Principles of Nasal Reconstruction after Mohs Micrographic Surgery

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Outline

• History of nasal reconstruction
• Mohs surgery
• Nasal Anatomy/Terminology
• Reconstructive ladder
• Nasal Reconstruction
  ▫ Inner lining
  ▫ Framework
  ▫ Cutaneous defects
History of Nasal Mutilation

• Prince Lakshmana in India (1500 BC)
  ▫ Amputated nose of Lady Surpunakha
  ▫ King Ravana arranged for reconstruction

• Sushruta Samhita (700 BC)
  ▫ First detailed description of nasal reconstruction
  ▫ Involved use of a cheek flap
  ▫ Performed by caste of potters in India.
History of Nasal Reconstruction

- **Italian Method:**
  - Developed by Antonious Branca
  - Upper arm tissue transfer
  - Revised by Benedetti and popularized by Tagliacozzi
History of Nasal Reconstruction

• Indian Method:
  ▫ Midline forehead tissue transfer
Mohs Micrographic Surgery

- Developed in 1930s by Dr. Federic Mohs
- Initially involved chemical fixation while tissue was still on patient.
- Today a fresh tissue technique is utilized.
  - Less pain
- Benefits:
  - Better cure rates
  - Maximal tissue conservation
  - Ability to trace perineural invasion
  - Low cost (Operating theater vs. office procedure)
Mohs Micrographic Surgery

Indications:
- Extensive recurrent skin cancers (did not respond to 1 tx)
- Unusually large primary skin cancers of long duration
- Poorly differentiated squamous cell carcinoma
- Morpheaform or fibrotic basal cell carcinoma
- Immune suppressed patient
Mohs Micrographic Surgery

Indications:
• Tumors with poorly demarcated clinical borders
• Tumors on the face in locations where deeper invasion of the skin along natural skin planes is possible or the extent of the tumor is difficult to define, such as eyelids, nasal alae, nasolabial folds, and circumauricular areas
• Areas where maximum conservation of tumor-free tissue is important for preservation of function, such as the penis or finger
Mohs - Future Trends

• Confocal laser scanning microscope
  ▫ Epidermis and part of dermis can be visualized based on different refractive indices of various structures in the skin, in vivo.

• Melanoma
  ▫ Use of Mohs technique in superficial melanoma (lentigo maligna and in situ melanoma) is still controversial. Clearly identifying melanoma cells in frozen horizontal sections is not always possible.
Mohs Micrographic Surgery

Basal cell carcinoma with fingerlike projections of tumor in the dermis

Tumor sliced with scalpel and cut into quadrants before frozen section; dark areas represent tumor

Maps of tumor location drawn from frozen section specimens, indicating areas of remaining tumor that must be removed
Mohs Surgery

• High risk anatomic areas
  ▫ Unclear if these areas provide fascial planes for spread.
  ▫ Studies have shown that these areas definitely tend to have more histologically aggressive tumors
Terminology
Septal Anatomy
Nasal Sidewall Anatomy
Nasal Anatomy

- Cartilaginous dorsum, upper lateral and alar cartilages frequently involved
- Often need soft tissue and structural reconstruction of defects
Tip Support

- Major tip support mechanisms:
  - Scroll area
  - Alar cartilages
  - Medial crural attachment to caudal septum
  - Septum
Introduction

- **Nasal aesthetics:**
  - Nose provides smooth transition from eyes to lips
  - Deformed nose disrupts facial harmony
- **Nasal function:**
  - Disruption of normal anatomy can cause nasal obstruction, nasal drainage or impaired olfaction
Aesthetic Principles

• Replace tissue with like tissue
  ▫ Replace all missing components

• Restore units and aesthetics

• Evaluate tissue surrounding donor and recipient sites
Nasal Reconstruction

• What does the patient want?
  ▫ Expectations

• Patient Factors
  ▫ Health of patient, health of skin, smoker, etc.

• Diagnose the nasal defect
  ▫ Subunits, tissue layer, internal structures

• Evaluate donor materials for missing surface and tissue layers
Replace tissue with like tissue

• **Cutaneous cover**
  ▫ Local or regional flaps
  ▫ Full thickness skin graft

• **Structural support**
  ▫ Septal cartilage
  ▫ Auricular or rib cartilage
  ▫ Calvarial bone

• **Lining flaps**
  ▫ Septal mucoperichondrial flaps
  ▫ Vestibular or turbinate mucosal flaps
Facial Regions

- Divides face based:
  - Concave vs. convex
  - Relaxed skin tension lines
  - Shadows.
- Attempt to hide scars at junction or along RSTL.
- Nose - region with subunits.
Restore units and aesthetics

- Nasal subunit principle:
  - Nose divided by contour lines
  - Zones of transition between nasal skin of differing texture and thickness.
- Subunits highlighted when light cast on nasal surface.
- Nasal framework primarily responsible for these variations in light reflections.
Restore units and aesthetics

- If greater than 50%, then best to excise and recon entire subunit.
- Takes advantage of trap door deformity to create buldge (convexity):
  - Desired in dorsum, tip, alae.
- Fresh wounds enlarge – use contralateral side to design template.
- Match color and texture.
Evaluate surrounding tissues

- Very thin skin
- Thickens as move caudally
- Thick sebaceous skin/fibrofatty tissue
- Dermis/dermis approximation
- Skin thinnest at rhinion
- Thickens as move caudally
- Thick sebaceous skin

Columella:
- Thinnest nasal skin
- Supported by medial crura
Skin thickness
Lining Flaps

(Important in preventing contracture of wound)
Lining Flaps

- Bipedicled vestibular flap (Aka bucket handle flap)
  - Make intercartilagenous incision between upper and lower lats
  - Elevate the flap, sufficiently to mobilize
  - Auricular cartilage can serve as framework to attach to.

(must be defect <1.5cm in vertical height)
Lining Flaps

- Unilateral Septal Mucopericondrial hinge flap
  - Sub-perichondrial dissection is completed from above downward towards the floor and from anteriorly to posteriorly
  - Turn flap laterally as a hinge

(Can measure up to 4-4.5cm in length and 2.5 – 3 cm in width)
Lining Flaps

- Turbinate mucoperiosteal flaps
  - Medialize the turbinate
  - Create several small perforations along the length of the turbinate
  - Finally fracture anteriorly
  - Remove the bone from flap
  - Transfer and secure into recipient location
Lining Flaps

- Septal composite chondromucosal pivotal flap
  - Indicated for large full thickness defects of central nose
Framework
Framework

- Function is to provide contour and maintain a patent airway.
- Should be placed at time of reconstruction.
- Should resemble closely the shape, size and contour of missing parts.
- Help fix mucosal flaps in place – prevent contracture.
Framework

- Cephalic Dorsum – cranial bone.
  - These are secured to frontal bone with miniplates.
- Caudal Dorsum – septal or auricular cartilage.
- Lateral Sidewall – may be replaced with bone or cartilage.
- Alar defects – cartilage (usually contralateral concha cymba).
Cutaneous cover
Nasal Reconstruction - Ladder

- Healing by secondary intention
- Dermabrasion
- Primary closure
- Full thickness skin grafts (FTSG)
- Composite grafts
- Random Flaps
- Pedicled Flaps
Secondary Intent

- Typically for medial canthal defects
- Results in contraction and distortion of nose
- Poor aesthetic outcomes on most defects of nose
Dermabrasion

- Limited to partial thickness defects
- Typically used after nasal reconstruction for refining scars
  - Works best for sebaceous skin
- May be used on scars after complex recon
Types of Flaps: Defined by direction of tissue movement

- Advancement flaps: Linear movement
  - Y-V advancement

- Rotational Flaps: Radial movement

- Transposition Flaps: Raised from donor sites and rotated over to defect
  - Rhomboid, bilobed
• Interpolated Flaps: Flap passed over or under bridge of skin separating site from defect:
  ▫ Island flap, Paramedian forehead flap.

Important to recognize vectors of pull and force
  ▫ Especially when pulling from structures with low tensile strength such as the eyelid.
## Local Flaps

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td>• Excellent color and contour match</td>
<td>• Technically more challenging</td>
</tr>
<tr>
<td>• Nearly 100% survival rate</td>
<td>• Secondary defect may cause distortion</td>
</tr>
<tr>
<td>• Easy wound care for patient</td>
<td>• More dissection &amp; undermining = increased</td>
</tr>
<tr>
<td>• Short healing period</td>
<td>swelling, bruising, risk of hematoma</td>
</tr>
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<td></td>
<td>• Risk of trapdoor deformity (pin cushioning)</td>
</tr>
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<td></td>
<td>• Need for additional scars</td>
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Primary closure

- Little redundant skin on nose
  - Easier on elderly patients
- Defect usually < 1cm
  - Dorsum or sidewall
- May produce alar or tip distortions (rotation of tip).
Primary closure
Sidewall- Cutaneous Cover

- FTSG
- Transposition Flap
- Forehead Flap
Full Thickness Skin Graft

- Used instead of STSG to avoid contraction
- Need intact framework to support
- Use like tissue
- Best on younger patients with thin skin
- Best for nasal sidewall unit defects
Dorsum - Cutaneous cover

- Glabellar Flap
- Forehead flap
- Primary closure
- FTSG
Glabellar Flap

- Single stage with good color and texture match
- Able to hide scar
- Not used if defects includes tip
Tip Lobule - Cutaneous cover

- Bilobe flap
- Forehead flap
- FTSG
Tip Lobule - Bilobe Flap

- Original design by Esser (1918)
- Modified by Zitelli
  - Narrow angle of transfer
  - Total transposition of <100°
- Ideal for defects:
  - 1.5 - 2.0cm
  - Best of >5mm from margin of nostril
• Preferably laterally based
• Most common nasal local flap
• Double transposition flap
• Little distortion of alar rim
Columella - Cutaneous cover

- FTSG (superficial)
- Composite graft (<1.5cm)
- Melolabial flap
- Forehead flap
Intermediate zone - Cutaneous cover

- V-Y advancement flaps
  - Small defects between the ala and tip
  - Based off nasalis muscle and fat
  - Defects <1.5cm
  - Vascular supply from angular artery
Alar rim - Cutaneous cover

- Melolabial flap
- Forehead flap
- Composite graft
Melolabial Interpolation Flap

• Preserves alar-facial sulcus
  ▫ Pedicle crosses sulcus and is taken down at 3 weeks

• Three types:
  ▫ Superiorly Based
    • Lateral nasal wall, nasal ala
    • Single stage
  ▫ Inferiorly Based
    • Nasal sill and columnella
  ▫ Island Pedicled flap
    • Indicated for whole subunit alar surface replacement
Melolabial Interpolation Flap
Paramedian Forehead flap

- Based off supratrochlear artery
  - 1.7 – 2.2cm lateral to midline
- Performed on same side of majority of defect
- Pedicle can be as narrow as 1.2cm
  - Allows for greater arch of rotation
  - Minimizes standing deformity
Paramedian Forehead Flap
Melolabial vs Forehead

<table>
<thead>
<tr>
<th>Melolabial Flap</th>
<th>Forehead Flap</th>
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<tbody>
<tr>
<td>Smaller alar defect</td>
<td>Larger alar flap</td>
</tr>
<tr>
<td>Lateral defect</td>
<td>Paramedian defect</td>
</tr>
<tr>
<td>Cheek skin laxity</td>
<td>Tight cheek skin</td>
</tr>
<tr>
<td>Elderly</td>
<td>Younger patients</td>
</tr>
<tr>
<td>No caregiver at home</td>
<td>Men with bearded cheek skin</td>
</tr>
<tr>
<td>Must wear glasses</td>
<td>Smoker</td>
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Take home points

• Mohs Surgery – Principles
• Reconstruction of Mohs Defects
  ▫ Cosmetic Principles
  ▫ Healing by Secondary Intent
  ▫ Skin Graft
  ▫ Primary closure
  ▫ Flap Reconstruction
  ▫ Reconstruction of specific locations