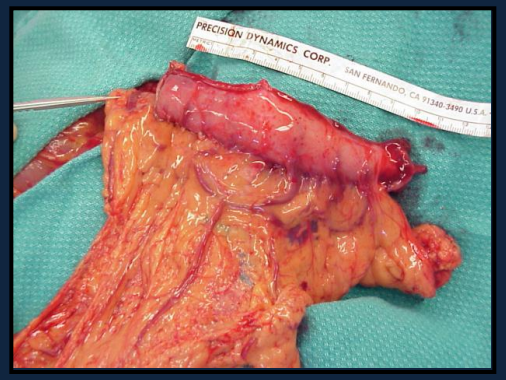


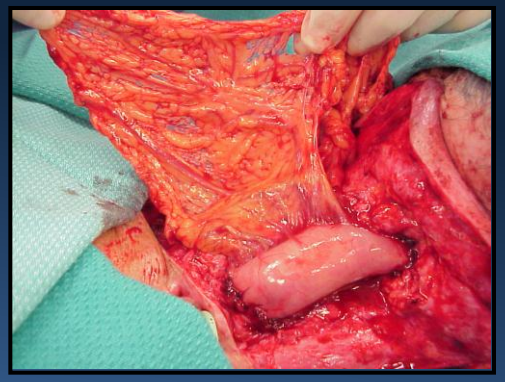
Most commonly used flap in our centre for repair of total circumferential defects

Gastro-Omental Flap



In salvage pharyngectomy following organ preservation therapy in good performance patients.



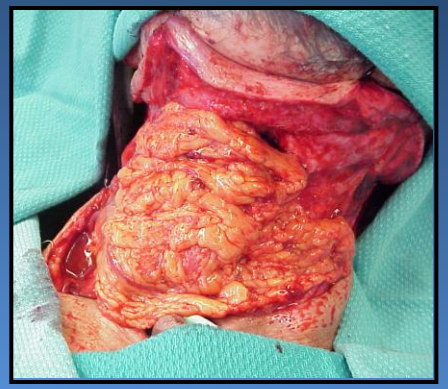


Advantages

- One Stage, Low Morbidity
- Unlimited tube diameter,
- Swallowing
- Speech
- Harvest with Omentum

Disadvantages

- abdominal harvest, mucoid secretions



Options in Pharyngeal Reconstruction

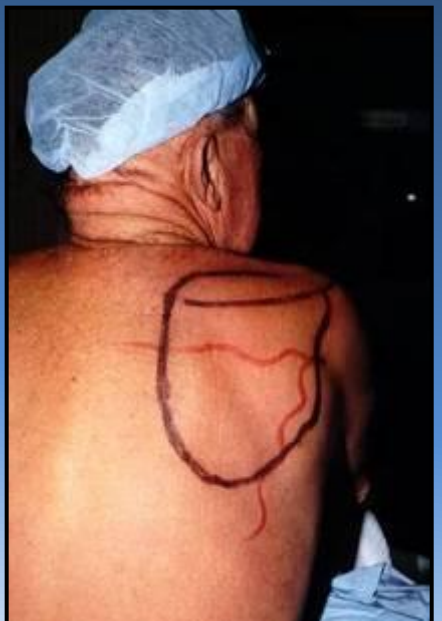
Flap Selection	Speech	Morbidity
Anterolateral Thigh + Stent	+++	**0**
Forearm + Stent	+++	**0**
Free Gastro-Omental	+++	+
Free Jejunum	+	+
Gastric Pullup	**0**	++++

Major Soft Tissue Defects - Flap Selection

- Local Flaps
- Regional Flaps
- Free Tissue Transfer
  - Radial Forearm Flap
  - Anterolateral Thigh Flap
  - Latissimus dorsi
    - Area … scalp
    - Atrophy and advantage
  - Scapula
    - Color match
    - Position
  - Rectus abdominis
    - Good hole filler
    - Muscle atrophy

Free Scapular Osseocutaneous Flap

High grade fibrosarcoma treated with pre-op radiation and surgery at 6 weeks

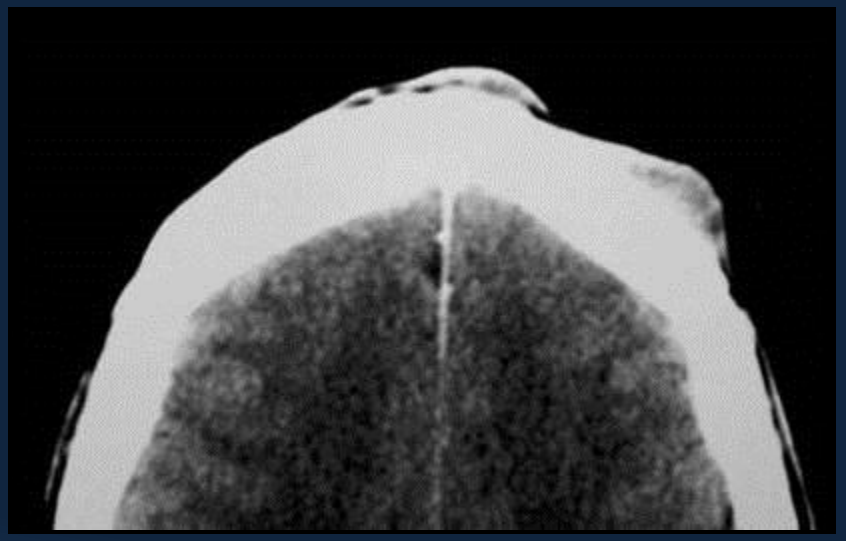


Acceptable colour match

4 months post-op

3 years post-op

Recurrent high grade Fibrosarcoma



Preoperative Radiation
60 Gy in 6 weeks

Total Scalp Resection

Latissimus Dorsi Myogenous Flap Elevation

Repair - Bi-lateral Latissimus Dorsi Free Flaps and Meshed Skin Graft

2 weeks post op

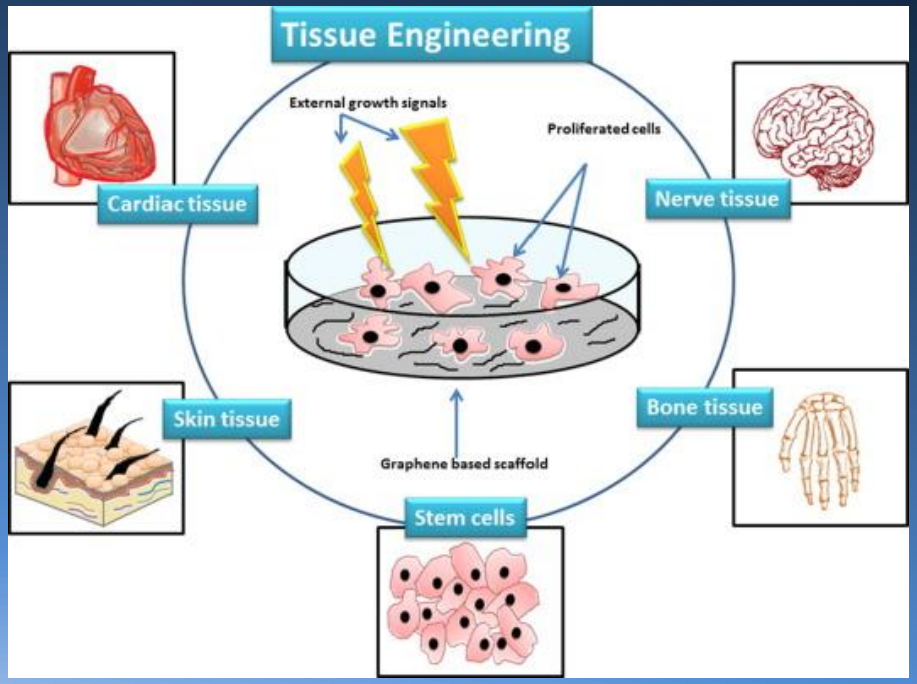
6 months post op

2 years post op

Zhong T, Gullane PJ, Neligan PC: Bilateral Latissimus Dorsi Flaps for Reconstruction of Extensive Scalp Defects. Cdn J of Plastic Surgery Vol 11: 1-4, 2003

The Next 50 Years

- Transplantation
- Robotics
- Tissue Engineering
- Image Guided Targeted Surgery



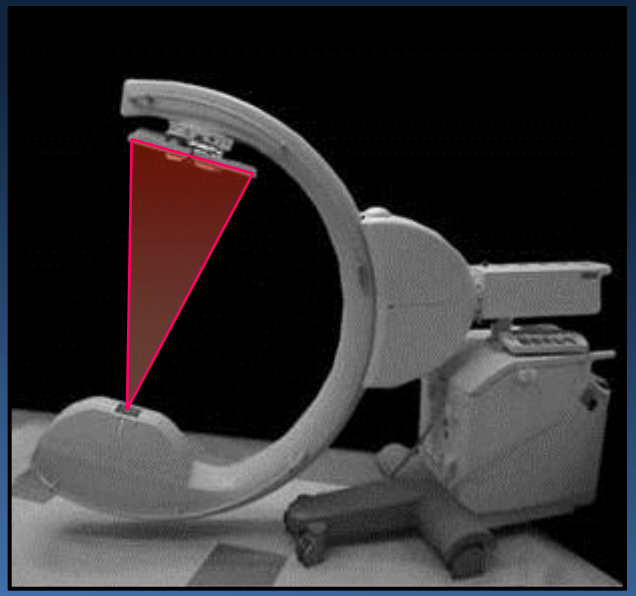


Image Guided Surgery
vs
Intraoperative Image Acquisition Surgery

The Options in Tissue Engineering

Cell Therapy

In Vivo

Cells

Signal Molecules

Scaffolds

Tissue Engineering

In Vitro

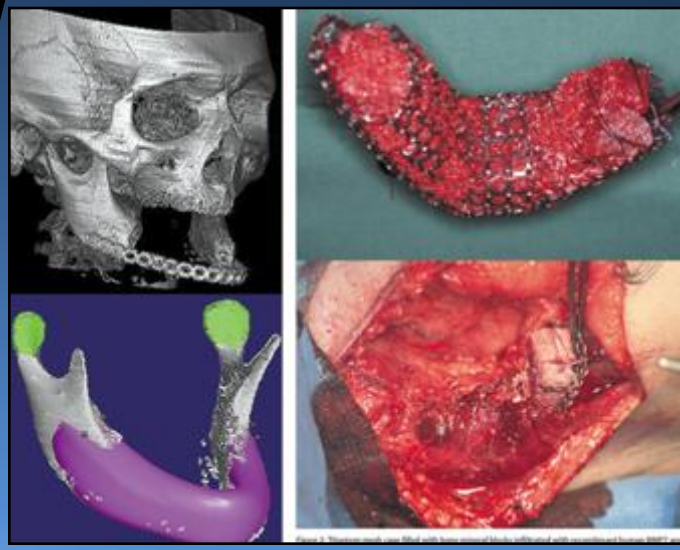
Tissue Regeneration

Tissue Regeneration

Tissue Regeneration

In Vivo

Prefabrication of Mandible
Warnke et al



2018

Conclusions

- Goals
- Principles
- Simple to complex
  - Reconstruction ladder
- Future