Nasal Evaluation & Non-surgical Therapy in SDB

Edward M. Weaver, MD, MPH

University of Washington
Harborview Medical Center
VA Puget Sound
Topics

• Significance of nasal obstruction
• Effect of nasal treatment
• Nasal evaluation
• Nasal medical treatment
Nasal Obstruction

- Is common in sleep apnea (30%)
- Can affect whole upper airway
  - Increases intrapharyngeal pressure gradient
  - Activates nasopulmonary reflex
  - Mouth opening → tongue base obstruction
Upper Airway Anatomy
Nasal Obstruction → Mouth Opening
How Does Open-Mouth Breathing Influence Upper Airway Anatomy?

Seung Hoon Lee, MD; Ji Ho Choi, MD; Chol Shin, MD; Heung Man Lee, MD; Soon Young Kwon, MD; Sang Hag Lee, MD

**Objectives/Hypothesis:** Open-mouth breathing during sleep may increase the severity of obstructive sleep apnea (OSA) and complicate nasal continuous positive airway pressure (CPAP) therapy in patients with OSA. The aim of this study was to assess the effect of open-mouth breathing on upper airway anatomy using lateral cephalometry and fiberoptic nasopharyngoscopy.

**Study Design:** This was a cross-sectional study.

**Methods:** Lateral cephalometry and fiberoptic nasopharyngoscopy were carried out on 28 subjects with a mean age of 36.7 years. We compared the effect of the mouth being open or closed on the results in lateral cephalometry (pharyngeal length, distance between the mandible and hyoid bone [MP-H], angles from the sella-nasion to mandibular points A and B [SNA, SNB, respectively], retropalatal, retroglossal, and hypopharyngeal distance) and fiberoptic nasopharyngoscopy (retropalatal and retroglossal cross-sectional area).

**Results:** On lateral cephalometric measurements, retropalatal distance ($P = .000$), retroglossal distance ($P = .000$), and MP-H ($P = .002$) were lower with mouth open, and pharyngeal length ($P = .000$) was greater. However, there were no significant differences in SNA and hypopharyngeal distance. On fiberoptic nasopharyngoscopy, retropalatal ($P = .005$) and retroglossal ($P = .000$) cross-sectional areas were significantly reduced with the mouth open.

**Conclusions:** Open-mouth breathing is associated with reduction of the retropalatal and retroglossal areas, lengthening of the pharynx and shortening of the MP-H in the upper airway. We suggest that knowledge of these anatomic changes improves our understanding of the increase of OSA severity and the low adherence to nasal CPAP therapy in mouth breathers.
Retro-Glossal Area (mm²) 137±58 78±36 P<0.001
Effect of treating severe nasal obstruction on the severity of obstructive sleep apnoea

H.A. McLean*, A.M. Urton*, H.S. Driver#, A.K.W. Tan†, A.G. Day‡, P.W. Munt* and M.F. Fitzpatrick*

ABSTRACT: An association between mouth breathing during sleep and increased propensity for upper airway collapse is well documented, but the effect of treatment for nasal obstruction on mouth breathing during sleep and simultaneous obstructive sleep apnoea (OSA) severity has not been described previously.

A randomised single blind placebo- and sham-controlled crossover study of treatment (topical decongestant and external dilator strip) for nasal obstruction was carried out in 10 patients (nine males; mean ± SEM 46 ± 5 yrs) with nasal obstruction and OSA. All patients had normal acoustic pharyngometry. The effect of treatment on nasal resistance, mouth breathing during sleep and OSA severity was quantified.

Treatment of nasal obstruction was associated with a dramatic and sustained reduction in nasal resistance and the oral fraction of ventilation during sleep (mean (95% confidence interval) absolute reduction in oral fraction 30% (12–49)). Improvements in sleep architecture were observed during active treatment, and there was a modest reduction in OSA severity (change in apnoea–hypopnoea index 12 (3–22)).

In conclusion, treating nasal obstruction reduced mouth breathing during sleep and obstructive sleep apnoea severity, but did not effectively alleviate obstructive sleep apnoea.
Effect of improved nasal breathing on obstructive sleep apnea

MICHAEL FRIEDMAN, MD, HASAN TANYERI, MD, JESSICA W. LIM, MD, ROY LANDSBERG, MD, KRISHNA VAIDYANATHAN, BS, and DAVID CALDARELLI, MD, Chicago, Illinois

Septoplasty and/or turbinate reduction.

<table>
<thead>
<tr>
<th></th>
<th>Pre-Op</th>
<th>Post-Op</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHI (/h)</td>
<td>32</td>
<td>40</td>
</tr>
<tr>
<td>LSAT (%)</td>
<td>83</td>
<td>84</td>
</tr>
<tr>
<td>CPAP Pressure (cm H2O)</td>
<td>9.3</td>
<td>6.7</td>
</tr>
</tbody>
</table>

Friedman, OtoHNS 2000; 122:71-4
Nasal Obstruction & CPAP Use

Research Questions
Does nasal obstruction ↓ CPAP use?

Does nasal treatment ↑ CPAP use?
Acoustic Reflection for Nasal Airway Measurement in Patients with Obstructive Sleep Apnea-Hypopnea Syndrome

Hsueh-Yu Li, MD; Heather Engleman; Chung-Yao Hsu, MD; Bilgay Izc, MSc; Marjorie Vennelle, RGN; Melanie Cross, MD; Neil J Douglas, MD

1Department of Sleep Medicine, Royal Infirmary, Edinburgh, UK; 2Department of Otolaryngology, Sleep Center, Chang Gung Memorial Hospital, Taipei, Taiwan; 3Department of Clinical Neuroscience, Kaohsiung Medical University, Kaohsiung, Taiwan

Figure 5

Li, Sleep 2005; 28:1554-9

\[ r = 0.34 \]

\[ p < 0.01 \]
CPAP Use

Abnormal Nasal Exam

Nasal Symptoms

Nasal Med.

Adjusted Odds Ratio

Husen, Sleep 2003; 26:A240
Question
Does turbinate reduction improve CPAP use and outcome?
Radiofrequency Treatment of Turbinate Hypertrophy in Subjects Using Continuous Positive Airway Pressure: A Randomized, Double-Blind, Placebo-Controlled Clinical Pilot Trial

Nelson B. Powell, MD; Adriane I. Zonato, MD; Edward M. Weaver, MD, MPH; Kasey Li, DDS, MD; Robert Troell, MD; Robert W. Riley, DDS, MD; Christian Guilleminault, MD

**Method:**

22 met inclusion criteria

![](image)

Sham n=5  RF n=17

Powell, Laryngoscope 2001; 111:1783-90
Adapted from Table IV
Turbinate Reduction and CPAP Use: A Randomized Blinded OSA Trial

Baseline → Turbinate Reduction

TURBO Clinical Trial

NATIONAL INSTITUTES OF HEALTH

National Heart Lung and Blood Institute
Topics

- **Significance of nasal obstruction**
  - Common
  - Worsens retrolingual airway in some
  - Decreases CPAP tolerance & use

- **Effect of nasal treatment**
  - Reduces mouth breathing
  - Improves AHI in some
  - Reduces CPAP pressure
  - Increases CPAP use
  - Complements other OSA treatments
Topics

• Significance of nasal obstruction
• Effect of nasal treatment
• Nasal evaluation
• Nasal medical treatment
Subjective
Nasal Obstruction Symptom Evaluation (NOSE) Instrument

Over the past 1 month, how much of a problem were the following conditions for you?

<table>
<thead>
<tr>
<th>Condition</th>
<th>Not a problem</th>
<th>Very mild problem</th>
<th>Moderate problem</th>
<th>Fairly bad problem</th>
<th>Severe problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nasal congestion or stuffiness</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Nasal blockage or obstruction</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Trouble breathing through my nose</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Trouble sleeping</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Unable to get enough air through my nose</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Stewart, OtoHNS 2004; 130:157-63
NOSE Scale Scoring

• Add all five answers
• Multiply by 5
• Range 0 – 100
  \[
  0 = \text{no problem} \\
  100 = \text{severe problem}
  \]

Stewart, OtoHNS 2004; 130:157-63
NOSE Scale

- Normal score 11
- Minimal clinically important difference: 6 - 19
- Septoplasty: 68±20 → 23±20
- RF Turbinate: 61±23 → 41±23

Stewart, OtoHNS 2004; 130:157-63
Stewart, OtoHNS 2004; 130:283-90
Visual Analog Scale

Please mark on this line how troublesome it is breathing through your nose on average:

Stewart, OtoHNS 2004; 130:157-63
Nasal Valve
Nasal Valve

- Nasal Valve
- Inferior Turbinate
- Septum
- Upper Lateral Cartilage
Nasal Valve Collapse
Nasal Valve Collapse
Nasal Medication

- Increase in nasal caliber reduces negative force (Bernoulli’s Law)
- Treat nasal airway
- Indirect effect on valve collapse
Otolaryngology Consultation

- Nasal airway evaluation
- Surgery evaluation
Nasal Cavity
Nasal Cavity Exam

- Speculum & headlight
- Septum
- Turbinates *
- Polyps *
- Mucosal disorders *

*Medically treatable (partial)
Nasal Valve

Septum
Septum Treatment

• Surgical
Turbinate Treatment

- Irritant avoidance
- Elevate head of bed
- CPAP heated humidity
- Nasal saline
- Nasal steroid
- Anti-histamine
- Oral decongestant
- Nasal decongestant
- Surgery
Polyp Treatment

• Allergen avoidance
• Nasal steroid (head-down)
• Anti-histamine
• Oral steroid
• Surgery
Mucosal Treatment

- Rule out serious disorder
- Irritant avoidance
- Nasal saline
- Nasal steroid
- Antibiotic ointment
- Antibiotic irrigation
- Otolaryngology evaluation
Topics

• Significance of nasal obstruction
  – Common
  – Worsens retrolinguinal airway in some
  – Decreases CPAP tolerance & use

• Effect of nasal treatment
  – Reduces mouth breathing
  – Improves AHI in some
  – Reduces CPAP pressure
  – Increases CPAP use
  – Complements other OSA treatments
Topics

• Nasal evaluation
  – Everyone can do basic evaluation
  – Otolaryngology for advanced evaluation

• Nasal medical treatment
  – Safe
  – Readily available
  – Often helpful
  – Surgical treatment backup
Nasal Evaluation and Non-Surgical Therapy in SDB

REFERENCES


