Turbinate Dysfunction

Shashidhar S. Reddy, MD, MPH
Faculty Advisor: Matthew Ryan, MD
The University of Texas Medical Branch
Department of Otolaryngology
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Overview

- Focus on Nasal Obstruction
- Anatomy
- Histology and Physiology
- Evaluation of Nasal Obstruction
- Turbinate Disorders
- Medical Management
- Surgical Management
Anatomy

- **Inferior Turbinate:**
  - An inferior infolding of the lateral nasal wall.
  - 60 mm in anterior to posterior direction.
  - Forms an important component of the nasal valve.
  - Derived from the maxilloturbinal ridge.
Anatomy

- **Middle Turbinate**
  - Lies medial to the anterior ethmoid air cells, the maxillary sinus ostium, the nasofrontal duct, and the uncinate process.
  - Length of 40 mm and mean height of 14.5 mm anteriorly and 7 mm posteriorly.
  - Develops from the second ethmoturbinal.
Anatomy

- **Superior Turbinate**
  - Meatus drains the posterior ethmoid air cells.
Anatomy

- **Nasal Valve**
  - **External Nasal Valve**
    - Boundaries include:
      - lower lateral cartilages
      - Soft tissue alae
      - Membranous septum
      - Sill of the nostril
    - Can be site of obstruction (e.g. s/p rhinoplasty)
Anatomy

- Internal Nasal Valve
  - Boundaries include:
    - Septum
    - Upper lateral cartilages
    - Anterior end of inf. Turbinate
  - 1.3cm from nares
  - Accounts for 50% of airway resistance
  - Inferior turbinate can affect this area greatly
Histology

- Three layers of Turbinates
  - Medial thin mucosa
  - Bone
  - Lateral thick mucosa

*From: Berger: Laryngoscope, Volume 111(12). December 2000. 2100-2105*
Histology

- Mucosa
  - Pseudostratified columnar ciliated respiratory epithelium
  - Goblet cells produce salts, glycoproteins, polysaccharides, lysozymes.
  - Complex array of arteries, veins, and venous sinusoids.
  - Lamina Propria contains the above tissue.
Physiology

- Functions of the Nose Related to Turbinates:
  - Airway
  - Filtration – most particles > 30µm
  - Heating – to 31-37 degrees
  - Humidification – to 95%
Physiology

- Chemical or microbial irritation leads to rapid inflammatory response.
- Nasal cycle lasts 2-6 hrs, occurs in 20-80% of people.
- Sympathetic nervous system increases vascular resistance
- Parasympathetic nervous system (vidian nerve) relaxes capacitance vessels.
- Sensory receptors = temperature receptors
Evaluation of Patients

- History – nasal obstruction symptoms

- Physical exam
  - Look for dynamic and structural cause of nasal obstruction.
  - Check before and after decongestion.
Evaluation of Patients

- **Rhinomanometry**
  - Anterior – pressure sensor in one nostril, flow meter in a mask.
  - Posterior – pressure sensor in the mouth, flow meter in a mask.
  - Ohm’s Law: \( R = \frac{P}{V} \)
  - Normal is .15 to .3 Pa/cm³
  - >.3 is usually associated with symptoms.
Evaluating Patients

- Acoustic Rhinometry
  - Measures cross-sectional area (CSA)
  - Minimal CSA before consistent reporting of nasal obstruction is \(0.3 \text{cm}^2\) or less.
  - Above \(0.3 \text{cm}^2\), reliability to predict gradation of symptoms is controversial.
Evaluating Patients

- Other tests:
  - Olfaction tests
  - Nasal smear
  - Tests of humidity and heating
Turbinate Disorders

- **Allergic rhinitis**
  - Histologic turbinate findings: mast cell abundance, seromucous gland hyperplasia, interstitial fibrosis, eosinophils on smear.
  - Probably the most frequent cause of turbinate-related nasal obstruction.

- **Acute rhinosinusitis** – Exam similar to AR
  - Leukocytes on nasal smear.
Turbinate Disorders

- **Chronic Rhinosinusitis**
  - Leads to longstanding changes in mucosa.
  - Fibrosis, polyposis.

- **Vasomotor Rhinitis**
  - Nasal congestion, rhinorrhea only

- **Drug Induced Rhinitis**
Turbinate Disorders

- Nasal Polyposis
  - Etiology unclear - ?denervated mucosa
  - Samter’s Triad

- Atrophic Rhinitis
  - Progressive slow atrophy of nasal mucosa
  - Questionable association with aggressive turbinate resection
Turbinate Disorders

- Anatomic
  - Septal Deviation
- Concha Bullosa
Turbinate Disorders

- Anatomic
  - Paradoxical middle turbinate curvature in 10-29%
  - Synechiae, polypoid changes
Medical Management

- Allergic Rhinitis – Nasal steroids with oral and/or topical antihistamines, systemic decongestants.
- Drug induced rhinitis – cessation of topical medicine and switch to steroids.
- Nasal Polyposis – systemic steroids, topical steroids.
- Rhinosinusitis: Antibiotics
Surgical Management

- Total inferior Turbinectomy

- Benefits:
  - Most effective in terms of LONG TERM improvement of airway
  - Ophir *et al* followed 186 patients for 10 years and showed that 82% showed subjective improvement, 95% had widely patent airways
Surgical Management

- Total Inferior Turbinectomy
  - Disadvantages –
    - Postoperative hemorrhage rate of 5-8%
    - Nasal crusting, sometimes lasting for months, up to 15% at one year, in a study by Mabry et al (40pts. followed for one year)
    - Synechiae 6-12% of the time
    - Atrophic rhinitis? Classic study by Moore shows rate of 66% in group of 18 pts at 3-5 years. Six ENTs in Australia reported none in 17,000 cases. (Fry et al 1992)
Surgical Management

- **Partial Turbinectomy**
  - Anterior portion, at nasal valve, is resected.

- **Advantages**
  - Addresses nasal valve
  - Courtis showed 92% satisfaction at >2 years

- **Disadvantages**
  - Similar to total, but less severe
Surgical Management

- Submucous Resection
  - Advantages
    - Decreased risk of hemorrhage
    - Preserves mucociliary clearance and air conditioning
  - Disadvantages
    - Technical difficulty
    - Tendency to relapse – 25% in a 1988 study by Mabry et al
Surgical Management

- **Mucosal Lesion-Producing techniques:**
  - Electrocautery, Cryosurgery, Laser Surgery
- **Advantages**
  - Local Anesthesia, Easy, low hemorrhage risk
- **Disadvantages**
  - Extensive post-op crusting, probable regrowth of lesions
Surgical Management

- Laser Illustrations
Surgical Management

- **Submucous Lesions**
  - Radiofrequency – unipolar or bipolar
    - Study by Back et al on twenty patients showed improvement in nasal cross-sectional area by acoustic rhinometry at one year
    - KTP, Argon, and CO2 have all been shown to be effective.
Surgical Management

- Corticosteroid Injection
  - Advantages – minimally invasive, low cost, cost effective
  - Disadvantages - Effects wear off by 6 weeks
- Microdebrider
Surgical Management

- **Vidian Neurectomy**
  - Ligate vidian nerve, thus cutting parasympathetic supply.
  - Transantral, Transseptal, Transpalatal.
  - Good immediate relief (Fernandes *et al*) reports 88% of 139 patients reported improvement in rhinorrhea.
  - Can have high complication rate including bleeding.
Surgical Management

- Middle Turbinate
  - Concha Bullosa
    - Indications
    - Complications
Surgical Management

- Middle Turbinate:
  - Medialization after sinus surgery
  - Prevents synechiae formation?
Surgical Management

- Resection of the normal middle turbinate?
  - Havas, *et al.* show clear benefit in reducing synechiae requiring revision at osteomeatal complex after partial resection of middle turbinate (15% without resection vs. 7.1% with) in a randomized trial of >1000 patients.
Conclusion

- Anatomy
- Histology/Physiology
- Evaluation of Nasal Obstruction
- Turbinate Disorders
- Medical Management
- Surgical Management
  - Controversial
Bibliography:


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