Surgical Treatment of Nasal Obstruction

Edward W. Chang, MD FACS
Chief of Education
Assistant Chief, Department of Head and Neck Surgery
Facial Plastic Surgery at Cosmetic Services
Kaiser Permanente-Santa Rosa Medical Center
February 13, 2010
Nasal Obstruction

Objectives

- The role of nasal obstruction in Sleep-Disordered Breathing
- Pathophysiology of nasal obstruction
- Methods of clinical assessment
- Discuss various nasal procedures and timing of the surgeries
Cultural and Linguistic Competence

- Nasal obstruction can present differently in different ethnicities
  - Platyrrhine: short nasal nose, broad base
  - Mesorrhine: having a moderately broad and high-bridged nose
  - Leptorhine: a long narrow nose
Patent Nasal Airway

- Establishes physiologic breathing
  - *Fitzpatrick 2003*
- Minimizes mouth breathing
  - As the jaw opens, the tongue falls back into the PAS
- May improve nCPAP tolerance
Nasal Surgery and SDB

- Verse 2002 Laryngoscope
- Evaluation of nasal surgery on 26 patients with OSAS and simple snoring (AHI<10)
- Limited efficacy in patients with OSAS
- Improved sleep quality and EDS independent of the severity of SDB
Nasal Surgery and SDB

- Blue Cross/Blue Shield 2009
  - Nasal surgery for OSA investigational and not medically needed
  - Radiofrequency of turbinates investigational and not medically needed
Nasal Obstruction

- May accentuate *Snoring*
- May worsen *Obstructive Sleep Apnea*
- *Nasal steroids improve sleepiness and reduce AHI*, Thorax 2004
Pathophysiology

- Nasal occlusion
- High nasal resistance
- More negative pharyngeal pressure
- Upper airway collapse
  - Upper airway as a Starling Resistor
    - Park, SS, Lung, 1993
- Nasal role unclear in SDB
  - Kushida, CA, OCNA, 2003
  - Rappai, M, CHEST, 2003
Nasal Obstruction as a Risk Factor

- Young, et. al. 1997
  - 911 subjects failed to demonstrate a correlation between OSAS severity and objective nasal resistance

- Young, et. al. 2001
  - Population based sample of 4,916
  - Nasal obstruction is a risk factor for snoring
  - Snoring on the continuum of SDB
  - Linked to significant morbidity
Nasal Obstruction as a Risk Factor

- Lofaso et.al. 2002 looked at 541 patients
- Cephalometrics, BMI, PSG and posterior rhinometry was done
- OSAS was defined as AHI > 15
- Daytime nasal obstruction is an independent risk factor for OSAS
  - Increase in negative oropharyngeal pressure during inspiration
  - Predisposition to upper airway collapse
Nasal Surgery and n CPAP

- Friedman et. al. 2000
- 50 patients with nasal obstruction and OSAS
- Subjectively 98% improvement in nasal breathing
- No significant change in RDI or LSAT
- nCPAP pressures decreased after surgery
Controversy

- Will reducing the nasal resistance allow patients to go into a deeper level of sleep causing more hypopneas and apneas?
- Since sinusitis is associated with mucosal inflammation and nasal obstruction, is there justification for FESS, septoplasty and turbinate reduction as first line therapies for OSAS?
Nasal Anatomy

Location of Obstruction

- Septum
- Turbinate
- Internal Valve
- External Valve
- Posterior pharynx
  - Tumor
Internal Nasal Valve

• Limen Vestibuli

• Main Regulator of Nasal Flow

• Ideal Angle = 10-15°

• Components
  Septum
  Ant.Inf.Turbinate
  ULC
External Nasal Valve

Components:

LLC
Columella
Nasal Floor
Nasal Obstruction

Clinical Assessment

- History and Physical
- Internal
  - Anterior rhinoscopy
  - Fiberoptic examination
The Nose

Clinical Assessment

- External
  - Inspection
  - Palpation
  - Review of standardized photographs
Location of Obstruction

- DNS
- Internal Valve Collapse
  - R- Static
  - L- Dynamic
- External Valve Collapse
  - L- Alar
Rhinophyma impeding nCPAP

- Severe OSAS, s/p PI and Trach
- Controlled on nCPAP
- Increasing difficulty in nCPAP use
- Dermabrasion under general anesthesia
- Post operative nCPAP via nasal pillows
Nasal Obstruction

- Turbinate Hypertrophy
- Allergy work-up
- Refractory to medical therapy
- Examination shows boggy, enlarged turbinates +/- DNS
RFVTR of the Turbinate

- **Pilot Study** Oto/HNS 1998 22 pts 382 J
- **nCPAP** Laryngoscope 2001 21 pts 350-500J
- **Smith et al** Laryngoscope 1999 11 pts 450 J
- **Utley et al** Laryngoscope 1999 10 pts 450x2J
  - Anterior and Middle lesions
- **Coste et al** Laryngoscope 2001 14 pts 340x3J
  - Upper Anterior
  - Lower Anterior
  - Middle
Temperature Controlled Radiofrequency Volumetric Tissue Reduction

Turbinate Reduction

May decrease nasal Congestion

May help decrease snoring

May decrease cpap pressures
Turbinate Reduction

- Sapci et. al., Laryngoscope 2003
- Mucociliary function with RF reduction, CO2 ablation, and partial turbinectomy
- RF effective in improving nasal obstruction while preserving mucociliary function
- Partial turbinectomy had similar results
- CO2 significantly reduced mucociliary function
Nasal Obstruction

- Deviated Septum
- 20-85% of population on examination have a deviated nasal septum
- Whether or not there is functional obstruction determines if treatment is needed
- Medical vs. Surgical
Nasal Alar Rim Reconstruction

Alar Structural Grafts

*RJ Troell, et al* Oto/HNS 2000;122:204-11

- 79 patients
- 40 NVG
- 39 NARR
- Response
- 75%
- 94.9%

- NARR
  - Irradiated rib cartilage
  - Longer, structurally stiffer

*PA Hilger Arch FPS 2009*

- Alar Rim Grafting
  - Host cartilage in inferior pocket
  - Support to external nasal valve
Internal Valve

- Schlosser and Park 1999 *Arch FPS*
- Clark and Cook 2002 *Laryngoscope*
- Stucker *et al* 2002 *Am J Rhinol*
- Stucker *et al* 2002 *Arch Oto/HNS*
- Lee and Glasgold 2001 *Arch FPS*
- Pearlman *et al* 2004 *Arch FPS*
Nasal Airflow Dynamics

- **Bernoulli Principle**
  - As the speed of a moving fluid (liquid or gas) increases, the pressure within decreases
Nasal Airflow Dynamics

- Poiseuille’s Law
  - Air flow is a function of the fourth power of the radius

\[ Resist = \frac{k(l)}{r^4} \]

- Cross-sectional area of the internal valve is between 55 and 83 mm sq
Internal Valve

- External devices used by professional athletes to alter the valve area have been shown to have objective effect on performance.*

- Park showed that the combination of spreader grafts and flaring suture to be superior to either modality alone in static obstruction.

- For dynamic sidewall collapse, a batten graft at the location of collapse is recommended.

* Griffin JW, Laryngoscope. 1997;107:1235-8
Nasal Obstruction

Timing of Procedures

- The location of the nasal obstruction determines the timing of the procedures

- **Turbinate reduction** - Temperature Controlled Radiofrequency, Office procedure
  - Prior to nCPAP
  - May decrease nCPAP pressures, and increase compliance
Nasal Obstruction

- **Nasal procedures post Phase I**
  - Septoplasty
  - Structural grafts - external valve reconstruction
    - Phase I surgery may alleviate the nasal obstruction by decreasing negative pressures
  - FESS
    - Attempt to delay until OSA improved
Nasal Obstruction

- *Nasal surgeries post Phase II*
  - Internal Valve Reconstruction
  - Rhinoplasty
    - MMO will change the nasal appearance
  - External approach
Conclusions

- Nasal obstruction plays an *important* but *minimum* role in OSAS
- Surgical corrections can help in nCPAP use and compliance
- Can help subjectively in quality of sleep and EDS
- Crucial to determine the level of nasal obstruction
- Timing of procedure is based on the location of obstruction
Thank You!