Free Flap Reconstruction in Head and Neck Surgery – HA's experience

HA Convention 2016

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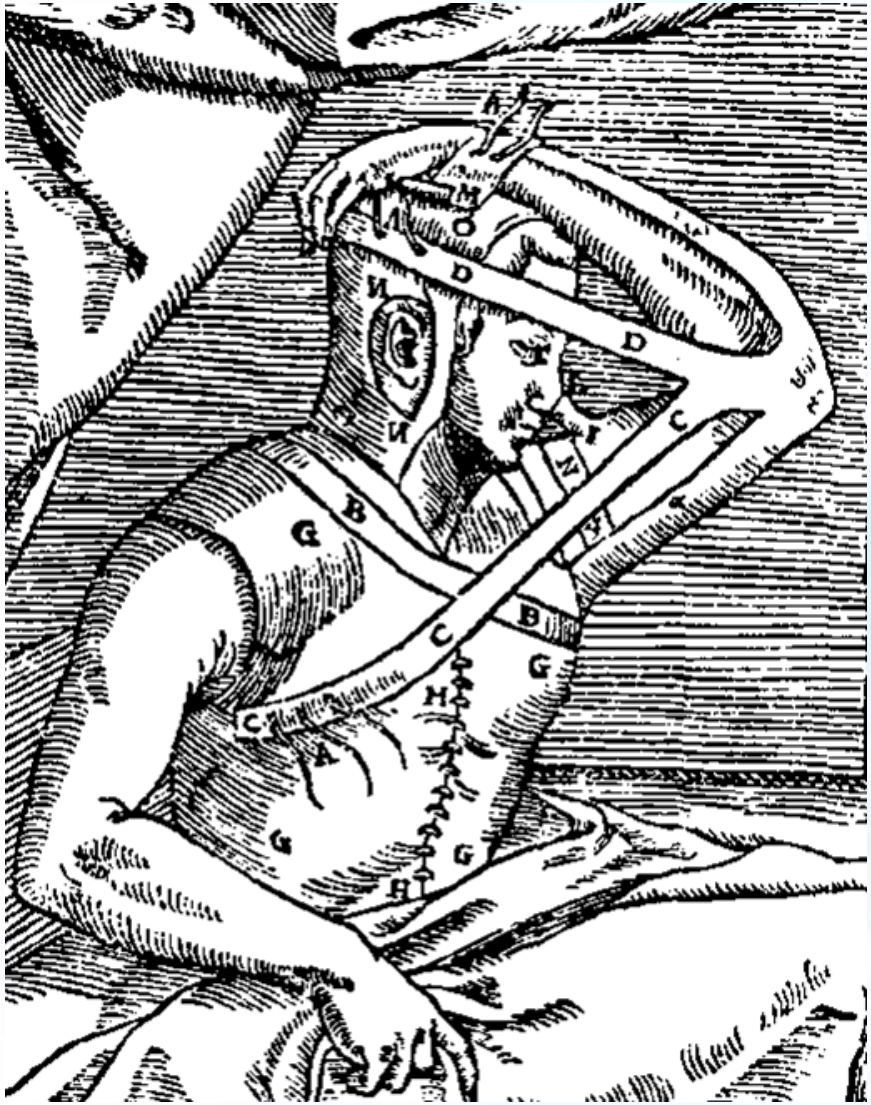
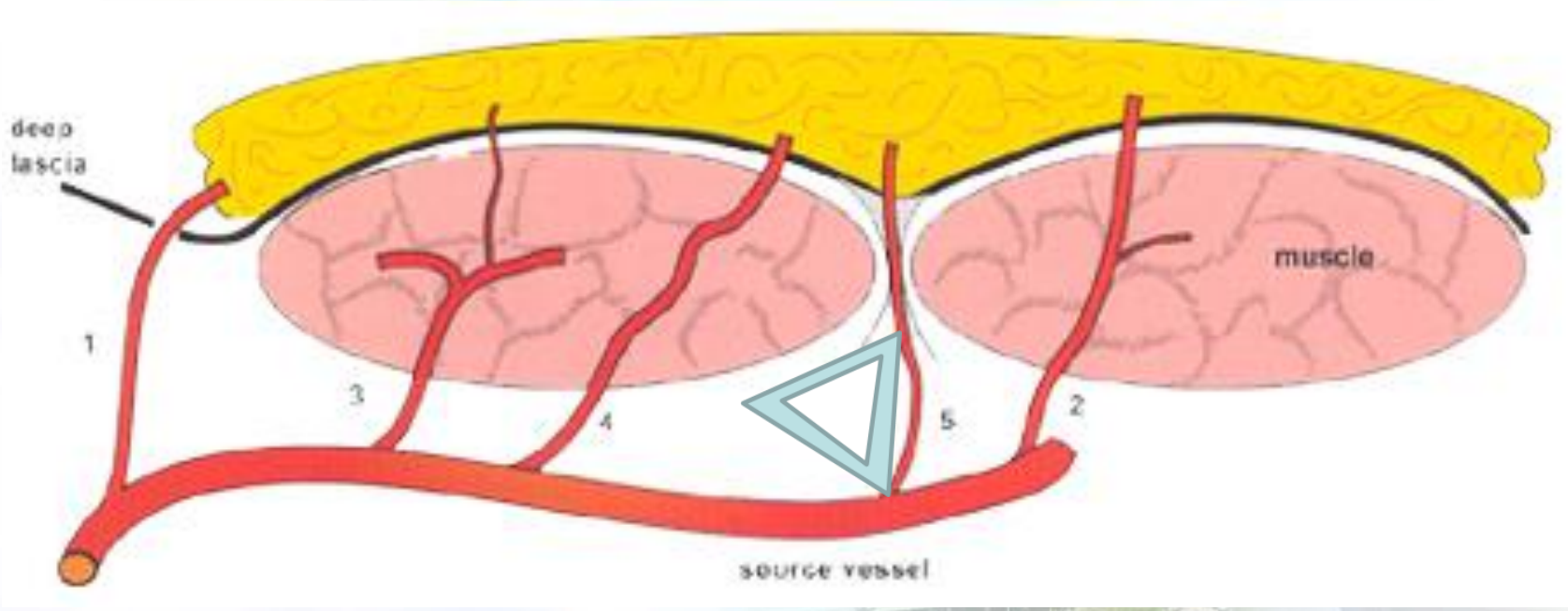


Gaspare Tagliacozzi (1545-1599)

- Published in 1597
- Pedicle arm flap for nasal reconstruction

Free Flap



Koshima and Soeda in 1980s

History of free flap transfer

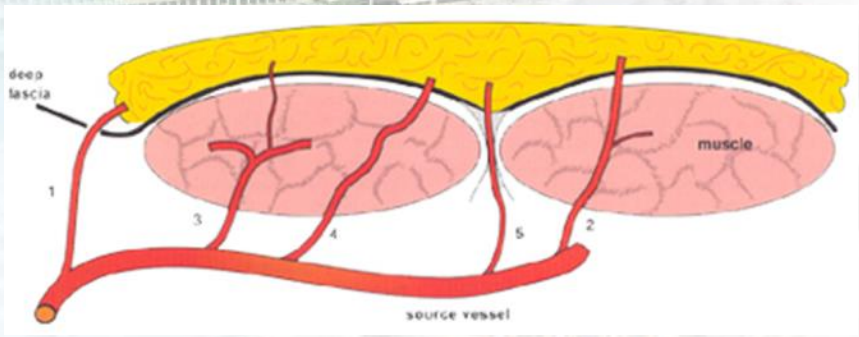
- *The first fully successful free flap - omental free flap by McLean and Buncke in 1970*
- *Daniel and Taylor reported transfer of the first groin flap, 1973*
- *1980s – rapid progression with increasing complexity and improvement in successful rate.*
- *late1980s-90s – perforators flaps & free style flaps*

ALT Flap –Song in 1984

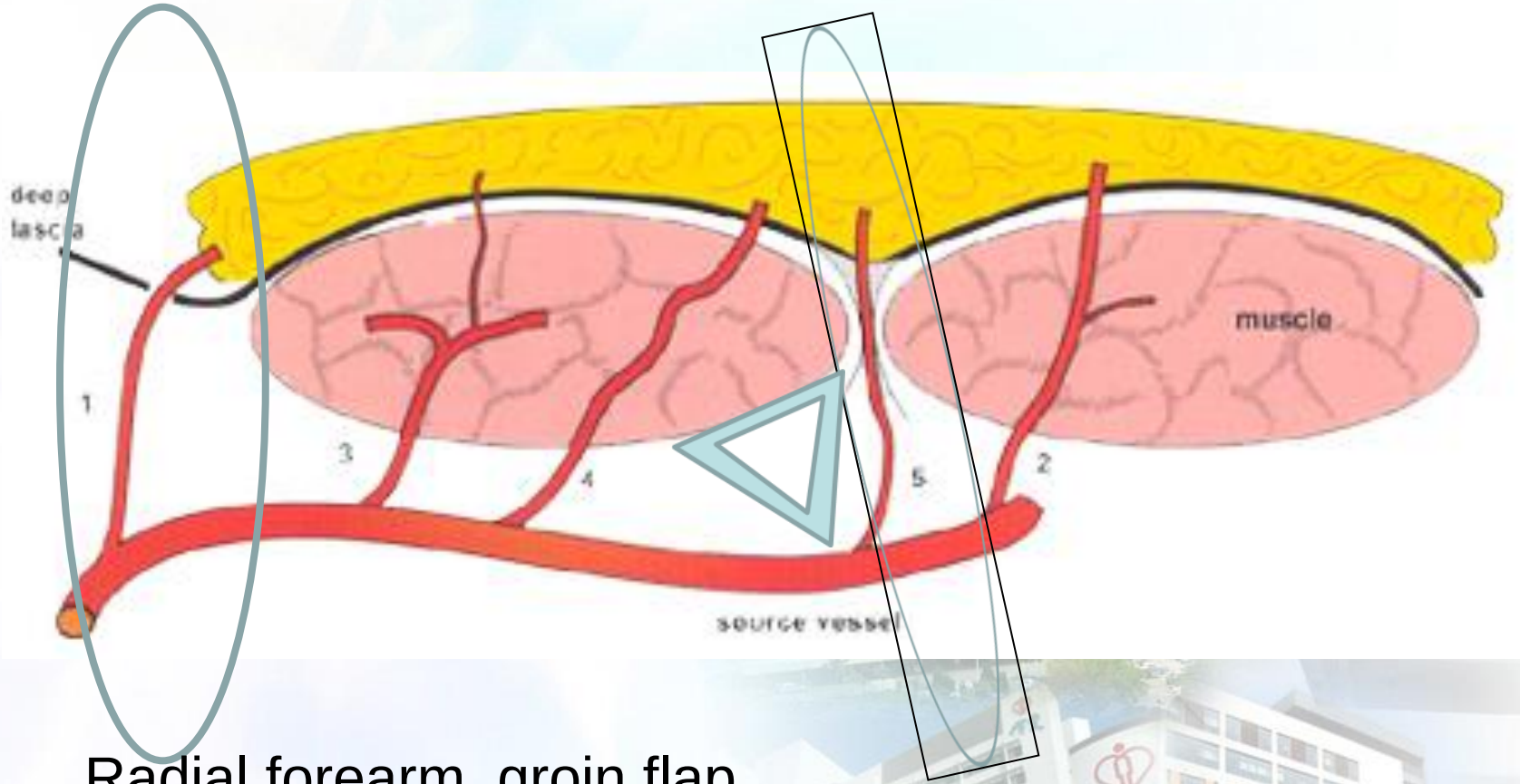
Fibula Flap

– Taylor et al in 1975

First fibula for mandibular reconstruction – Hidalgo in 1989

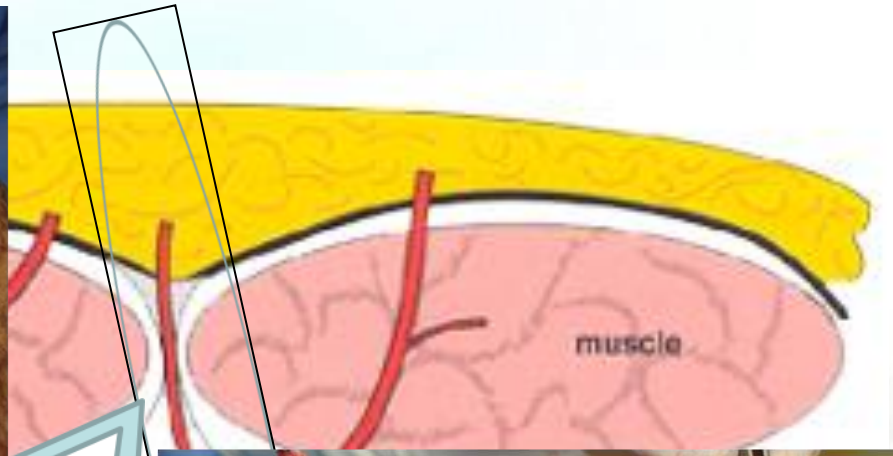


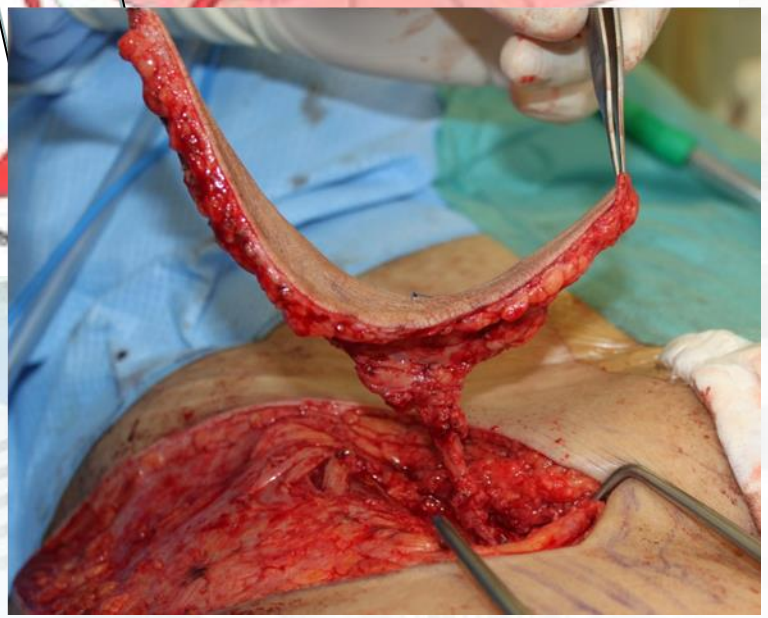
Fasciocutaneous flap



Radial forearm, groin flap

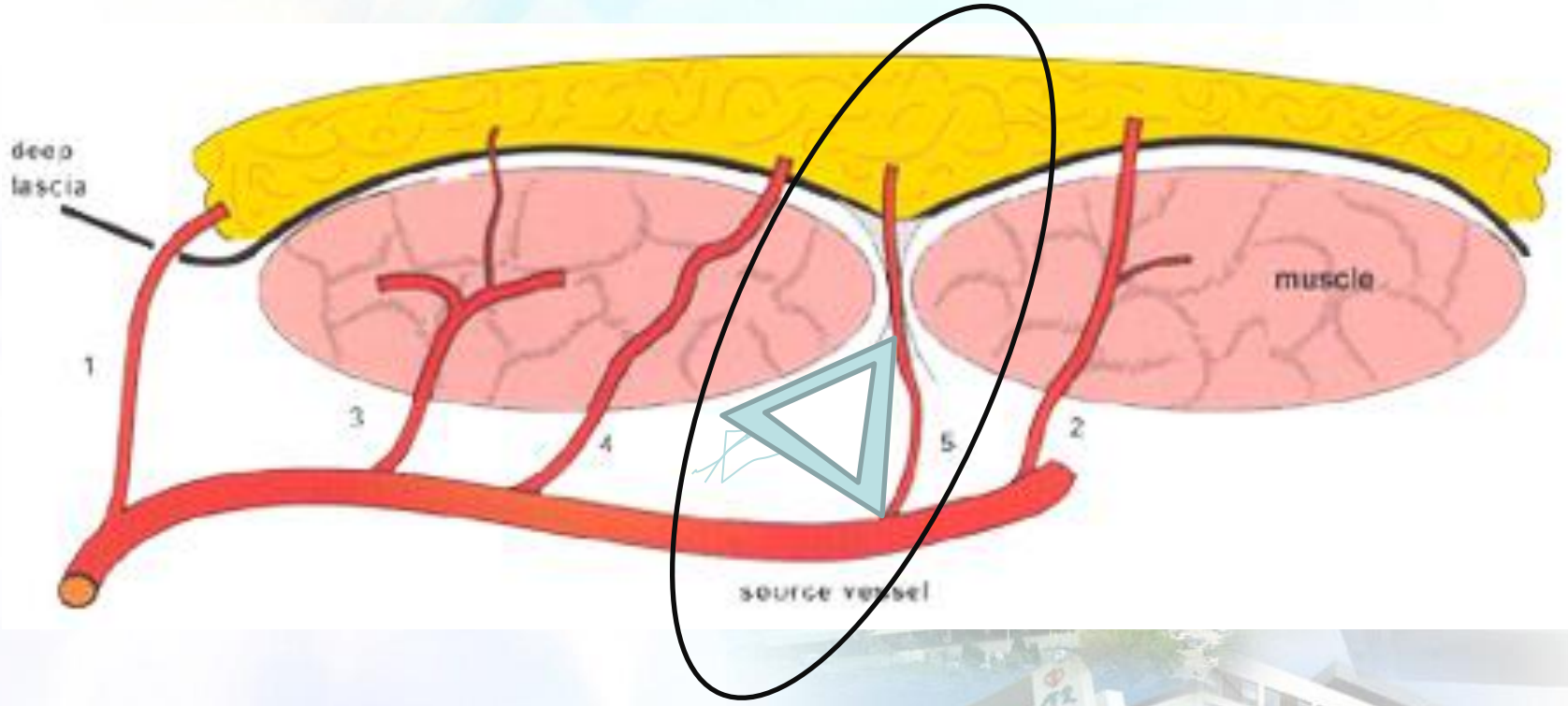
Fasciocutaneous flap





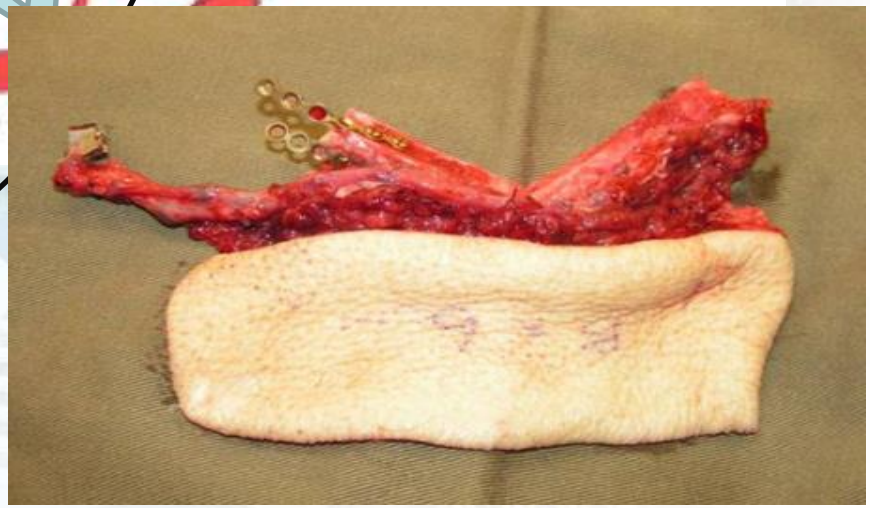
Radial forearm, groin flap

Osteocutaneous flap



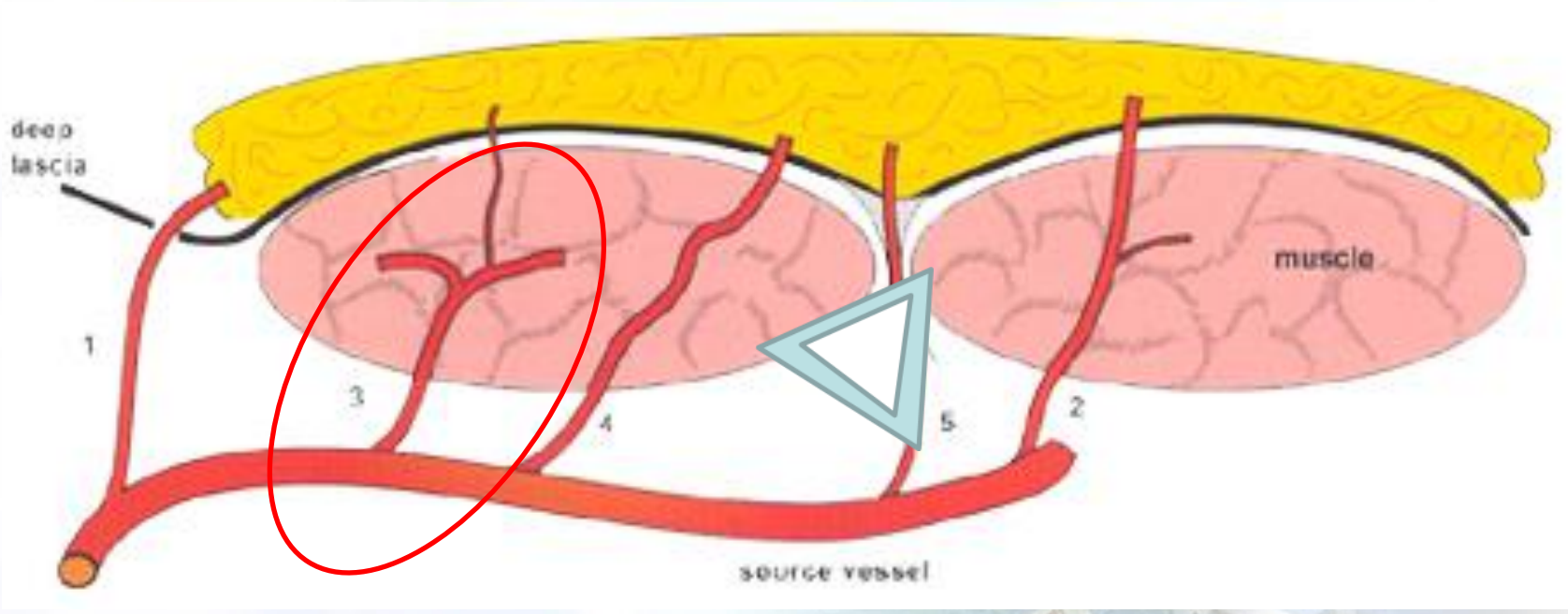
Fibula Flap

Osteocutaneous flap



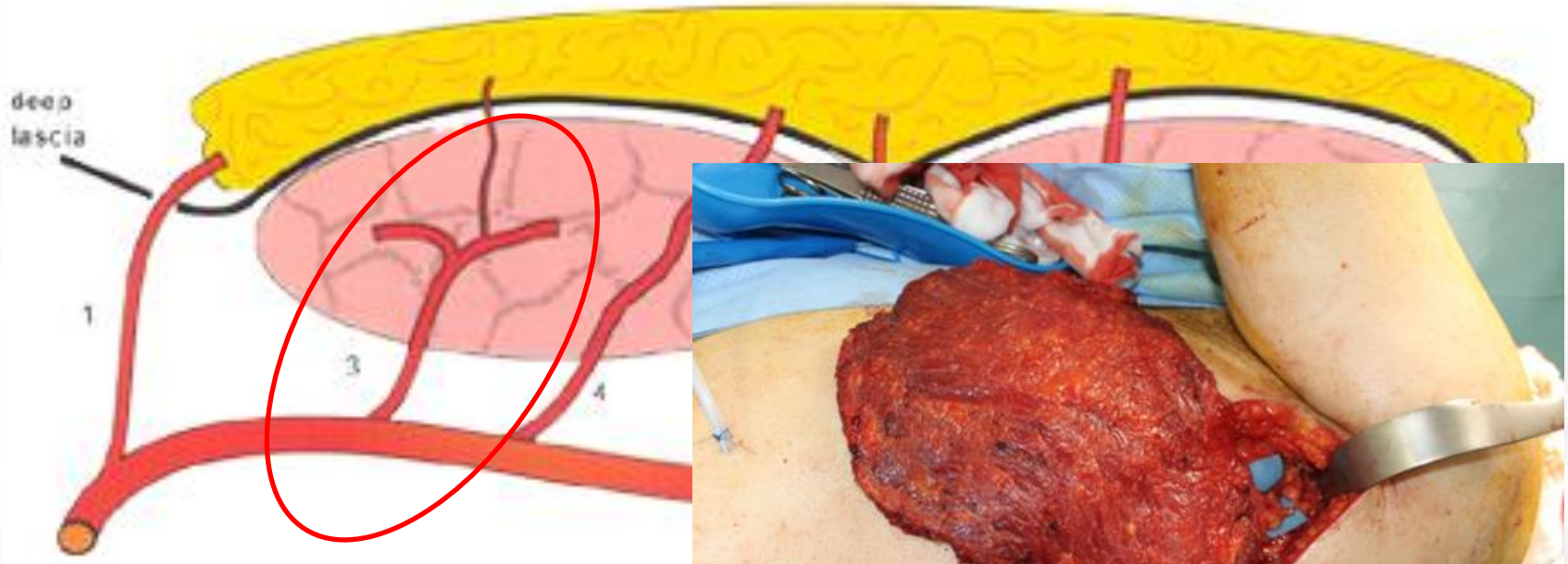
Fibula Flap

Muscle only flap



Latissimus dorsi (LD)
Vartus lateralis Flap

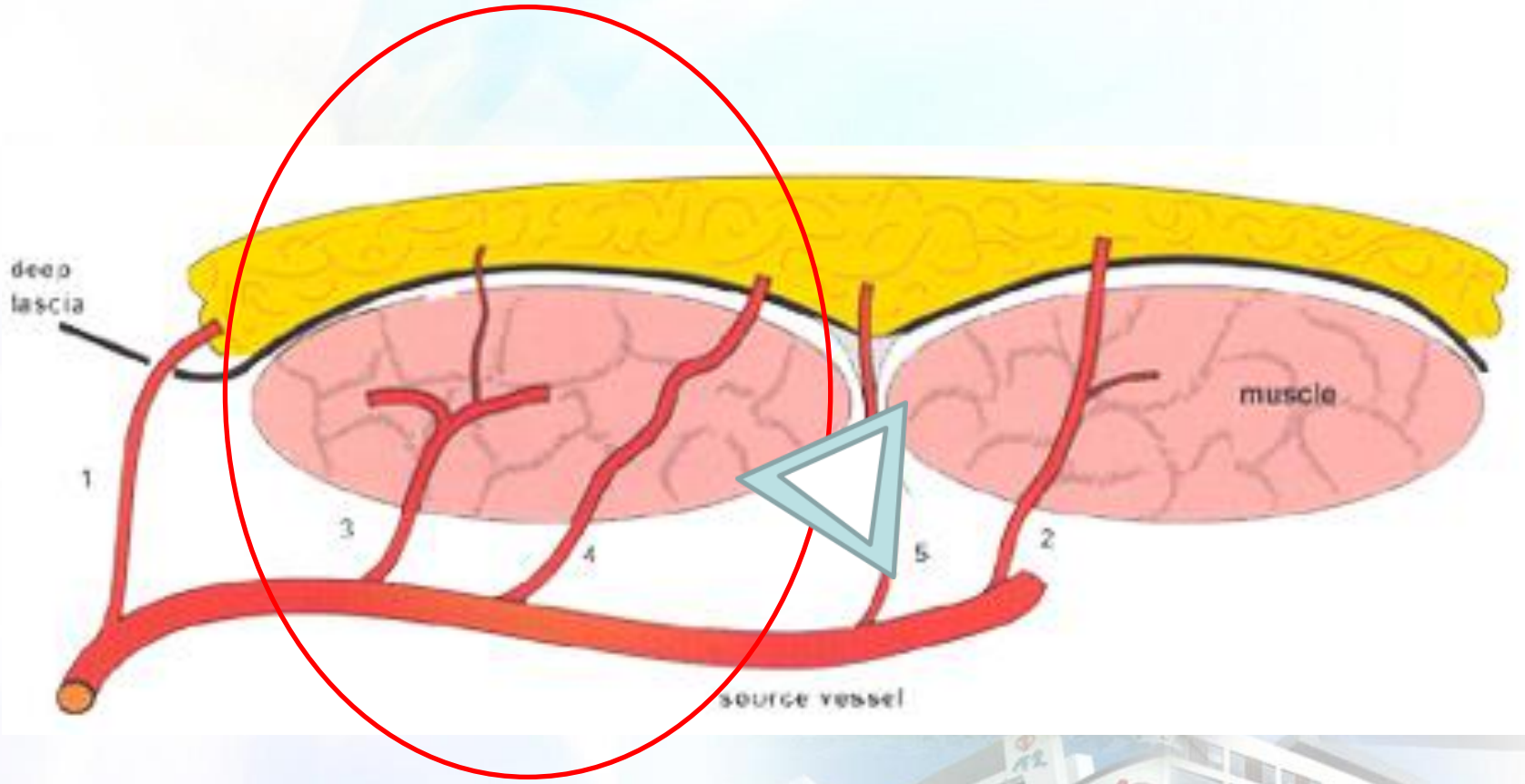
Muscle only flap



Latissimus dorsi (LD)

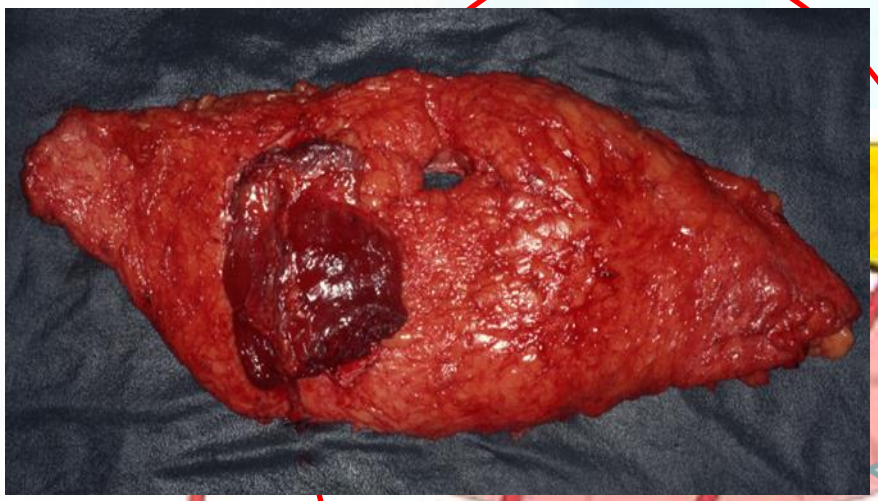
Vartus lateralis Flap

Myocutaneous flap



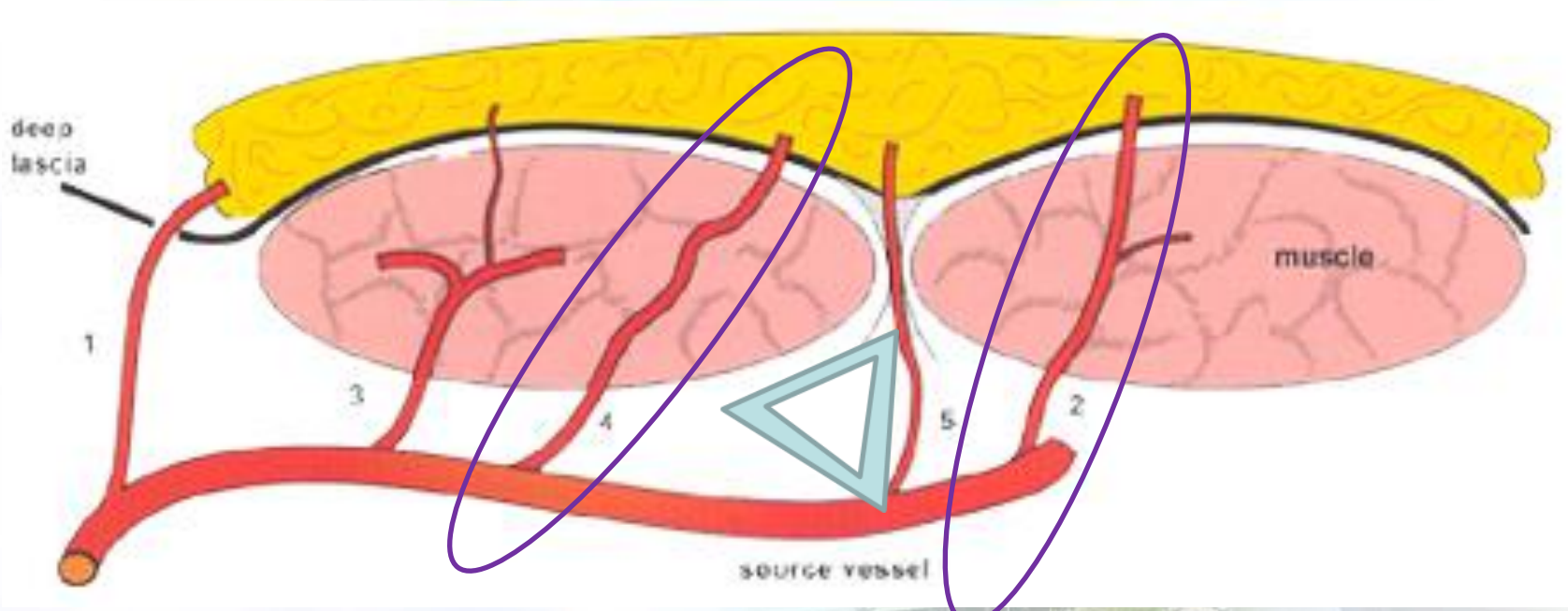
VRAM, TRAM / msTRAM,
LD Flap

Myocutaneous flap



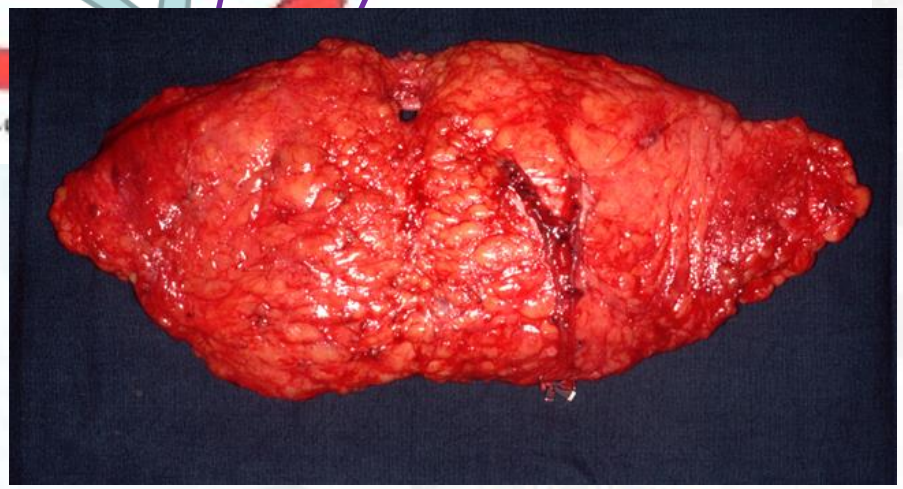
VRAM, TRAM / msTRAM,
LD Flap

Perforator flap



ALT, Medial Sural,
DIEP Flaps

Perforator flap

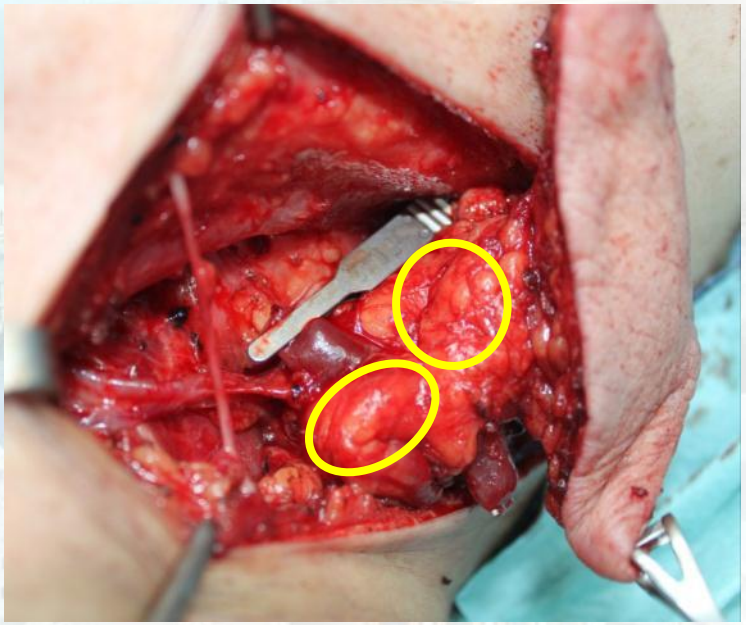


ALT, Medial Sural,
DIEP Flaps

Visceral / Lymph Node Flap

- Free Jejunal flap

- Free lymph node flap



Reconstruction	Total	Total (%)
Head and neck (malignant)	504	86.10%
Head and neck (benign)	25	4.30%
Breast (primary reconstruction)	20	3.40%
Breast (secondary reconstruction)	3	1%
Burns	18	3.10%
Upper limb	1	0.20%
Lower limb	9	1.50%
Trunk	3	1%
Transsexualism	2	0.30%
Total	**585**	

SOMIP review Data : 7/2009-6/2013

Head and Neck Cancer

- Types :
  - Nasopharynx (NPC)
  - Lip, Oral cavity and Pharynx
  - H&N Skin & Soft tissue cancer

Head and Neck Cancer

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Data type: Incidence

Sex: Both

Year range: 2004-2013

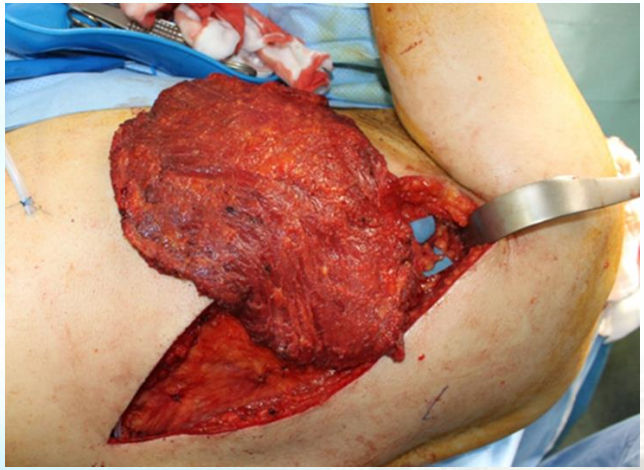
Cancer site(s): Lip, oral cavity and pharynx except nasopharynx

Standard population used: World (WHO 2000)

No. of new cases by selected age groups

Year	0-19	20-44	45-64	65+	Age Unkn.	All Ages
2004	2	65	180	238	0	485
2005	5	61	166	228	0	460
2006	2	55	186	227	0	470
2007	3	54	208	217	0	482
2008	5	49	215	261	0	530
2009	2	70	227	212	0	511
2010	1	48	255	237	0	541
2011	2	48	269	220	0	539
2012	2	58	242	245	0	547
2013	1	62	273	311	0	647
Average	3	57	222	240	0	521

Scalp Angiosarcoma



Head and Neck Surgery

- Quality of life after Head & Neck surgery (malignant / locally aggressive benign)

- Significant impairment
  - Functional
    - Articulation & Speech
    - Chewing & Swallowing
    - Upper Airway
  - Cosmetic appearance

Head and Neck cancer reconstruction

- Repair Defect
- High complexity with multiple functions – speech, swallowing, breathing
- Aerodigestive Tact contamination
- Appearance
- Primary healing
- Restoration / Preservation of functions
- Separate contaminated site with vital structure
  - e.g. carotid, jugular, nerves, intracranium
- Restore asthetically acceptable appearance

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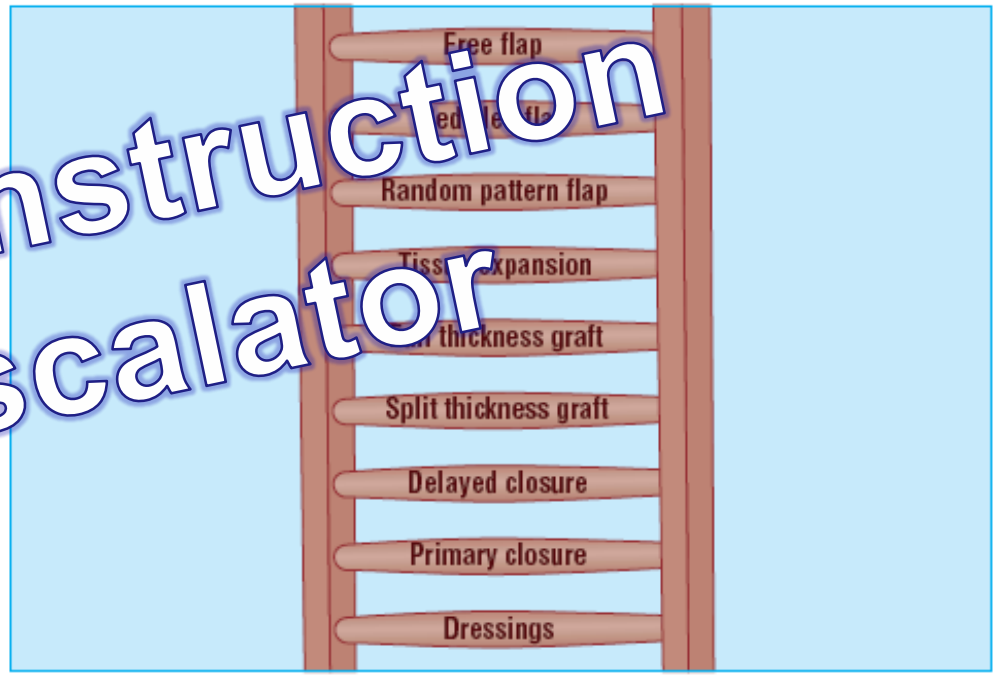
Reconstruction Ladder

- Free flap
- Pedicle flap
- Local flap
- Tissue expansion
- Skin graft
- Delay primary closure
- Primary closure
- Heal by secondary intention



The "reconstructive ladder" is used by reconstructive surgeons to assess the complexity of treatment required

Reconstruction Escalator

Functional, cosmetic & donor site morbidities

Free flap in Head & Neck

- 1st line options in most head and neck reconstructions
- Allow complex reconstruction with composite tissues transfer
- More aggressive tumour resection can be made possible
- Improve functional and cosmetic outcomes

Free flap in Head & Neck

- Free Flap
  - limited pedicle flap available, except DP, PM & LD
    - Too bulky – difficult inset : leakage / fistula
    - Limitation in the area of coverage
    - Multiple stages operation
    - Reserve for salvage when complication occur like orocutaneous fistula, flap failure
  - Combination of flaps
    - Free & pedicle flap
    - Double free flaps

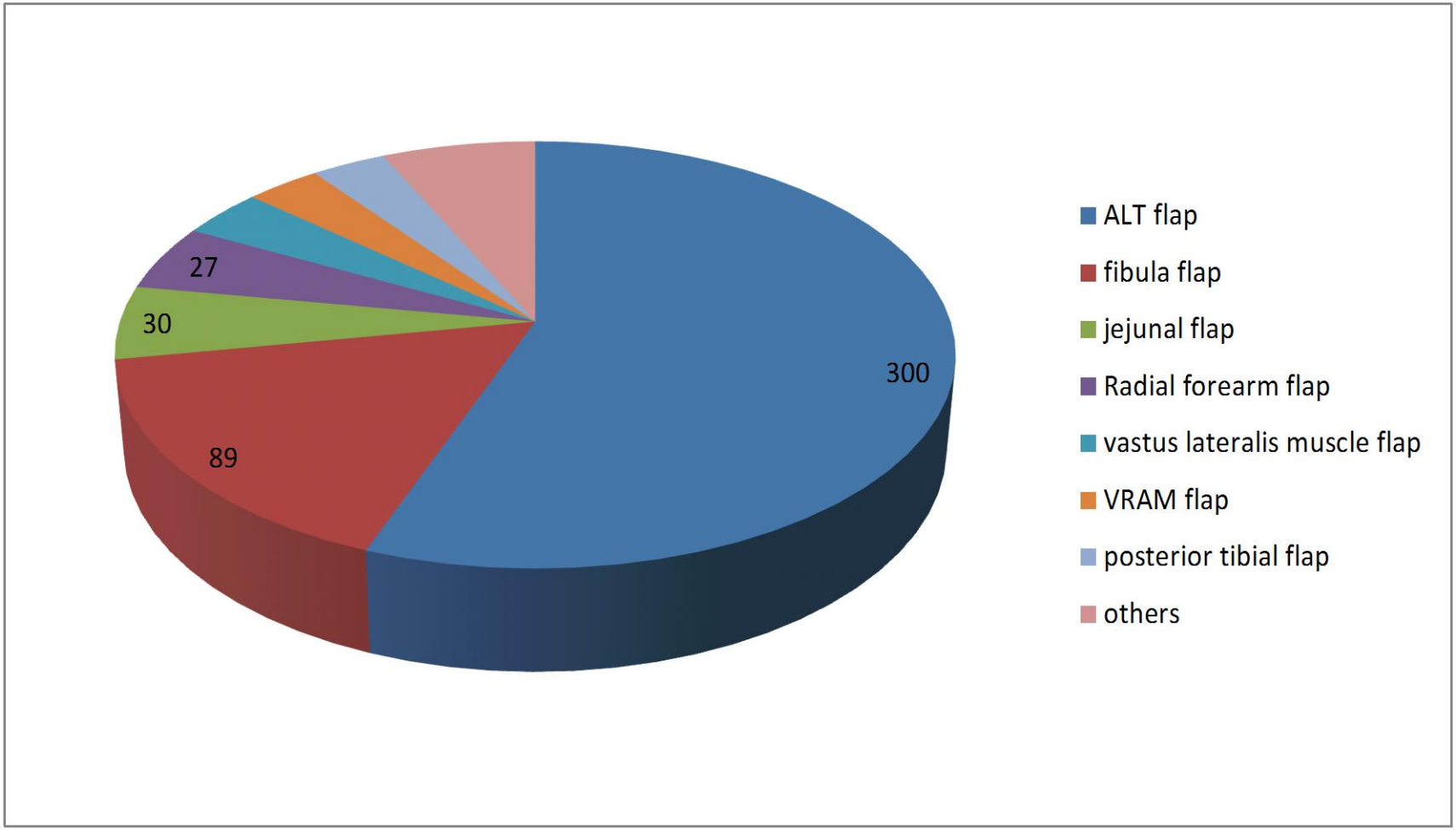
Free flap in Head & Neck

- Advantage
  - Freedom in the choice of tissue
  - Composite transfer
  - Flap inset not limited by the pedicle
  - One stage operation
  - More optimal functional and cosmetic outcome
- Disadvantage
  - Higher risk of flap failure
  - Technically demanding
  - Longer OT time
  - Rely on the availability of good recipient vessels
  - Plan of salvage

Commonly Used Free Flap

- Radial forearm – donor site morbidity
  - Medial sural perforator flap
- ALT Flap
- Fibula Flap
- Rectus Myocutaneous Flap
  (VRAM or TRAM)
- Latissimus Dorsi Flap
- Visceral flap - Jejunum

SOMIP review data 2009 -2013



Type of flap	total	Total %
ALT flap	300	55.66
fibula flap	89	16.51
LD flap	8	1.48
Radial forearm flap	27	5
VRAM flap	18	3.34
DIEP flap	2	0.37
jejunal flap	30	5.57
groin flap	3	0.56
AMT flap	5	0.93
tensor fascia lata flap	9	1.67
vastus lateralis muscle flap	20	3.71
posterior tibial flap	18	1.34
lateral arm flap	3	0.56
iliac bone	1	0.19
thoracodorsal artery flap	3	0.56
DCIA iliac flap	1	0.19
LD composite falp	1	0.19
ALT + iliac bone graft	1	0.19

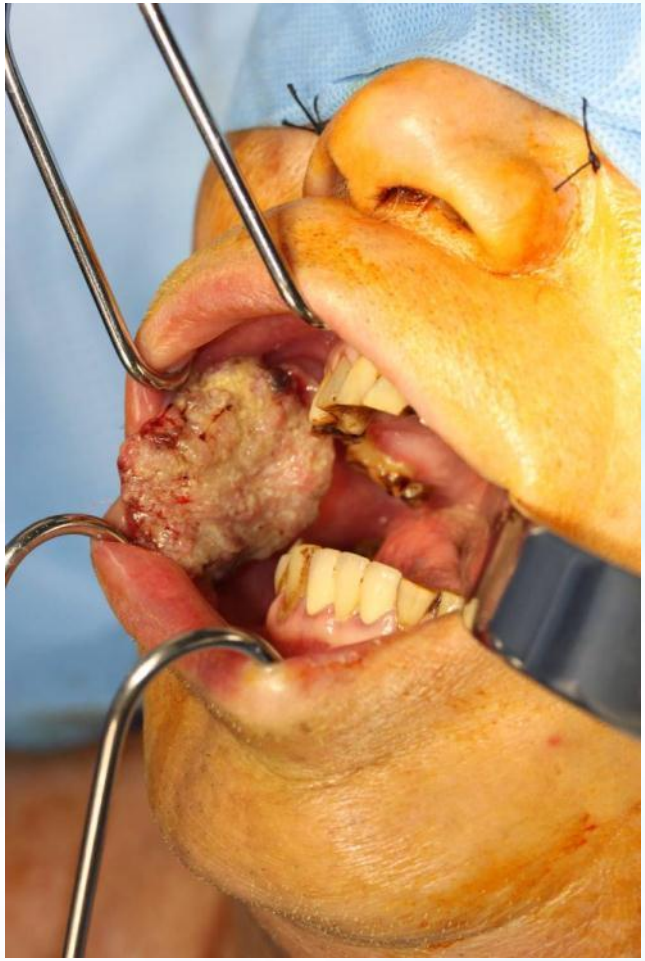
Cases illustrations

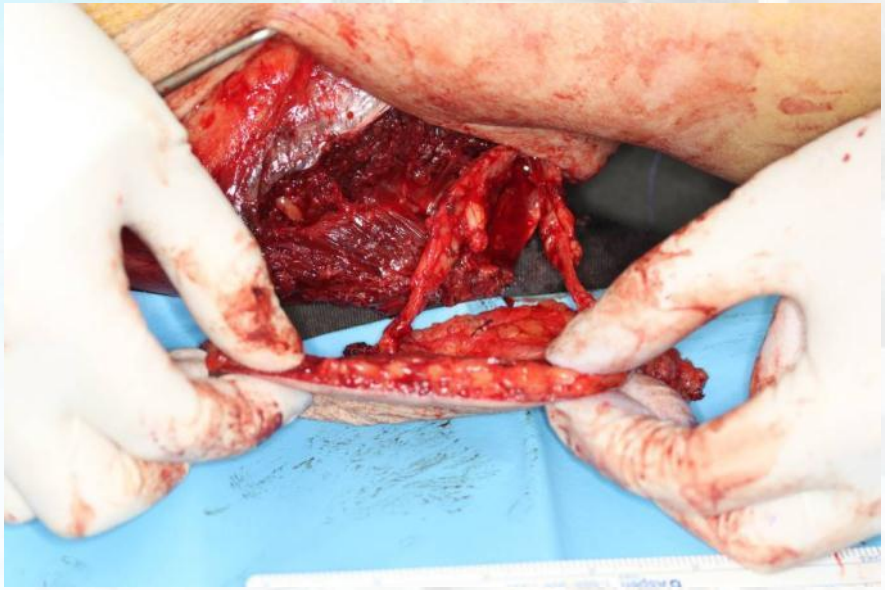
Reconstruction of buccal, tongue & pharyngeal defects

Goals of reconstruction

- Buccal mucosa :
  - Resurface
  - Prevent trismis
- Tongue :
  - Mobility of residual tongue
  - Bulk of posterior tongue
- Pharynx :
  - Restore continuity of upper digestive tract

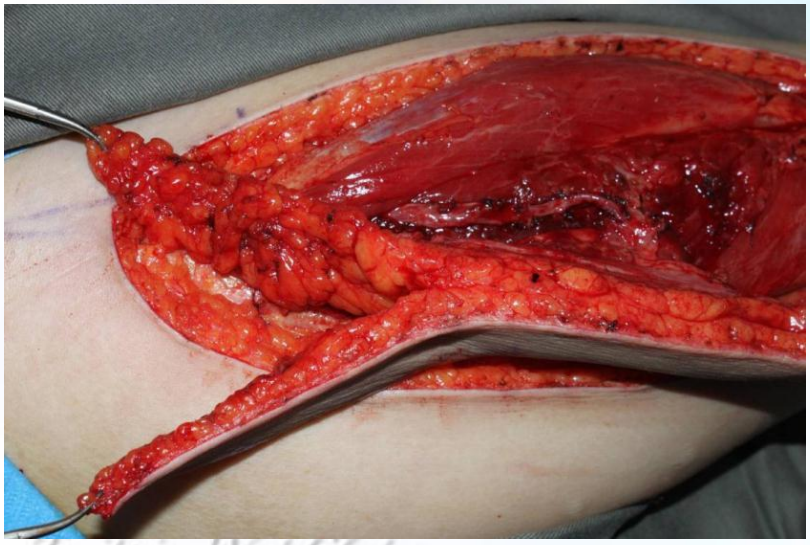
70/M CA buccal –full thickness *(medial sural flap)*

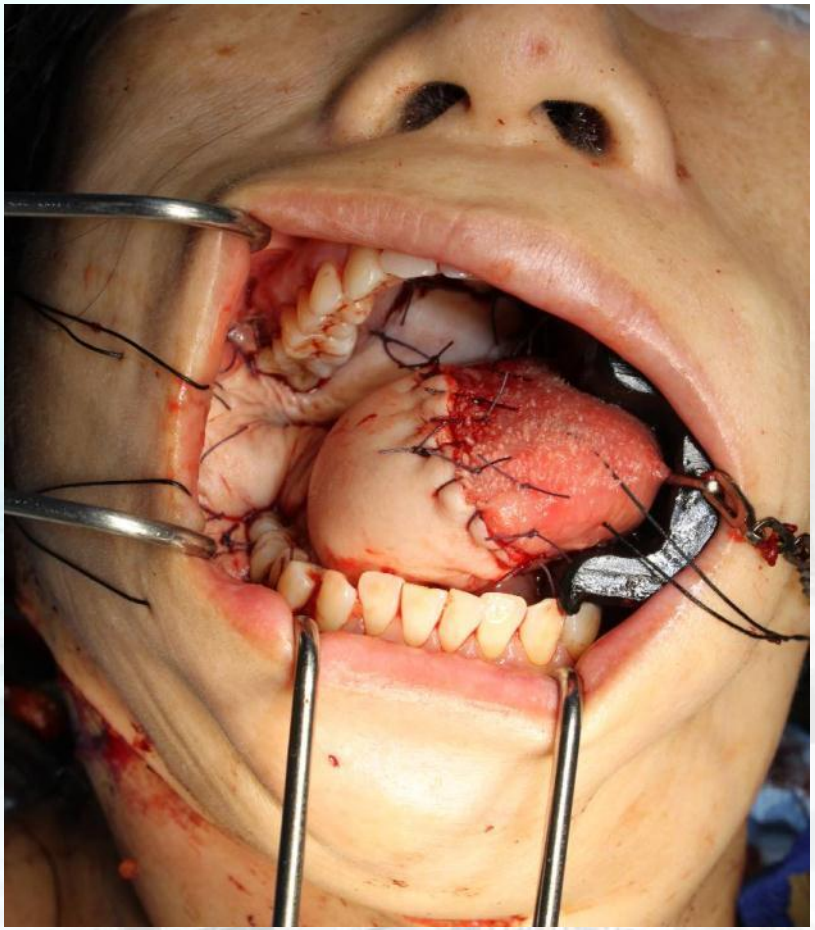




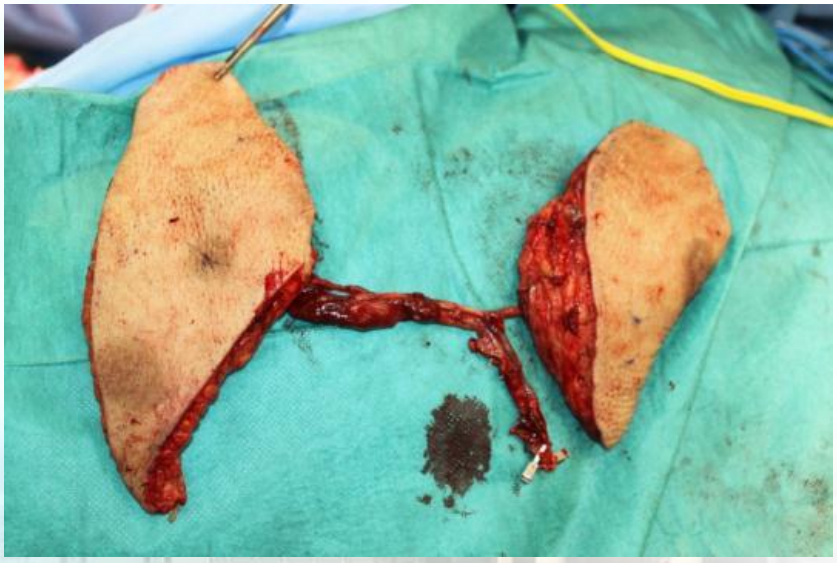

Aspen
1-888-364-7004
CM
INCHES

42/F right tongue cancer
(thinned ALT flap)

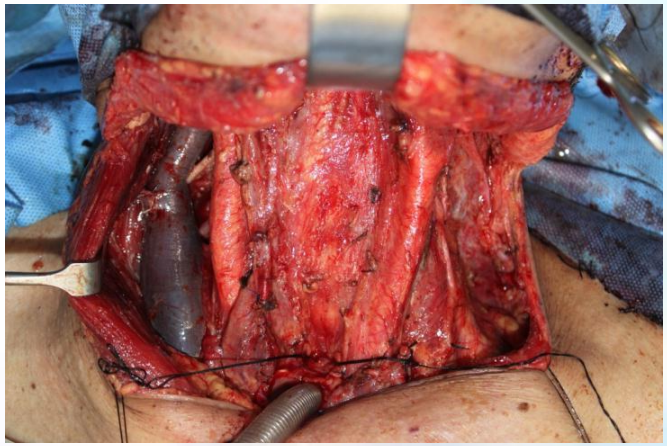


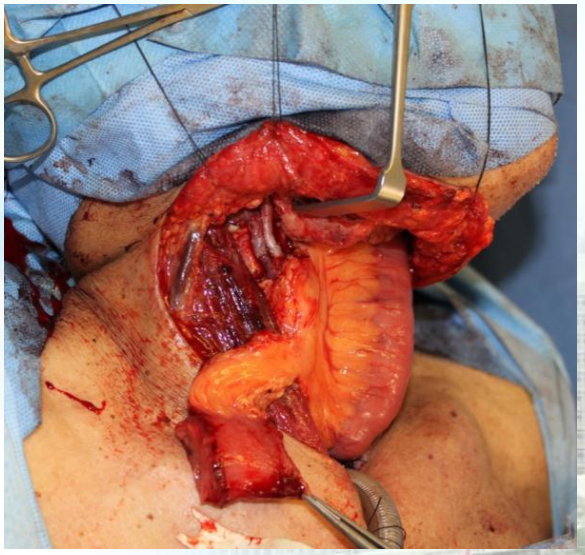


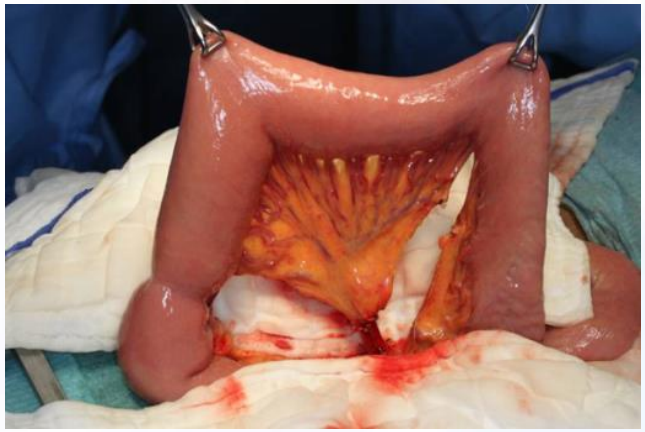
58/F, recurrent CA tongue,
(ALT flap with double skin islands)



62/M CA hypopharynx
(jejunal flap)







Cases illustrations

Reconstruction of mandibular defects

Goals of Reconstruction

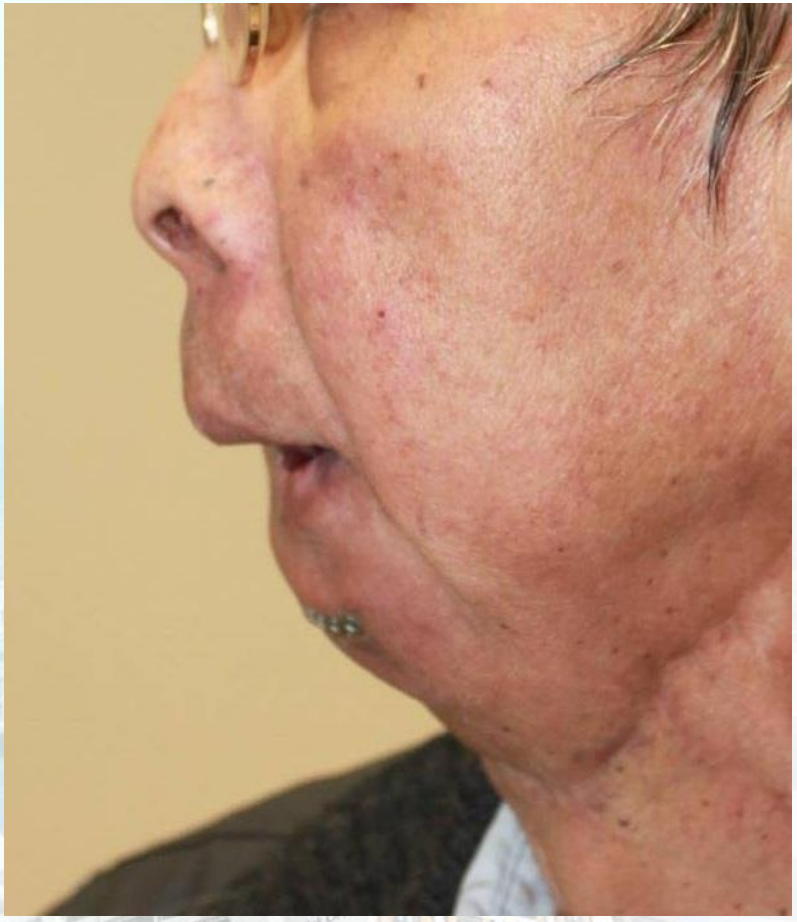
- Achieve primary wound healing
- Restore the framework and continuity of the mandibular arch
- Preserve occlusal relationship
- Mouth opening and oral sphincter function
- Maintenance of the oropharyngeal pathway and preserve mobility of tongue
- Allow dental rehabilitation

“Andy Gump” Deformity
(Anterior defect)

- *Named after a character in an early 20th-century comic strip who had an altered facial profile due to a missing lower jawbone, or mandible. The character was likely modeled after a patient who had undergone an early surgery for head and neck cancer that involved the removal of the lower jaw. Not only did patients have a different facial profile as the result of such a surgery, but they also had problems with eating and drooling*

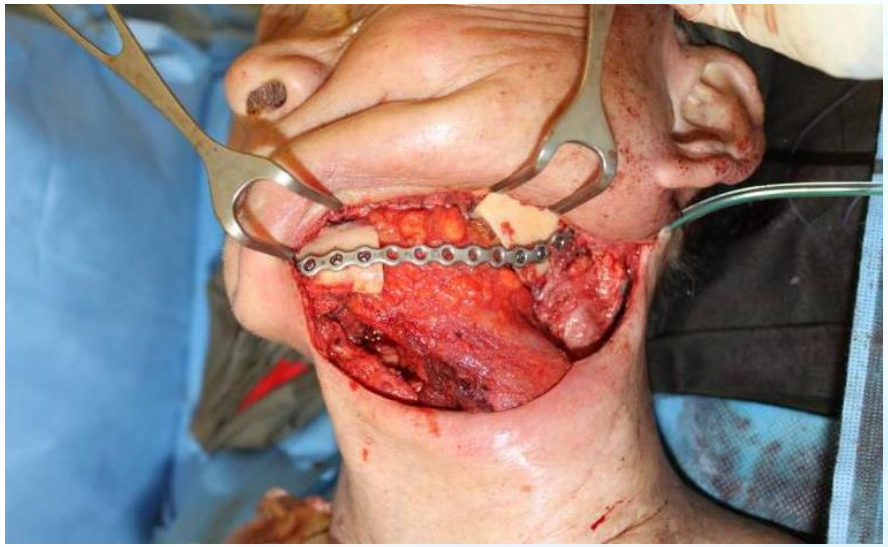
- **Reconstruction Plates + Soft tissue reconstruction**
  - Simple
  - Lateral defect
  - Not / will not have irradiation
  - Lack of long term reliability
  - Extrusion, loosening and plate fatigue

Lower Alveolus SCC



PM composite rib pedicle flap + reconstruction plate

Lower alveolus SCC



Vascularized Osteocutaneous Flap

- Free Fibular Flap
- Scapular Free Flap
- Iliac Crest (DCIA flap)

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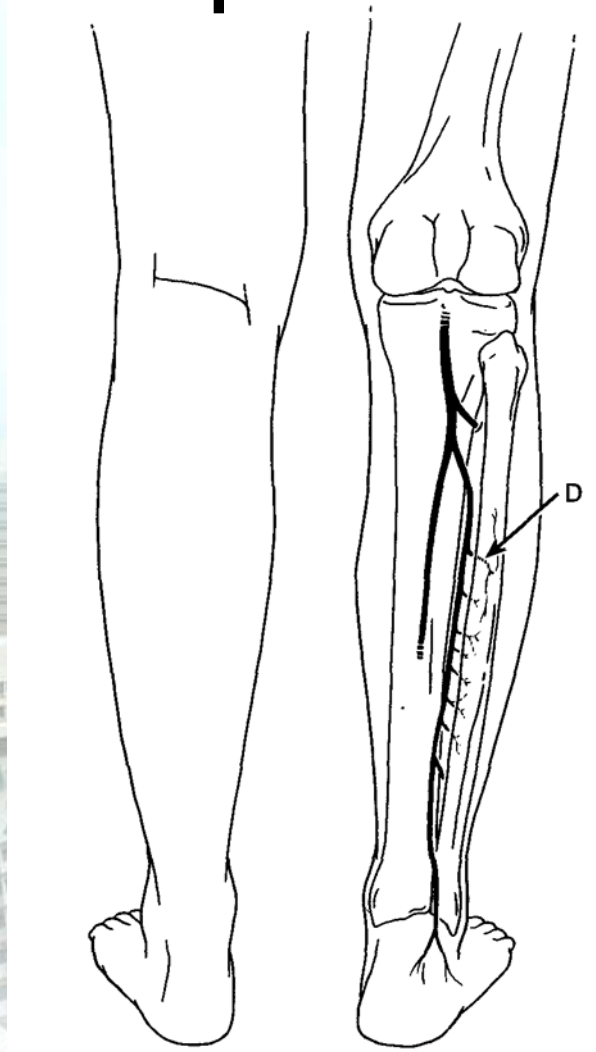
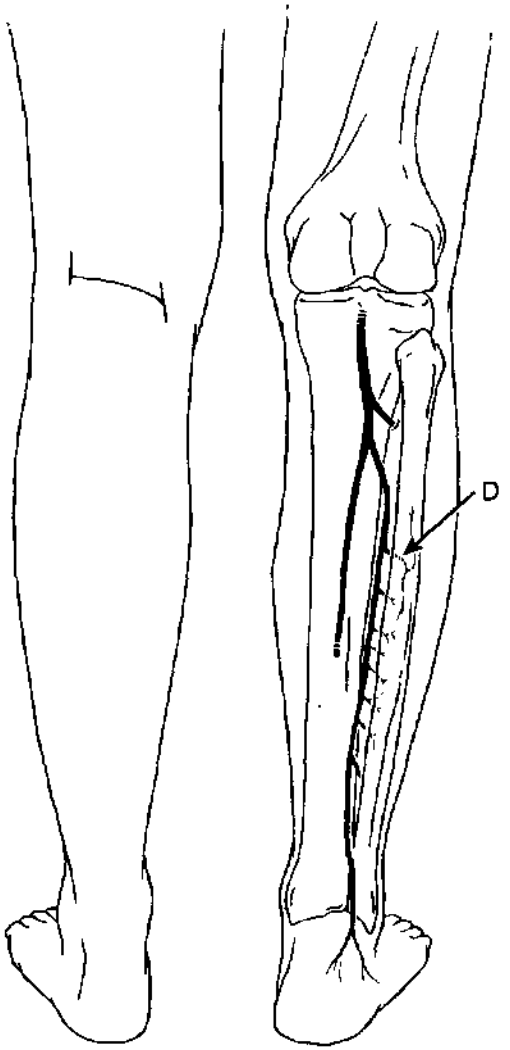
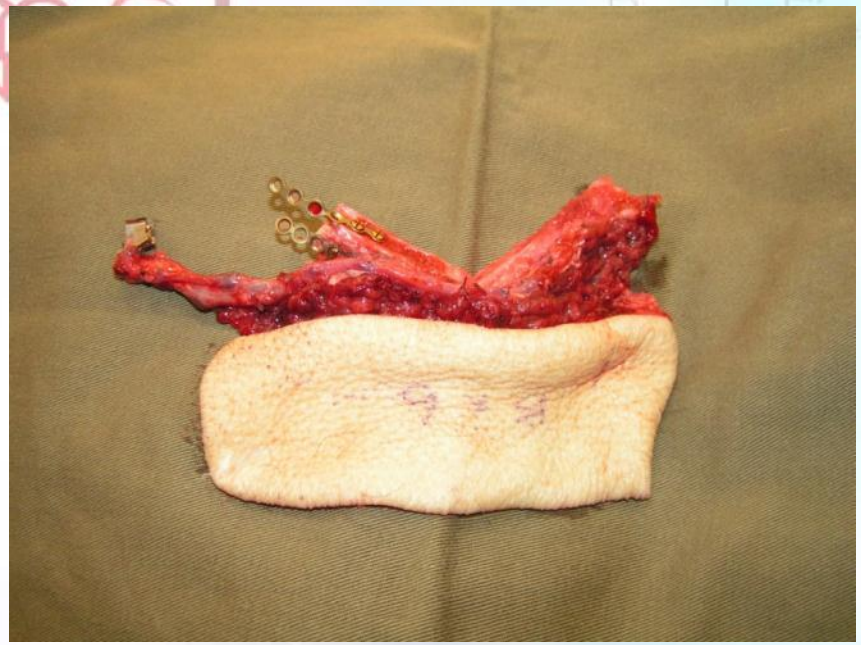
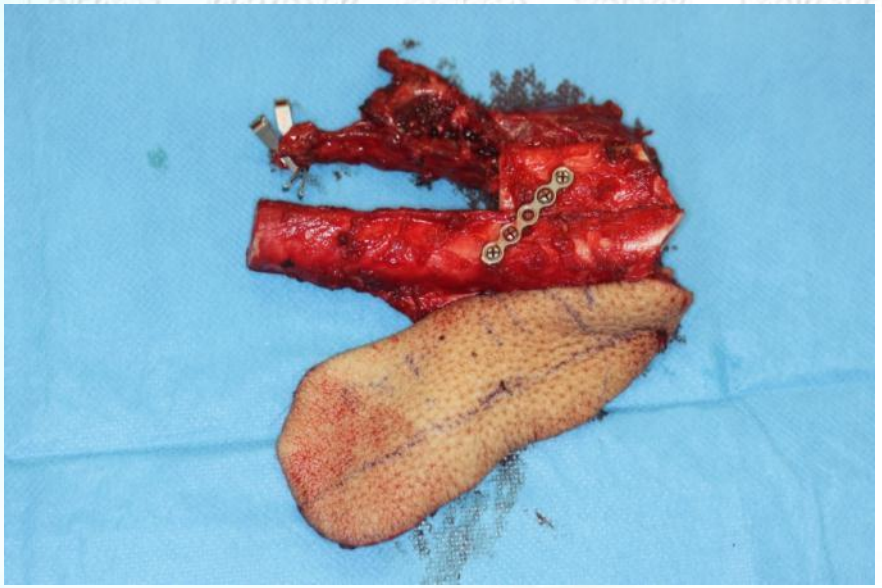


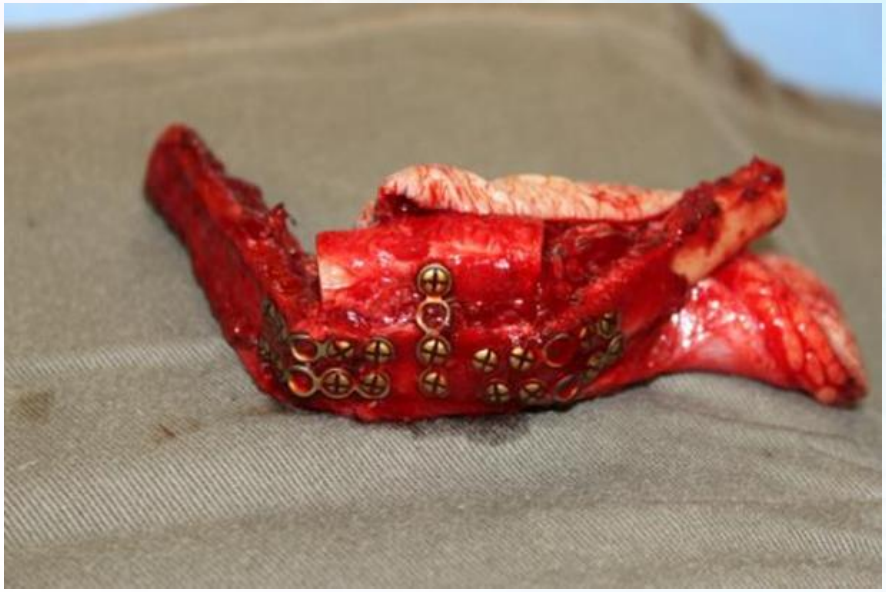
Free fibular flap

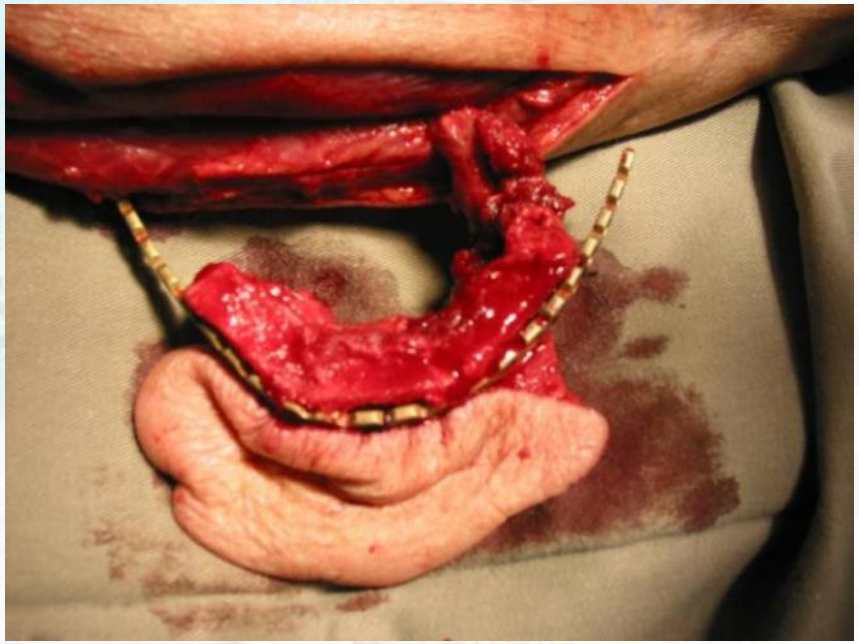
- Hidalgo, 1989
- FU-chan Wei, et al, 1994
- Peroneal vessels
- Osseous flap – bone only
- Osteocutaneous flap
  - Bone and skin island
  - For mandible and FOM/skin reconstruction







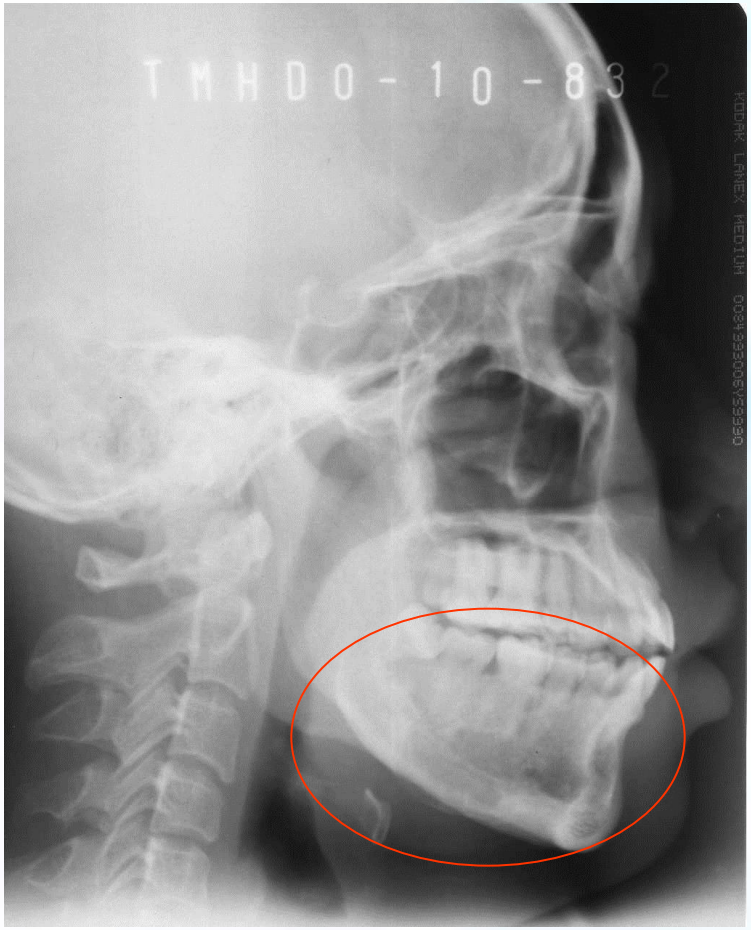


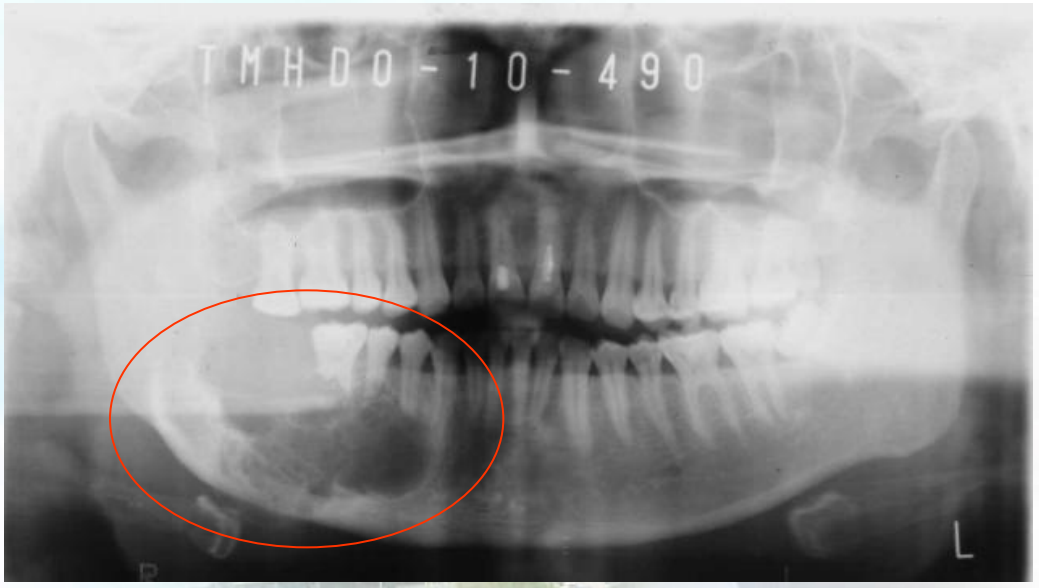


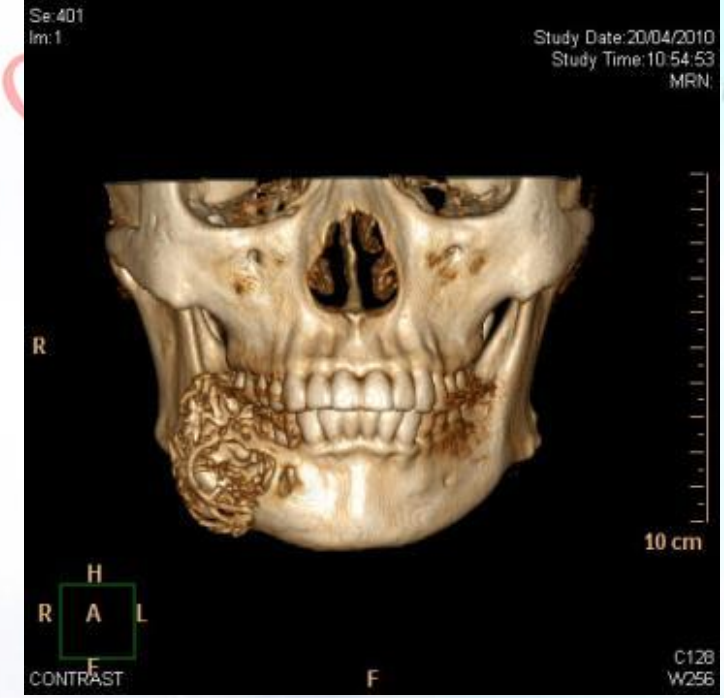
RECONSTRUCTION OF

LATERAL / HEMIMANDIBULECTOMY DEFECT

38/F Right Mandible Ameloblastoma



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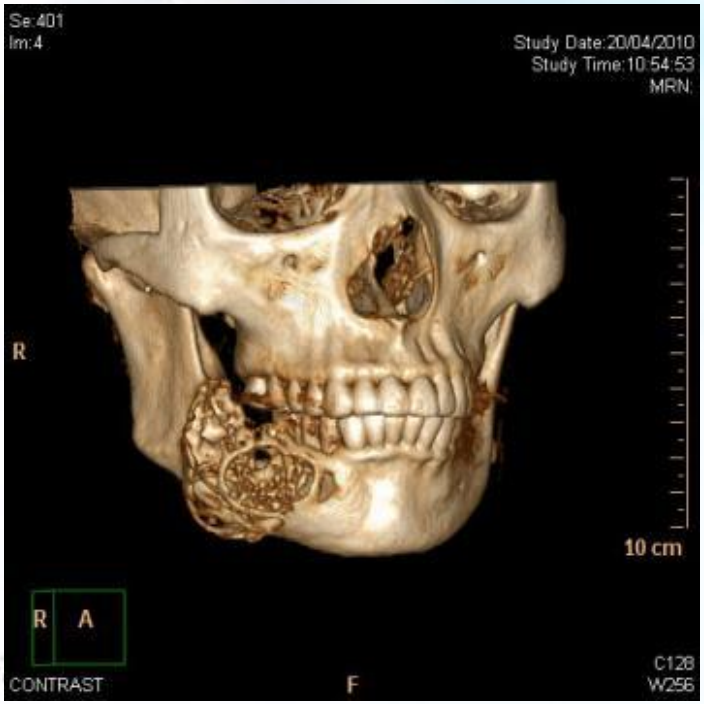
Study Time:10:54:53
MRN:
R
10 cm
H
R A L
F
CONTRAST
F
C128
W256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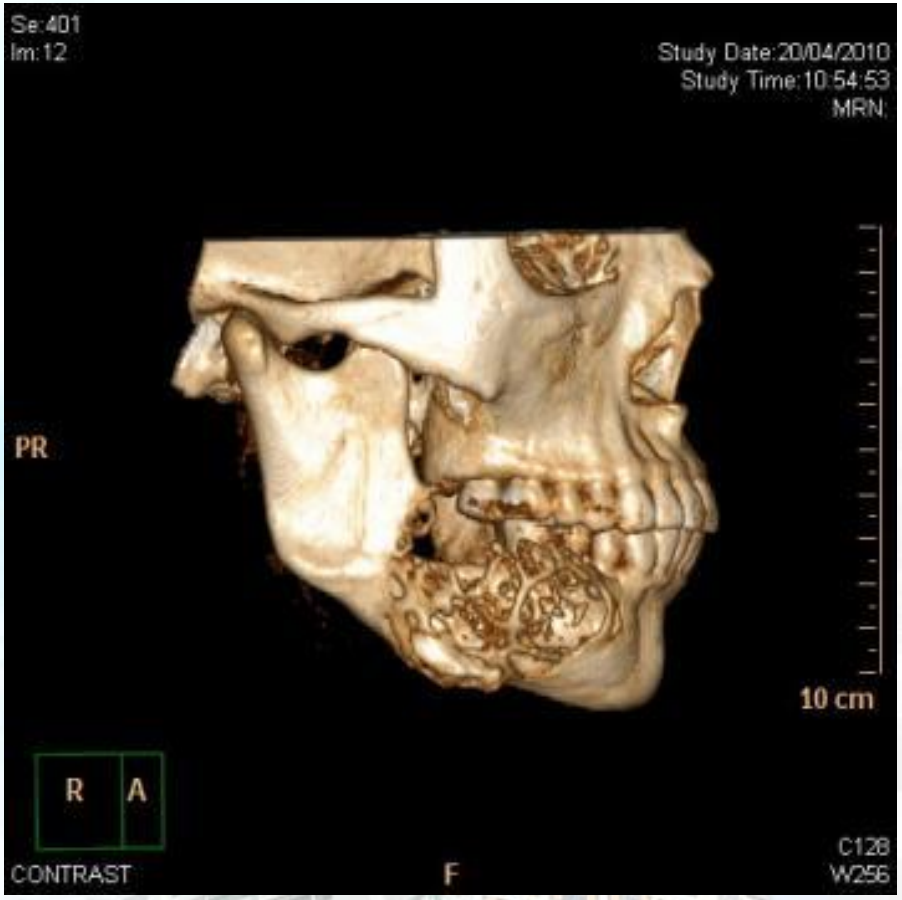
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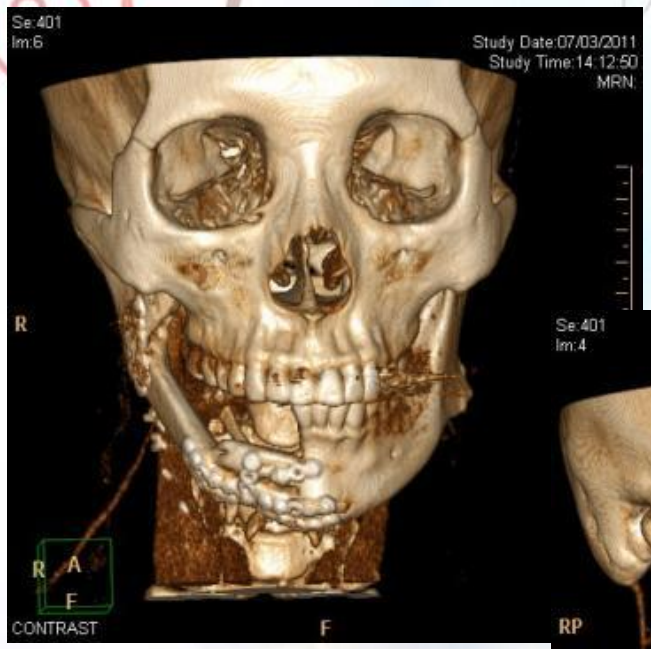
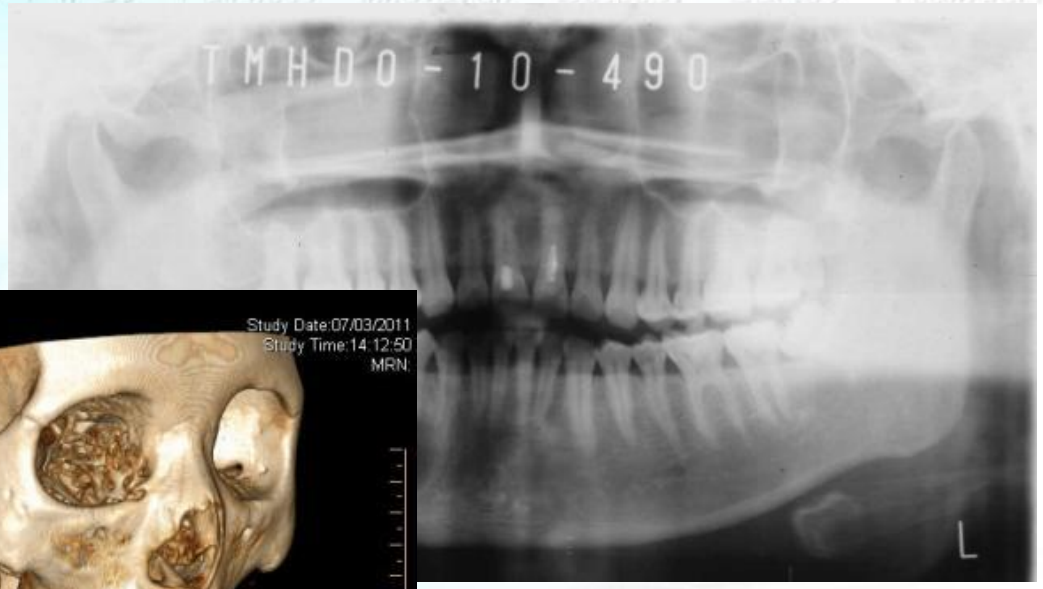
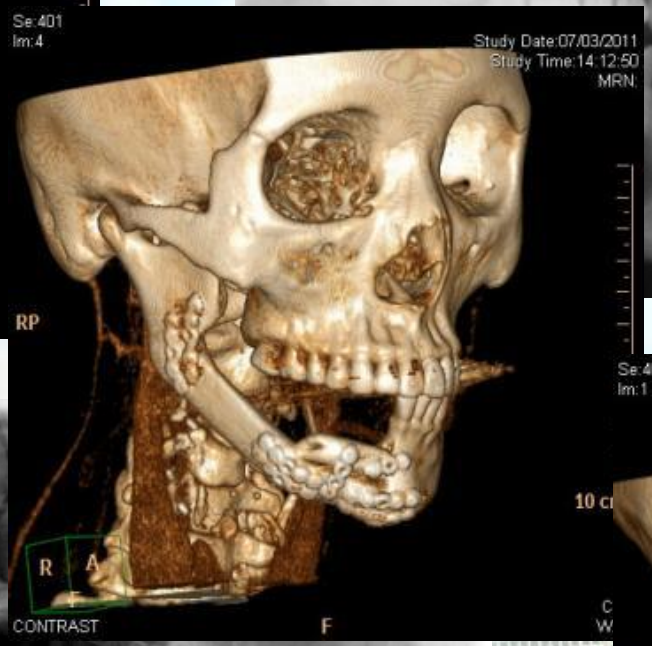
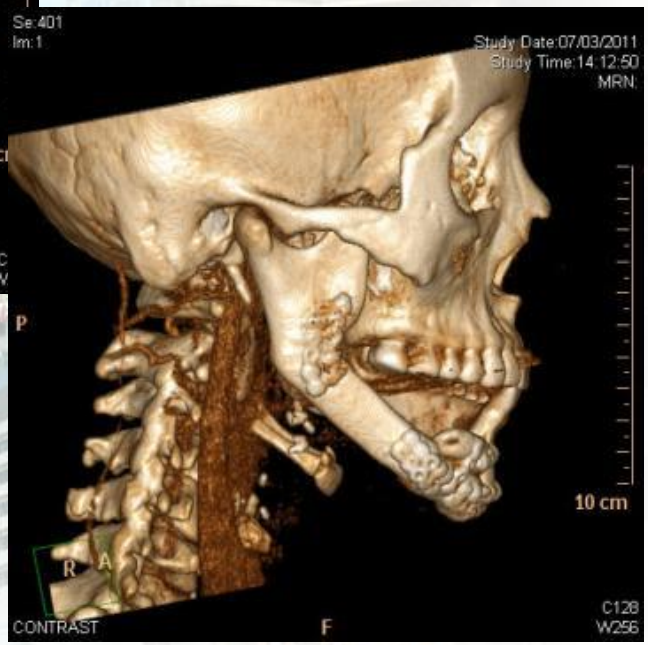
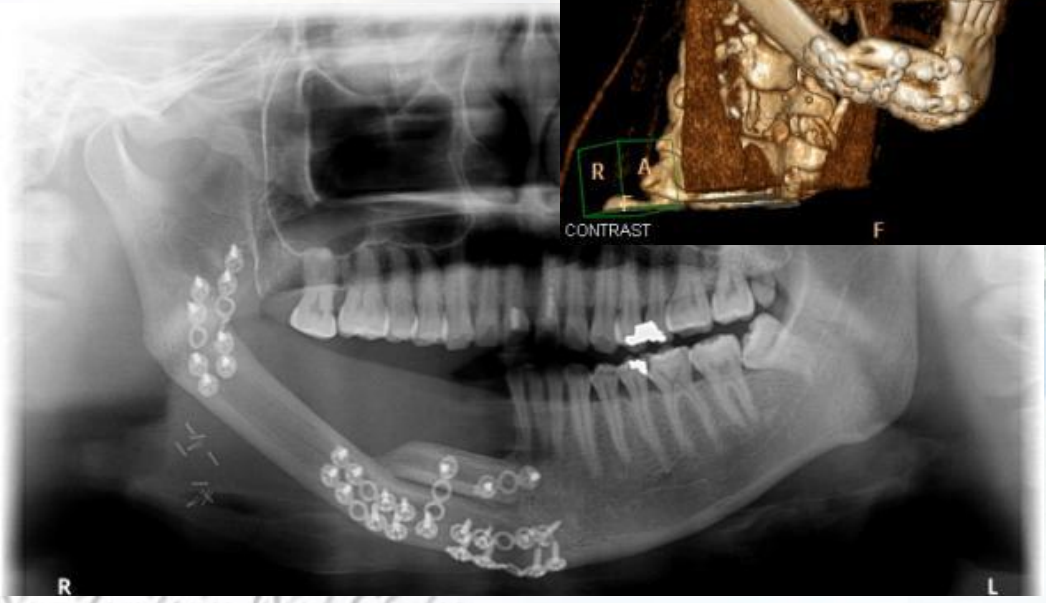




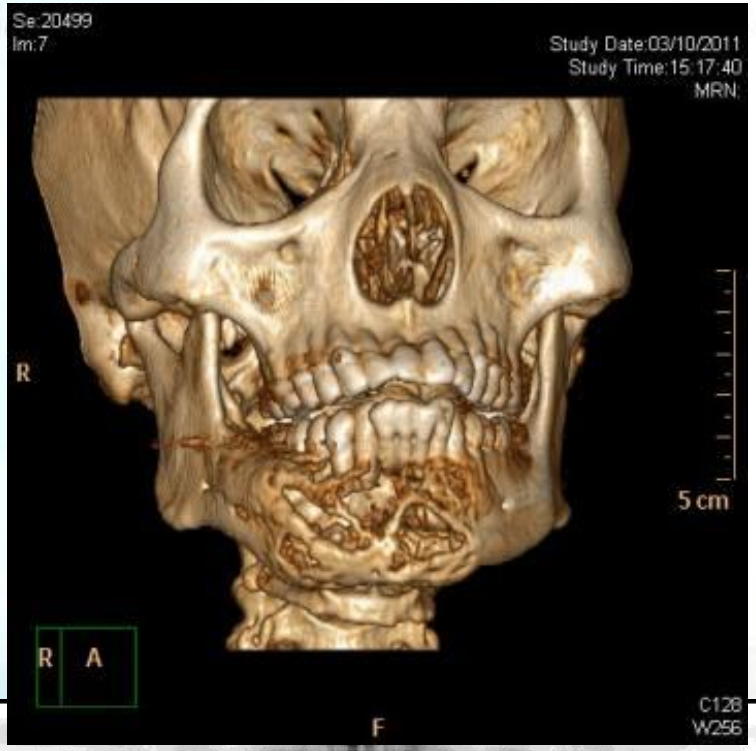






RECONSTRUCTION OF

CENTRAL / ANTERIOR ARCH DEFECT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Study Time:15:17:40
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R
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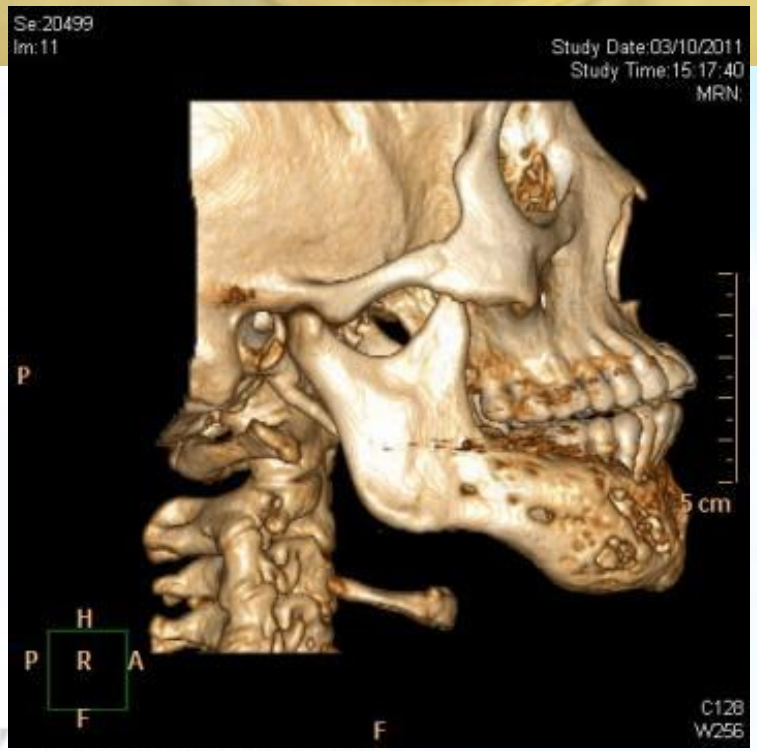
R A
F
C128
W256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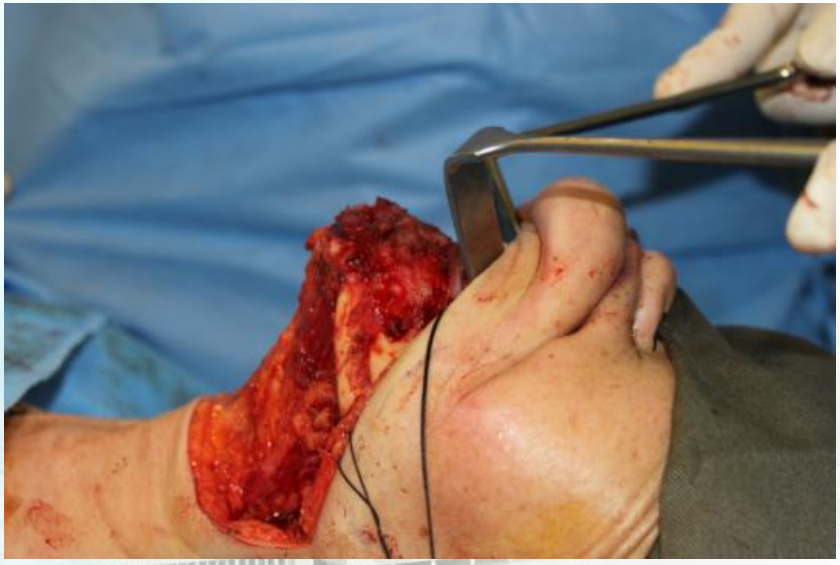
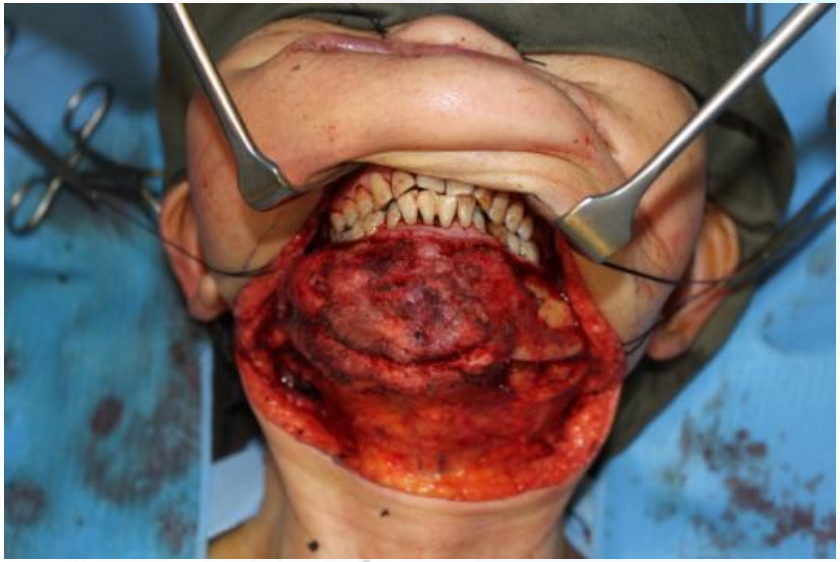
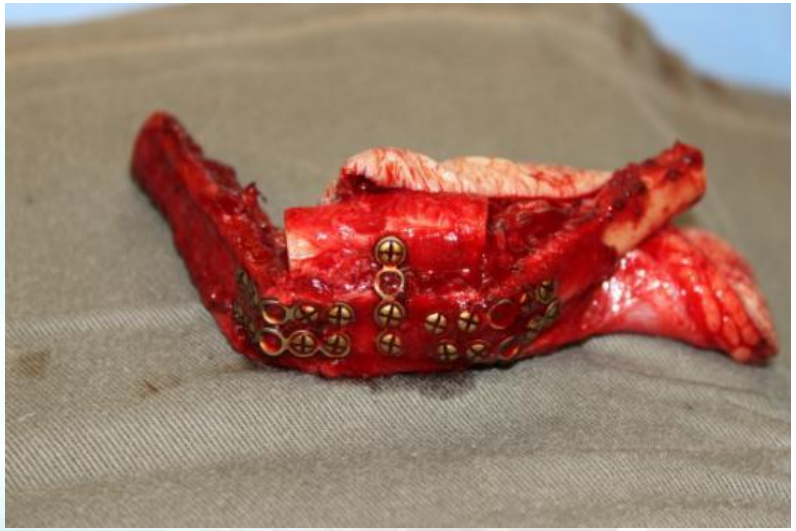
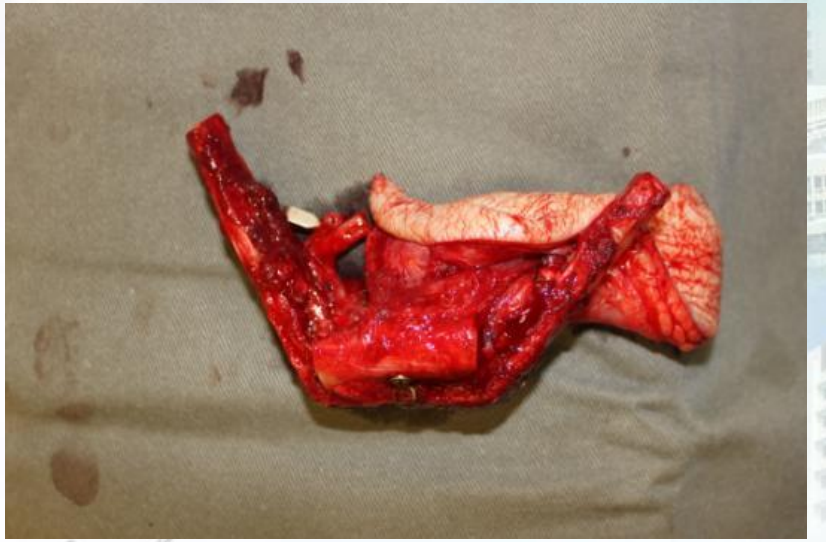
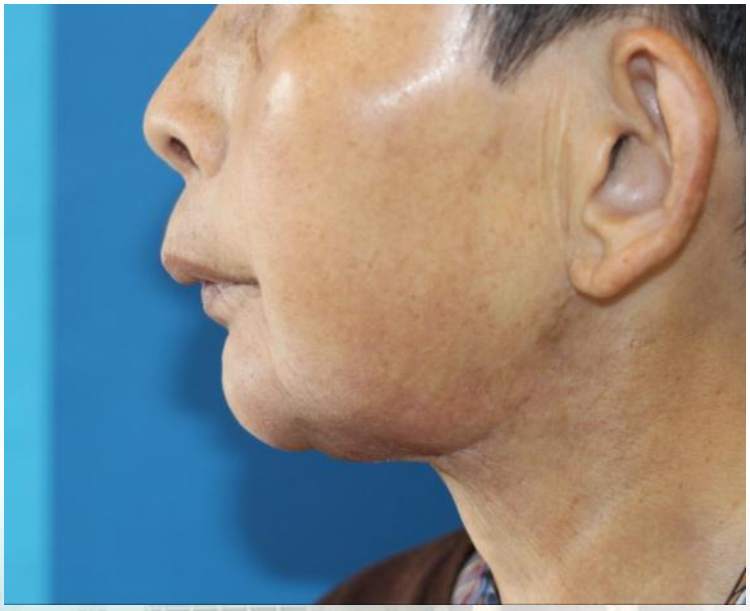










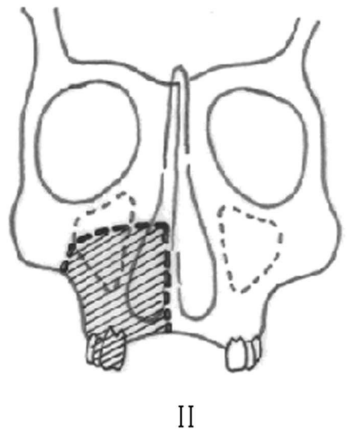
Cases illustrations

Reconstruction of maxillary defects

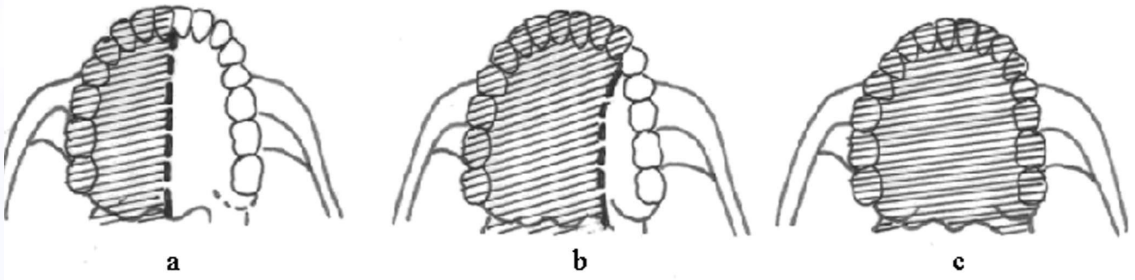
Low Maxillectomy Defect & Obturator

Low maxillectomy defect

- Goal
  - Repair the oronasal fistula
  - Support the alar base and upper lip
  - Dental rehabilitation by implant

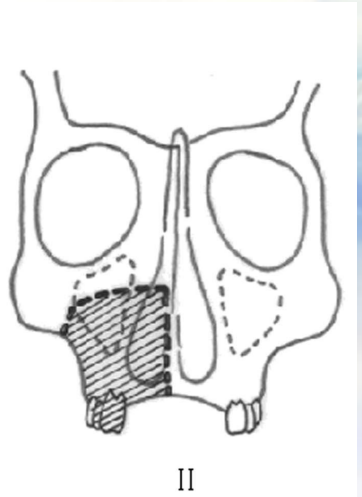


II

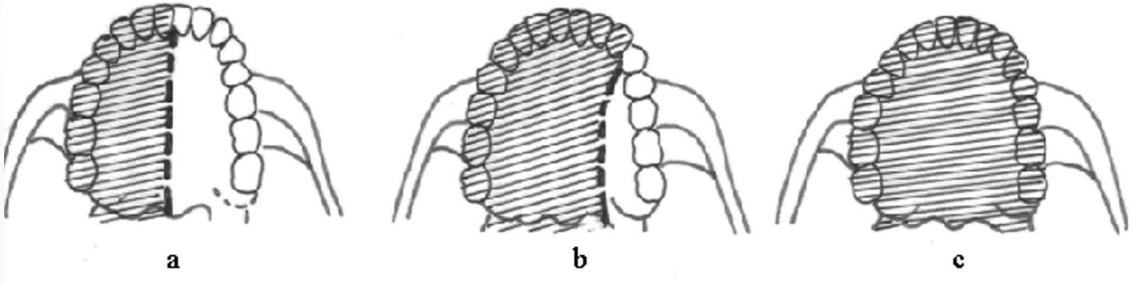


a b c

Low maxillectomy defect

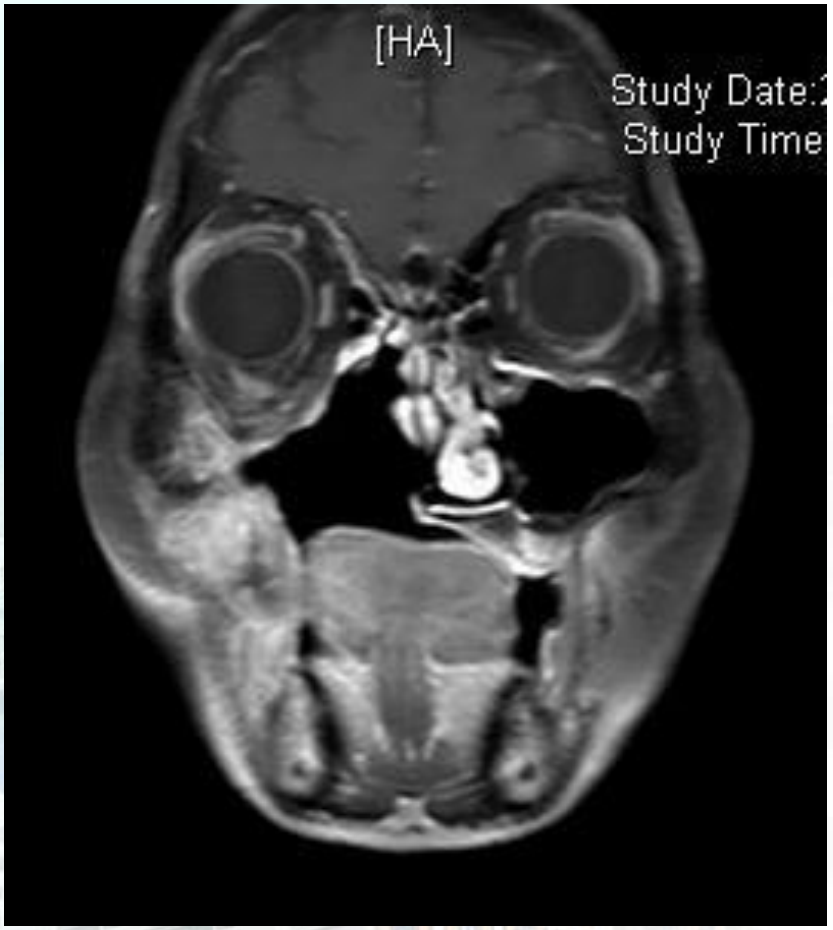


- Soft tissue flap
  - Posterior alveolus
  - Edentulous patient
- Osteocutaneous flap
  - Anterior arch involvement

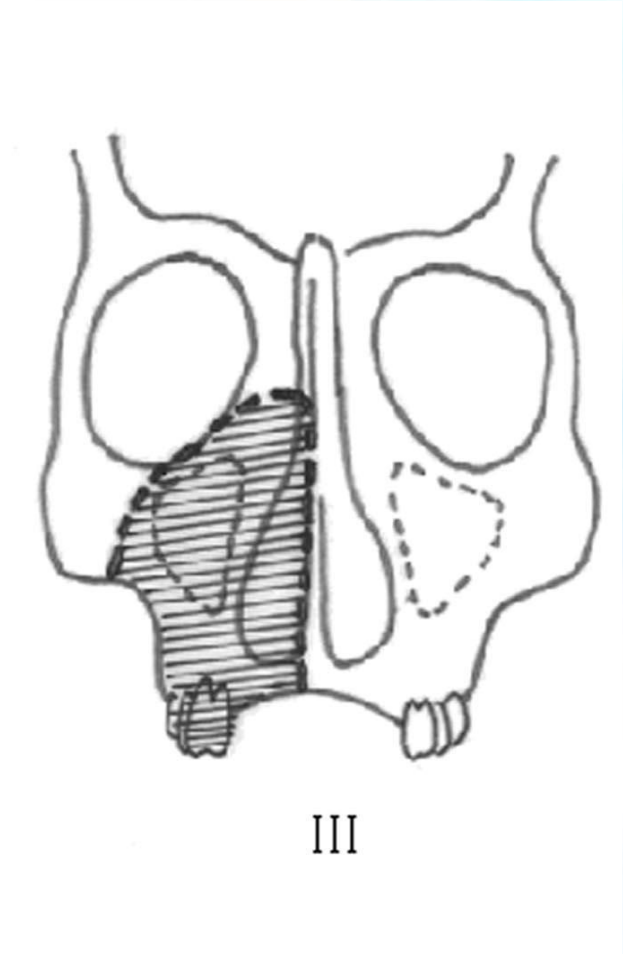


46/M mucoepidermoid CA left upper alveolus (fibular flap reconstruction & dental implant)

Total / High Maxillectomy

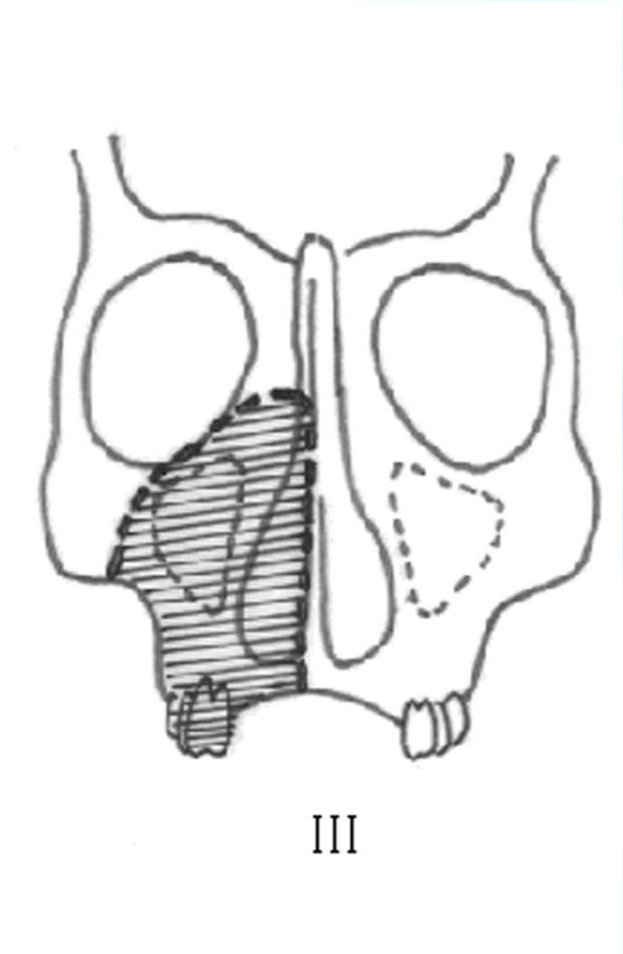


High maxillectomy defect



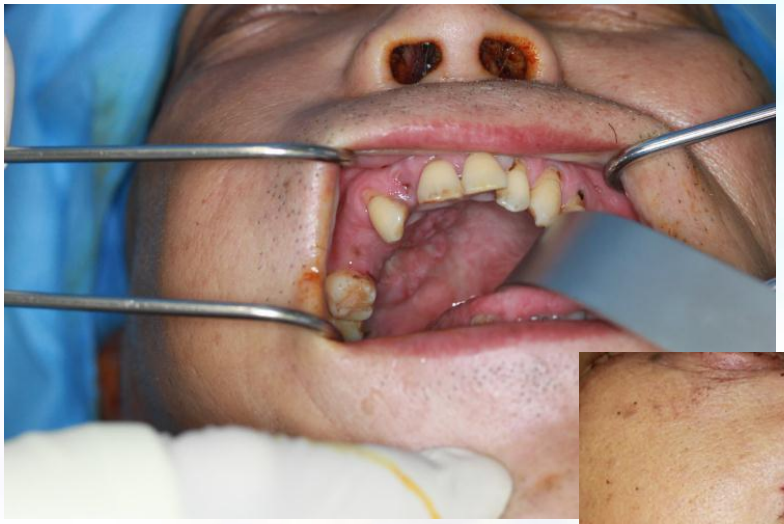
- Aim
  - Support the globe
  - Obliterate the cavity
  - Repair the oronasal fistula
  - Support the cheek, alar base and upper lip
- Soft tissue flap
  - Rectus Flap
  - ALT Flap

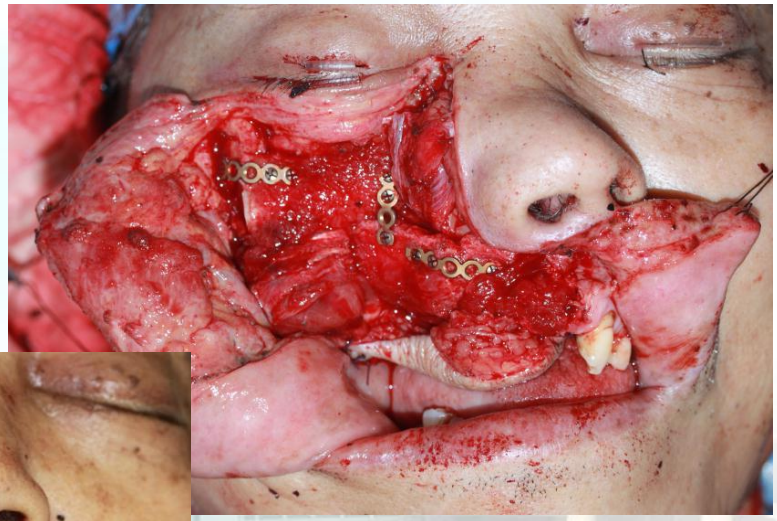
High maxillectomy defect

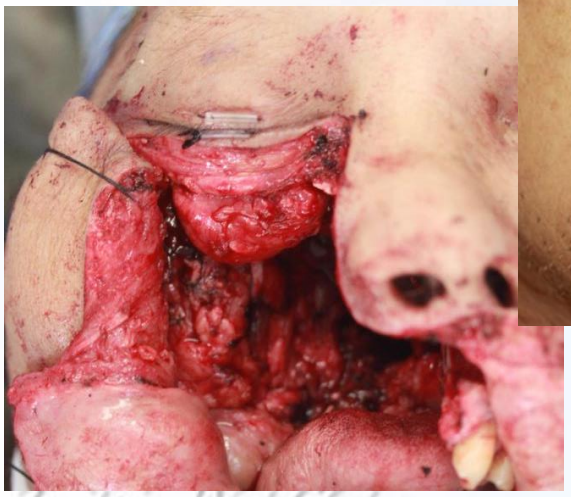


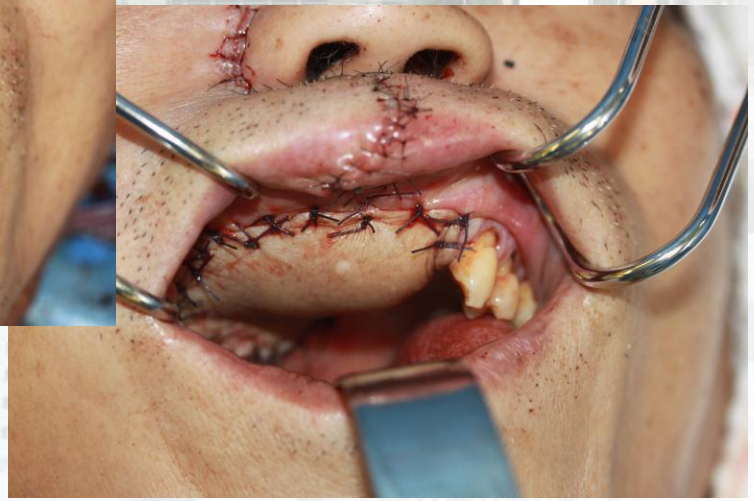
- Osteocutaneous flap
  - Long lasting support
  - Osteointegration
    - Fibula Flap
    - Iliac Crest Flap (DCIA)
- Fibular Flap
  - Long pedicle
  - Multiple oestotomy and stacking - 3D reconstruction

High maxillectomy defect

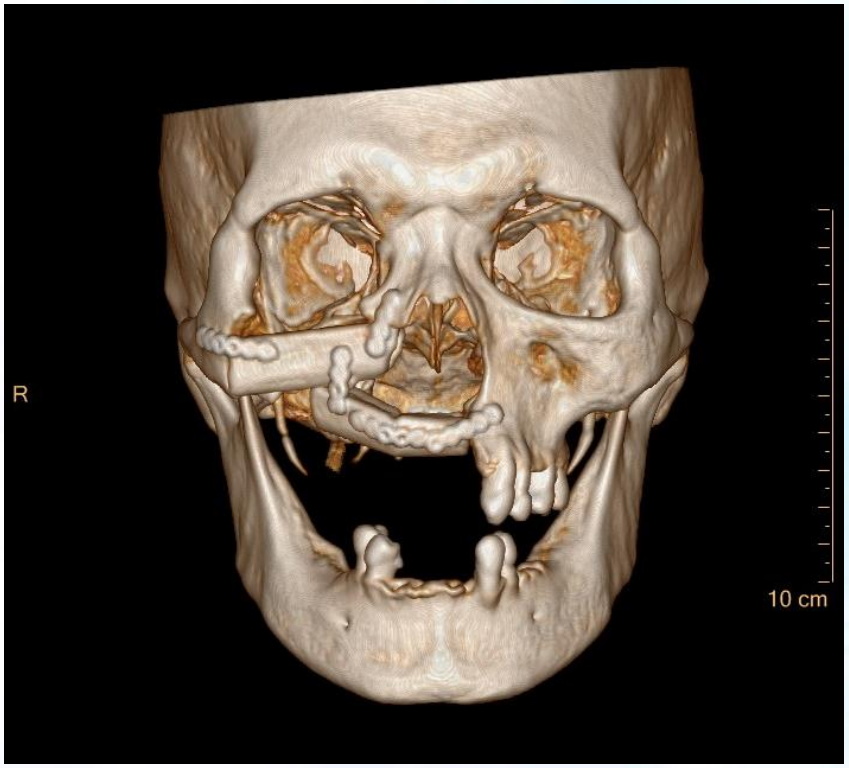








Post op 3D CT



Post Radiotherapy

SOMPI REVIEW ON FREE FLAP SURGERY IN HONG KONG (2009-2013)

Dr Harriette Ho
Dr Albert Yuen

10 surgical departments in public hospitals performed free flap surgery, including

- Queen Mary Hospital
- Prince of Wales Hospital
- Kwong Wah Hospital
- Tuen Mun Hosptial
- Queen Elizabeth Hospital
- United Christian Hospital
- Ruttonjee Hospital
- Tung Wah Hospital
- Pamela Youde Nethersole Eastern Hospital
- North District Hospital

Reconstruction	Total	Total (%)
Head and neck (malignant)	504	86.10%
Head and neck (benign)	25	4.30%
Breast (primary reconstruction)	20	3.40%
Breast (secondary reconstruction)	3	1%
Burns	18	3.10%
Upper limb	1	0.20%
Lower limb	9	1.50%
Trunk	3	1%
Transsexualism	2	0.30%
Total	**585**	

Head and neck free flap surgery

- Total 539 free flaps
- Malignant disease: 504 (93.5%)
- Benign disease: 35 (6.5%)
  - Complication of cancer treatment :15
    - Osteoradionecrosis – 10
    - Fistula – 2
    - Others – 3
  - Benign aggressive tumour : 6
  - Burn :10
  - Others : 4

Reconstruction	Total	Total %
Head and neck cancer	504	93.51
Burn	10	1.86
ORN	10	1.9
Ameloblastoma	5	0.93
Dermatitis	1	0.19
Hemangioma	1	0.19
Post radiotherapy	1	0.19
Fibroma	1	0.19
Orocutaneous fistula	1	0.19
post orbital enucleation	1	0.19
Necrotizing fasciitis	1	0.19
Ossifying fibroma	1	0.19
Oronasal fistula	1	0.19
pharyngocutaneous fistula	1	0.19

Reconstruction	Total	Total %
Head and neck cancer	504	93.51
Burn	10	1.86
ORN	10	1.9
Ameloblastoma	5	0.93
Dermatitis	1	0.19
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Necrotizing fasciitis	1	0.19
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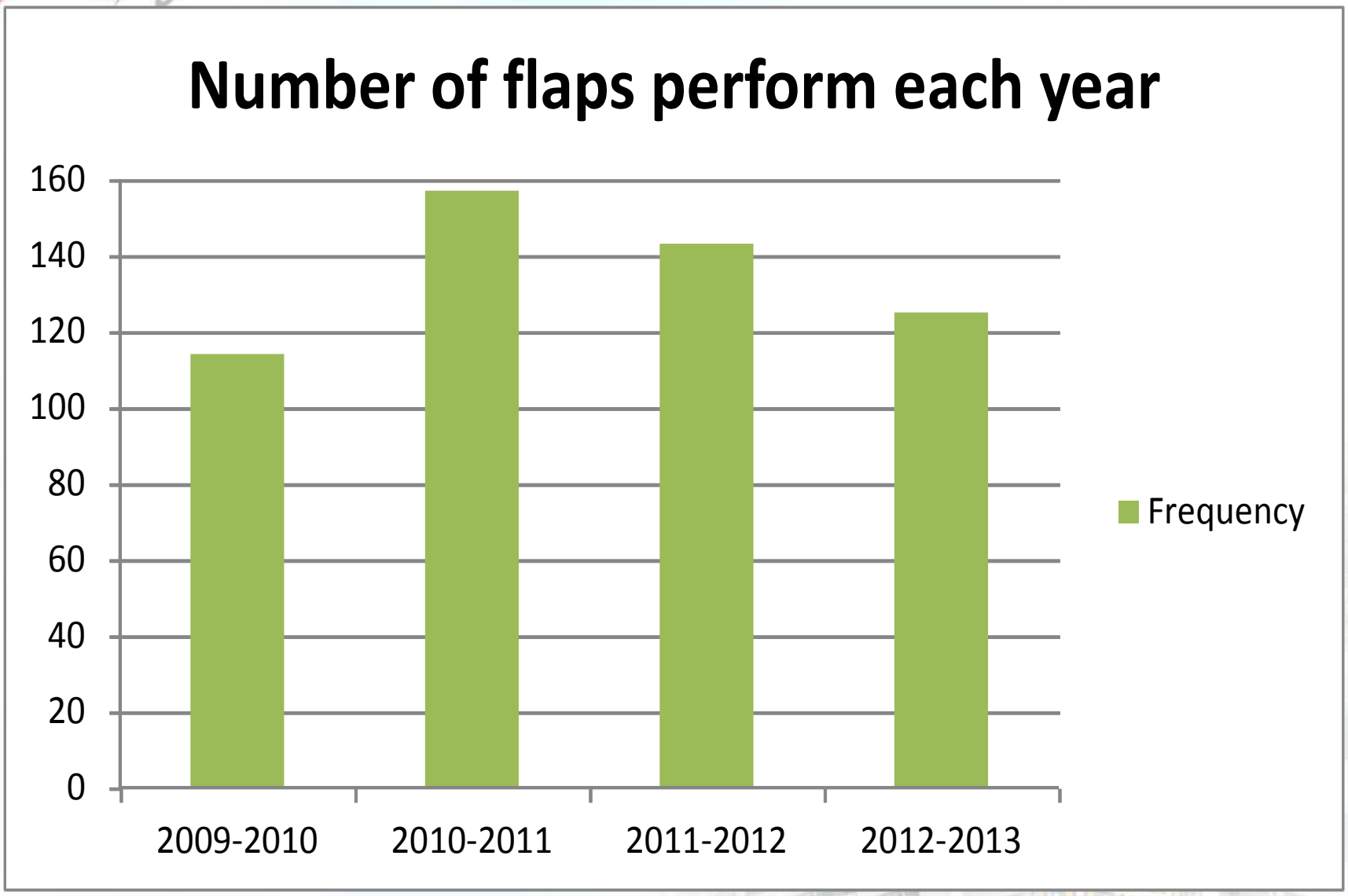
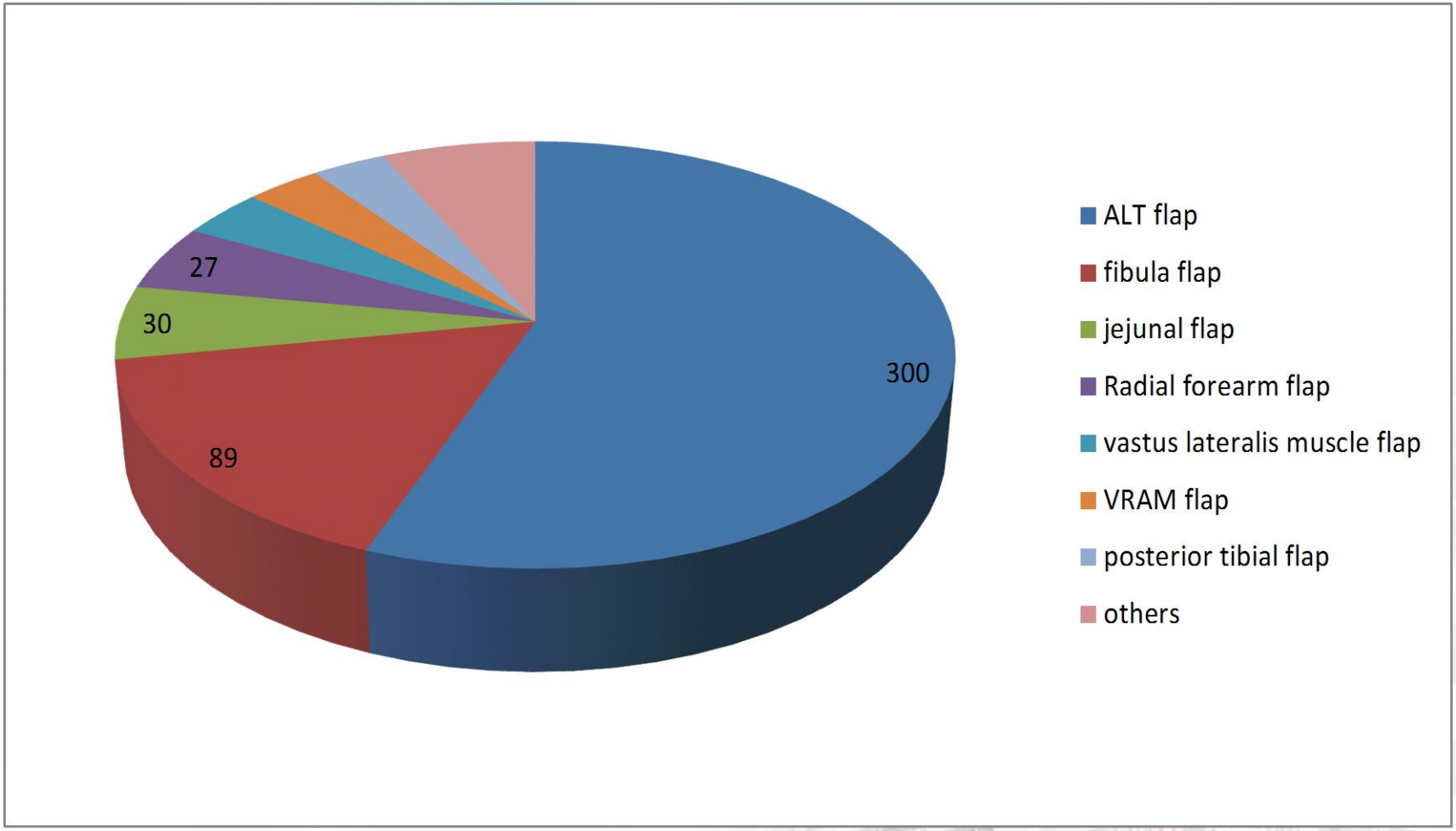
Oronasal fistula	1	0.19
pharyngocutaneous fistula	1	0.19


Number of flaps perform each year
160
140
120
100
80
60
40
20
0
2009-2010
2010-2011
2011-2012
2012-2013
Frequency

Types of flaps



Type of flap	total	Total %
ALT flap	300	55.66
fibula flap	89	16.51
LD flap	8	1.48
Radial forearm flap	27	5
VRAM flap	18	3.34
DIEP flap	2	0.37
jejunal flap	30	5.57
groin flap	3	0.56
AMT flap	5	0.93
tensor fascia lata flap	9	1.67
vastus lateralis muscle flap	20	3.71
posterior tibial flap	18	1.34
lateral arm flap	3	0.56
iliac bone	1	0.19
thoracodorsal artery flap	3	0.56
DCIA iliac flap	1	0.19
LD composite falp	1	0.19
ALT + iliac bone graft	1	0.19

The most common type of flaps performed:

Anterolateral thigh flap (n=300, 55.6%)

Fibular flap (n=89, 16.51%)

Jejunal flap (n=30, 5.57%)

Radial forearm flap (n=27, 5.00%)

Other flaps including

LD flap (n=8, muscle flaps 3, myocutaneous flaps 5)

Vastus lateralis muscle flap (n=20)

Posterior tibial flap (n=18)

VRAM flap (n=18)

The most common type of flaps performed:

Anterolateral thigh flap (n=300, 55.6%)

Fibular flap (n=89, 16.51%)

Jejunal flap (n=30, 5.57%)

Radial forearm flap (n=27, 5.00%)

Other flaps including

LD flap (n=8, muscle flaps 3, myocutaneous flaps 5)

Vastus lateralis muscle flap (n=20)

Posterior tibial flap (n=18)

VRAM flap (n=18)

- All double free flaps performed for head and neck reconstruction
- 12 double free flaps:
  - ALT + fibular flaps (9)
  - Double ALT flaps (1)
  - LD + groin flaps (1)
  - Fibular + VRAM flaps (1)

Results in Head and Neck free flap surgery

- Total free flaps: 539
- Flaps with total failure: 45 (8.35%)
- Flaps with partial failure: 23 (4.27%)
- Overall success rate: 91.65%

	Overall results	Head and Neck results
Total free flaps	585	539
Total failure	54 (9.2%)	45 (8.35%)
Partial failure	23 (4.3%)	23 (4.27%)
Success rate	90.8%	91.65%

Salvage procedures

- Flaps required salvage procedures: 24 flaps (4.45%)
- Successful salvage rate: 79.2% (N=19)

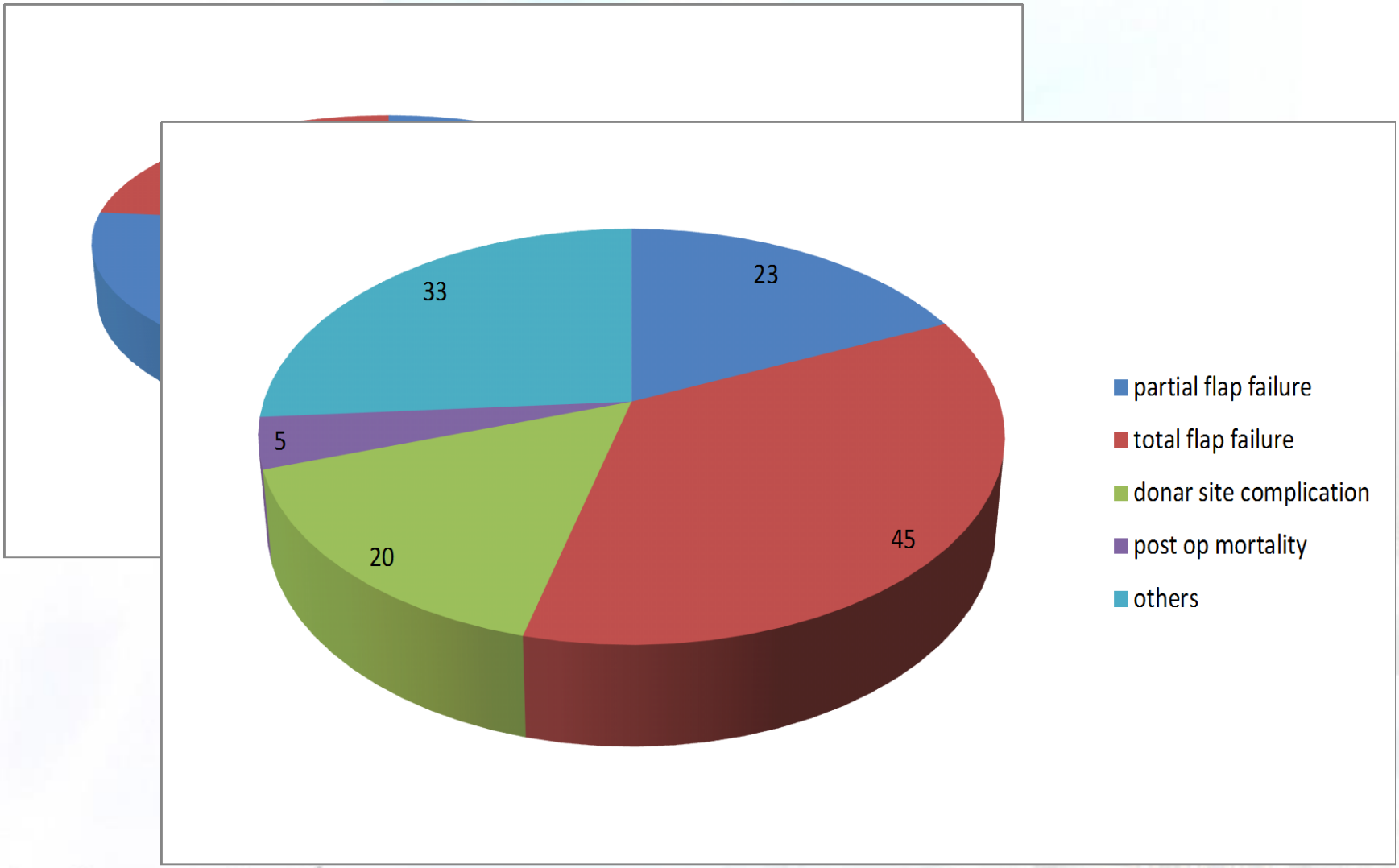
	Reanastomosis	Vein graft	Exploration only
Salvaged	6	4	9
Failed	4	0	1
Total flaps	10	4	10

Second free flap

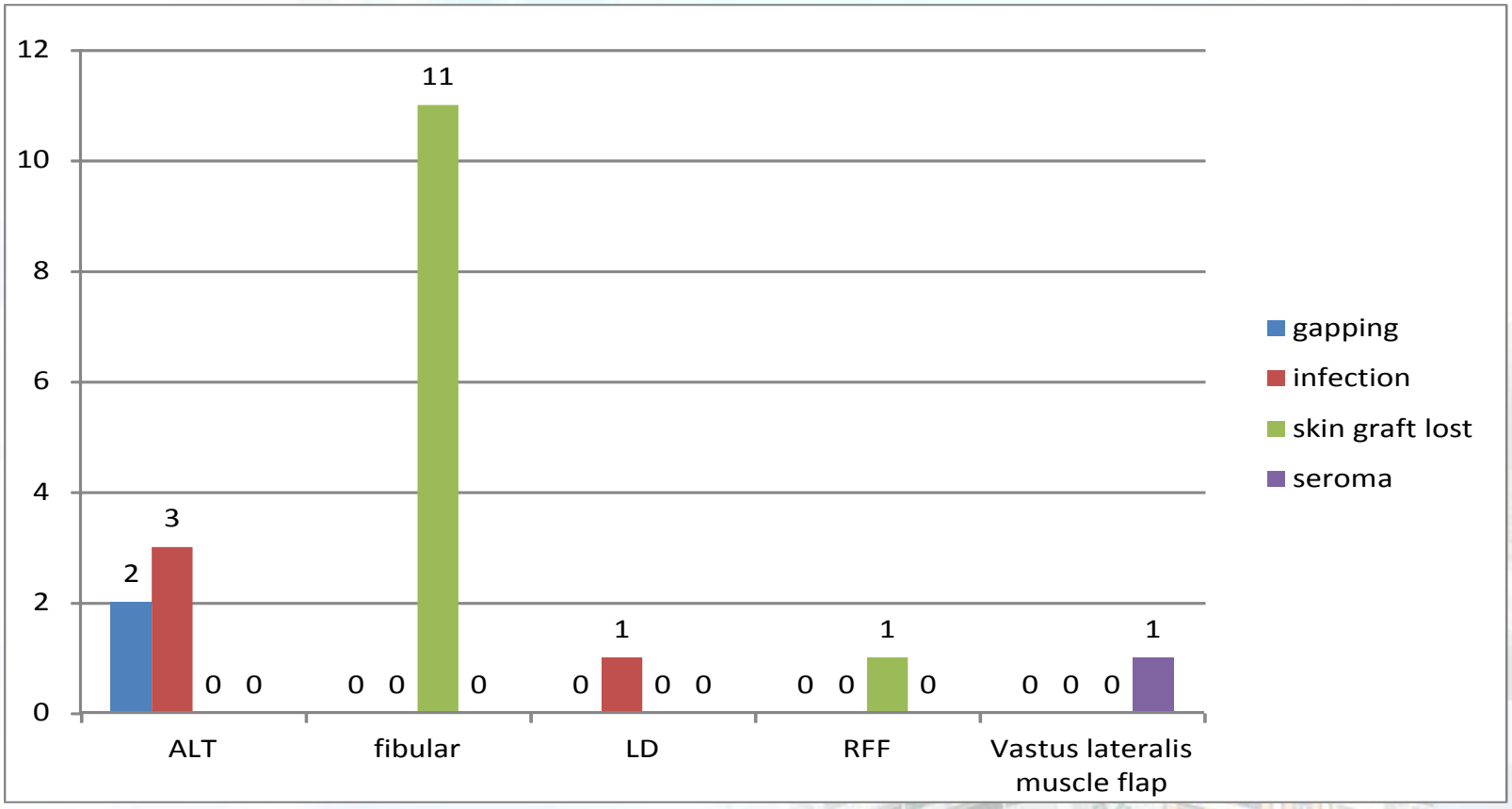
- 17 second free flaps done
- 10 ALT flaps

	Number	Complication	Intervention
ALT	10	0	Not applicable
Radial forearm	1	0	Not applicable
Posterior tibial	1	1 (total failure)	PM flap
VRAM	1	1 (total failure)	Debridement, nasal septal flap
LD	2	0	Not applicable
Fibula	1	0	Not applicable

Complications



Donor site morbidity



Limitations

- Retrospective review based on SOMIP database
- Surgical departments under HA
- Some details may not be retrieved or documented

Discussion

- No previous similar study published
- Multi-center regional retrospective study
- Variations between centers, esp those with relatively smaller case numbers
- Follow up studies
- TMH results (successful rate)

  7/2009 –6/2013 : 67/73 (91.8%)

  7/2013-12/2015 : 46/47 (97.9%)

  overall : 113/120 (94.2%)

Conclusion

- Advance in reconstruction technique with free microvascular composite tissue transfer
- Resection of complicated tumour and reconstruction afterward can be made feasible
- Maximize functional and aesthetic outcomes and improve the quality of life
- Microvascular free flap surgery has been well established in Hong Kong
- Complication rate is comparable with international standard

Acknowledgement

- Dr. Yuen Wai Cheung
- Dr. Ho Hiu Ching Harriette