Pediatric Sleep Apnea

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Objectives

- **Introduction**
  - Definitions
  - Significance
  - Diagnosis
  - Epidemiology
  - Risk Factors
  - Pathophysiology
- **Management**
- **Special Patients with Sleep Apnea**
  - Severe OSA
  - Complicated Patients
  - Cleft Patients
  - Down Syndrome
- **Conclusions**
- **Discussion**
“THE FAT BOY RETURNED, SLUMBERING AS PEACEABLY IN HIS DICKEY, OVER THE STONES, AS IF IT HAD BEEN A DOWN BED ON WATCH SPRINGS.

BY SOME EXTRAORDINARY MIRACLE HE AWOKE OF HIS OWN ACCORD, WHEN THE COACH STOPPED, AND GIVING HIMSELF A GOOD SHAKE TO STIR UP HIS FACULTIES, WENT UPSTAIRS TO EXECUTE HIS COMMISSION.”

--CHARLES DICKENS
Case number 1

SEVEN YEAR OLD CHILD ARRIVING TO CLINIC WITH HIS PARENTS
MAIN COMPLAINT – SNORING

ANAMNESIS
Definitions

- Sleep-disordered breathing (SDB) refers to the clinical spectrum of repetitive episodes of complete or partial obstruction of the airway during sleep.
  - **Primary Snoring (PS)**
    - Snoring without obstructive apnea, frequent arousals from sleep, or gas exchange abnormalities.
  - **Obstructive Hypoventilation Syndrome (OHS)**
    - Persistent partial upper airway obstruction associated with gas exchange abnormalities, rather than discrete, cyclic apneas.
  - **Upper Airway Resistance Syndrome (UARS)**
    - Increasingly negative intrathoracic pressures during inspiration that lead to arousals and sleep fragmentation.
  - **Obstructive sleep apnea (OSA)**
    - Disorder of breathing during sleep characterized by prolonged partial upper airway obstruction and/or intermittent complete obstruction.
    - Disrupts normal ventilation.
    - Disrupts normal sleep patterns.
Significance

- **Significance**
  - **Daytime somnolence**
    - Motor Vehicle Accidents
  - **Cognitive dysfunction**
    - Behavioral problems
      - ADHD
    - Impaired work performance
    - Impaired school performance
  - **Metabolic effects**
    - Insulin resistance
    - Type II diabetes
    - Metabolic Syndrome
  - **Cardiovascular morbidity**
    - Pulmonary Hypertension
    - Cor Pulmonale
    - Systemic Hypertension
    - Stroke
  - **Failure to Thrive**
    - Rarely a presenting symptom now
  - **Death**
    - Hypothesized to be involved with SIDS
Diagnosis

- **History & Physical**
  - Sleep history screening for snoring should be part of routine health care visits.
  - OSA unlikely in absence of snoring.
  - If snoring history elicited should obtain more detailed sleep history.
    - Including: labored breathing, apneas, diaphoresis, enuresis, cyanosis, behavior/learning problems.

- **Audio taping/Video taping**
  - Discrepancies from different centers make this method unreliable.

- **Abbreviated (Nap) Polysomnography**
  - High PPV but Low NPV.
    - Useful if results are positive.
  - False positive results in patients with coexistent medical problems (obesity, asthma).

- **Polysomnogram (PSG)**
  - “Gold Standard.”
  - Can assess severity of SDB.
    - Includes EEG, EKG, EOG, EMG, saturation monitor, respiratory effort and airflow monitor.
Diagnosis

- **Apnea**
  - Any pause in respiration.
  - Versus at least 10 s in adults.

- **Hypopnea**
  - Reduction of airflow by 50% for two respiratory cycles accompanied by reduction of saturation by 3% or arousal from sleep.

- **AHI**
  - Sum of Apneas and Hypopneas per hour of sleep.

- **RDI**
  - Sum of Apneas, Hypopneas, and respiratory event-related arousals per hour of sleep.

- **AHI or RDI of 1 to 5 events per hour is most often used to identify children with OSA.**
  - Versus ≥ 5 events in adults.
Most studies showed 0.2% to 4.0% prevalence of parent-reported apnea.

Depending on threshold of AHI to diagnose, the prevalence of pediatric OSA ranges from 1% to 4% in most studies.

Children with abnormal PSG that go untreated will continue to have abnormal findings.

A significant proportion of patients with primary snoring will have resolution of this symptom.

Only a small proportion of patients that do not snore will develop this habit.

**Epidemiology of Pediatric Obstructive Sleep Apnea**

Julie C. Lumeng\(^1\) and Ronald D. Chervin\(^2\)

\(^1\)Center for Human Growth and Development and Department of Pediatrics, and \(^2\)Sleep Disorders Center and Department of Neurology, University of Michigan, Ann Arbor, Michigan

Meta-analysis of almost 48 studies evaluating the frequency of snoring, OSA and SDB in various pediatric cohorts.

DOI: 10.1513/pats.200708-135MG
Internet address: www.atsjournals.org
## Epidemiology

<table>
<thead>
<tr>
<th></th>
<th>Pediatric OSA</th>
<th>Adult OSA</th>
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<tbody>
<tr>
<td>Age</td>
<td>Preschool</td>
<td>Elderly</td>
</tr>
<tr>
<td>Gender</td>
<td>Equal</td>
<td>M&gt;F</td>
</tr>
<tr>
<td>Etiology</td>
<td>Adenoid/Tonsil hypertrophy</td>
<td>Obesity</td>
</tr>
<tr>
<td>Weight</td>
<td>FTT, normal, or obese</td>
<td>Obese</td>
</tr>
<tr>
<td>Behavioral</td>
<td>Hyperactive</td>
<td>Somnolent</td>
</tr>
<tr>
<td>Sleep architecture</td>
<td>Normal</td>
<td>Decreased delta and REM sleep</td>
</tr>
<tr>
<td>Surgical Rx</td>
<td>T&amp;A</td>
<td>UPPP</td>
</tr>
<tr>
<td>Medical Rx</td>
<td>CPAP (rarely)</td>
<td>CPAP</td>
</tr>
</tbody>
</table>

**State of the Art**

**Sleep-disordered Breathing in Children**

CAROLE L. MARCUS

The Endowed Division of Pediatric Respiratory Sciences, Johns Hopkins University, Baltimore, Maryland

*Am J Respir Crit Care Med Vol 164, pp 16–30, 2001*

Internet address: www.atsjournals.org

Review article that focuses on the difference between pediatric and adult OSA from a physiological development perspective.
Cohort of 399 pediatric patients in the greater Cleveland area aged 2-18 years investigated by home-PSG.
Pediatric Obstructive Sleep Apnea
Complications, Management, and Long-term Outcomes

Oscar Sans Capdevila¹, Leila Kheirandish-Gozal¹, Ehab Dayyat¹, and David Gozal¹,²

¹Division of Pediatric Sleep Medicine, Department of Pediatrics, University of Louisville; and ² Kosair Children’s Hospital Research Institute, Louisville, Kentucky

DOI: 10.1513/pats.200708-138mg
Internet address: www.atsjournals.org

Review article describing the consequences and end-organ morbidity associated with pediatric OSA.
Pathophysiology of Pediatric Obstructive Sleep Apnea

Review article from describing the mechanisms of airway resistance during sleep in children with OSA.

Figure 1. Top: Three-year-old normal control male subject. Sagittal images from various points in the respiratory cycle show no significant change in airway diameter at the level of the hypopharynx (arrows in image 1) or nasopharynx (arrows in image 2). Bottom: Eleven-year-old male patient with obstructive sleep apnea (OSA). Sagittal images from various points of the respiratory cycle demonstrate airway collapse at the level of the hypopharynx (arrows in images 1 and 2). The palatine tonsils (P in image 2) are enlarged and are seen to move inferiorly and medially during the respiratory cycle to obstruct the airway (image 2). The adenoids are enlarged (A in images 1 and 2). Modified by permission from Reference 34.
Pathophysiology

Large pediatric cohort of the Louisville, Kentucky Jefferson County Public School system of children aged 5-7 years. 378 randomly of those that snored underwent PSG.
Cohort of 700 children from kindergarten to 5th grade of the Dauphin County public school system in Hershey, Pennsylvania that underwent overnight PSG.
Study from Cincinnati of 92 patients undergoing adenotonsillectomy that underwent noninvasive measurements of cerebral oxygenation during sleep and wake periods.

**Figure 1.** Normalized regional cerebral oxygenation ($\Delta rS_O_2$) means for sleep stages 1, 2, 3, and 4 and rapid eye movement for control subjects, children with primary snoring, and children with OSA. $\Delta rS_O_2 =$ difference in cerebral oxygenation between sleep and wake periods; OSA = obstructive sleep apnea.
Management

“To know even one life has breathed easier because you lived. This is to have Succeeded.”

--Ralph Waldo Emerson
Positive Pressure Ventilation

Review

Obstructive sleep apnea syndrome and asthma: the role of continuous positive airway pressure treatment

Michel Alkhalil, MD; Edward S. Schulman, MD; and Joanne Getsy, MD


Review of the literature of 5 prospective trials of CPAP for OSA and explores mechanisms of its beneficial effects.

Figure 1. Beneficial effects of continuous positive airway pressure (CPAP) in patients with asthma and obstructive sleep apnea (OSA) syndrome.
Positive Pressure Ventilation

- **Effects**
  - Local and Systemic Anti-inflammatory effects.
  - Restore sleep pattern.
  - Promote weight loss.
    - Suppress leptin secretion in adipose tissue.
  - Improve cardiac function.
  - Suppress acid reflux.
  - Decrease airway hyper-responsiveness.

Figure 1. Beneficial effects of continuous positive airway pressure (CPAP) in patients with asthma and obstructive sleep apnea (OSA) syndrome.
Positive Pressure Ventilation

- **Advantages**
  - Avoids perioperative complications of adenotonsillectomy.
    - But does have localized/temporary effects from equipment such as nasal irritation, skin breakdown.
  - May serve as a “bridge” preoperatively until surgery to reduce morbidity.
  - Can be used postoperatively for residual OSA.
    - Useful in obese and complex patients.
  - High flow nasal cannula recently shown to also be effective.

- **Disadvantages**
  - Poor compliance
    - ≥3-4h of use per night is considered good compliance.
    - Estimated at only 50-60%.
    - Children require more sleep than adults; therefore such limited use may not be adequate.
  - Requires training for parents as well as patients.
  - Lifelong use required.
  - Risk for aspiration of stomach contents.
    - Very young.
    - Significant GERD.
    - Neuromuscular weakness.

Figure 1. Beneficial effects of continuous positive airway pressure (CPAP) in patients with asthma and obstructive sleep apnea (OSA) syndrome.
Adenotonsillectomy

- Exclusion Criteria
  - Children with BMI > 95\textsuperscript{th} percentile.
  - Children with developmental delay or neuromuscular disease.
  - Children with craniofacial syndromes or asthma.

- All children showed improvement in respiratory parameters after surgery.
- 82\% of children had resolution of OSA (to AHI <5).
- Improvement in all fields of OSA-18.

Prospective Cohort Study of 79 patients that underwent adenotonsillectomy w/ monopolar cautery and suction ablation followed by PSG 3-6 months postoperatively.
- Prospective Cohort Study of 79 patients that underwent adenotonsillectomy with monopolar cautery and suction ablation followed by PSG 3-6 months postoperatively.
Adenotonsillectomy

- **Efficacy**
  - AHI
  - Quality of life
  - Cognition
    - Pediatric Sleep Questionnaire
    - IQ Test
  - Cardiovascular Parameters
    - Cerebral blood flow
    - Hemoglobin Saturation
    - Pulse Rate
    - Pulse variability
  - School performance
    - Significant improvement in grades from 1st to 2nd grade in cohort that underwent adenotonsillectomy.
    - No significant change in control group and group that chose not to have adenotonsillectomy.
      - All patients started in lowest 10th percentile of class.
  - Enuresis/Incontinence
    - Children with OSA have increased risk for enuresis.
      - Possibly related to increased levels of BNP?
    - Significant decrease in nocturnal enuresis and voids/day after adenotonsillectomy.
Powered Intracapsular Tonsillectomy & Adenoidectomy (PITA)

Intracapsular vs. Extracapsular Tonsillectomy: A Comparison of Pain
Michael S. Cohen, MD; Anne E. Getz, MD; Glenn Issacson, MD; FAAP, FACS; John Gaughan, PhD; Wasef Sorooshy, MD, MBA
Laryngoscope 117: October 2007

Ambulatory Powered Intracapsular Tonsillectomy and Adenoidectomy in Children Younger Than 3 Years
John P. Bent, MD; Max M. April, MD; Robert F. Ward, MD; Alexander Sorin, MD; Brian Briley, MS; Gregg Weiss, MD
Arch Otolaryngol Head Neck Surg. 2004;130:1197-1200

Microdebrider Tonsillectomy vs Electrosurgical Tonsillectomy
A Randomized, Double-blind, Paired Control Study of Postoperative Pain
Matthew T. Lester, MD; Michael J. Cunningham, MD; Barry Benjamin, MD; Michael Williams, MD; Ann Tylor, RN; Debra A. Schumacher, ScD, OD; MIP; Christopher J. Bartnick, MD, MS (Ep)
Arch Otolaryngol Head Neck Surg. 2006;132:593-604

Postoperative Recovery After Microdebrider Intracapsular or Monopolar Electrocautery Tonsillectomy
A Prospective, Randomized, Single-blinded Study
Steven E. Schol, MD, MS; Ralph F. Weenmore, MD; Roger B. March, PhD; Joanna Stow, RN; Ian M. Jacob, MD
Arch Otolaryngol Head Neck Surg. 2006;132:270-274

A. Intraoperative view of tonsillar hypertrophy. B. Intraoperative view immediately after intracapsular tonsillectomy. C. Three-week postoperative view through a 50° telescope (angled inferiorly) after intracapsular tonsillectomy. Note the well-preserved tonsilar pillars without visible scarring.
Advantages

- Decreased pain compared to extracapsular tonsillectomy.
  - Reduced dehydration.
  - Reduced need for analgesics (narcotics).
  - Earlier return to normal diet.
- Lower risk of hemorrhage.
  - Fewer exposed blood vessels.
- Improves PSG and OSA-18 scores.

Disadvantages

- Risk of tonsil re-growth.
  - Risk of recurrent tonsillitis.
- Longer surgery.
  - Four minutes.
- More blood loss.
  - Fifteen cc.
Surgery for Pediatric Sleep Apnea

David H. Darrow, MD, DDS

Departments of Otolaryngology and Pediatrics, Eastern Virginia Medical School, 825 Fairfax Avenue, Norfolk, VA 23507, USA

Children’s Hospital of The King’s Daughters, 601 Children’s Lane, Norfolk, VA 23507, USA

Review of surgical management of pediatric OSA.

Fig. 8. Technique of mandibular distraction. (A) Planned bone cuts and pin placement for mandibular distraction. Bone cuts are designed as in a bilateral sagittal split osteotomy. Two pins are placed on either side of the osteotomy. In neonates, each pin is passed straight through from one side of the mandible to the other. (B) The medial osteotomy is prepared by scoring the bone. The bone is released with a gentle twist of the osteotome. (C) The multivector distractor is applied to the inserted pins. Distraction may proceed at a rate of 1 to 2 mm per day. (From Darrow DH, Weiss DD. Management of sleep-related breathing disorders in children. Operative Techniques in Otolaryngology-Head and Neck Surgery 2002;13:111–18; with permission.)
Maxillary/Mandibular Distraction

- Patients with Pierre Robin sequence or mandibular hypoplasia have shown significant improvement in flow limitation with mandibular advancement.
  - Large meta-analysis of 1185 patients included 88 tracheotomized patients for poor airways.
    - 78.4% decannulation rate after distraction.
    - 97% of children and 100% of adults with OSA were cured of symptoms.
- Patients with high-arched palates or craniofacial abnormalities resulting in maxillary narrowing benefit from LeFort osteotomies and maxillary distraction.
  - Can be curative.
    - Enlarges nasal cavity.
    - Enlarges lateral diameter of palate and oropharynx.
Tracheostomy

- Tracheostomy is an effective for upper airway obstruction.
  - Often avoids a difficult postoperative course.
  - Provides an immediate improvement in symptoms.

- Can be used as a temporizing measure in patients until skeletal expansion and soft-tissue reduction can be performed.
  - Syndromic patients
  - Craniosynostosis patients

- Not perfect.
  - Complications
    - Stoma narrowing
    - Plugging
    - Accidental decannulation
  - Deleterious effect on psychosocial function of patients and families.
This study is based on a quality of life survey sent to patients that had either tracheostomy or sleep apnea surgery (SAS) for OSA.

TABLE I Mean Medical Rankings after Sleep Apnea Surgery Compared with Tracheostomy

<table>
<thead>
<tr>
<th>Medical Subscale</th>
<th>SAS *(n = 16)</th>
<th>T *(n = 6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours per day spent on care</td>
<td>0.7</td>
<td>2.3*</td>
</tr>
<tr>
<td>Hours per night spent on care</td>
<td>0.3</td>
<td>1.8*</td>
</tr>
<tr>
<td>No. of doctor visits‡</td>
<td>0.8</td>
<td>2.2*</td>
</tr>
<tr>
<td>No. of emergency room visits‡</td>
<td>0.0</td>
<td>1.0*</td>
</tr>
<tr>
<td>No. of hospitalizations‡</td>
<td>0.5</td>
<td>1.7*</td>
</tr>
</tbody>
</table>

* SAS, sleep apnea surgery; T, tracheostomy.
† A worse ranking was noted in T group for all items (p < 0.05).
‡ During the past year.

TABLE II Mean Psychosocial Rankings after Sleep Apnea Surgery Compared with Tracheostomy

<table>
<thead>
<tr>
<th>Psychosocial Subscale</th>
<th>SAS *(n = 16)</th>
<th>T *(n = 6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social isolation</td>
<td>1.3</td>
<td>2.5</td>
</tr>
<tr>
<td>Stress level</td>
<td>1.1</td>
<td>1.3</td>
</tr>
<tr>
<td>Manage home/chores</td>
<td>0.56</td>
<td>2.2*</td>
</tr>
<tr>
<td>Recreation ability</td>
<td>0.64</td>
<td>3.0*</td>
</tr>
<tr>
<td>Child’s peer relationships</td>
<td>1.5</td>
<td>3.2*</td>
</tr>
</tbody>
</table>

* SAS, sleep apnea surgery; T, tracheostomy.
† A worse ranking was noted in T group (p < 0.05).
Management Algorithm

Skeletal expansion combined with soft-tissue reduction in the treatment of obstructive sleep apnea in children: Physiologic results

STEVEN R. COHEN, MD, DAVID A. ROSE, MB BS, FRACS, FERNANDO D. BURSTEIN, MD, JEAN-FRANCOIS LÉFAIVRE, MD, FRCS, JOHN E. RISKI, MD, and CATHY SIMMS, RN, Atlanta, Georgia

Study of 20 consecutive patients with refractory OSA that underwent aggressive skeletal and soft-tissue surgery to avoid tracheostomy.

Fig. 6. Treatment protocol.
Special Patients with Sleep Apnea

“[Pediatric Otolaryngologists] take care of special problems or special children, or both, in a special institution.”

--Charles D. Bluestone
Complicated Patients

- Risk Factors for Postoperative Respiratory Complications in Children with OSAS undergoing Adenotonsillectomy
  - Age Younger than 3 years
  - Severe OSAS on PSG
  - FTT
  - Obesity
  - Prematurity
  - Recent URI
  - Craniofacial abnormalities
  - Neuromuscular disorders
Complicated Patients

Introduction

- Patients at high risk for undergoing general anesthesia and oropharyngeal surgery must be more thoroughly scrutinized prior to surgery.
  - Asthma
  - CHD
  - Morbid obesity
  - Down Syndrome
  - CP
  - Craniofacial abnormalities
- A double-edged sword because these are the patients manifesting the worst symptoms of OSA.
  - Failure to thrive
  - Pulmonary hypertension
  - Higher rate of complications because they do not possess the reserve to easily undergo the stress of surgery.
- The multifactorial causes of upper airway obstruction in these patients also implies a lower probability of success.

A prospective and retrospective study examining patients with complicated underlying medical disorders with preoperative and postoperative PSG.
Complicated Patients

Summary

- Pre-op PSG when OSA suspected with complicated medical problems, craniofacial/syndromic children.
- Post-op PSG with persistent Sx, complicated medical problems, craniofacial/syndromic children.
- Pharyngeal surgery is effective at treating OSA in patients with and without complicated medical problems.
- UPPP is an alternative method to tracheostomy in this population.
- Post-op ICU monitoring with overnight intubation should be considered in this at-risk population.

A prospective and retrospective study examining patients with complicated underlying medical disorders with preoperative and postoperative PSG.
Severe OSA

- **Introduction**
  - Children with severe OSA are more likely to have respiratory compromise after adenotonsillectomy.
    - Overnight observation is recommended after adenotonsillectomy in patients with severe OSA.
  - This study did not have a control group of patients with severe OSA that did not undergo adenotonsillectomy.
  - This study did not assess long-term efficacy of adenotonsillectomy in severe OSA.

• Study on 29 children 1-18 years of age with RDIs ≥ 30 that underwent adenotonsillectomy followed by PSG 6 months postoperatively.
Severe OSA

Outcome of adenotonsillectomy for severe obstructive sleep apnea in children

Ron B. Mitchell\textsuperscript{a,b,*}, James Kelly\textsuperscript{a}

\textsuperscript{a}Department of Surgery, Health Sciences Center, University of New Mexico, USA
\textsuperscript{b}Department of Pediatrics, Health Sciences Center, University of New Mexico, USA

- Study on 29 children 1-18 years of age with RDI ≥ 30 that underwent adenotonsillectomy followed by PSG 6 months postoperatively.

<table>
<thead>
<tr>
<th>RDI\textsuperscript{*}</th>
<th>Pre-operative PSG</th>
<th>Post-operative PSG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean RDI</td>
<td>63.9</td>
<td>14.2</td>
</tr>
<tr>
<td>Mean RDI 95% CI</td>
<td>51.9–75.8</td>
<td>8.9–19.5</td>
</tr>
</tbody>
</table>

**Table 1** Pre- and post-operative PSG results

\textsuperscript{*} P-value for difference in mean RDI < .0001; two-tailed paired t-test.
Severe OSA

Summary

- Children with severe OSA show a significant improvement in RDI and quality of life.
- OSA does not resolve in the majority of these patients.
- Postoperative PSG is recommended for all children with severe OSA.
  - To identify those who may require further therapy.

Outcome of adenotonsillectomy for severe obstructive sleep apnea in children

Ron B. Mitchell\textsuperscript{a,b,*}, James Kelly\textsuperscript{a}

\textsuperscript{a}Department of Surgery, Health Sciences Center, University of New Mexico, USA
\textsuperscript{b}Department of Pediatrics, Health Sciences Center, University of New Mexico, USA

- Study on 29 children 1-18 years of age with RDIs \( \geq 30 \) that underwent adenotonsillectomy followed by PSG 6 months postoperatively.
Cleft Population

Introduction

- Facial clefts (lip and palate) affect as many as 1 in 680 live births in the US/year.
  - Most attention is directed towards repairing obvious facial deformities and correction of speech and middle ear disease.
- However, this population, with its inherent craniofacial deformities, are prone to multifactorial obstruction of airways.
  - Nasal vestibule b/c of nasal floor closure.
  - Septal deviation towards non-cleft side.
  - Further in the nose, use of vomer flaps for palatal reconstruction can thicken the palate.
- Finally, VPI procedures (pharyngeal flaps and sphincter-pharyngoplasties) always decrease the cross-sectional area of the airway.

Sleep Disordered Breathing and Obstructive Sleep Apnea in the Cleft Population

A three-year retrospective chart review by a tertiary cleft and craniofacial team of 539 patients.
Cleft Population

Sleep Disordered Breathing and Obstructive Sleep Apnea in the Cleft Population

Harlan Muntz, MD, FAAP, FACS; Matthew Wilson, MD; Albert Park, MD, FAAP; Marshall Smith, MD, FAAP, FACS; J. Fredrik Grimmer, MD, FAAP

A three-year retrospective chart review by a tertiary cleft and craniofacial team of 539 patients.

Fig. 1. In the initial polysomnogram (PSG), there was only one completely normal study. Graph A shows that 12% of the children did not have obstructive sleep apnea (OSA), but 88% did have OSA. Graph B shows that the distribution is reasonably equal between mild, moderate, and severe cases.
Cleft Population

- Roughly 1/3 improved, 1/3 remained unchanged, and 1/3 had worsening of PSG scores after airway surgery.
  - TpA
  - Tonsillectomy
  - Flap takedown
  - Combination

A three-year retrospective chart review by a tertiary cleft and craniofacial team of 539 patients.
Cleft Population

**Summary**

- OSA is more common in the cleft population (22% in this study).
  - Need for more detailed sleep history.
  - More common in syndromic cleft population ($p < 0.001$).
- Source of obstruction is frequently multifactorial.
- More frequent use of pre-op and post-op PSG strongly suggested.
- Complete adenoidectomy may increased the risk of VPI in the cleft population.
  - The adenoid pad may actually assist in closure of the palate.
  - Many otolaryngologists perform only a partial adenoidectomy leaving the inferior rim of adenoid tissue to assist with closure and speech.

Sleep Disordered Breathing and Obstructive Sleep Apnea in the Cleft Population

Harlan Muntz, MD, FAAP, FACS; Matthew Wilson, MD; Albert Park, MD, FAAP; Marshall Smith, MD, FAAP, FACS; J. Fredrik Grimmer, MD, FAAP

A three-year retrospective chart review by a tertiary cleft and craniofacial team of 539 patients.
Down Syndrome

- Introduction
  - DS occurs in approximately 1.5 of 1000 births.
    - 10% of mentally retarded persons.
  - DS children commonly have otolaryngologic problems.
    - Frequent URIs, COM, HL and hypothyroidism.
  - They also fall into the group of children with craniofacial and neurologic anomalies which predispose them to OSA.
    - Small midface and cranium
    - Relatively narrow nasopharynx
    - Marcroglossia
    - Hypotonia
    - Tendency for obesity
    - Relatively small larynx
  - In addition, given their congenital heart defects, they are already predisposed to cor pulmonale.
    - Known complication of prolonged OSA (part of the Pickwickian syndrome).
  - Because of these factors, the incidence of OSA in patients with DS has been estimated to be from 54% to 100%.

A retrospective review of patients with a diagnosis of Down syndrome who underwent tonsillectomy and/or adenoidectomy.
Down Syndrome

Summary

- T&A is successful in the majority of patients with Down Syndrome (69%).
  - More aggressive intervention such as UPPP, CPAP, tracheostomy are necessary in some patients.
- Preoperative evaluation should include assessment for cardiac, thyroid, and cervical abnormalities.
- Surgical planning should be based on the severity of disease.
- Follow up sleep studies are indicated to evaluate for the need for more aggressive treatment in patients with persistent symptoms.
- DS patients should be admitted post-operatively as persistent OSA and other complications are common.
  - ICU monitoring is often necessary.

A retrospective review of patients with a diagnosis of Down syndrome who underwent tonsillectomy and/or adenoidectomy.
Conclusions

- **Pediatric OSA** is becoming an increasingly significant disorder.
- **Pre-op screening** cost-efficacy needs to be assessed.
- **Adenotonsillectomy** is effective in treating pediatric OSA.
- **Algorithms** for treating patients with severe OSA and special patient populations are still being optimized.
- **Post-op PSG Indications** will continue to be a topic of investigation and controversy.