

Pediatric Obstructive Sleep Apnea Case Study : Margaret-Ann Carno PhD, CPNP, D,ABSM
for the Sleep Education for Pulmonary Fellows and Practitioners, SRN ATS Committee
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Part 1: Case Presentation: You are conducting a follow up visit of a 6 year old African American male who was initially referred to you for "wheezing" both during the day and night, night time cough, what mom describes as unable to catch his breath at night and finally snoring nightly. During the initial visit you diagnosed the child with asthma and prescribed a low dose ICS and albuterol prn. His other past medication history included eczema. Mom states that the wheezing has improved and does not seem to be interfering with his physical activity. She is still concerned though about the snoring. She thought that it was related to the asthma

What questions would you ask mom at this visit? What potential surveys/questionnaires would you ask the mom to fill out? What are you beginning differential diagnoses?

- 1) What questions would you ask mom at this visit? (is the snoring every night or only when the child is ill; does any one related to the child have OSA or snore; does the child have daily headaches; how is the child performing in school, are there issues with distraction, hyperactivity or "just too much energy". Other questions, has the mom witnessed difficulty breathing while sleeping; any gasping, or apnea. Finally, how is the cough at night)
- 2) What potential surveys/questionnaires would you ask the mom to fill out?
 - a. CSHQ
 - b. PSQ
 - c. Peds sleepiness scale <http://psycnet.apa.org/psycinfo/2004-17237-008>

The results of the surveys are all positive for disrupted sleep

Mom states, the snoring is almost nightly but everyone snores in the household, the child has a morning headache at least 2 mornings a week and the teacher has reported that while he is doing "fine" in school he just cannot stay still and needs directions repeated.

Case Presentation: Mom states, the snoring is almost nightly but everyone snores in the household, the child has a morning headache at least 2 mornings a week and the teacher has reported that while he is doing "fine" in school he just cannot stay still and needs directions repeated. Mom states that she "Does not think that this is an issue as he is just a boy!"

You now look at his chart, Height is 1.182 m, Weight is 24.3Kg the BMI %ile is 89% (z-score is 1.25), heart rate is 90, respiratory rate is 20, oxygen saturations are 98% and Blood pressure is 90/60

Physical Exam: You conduct your physical exam; Breath sounds are equal clear, good aeration and no wheezing is heard. Heart sounds, regular rate, with a physiological split of S2. No clubbing of the finger nail beds are noted, the abdomen is soft, obese, non-distended, non-tender, the palate is in a dependent position and tonsils are almost touching the uvula. Mallipoti score is a 4.

Finally the nasal mucosa is reddened and swollen but not with a large amount of white mucous.

Questions: What are important components of a good sleep physical examination? What are risk factors for pediatric obstructive sleep apnea, in general, and this patient in particular? What are symptoms of sleep disordered breathing? What test would you order and how would you explain this to the child and mom?

Questions: What are important components of a good sleep physical examination?

- *Tonsil size, pharynx crowding, height, weight*
- What are risk factors for pediatric obstructive sleep apnea, in general, and this patient in particular?
 - *Weight, race and tonsil size, family history*
- What are symptoms of sleep disordered breathing?
 - *Nightly snoring, daytime behavioral issues, daytime sleepiness*
- What test would you order and how would you explain this to the child and mom?
 - *Overnight polysomnography*

Part II: Diagnostic Testing: You decide that SA is at high risk for sleep-disordered breathing and request in-lab, attended polysomnography. The sleep study report is as follows:

SLEEP ARCHITECTURE: (*frontal, central and occipital EEG, right and left EOG and digastric EMG*)

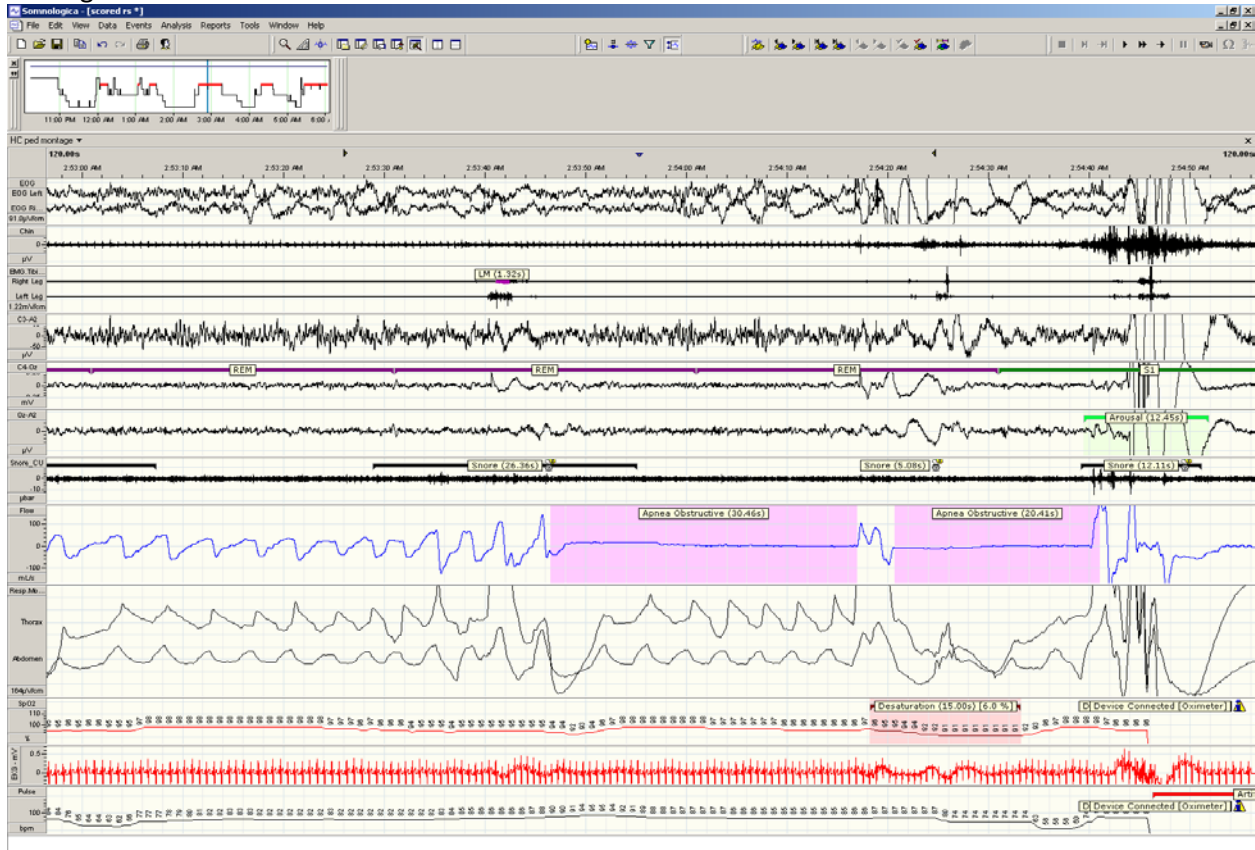
fragmentation of sleep stages, increase in arousals, limb movements within normal limits

RESPIRATION: The obstructive apnea-hypopnea index (AHI) was 12.5 per hour of sleep.

OXYHEMOGLOBIN SATURATION: (*pulse oximetry with beat by beat sampling*) Mean oxyhemoglobin saturation was 95%. Oxyhemoglobin saturation was below 88% for 5 minutes. The SaO₂ ranged from 98-84%. The patient was studied on room air.

EtCO₂ was within normal range

Tracing



Questions: What tests are available to diagnose sleep disordered breathing?
 How do you calculate overall AHI vs obstructive AHI?

Questions: What tests are available to diagnose sleep disordered breathing?
 In lab overnight polysomnography and home testing (no solid data for less than 18 years of age)

How do you calculate overall AHI vs obstructive AHI?
 Obstructive AHI is the AHI without the Central Apneas

Part III: Treatment: Based on polysomnography results you make treatment recommendations.

Questions: What treatment options are available for sleep disordered breathing and what would you recommend for this patient?
 – T&A vs CPAP; T&A is usually the first line treatment

Part III: Treatment: After some discussion with mom she agrees to bring her son to see an ENT doctor for a possible T&A. Your office assists in making the appointment for mom

Questions:
 • Why is T&A first line treatment for children with OSA?

- To enlarge the airway space and remove the obstruction caused by tonsil and adenoid hypertrophy
- What are the chances that a T&A will completely cure this child's OSA?
 - ~80-90%
- Would you repeat the overnight PSG after surgery? Why or Why not?
 - Yes because of the obesity he is at high risk for the T&A to reduce the severity of the OSA but not a complete cure

Case Continues: Mom and the child returns 12 weeks after the T&A. There were no complications after surgery but mom states that the snoring has decreased only a little.

- Questions: Why do you think that the snoring and daytime symptoms have not resolved completely?
 - He has residual OSA, due to obesity
- What do you do now?
 - Order a post-operative NPSG

Case continuation: After talking at length with mom, she agrees to bring the child back for a repeat overnight sleep study

- The results of the study are obstructive AHI 8 /hr

Questions:

- Why did the T&A not completely resolve the OSA?
 - Weight, other facial/airway characteristics
- What is your next treatment option?
 - CPAP

You order a CPAP titration after the child undergoes a mask fitting session

Why is it important to make sure that the mask fits the child?

- to prevent air leakage, delivery of the correct pressures and to assist with adherence

Case Continuation: The child undergoes the CPAP titration study a pressure of 7 cmH₂O relieves the child's OSA

Questions: How do you monitor CPAP adherence in children?

- Parental report, CPAP adherence downloads

Conclusion: SA returns after 3 months of CPAP use and Mom reports improvement in daytime hyperactivity. Compliance download demonstrates 5 hour average use every night with heated humidification.

References:

- 1) Marcus, C. et al. (2012) Diagnosis and Management of Childhood Obstructive Sleep Apnea Syndrome. *Pediatrics* 130 (3):576-584
- 2) Aurora R. et al (2011) Practice Parameters for the Respiratory Indications for Polysomnography in Children. *Sleep* 34(3):379-388.