Critical Review of T & A in the Treatment of Sleep Apnea in Children

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Pediatric SDB 2010: What’s new?

• Discuss diagnosis of SDB
• Discuss role of sleep study in diagnosis of Pediatric SDB
• Review current treatment options for Pediatric SDB
• Review treatment outcomes for Pediatric SDB
AAP Clinical Practice Guidelines

- All children should be screened for snoring
- **Diagnostic evaluation** is useful in discriminating between PS and OSA

*Pediatrics* 2002;109:704-712
Sleep Disordered Breathing Diagnosis: How well do we do?

Meta-analysis of 113/2115 initially reviewed articles

- Polysomnography recognized as gold diagnostic standard
- Diagnostic accuracy of questionnaire and other purely clinical assessments is low

Sleep Disordered Breathing: How well do we reliably diagnose?

- Systematic review of the literature of articles on clinical diagnosis of SDB
- 12 articles identified
- Clinical history and physical exam are not reliable for diagnosis of SDB
- Lack of validated polysomnography threshold of clinically significant disease

Sleep Disordered Breathing: Is there a genetic cause?

• 4.5-5 times as likely for sibling to have risk of TAH and SDB

• Higher rates in certain ethnicities
Sleep Studies:
To Order or Not to Order

- Availability
- Reliability
- Cost
- What to do with the information?
Sleep Studies: What do I do with the information?

- Alphabet soup
  - AHI = apnea/hypopnea index
  - RDI = respiratory disturbance index
  - Mean O2 sat
  - Lowest O2 sat
  - Subjective assessment
Sleep Studies: 
Kids are NOT little adults

- Apnea=90% cessation of flow for 2 breath duration
- Hypopnea=50% dec flow for 2 breath duration with 3% desat or arousal
- AHI=A’s + H’s/hours of sleep
Sleep Studies:
What is abnormal?

- Current general consensus
  - AHI (# of apneas and hypopneas/hrs of sleep)
    - 1-5 = mild
    - 5-15 = mod
    - >15 = severe
Sleep Studies: To Order or Not to Order

Mitchell et al. 2006

- ASPO survey (107)
  - 17% no access to sleep lab
  - 40% no access to Ped sleep lab
  - 50% had >6 week wait for sleep study
  - Majority of respondents rely on clinical diagnosis
Sleep Studies: To Order or Not to Order

Problems:
- Clinical assessment not good enough
- Sleep study is best test we have BUT still has limitations
- Can we do better?
  - Questionnaire
  - Functional MRI
  - Sleep-induced airway endoscopy
SDB Diagnosis: Bottom Line

- Clinical diagnosis still most commonly used modality
- Sleep study still considered “gold standard” despite limitations
- Room for improvement
Why Treat?

Effects of SDB

SDB has been associated with:

1. Growth inhibition
2. Pulmonary HTN and cor pulmonale
3. Attention deficit hyperactivity disorder (ADHD)
4. Poor school performance
Effects of SDB

Children with SDB are at greater risk for

- Hyperactivity
- Learning Problems
- Odds ratio for neurobehavioral abnormalities: 2.93 (95% CI: 2.23-3.83)

SDB and Attention

• 100 ADHD children
• 49 controls
• All underwent sleep studies
• Increased frequency of sleep problems in children with ADHD

Sleep Disordered Breathing: Treatment

T & A for ADHD

• 66 school-age children with ADHD
• All had sleep studies AHI >1< 5
• 27 had medical treatment
• 25 had T & A
• 14 had no treatment
• Pre vs post surgery behavior scores (p=0.0001)
• Surgery vs. medical tx behavior scores (p=0.07)

SDB and Cognition: Bottom Line

Does appear to be a link between SDB and behavioral and cognitive problems but extent of correlation remains unclear.
Sleep Disordered Breathing: Treatment

- Medical
  - Medications
  - CPAP
- Surgical
  - T & A
  - Turbinoplasty
  - Palatal expansion
  - Maxillary advancement
  - Mandibular distraction
  - Base of tongue radiofrequency
  - Genio-hyoid advancement
  - Glossopexy
  - Supraglottoplasty
  - trach
SDB: Medical Treatment

- Nasal steroids
- Leukotriene inhibitors
TAH associated with chronic inflammatory state

- Incr T cell lymphocytes
- Incr Prostaglandin E2
- Incr Leukotrienes B4 and C4/D4/E4
- Incr CRP
- Incr lipoproteins

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Sleep Disordered Breathing: Medical Treatment

Fluticasone Nasal Spray
- randomized, blinded, placebo-controlled trial
- 25 children
- Treatment for 6 weeks
- SDB by PSG
- Outcome measures
  - T & A size
  - PSG (P=.03)
  - Symptoms

Sleep Disordered Breathing: Medical Treatment

Leukotriene Modifier Therapy for Mild SDB

- 24 children
- 16 weeks therapy
- Pre-op sleep study AHI score of >1<5
- Outcome measures: adenoid size, sleep study (P<0.017)

• Meta-analysis of 113/2115 initially reviewed articles
  – Adenotonsillectomy is curative in 75-100%

• Meta-analysis of 1079 subjects
  – T & A curative (AHI<1) in 59.8%
Sleep Disordered Breathing: Surgical Treatment

Adenotonsillectomy provides SS improvement in QOL


Sleep Disordered Breathing: Surgical Treatment

- Surgical
  - T & A
  - Turbinoplasty
  - Palatal expansion
  - Mandibular distraction
  - Maxillary advancement
  - Base of tongue radiofrequency
  - Glossopexy
  - Supraglottoplasty
  - trach
What have I learned?

- Pediatric SDB is also heterogenous
- T & A does not have a 100% cure rate
Sleep Disordered Breathing

What Do I Want to Know?

1. Who is more likely to fail T & A?
2. Where are the most likely sites of obstruction?
3. How do we best identify these?
4. What surgery will be most successful?
Sleep Disordered Breathing

Who?

– Risk Factors?
Craniofacial Anomalies
## Sleep Disordered Breathing: T & A Failures

<table>
<thead>
<tr>
<th>Patients</th>
<th>Normal</th>
<th>Obese</th>
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<tbody>
<tr>
<td>Preop AHI</td>
<td>17.1</td>
<td>23.4</td>
</tr>
<tr>
<td>Postop AHI</td>
<td>1.9</td>
<td>3.1</td>
</tr>
<tr>
<td>Persistent disease</td>
<td>28%</td>
<td>76%</td>
</tr>
</tbody>
</table>

Sleep Disordered Breathing: T & A Failures

- 79 patients with SDB (AHI>=5)
  - Mild AHI 5-10
  - Mod AHI 10-20
  - Severe AHI >20
- Preop AHI mean = 27.5
- Postop AHI mean = 3.5
- P=<0.001
- Persistent disease
  - 0% mild
  - 12% moderate
  - 36% severe

Sleep Disordered Breathing: T & A Failures

–50% of children with Down Syndrome with have persistent SDB after T & A

Sleep Disordered Breathing

Risk Factors for T & A failures:
1. Craniofacial anomalies
2. Neurologic Compromise
3. Obesity
4. Pre-treatment Severity
Sleep Disordered Breathing

T & A Failures: Where?

- Nose
- Midface
- Pharynx
- Tongue base
- Jaw
- Supraglottis

Sleep Disordered Breathing

T & A Failures:
How?

– Do we need to get a post-op sleep study?
– Dynamic Airway Imaging
– Sleep-induced airway endoscopy
Dynamic Airway MRI
Persistent SDB: Sleep endoscopy
Lingual tonsillar hypertrophy
Persistent SDB: Sleep endoscopy

Pharyngomalacia
Persistent SDB: Sleep endoscopy

Late-onset Laryngomalacia

### Persistent SDB: Surgical Treatment Beyond T & A

<table>
<thead>
<tr>
<th>Condition</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turb hypertrophy</td>
<td>5</td>
</tr>
<tr>
<td>Adenoid regrowth</td>
<td>7</td>
</tr>
<tr>
<td>Pharyngomalacia</td>
<td>7</td>
</tr>
<tr>
<td>Lingual tonsil hypertrophy</td>
<td>7</td>
</tr>
<tr>
<td>Tongue base collapse</td>
<td>8</td>
</tr>
<tr>
<td>Laryngomalacia</td>
<td>8</td>
</tr>
</tbody>
</table>
Summary

• Still need to refine our diagnostic tools for Ped SDB
• Identify risks factors for persistent SDB
• Consider sleep-induced airway endoscopy for diagnosis of persistent SDB
• Medical therapy may be enough for mild persistent SDB
• Outcomes studies needed