Oral Cancer
Reconstructive Surgery
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Content of the course

- Introduction
- Reconstructive anatomy of the oral cavity and classification of defects
- General rules for the reconstruction of the oral cavity
- Reconstructive specificities by anatomic sub-regions
  - Mandible
  - Floor of the mouth (FOM)
  - Tongue
  - Internal cheek
  - Palate

The oral cavity is a very special place for reconstruction

- Mucosal lining not found anywhere else
- Concentration of highly specialized organs
- Implicated in essential functions for survival
  - Mastication
  - Feeding
  - Taste
  - Elocution
  - Breathing

Any trauma is responsible for functional sequelae and quality of life impairment
| 1) Introduction                                                                 |
| 2) Anatomy & classification                                                   |
| 3) General rules                                                              |
| 4) Regional specificities                                                      |
|   • Mandible                                                                  |
|   • FOM                                                                       |
|   • Tongue                                                                    |
|   • Internal cheek                                                            |
|   • Palate                                                                    |

Concentration of highly specialized organs and tissues
- Topographic division of the oral cavity
- General rules for reconstruction
- Special reconstructive demands for each area and organ
- Need for a clear classification of the defect
  - Guide to the reconstructive decision making
  - Prerequisites for the evaluation of results
    - Quality of life
    - Functional evaluation

Topographic division of the oral cavity
- Lip
- Floor of mouth (FOM)
- Internal cheek
- Hard palate
- Soft palate
- Mobile tongue

Classification of defect

- Almost exhaustive
  - Bone + Mandibular reconstruction
  - Soft tissue defects
    - Tongue
    - FOM
    - Internal cheek
    - Palate
  - But excluding the hard palate
Classification of defect

1) Introduction
2) Anatomy & classification
3) General rules
4) Regional specificities
   - Mandible
   - FOM
   - Tongue
   - Internal cheek
   - Palate

Bone
Soft tissues

Evaluation of results

Essential:
- To assess the efficiency of the reconstructive technique
- To compare results in different institutions

Assessment on 2 criteria
- Subjective = Quality of life questionnaires
  - EORTC-HN 35, PSS
- Objective = no universal test

Bone
Soft tissues
Neurologic
- Hypoglossal : NH
- Lingual : NL
- Inferior alveolar : NIA

Regional
- Mandible
- FOM
- Tongue
- Internal cheek
- Palate
Follows the fundamental rules of plastic surgery

Every reconstructive procedure has 3 goals

1. Assure the survival of the patient
2. Recreate the plastic and aesthetic of the region
3. Restore the function of the organ

1. Post-operative hemorrhagic accident
   - After oral cavity carcinologic surgery
   - One life threatening situation = rupture of the jugulo-carotid vascular axis
   - Measures to prevent hemorrhage
     - Tight sealing of the oral cavity to prevent salivary fistula
     - Protection of the vascular axis
   - When?
     - After radical neck dissection
     - In salvage surgery
     - Which tissue?
       - Locoregional muscular flap (Pectoralis major)

2. Post-operative Airway patency impairment
   - Avoid aspiration
   - Airway obstruction

2) Recreate the plastic and aesthetic of the lower 1/3 of the face

The character of the face is defined by the association of hard and soft tissues

- Hard tissues
  - Composed by bone and cartilage
  - Creating a scaffolding & forming for the facial infrastructure
  - Responsible for projection, height & contour of the face

- Soft tissues
  - Responsible for projecting organs & contents of the face

Mandible
- FOM
- Tongue
- Internal cheek
- Palate
2) Recreate the plastic and aesthetic of the lower 1/3 of the face

1) Introduction

2) Anatomy & classification

3) General rules

4) Regional specificities
   - Mandible
   - FOM
   - Tongue
   - Internal cheek
   - Palate

The character of the face is defined by the association of hard and soft tissues:

1. Hard tissues
   - Composed of bone and cartilage
   - Responsible for projection, height & contour of the face

2. Soft tissues
   - Including muscles & nerves of the face covered by the skin
   - Responsible for the mobility, expression and definition of the face
2) Recreate the plastic and aesthetic of the lower 1/3 of the face

- The character of the face is defined by the association of hard and soft tissues.
- Each of these components has to be reconstructed independently to avoid major aesthetic sequelae.

- Regional specificities
  - Mandible
  - FOM
  - Tongue
  - Internal cheek
  - Palate

- Golden rules & workhorse techniques
  - Bone infrastructure
    - When to use bone graft / vascularized bone flap?

- Type of bone graft
  - Free bone graft
  - Vascularized bone graft

- Pressure applied
  - Contamination
  - Irradiation
  - Type of bone graft
<table>
<thead>
<tr>
<th>1) Introduction</th>
<th>2) Recreate the plastic and aesthetic of the lower 1/3 of the face</th>
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</thead>
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<td>- Workhorse techniques for Mandible &amp; Pterygo-maxillary pillar</td>
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<td>- Soft tissues coverage</td>
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<tr>
<td></td>
<td>- Respect tension lines et aesthetic sub-units</td>
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</table>

2) Recreate the plastic and aesthetic of the lower 1/3 of the face

- The character of the face is defined by the association of hard and soft tissues
- Each of these components have to be reconstructed independently to avoid major aesthetic sequelae
- Golden rules & workhorse techniques
  - Bone infrastructure
    - When to use bone graft / vascularized bone flap
    - Workhorse techniques for Mandible & Pterygo-maxillary pillar
  - Soft tissues coverage
    - Respect tension lines et aesthetic sub-units

### Anatomic Units

- Mandible
- FOM
- Tongue
- Internal cheek
- Palate

### Tension lines
2) Recreate the plastic and aesthetic of the lower 1/3 of the face

The character of the face is defined by the association of hard and soft tissues. Each of these components has to be reconstructed independently to avoid major aesthetic sequelae.

### Golden rules & workhorse techniques

- Bone infrastructure
  - When to use bone graft / vascularized bone flap
  - Workhorse techniques for Mandible & Pterygo-maxillary pillar

- Soft tissues coverage
  - Respect tension lines and aesthetic sub-units
  - Prefer local flaps “There is no better tissues than local tissues” (Gillies)
  - Workhorse and recently introduced local skin flaps

#### Regional specificities

- Mandible
- FOM
- Tongue
- Internal cheek
- Palate

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2) Recreate the plastic and aesthetic of the lower 1/3 of the face

- The cervico-jugal flap

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2) Recreate the plastic and aesthetic of the lower 1/3 of the face

- The cervico-jugal flap
- The submental perforator flap
2) Recreate the plastic and aesthetic of the lower 1/3 of the face
- The cervico-jugal flap
- The submental perforator flap
- The supraclavicular flap

3) Restore the function
- No Autologous flap have the characteristic of oral tissues
- The Golden rules are:
  - Respect and help the function of the remaining organs
  - If possible, close with local tissues (FAMM – Buccinator flap) but do not add an other traumatism
  - The simple is often the better
  - Avoid the tethering and the pooling effect

4) Specificities
- Mandible
- FOM
- Tongue
- Internal cheek
- Palate

Specificities of mandibular defects secondary to carcinologic resection
- Long defects
  - Two major types
    - Lateral
    - Central
  - Associated with large soft tissues resection
  - Irradiated tissues
  - Reconstruction with vascularized bone flaps
1) Introduction
2) Anatomy & classification
3) General rules
4) Regional specificities

3 major donor sites

- Fibula
- Iliac crest
- Scapula

Tissue Composition of the flap

<table>
<thead>
<tr>
<th>Flap</th>
<th>Bone</th>
<th>Skin-paddle</th>
<th>Pedicle</th>
<th>Position</th>
<th>Morbidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibula</td>
<td>A</td>
<td>C</td>
<td>B</td>
<td>A</td>
<td>A</td>
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<tr>
<td>Radius</td>
<td>D</td>
<td>A</td>
<td>A</td>
<td>C</td>
<td>D</td>
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<tr>
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<td>C</td>
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<td>D</td>
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<td>B</td>
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<td>B</td>
<td>C</td>
</tr>
</tbody>
</table>

Decision making process

3 questions

1. Is there any vascular contra-indication for free flap surgery?
   - Patient history of the neck and lower extremity
   - Echo-Doppler of the neck and lower extremity
   - If yes: no bone reconstruction or reconstruction plate and musculo-cutaneous loco-regional flap

2. Is the bone defect lateral or central?
   - If lateral, bone replacement is not mandatory
   - If central, bone replacement is mandatory

3. Is the bone defect alone or associated to soft tissues resection?
   - If alone, bone replacement is the primary goal of reconstruction
   - If associated, soft tissues replacement can be the primary goal of the reconstruction
1) Introduction

2) Anatomy & classification

3) General rules

4) Regional specificities

- Mandible
- FOM
- Tongue
- Internal cheek
- Palate

Clinical situation 1

- The answer to the 3 questions
  1. No vascular contra-indication for free flap
  2. Lateral defect
  3. Bone alone

- Reconstructive decision
  - Bone reconstruction is not mandatory for the survival of the patient

- Goals of reconstruction
  - Bone & closure + vascular anastomosis
  - Bone + closure + vascular anastomosis
  - First choice free flap

Clinical situation 2

- The answer to the 3 questions
  1. No vascular contra-indication for free flap
  2. Central defect
  3. Bone alone

- Reconstructive decision
  - Central defect of the mandible is responsible for severe plastic and functional sequelae

- Goals of reconstruction
  - Bone reconstruction is mandatory
  - Bone + closure + vascular anastomosis
  - First choice free flap

Clinical situation 3

- The answer to the 3 questions
  1. No vascular contra-indication for free flap
  2. Lateral defect
  3. Bone associated to soft tissues loss (Tongue or lateral wall of oropharynx)

- Reconstructive decision
  - Soft tissues reconstruction is the primary goal
  - Bone reconstruction is not mandatory & is a second goal

- Goals of reconstruction
  - Survival of patient = protection of vessels and airways
  - Plastic & Aesthetic = lateral contour of the face
  - Functional = restore deglutition & elocution, avoid aspiration

- First choice free flap
  - Fibula
  - Composite scapula
  - Composite fibula
  - 2 free flaps
1) Introduction

2) Anatomy & classification

3) General rules

4) Regional specificities

Clinical situation 4

- The answer to the 3 questions
  - No vascular contra-indication for free flap
  - Central defect
  - Bone associated with soft tissues (mobile tongue, lip)

Reconstructive decision
- Bone and soft tissues reconstruction is both primary goals
- Complex reconstruction is mandatory

Goals of reconstruction
- Survival of patient = vessels protection, airways
- Plastic & Aesthetic = avoid Andy gump
- Functional = restore lip patency, mastication, deglutition, speech, breathing

First choice free flap
- No single flap will do the job properly
- 1 flap with sacrifice of some goals
- 2 free flaps

Decision making process

- The goals of reconstruction
  - Survival of patient
  - Tissue sealing at the oral cavity
  - Plastic & aesthetic
  - Functional

First choice flap
- For small defects
  - Local mucosal flaps (FAMM and buccinator)
- For large defects
  - Local fascio-cutaneous flap (infrahyoid flap)
  - Fascio-cutaneous thin free flap (forearm flap)

Specificities of tongue defects secondary to carcinologic resection

- Anatomy of the tongue
  - Divided in 2 units but one organ
  - Mobile tongue (MT)
  - Base of the tongue (BT)

- Belonging to 2 anatomic regions
  - Mobile tongue (MT) = oral cavity
  - Base of the tongue (BT) = Oropharynx

- Relation of the tongue with neighborhood organs
  - Close relation with other oral cavity, oropharynx & larynx components

- Carcinologic resection does not respect anatomic divisions
  - Mobile tongue resection will be removed
1) Introduction
2) Anatomy & classification
3) General rules
4) Regional specificities

(Reg)

Specificities of tongue reconstructive procedure

- The tongue is a
  - Unique organ in the body
  - Highly involved in very precise & essential functions
  - Feeding, speech, taste

Consequence for the reconstruction = remain humble

- Use available replacing tissues
- Avoid to impair the function of remaining organs
- Conserve the remaining functions
- The most simple procedure gives often the best results

(McConnel, Arch Otolaryngol Head Neck surg, 1998)

(Reg)

Function of the tongue

- Mobile tongue (MT) = mobility
  - Oral phase of deglutition
  - Elocution (anterior syllables: T, S, D)
  - Taste (not to be restored)
  - Sensitivity (lingual nerve)

- Base of tongue (BT) = Bulk
  - Oropharyngeal phase (pump) of deglutition
  - Elocution (posterior syllables: G, K, Q, R)
  - Contraction (hypoglossal)
  - Sensitivity
  - Airway protection

(Reg)

Goals of reconstruction

- Assure survival of the patient
  - Assure protection = equivalent

- Recreate Plastic & aesthetic of the face

- Restore Function
  - Mobile tongue (MT) = Mobility
    - Restore the crease between tongue and FOM = avoid the tethering effect
  - Restore shape for dento-lingual & lip to tongue contact
  - Restore sensitivity = sensitive nerve anastomosis to lingual nerve
  - Base of tongue (BT) = Bulk
  - Assure stable bulk to protect larynx
  - Favor adipo-fascio-cutaneous flap to musculo-cutaneous flap
  - Laryngeal suspension
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- Mandible
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Flap proposed for reconstruction

Mobile tongue
- Local and flap + radiation
- Free flap + external-beam irradiation
- Perforator flap

Specificities
- Thin & pliable
- Sensitive

Indications
- Hemiglossectomy with FOM + resection
- Bilobated flap

Forearm flap for mobile tongue (MT) reconstruction
- Forearm flap for mobile tongue (MT) reconstruction
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- Forearm flap for mobile tongue (MT) reconstruction
- Forearm flap for mobile tongue (MT) reconstruction
# Mobile tongue

Mobile tongue

- Localised flap
- Adjacent flap
- Free flap
- Other intra-oral techniques

# Base of the tongue

Base of the tongue

- Localised flap
- Adjacent flap
- Free flap

# Free flaps = adipo-fascio-cutaneous

- Forearm free flap
- Antero-lateral flap

# Local mucosal flaps = FAMM, Buccinator

- Localised flap
- Adjacent flap

# Local neck flap = infrahyoid

- Localised flap
- Adjacent flap

# Free flaps

- Latissimus dorsi free flap
- Antero-lateral free flap
- Rectus-abdominis free flap

# Base of the tongue

Base of the tongue

- Localised flap
- Adjacent flap

# Indications

- Base of tongue resection
- Total glossectomy
- Laryngeal suspension

# Specificities

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Free rectus abdominis musculo-cutaneous flap for base of tongue (MT) reconstruction

[Image of rectus abdominis flap]

Specificities
- Mandible
- FOM
- Tongue
- Internal cheek
- Palate

Indications
- Base of tongue resection
- Total glossectomy
- Laryngeal suspension

Flap proposed for reconstruction

Mobile tongue
- Forehead flap (FT, FTDM, Bermudez)
- Buccinator flap (B)
- Inner cheek flap (IC)

Base of the tongue
- Local neck flap = infrahyoid
- Free flaps = adipo-fascio-cutaneous
- Forearm free flap
- Antero-lateral flap
- Rectus-abdominis free flap

Ö

Indication of the reconstructive technique according to the group of defect

Clinical application and indications


Groups of defects according with the indication of reconstruction

- Marginal Glossectomy
  - Group < T
    - M < 1/4
  - Group < T M 1/4

- Hemiglossectomy of MT = Group TM 1/2

- Total Glossectomy of MT = Group TM NF

- Hemiglossectomy of BT = Group TB 1/2

- Subtotal Glossectomy = Group TB 3/4

- Total glossectomy = Group TG
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### Group I = marginal glossectomy

**Goal**
- Respect the function of the remaining tongue

**Technique**
- Secondary intention healing
- Mucosal flap (FAMM, buccinator)

### Group II = hemiglossectomy of MT

**Goal**
- Respect the mobility of the remaining MT
- Recreate the FOM
- Restore sensitivity

**Technique**
- First choice = Bilobated forearm free flap
- Second choice = Anterolateral thigh free flap
- Sensitive nerve anastomosis

### Group III = Total glossectomy of MT

**Goal**
- Restore the shape of the MT (dental and lip contact)
- Respect & help to the base of the tongue mobility
- Avoid the anterior pooling effect
- Restore sensitivity

**Technique**
- Cathedral tryptique forearm or anterolateral thigh flap
- Sensitive nerve anastomosis
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Group IV = hemiglossectomy of BT

**Goal**
- Preserve occlusal arch
- Compress the mobility of the remaining BT
- Choose flap with wide caliber
- Restore sensitivity

**Technique**
- First choice = anterolateral thigh flap

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Group VI = Total glossectomy

**Goal**
- Bring stable volume
- Protect the larynx = laryngeal suspension
- Restore sensitivity

**Technique**
- First choice = rectus abdominis
- Second choice = antero-lateral thigh flap

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Reconstruction des glossectomies totales **Groupe TG**

**But**
- Rapport de volume stable pour protéger
- Le larynx
- Restaurer la sensibilité
- L'assouplissement linguale

**Moyen**
- Lambeau fascio-cutanéo-graisseux
- De grand droit
- Anastomose nerveuse sensitivo-motrice entre nerf segmentaire
- Restaurer le sensibilité
- +/- anastomose motrice
- Suspension laryngée mixte et lingual + XII
1) Introduction

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   - Tongue
   - Internal cheek
   - Palate

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Goals and workhorse technique of the reconstruction

- Assure survival of the patient
- Recreate plastic and aesthetic
  - A combination of local flap and thorax rotation
- Restore the function
  - The internal cheek lining is elastic
  - Allows wide spectrum movement from closer to large opening without redundant tissues
  - Large skin paddle is necessary
  - Bone infrastructure = PM pillar
  - Soft tissue coverage = local techniques if possible for lip and nose reconstruction
  - First choice = anterolateral thigh flap

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Goals of the reconstruction

- Assure survival of patient
- Recreate plastic and aesthetic
  - Close the buccosinusal and nasal communication
  - Assure the continuity of the nasal cavity
  - Avoid soft-palate insufficiency
  - Prepare dental rehabilitation

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The P parameter

- Anterior
- Posterior

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1) Introduction

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4) Regional specificities
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Class VI
No PM pillar interruption

Is the PM pillar interrupted?

Is the SP interrupted?

Specificities
- Mandible
- FOM
- Tongue
- Internal cheek
- Palate

The H parameter is essential
- Defines the PM pillar interruption
- The canine point is the key

Class I
Is the PM pillar interrupted?

Location - center point?

Specificities
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Class III
- Location/canine point?
- Is it subtotal?

Class IV
- Location/canine point?

Class V
- Other units removed?
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Class II = center of the problem

- The canine fossae = key point
- The premaxillary = base of the central structure of the midface
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### Class II

- Is the PM pillar interrupted?
- Is the canine point interrupted?
- Is the other pillar interrupted?

<table>
<thead>
<tr>
<th>Specificities</th>
<th>Class</th>
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<tbody>
<tr>
<td>Mandible</td>
<td>I</td>
</tr>
<tr>
<td>FOM</td>
<td>II</td>
</tr>
<tr>
<td>Tongue</td>
<td>III</td>
</tr>
<tr>
<td>Internal cheek</td>
<td>IV</td>
</tr>
<tr>
<td>Palate</td>
<td>V</td>
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### Summary

- Classification with 3 parameters
- Regrouping patients in 6 classes

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<td>V</td>
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<td>VI</td>
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PM pillar interruption