Sleep Apnea in Children: A Wake Up Call

Harold S. Pine, MD, FAAP, FACS
Identify areas of weakness regarding OSA in children.

Define what is OSA and how it is different in kids when compared to adults.

Illustrate what pediatricians can do in their own practices in suspected cases of OSA.

Discuss new clinical practice guidelines on sleep studies and tonsillectomy.

I own 50 shares of Arthrocare, the parent company that makes coblation wands for tonsillectomy.

I really want an Apple iPad but my wife says I cannot afford one.
Who is Harold Pine?

Wanted to be a Marine

My proposal at 18,000 feet
This is my rifle...  In the Negev
Life as a Surgeon

Lecturing in Vietnam

Post op Rounds in Hanoi Vietnam
A short Quiz

- 18 question Quiz
- T or F
- How does your knowledge of OSA compare to the 497 doctors who did this Quiz back in 2005
- The mean score was about 70% correct (about 12 correct out of the 18)
- Mean score for ENT Dept 80%
<table>
<thead>
<tr>
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<th>Pediatric Obstructive Sleep Apnea Quiz</th>
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<tr>
<td>1.</td>
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<td>3.</td>
<td>Nearly 2% of children have OSA.</td>
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I am seeing more patients like this come into the office
What is OSA?

- A disorder of breathing during sleep characterized by prolonged partial upper airway obstruction and or intermittent complete obstruction that disrupts normal ventilation during sleep and normal sleep patterns.
Sleep Disordered Breathing

- Snoring
- Upper Airway Resistance
- Obstructive Sleep Apnea
OSA often Multifactorial

Tonsils and adenoids

Obesity

Allergy

Makes it hard to sleep
School Nurses and Teachers can Help

Open Wide and Meet Your Tonsils!
Sequelae of OSA

Medical

Behavioral

Cognitive

Psychological

OSA
Interplay of Multiple Factors

- OSA
- Altered Hormones
- Poor Diet
- Obesity
- Reduced Activity
Deep sleep helps kids grow
OSA-18

Sleep Disturbance

Caregiver Concerns

Physical Symptoms

Daytime Function

Emotional Distress
### Obstructive Sleep Apnea Syndrome Quality of Life Survey

#### Sleep Disturbance

During the past 4 weeks, how often has your child had…

- …loud snoring?
- …breath holding spells or pauses at night?
- …choking or made gasping sounds while asleep?
- …restless sleep or frequent awakenings from sleep?

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## Physical Symptoms

During the past 4 weeks, how often has your child had…

- …mouth breathing because of nasal obstruction?
- …frequent colds or upper respiratory infections?
- …nasal discharge or a runny nose?
- …difficulty in swallowing food?
Obstructive Sleep Apnea Syndrome Quality of Life Survey

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**Emotional Distress**

During the past 4 weeks, how often has your child had…

…mood swings or temper tantrums?

…aggressive or hyperactive behavior?

…discipline problems?
Daytime Function

During the past 4 weeks, how often has your child had…

…excessive daytime sleepiness?

…a poor attention span or concentration?

…difficulty getting up in the morning?
## Obstructive Sleep Apnea Syndrome Quality of Life Survey

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### Caregiver Concerns

During the past 4 weeks, how often have the problems described above...

...caused you to worry about your child's general health?

...created concern that your child is not getting enough air?

...interfered with your ability to perform daily activities?

...made you frustrated?

**MAXIMUM SCORE: 126**
OSA and Enuresis

- Bedwetting present in 1/3 of kids with OSA
- Proposed factors include:
  1. Decreased arousal response
  2. Impaired Urodynamics—Increased abdominal pressure leading to increased bladder pressure
  3. Affects secretion of ADH
Periodic leg movement disorder

- Involuntary limb movements which cause frequent arousals
- Score greater than 5 is abnormal
- Association with iron deficiency
OSA and ADHD

- These 2 problems share many of the same behavioral manifestations.
- In any child where a diagnosis of ADHD is being considered, please think about the possibility of underlying OSA.
What Should the Pediatrician Do?

- Clinical Practice Guidelines 2002- “A sleep history screening for snoring should be part of routine health care visits.”
- In children, OSA less likely in the absence of habitual snoring.
- If snoring, then what?
- Clinical Practice Guidelines 2012- “If a child snores on a regular basis and has signs and symptoms of OSA, then either obtain a sleep study or refer to a sleep specialist or otolaryngologist”
How to Grade Tonsils
Malampati Score

Class 1: soft palate, fauces, uvula, pillars
Class II: soft palate, fauces, portion of uvula
Class III: soft palate, base of uvula
Class IV: hard palate only
Fig 1. The Friedman palate position is based on visualization of structures with the mouth open widely without protruding the tongue.
Diagnostic Techniques

- History and physical
- Questionnaires
- Parents report
- Audiotaping
- Videotaping
- Overnight oximetry
- Nap polysomnography
- Home polysomnography
- Formal sleep center polysomnography
Pediatric Sleep Questionnaire

- 22 Questions
- If “don’t know” is circled, drop the question
- To get score, divide the number of “yes” by the total numbered answered either “yes” or “no”.
- Score > 0.33 is positive

- Sensitivity 0.85
- Specificity 0.87

<table>
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<tr>
<th>I</th>
<th>do</th>
<th>don’t</th>
<th>feel sleepy today.</th>
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<tbody>
<tr>
<td>I</td>
<td>do</td>
<td>don’t</td>
<td>feel hungry today.</td>
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<tr>
<td>I</td>
<td>do</td>
<td>don’t</td>
<td>have tonsils that look big today.</td>
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<tr>
<td>I</td>
<td>do</td>
<td>don’t</td>
<td>have a sore throat today.</td>
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<tr>
<td>I</td>
<td>do</td>
<td>don’t</td>
<td>have lots of energy today.</td>
</tr>
<tr>
<td>I</td>
<td>do</td>
<td>don’t</td>
<td>feel well and happy today!</td>
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A couple key points

- Large tonsils and adenoids do not indicate the presence of OSA
- Loudness of snoring does not correlate with degree of OSA
- A formal sleep study remains the gold standard in diagnosing OSA and other sleep related disorders.
A sleep study gives a lot of info

- EEG
  - Stages of sleep
- Eyes
  - Stages of sleep
  - Slow rolling eye movement
  - REM
- Legs
  - Periodic limb movement disorder
- 02 sats
- EKG
- Chin
  - Muscle atonia during REM
- Nasal/Oral Airflow
- Snoring
- Thoracic Effort
- Abdominal Effort
Sleep Lab at UTMB
OK, now you can go to sleep

Could you sleep hooked up to all these wires?
There’s video too

- The parents are not supposed to sleep in the same bed
Red arrow is OSA
Who Needs a Sleep Study?

- Obese
- Down syndrome
- Craniofacial abnormalities
- Neuromuscular disorders
- Sickle cell
- Mucopolysaccharidoses

- When the need for surgery is uncertain or if the physical exam does not match the severity of the history
Big Tonsils
Sometimes I’m wrong

- 12 year old
- 146 lbs
- BMI = 28.6 (>95%)
- Big Tonsils
- Good student
- Thought for sure
  he had OSA
- RDI = 0

- This child really did have big tonsils
Not all overweight Kids Have OSA

- I just did not believe the sleep questionnaire
- 11 year old
- Weighs 166 lbs
- BMI = 34.2
- Had negative sleep questionnaire
- Negative sleep study as well with RDI = 0.7
Definitions

- Apnea
- Hypopnea
- RERA (Respiratory Event Related Arousal)

- Our sleep lab will report the **RDI** (respiratory disturbance index) which includes all of the 3 above. In children, an RDI greater than 1 is considered abnormal.
What is OSA?

- At least a 10 second cessation of airflow despite continuous ventilatory effort or 2 breaths
- May or may not be associated with an oxyhemoglobin desaturation of at least 3% or 4%
- May or may not be associated with a cortical arousal
- May or may not be accompanied by snoring
- May be REM (rapid eye movement) related
- May be positional
How is Pediatric OSA different from adults

- Surgery is often first line therapy
- AHI > 1 is abnormal (adults require >5)
- Minimum O2 saturation < 92 (adults < 85)
- Kids often do not have daytime sleepiness
- Kids often have behavioral manifestations
“Snores like a Bear”

- Really cute little girl
- 7 years old
- Weighs 104 lbs
- BMI = 29.2
- Sleep questionnaire = 0.81
- RDI = 52.6 with 336 apneas
Not quite as cute anymore

- 1 year older and a lot heavier, she is not so cute
Therapy

- Remains first line

- Very helpful

- Treat underlying allergy
Sometimes it gets complicated

Sleep Study done Feb 2010 revealed RDI of 42.9 and 306 apneas
Amazing What Surgery Can Do
“Right now, doctors, a lot of times, are forced to make decisions based on the fee payment schedule that's out there. So if they're looking and -- and you come in and you've got a bad sore throat, or your child has a bad sore throat, or has repeated sore throats, the doctor may look at the reimbursement system and say to himself, 'You know what? I make a lot more money if I take this kid's tonsils out.'

"Now, that may be the right thing to do. But I'd rather have that doctor making those decisions just based on whether you really need your kid's tonsils out or whether it might make more sense just to change -- maybe they have allergies. Maybe they have something else that would make a difference."
Just so you know Mr. Obama

- Medicaid pays me $218.00 for a Tonsillectomy and adenoidectomy
- That includes all the preop care, the surgery, and any care I give the child for 90 days after surgery
So what are the indications?

- **Obstructive Sleep Apnea**

- **Recurrent Tonsillitis**
  - Paradise Criteria
    - 7 in one year
    - 5 each year for two years
    - 3 each year for three years
Paradise Criteria

- Documentation in the medical record of each episode of sore throat and one or more of the following:
  - Temperature greater than 38.3
  - Cervical adenopathy
  - Tonsillar exudate
  - Positive strept test
Modifying Factors per Guidelines

- Multiple antibiotic allergy/intolerance
- PFAPA (periodic fever, aphthous stomatitis, pharyngitis, and adenitis)
- History of PTA (peritonsillar abscess)

- I would add PANDAS (Pediatric Autoimmune Neuropsychiatric Disorders Associated with Streptococcal Infections)
- Severe dysphagia
Tonsillectomy in the 21st Century

- By combining radiofrequency energy with a saline solution, Coblation is able to gently and precisely remove tonsils without damaging surrounding healthy tissue.
Coblation is Cool
One of my Chief Residents in action.
Large Tonsils
3 year old with RDI of 30.4

- **Kissing Tonsils**
  - 89 apneas

- **Pus in Nose**
  - 93 hypopneas
As I approached the room all I could hear was crying.
Post op Sleep Study

- 11 year old a few months after T&A
- 159 lbs
- BMI 33.2
- Preop RDI = 5.7
- 40 apneas
- Post op sleep study reveals RDI = 0
- When to order post op sleep study?

Even with child gaining weight, the benefits of the T&A remain
What can the pediatrician do?

- Be aware of the far reaching consequences of untreated OSA
- Understand how tonsils may contribute to the problem
- Dispel common myths about tonsils
- Raise awareness of the issue among parents, teachers, and students
Tonsil Myth #1

- Tonsils are mainly removed for sore throats and tonsilitis.
Tonsil Myth #1

- Actually, 75% of tonsillectomies are now performed to help treat obstructive sleep disorders.
Tonsil Myth #2

- Doctors don’t remove tonsils anymore.
Tonsil Myth #2

- Actually, despite what President Obama might think, we don’t unless there is a good reason.

- There are roughly 600,000 tonsillectomies performed per year in the US.
Tonsil Myth #3

- A child will be in severe pain for 2 weeks after a tonsillectomy.
Tonsil Myth #3

- Actually, several studies show that by using low temperature techniques, there is less pain after surgery than with traditional electrocautery.
- Most are pain free by 2 weeks
Children can only eat ice cream after a tonsillectomy.

This one made famous by the Brady Bunch episode where Cindy and Carol both had tonsillectomies and got to eat ice cream in bed.
Tonsil Myth #4

- Actually, using low temperature techniques, children can return to a regular diet 3x faster.
Tonsil Myth #5

- Tonsillectomies have always been performed the same way.
- Keep in mind the first one was done with a finger by Celsus in first century BC.
Tonsil Myth #5

- Actually, there are multiple newer techniques. Just recently, coblation tonsillectomy became the most common single instrument to do the procedure.
Open Wide and Meet Your Tonsils!

1. What Are Tonsils?
   Tonsils are two pink lumps on each side of the back of your throat that help your body fight off infections.

2. Where Are My Tonsils?
   Tonsils are at the back of your throat. To see them, look in a mirror, open your mouth wide, and say “sahhh!”

3. What Do Tonsils Do?
   Tonsils help fight off bad germs that can make you feel unwell.

4. What Do Tonsils Look Like?
   Each tonsil is about the size of a grape. Healthy tonsils are the same color as your gums.

5. Do Your Tonsils Seem Big?
   Open wide and take a look at your tonsils. Do they look big? Do they look close together? If they do, be sure to tell your parents what your tonsils look like.

What Else Is in My Mouth?

Teeth—Your teeth are the hard white parts that grow in rows inside your mouth. When you eat, you use your teeth to bite and chew food.

Lips—Your lips are the edges of your mouth. When you eat, your lips help keep food inside. You can also hum and whistle with your lips!

Tongue—Your tongue is the long part that moves inside your mouth. You use your tongue for talking, tasting, and swallowing.

Uvula—The uvula is the small hanging part that is located in the back of your throat. The uvula helps your food move down your throat.
Dear Family,

In school, your child has been learning critical reading, writing, health, and science skills, while increasing his or her understanding of what healthy tonsils do and how they look. Enlarged tonsils have been found to cause a condition known as sleep-disordered breathing (SDB). Medical research has identified the connection between SDB and substantial childhood health problems, behavior difficulties, and hindered learning and physical growth. Recognizing symptoms of problems caused by enlarged tonsils is important for your child’s health. You’ll find valuable new information you can use in these family pages, developed by Scholastic and generously sponsored by TonsilFacts.com. On the reverse of this page, you will find information and guidance you can use in speaking with your family physician about enlarged tonsils, along with information on effective solutions.

**Tonsil Basics**
- Children are born with two tonsils, one on each side of the back of the mouth.
- Healthy tonsils are pink and oval in shape.
- Scientists believe that tonsils work as part of the body’s immune system by fighting germs that attempt to invade the body, and that they help to develop antibodies to germs. This happens primarily during the first few years of life, becoming less important as we get older.*

**Tonsil Problems**
- Enlarged tonsils can partially block the throat and breathing passage. This condition can create breathing problems that may cause sleep-disordered breathing, which can lead to other health and behavior problems.*
- Symptoms of sleep-disordered breathing include snoring, restless sleep, breathing pauses, and, in some cases, sleep apnea.* During the day, children may be tired, moody, and inattentive.*
- Tonsilitis is an infection in the tonsils.

**Tonsillectomy**
- Tonsillectomy is the removal of the tonsils. 75% of tonsillectomies are done to remove enlarged tonsils.*
- Enlarged tonsils are the most common cause for SDB; thus tonsillectomy is an effective treatment for pediatric sleep-disordered breathing.*

Learn more about tonsils and tonsillectomy at TonsilFacts.com/school

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**Tonsil Checklist: Talking with the Doctor**

Watch for these symptoms of enlarged tonsils and tonsil-related health problems. Call your family doctor at the first sign of tonsil problems. Fill out this page and take it with you when you visit the doctor.

**Check off any symptoms that your child has below:**

- Loud and/or labored breathing
- Difficulty swallowing
- Frequent and disruptive gasping or snorting noises
- 7 episodes of tonsilitis in one year
- 5 episodes of tonsilitis per year for two years in a row
- 3 episodes of tonsilitis per year for three years in a row

**If your child is younger than 5:**
- Gasping for air while sleeping
- Breathing stops while sleeping
- Breathing through the mouth while sleeping
- Regularly waking up in the middle of the night
- Restlessness
- Snoring

**If your child is older than 5:**
- Bed-wetting at night
- Behavior problems
- Shortened attention span
- Underweight, overweight, or experiencing abnormal appetite for his/her age
- Snoring

Learn More and Find a Doctor

If your child needs his or her tonsils removed, you’ll probably need to see an otolaryngologist or ENT (Ear, Nose, and Throat) surgeon. Visit TonsilFacts.com/school to learn more about tonsils and to find an ENT with experience in advanced tonsillectomy procedures that can make recovery quicker and less painful for children.

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Generously sponsored by TonsilFacts.com
Part 1. Label the picture with each part of your mouth. One word is done for you.

tonsils
lips
tongue
teeth
throat
UVULA
Recognize that OSA is becoming more common
Screen kids for snoring but also have a pediatric sleep questionnaire available in the office
Please consider OSA in patients with bedwetting
Please consider OSA in patients with ADHD
Dr. Pine’s Pearls

- Have a low threshold to get a sleep study
- If you look at 1 number find the overall respiratory disturbance index (**RDI**)
- In kids, RDI > 1 is abnormal
- If periodic leg movements > 5, order iron studies
- Document very well any cases of sore throat
Dr. Pine’s Pearls

- Don’t forget to refer to your friendly neighborhood pediatric ENT surgeon

- My boys on their very first day of school.
Diagnosis and management of childhood obstructive sleep apnea syndrome.


Clinical practice guideline: Polysomnography for sleep-disordered breathing prior to tonsillectomy in children.


Clinical practice guideline: Tonsillectomy in children.


Pediatric sleep questionnaire (PSQ): validity and reliability of scales for sleep-disordered breathing, snoring, sleepiness, and behavioral problems.

Chervin RD, Hedger K, Dillon JE, Pituch KJ.

Questions?