

Anesthetic Risks of Obstructive Sleep Apnea in Children

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Risk Factors for OSA in Children

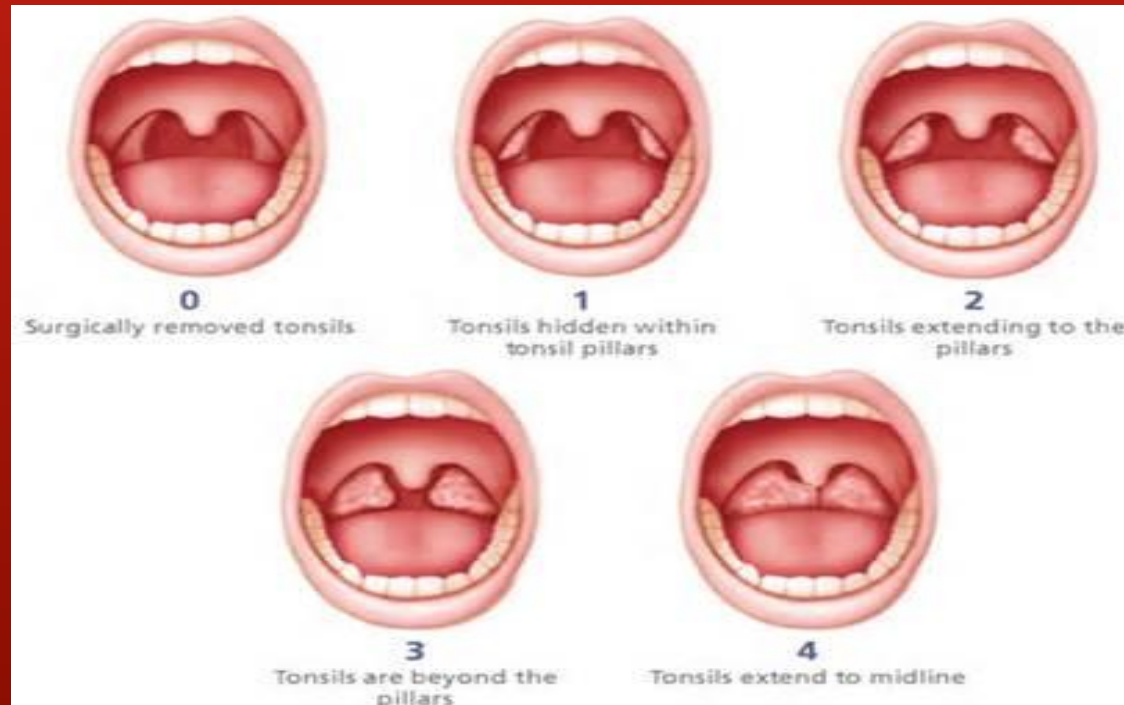
- Obesity
- Enlarged tonsils and adenoids
- Large tongue
- Craniofacial Abnormalities
- Neuromuscular Disorders
- Glycogen Storage Disease
- Genetics

Obesity

- Obesity continues to be a concern among children in the US
- Percentage of children who are overweight or obese ranges from 22% in Utah to 39.8% in Louisiana
- Health problems associated with obesity include OSA, hypertension, dyslipidemia, diabetes, insulin resistance
- These patients may present for T & A, cholecystectomy, orthopedic surgery, and many other types of procedures

Enlarged Tonsils and Adenoids

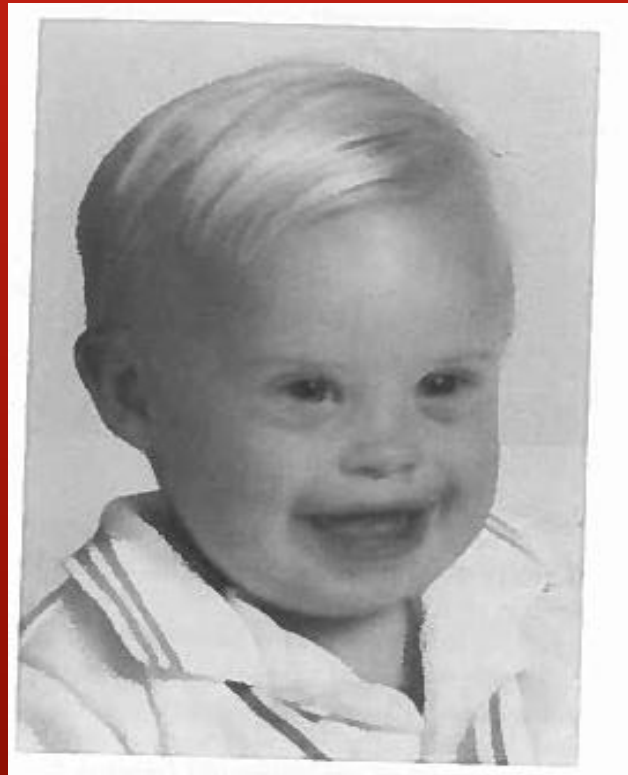
This is a frequent cause of OSA in children, and may be improved by T & A



Large Tongue

- Large tongue size is seen in children with Trisomy 21, Beckwith-Wiedeman Syndrome, and hypothyroidism

Trisomy 21



Beckwith-Wiedeman Syndrome



Craniofacial Abnormalities

- Crouzon's Syndrome
- Pierre Robin Anomalad
- Treacher Collins Syndrome
- Achondroplasia

Crouzon's Syndrome



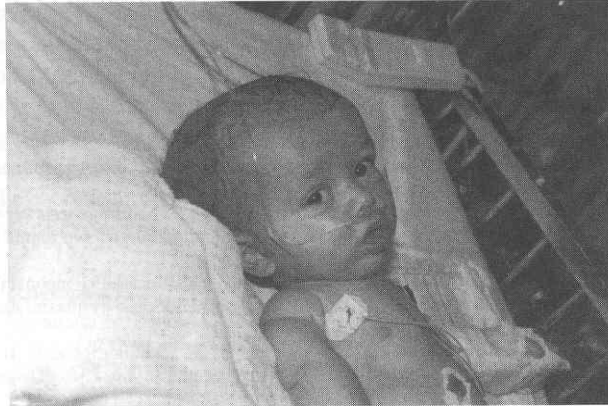
Pierre Robin Anomalad



Treacher Collins Syndrome

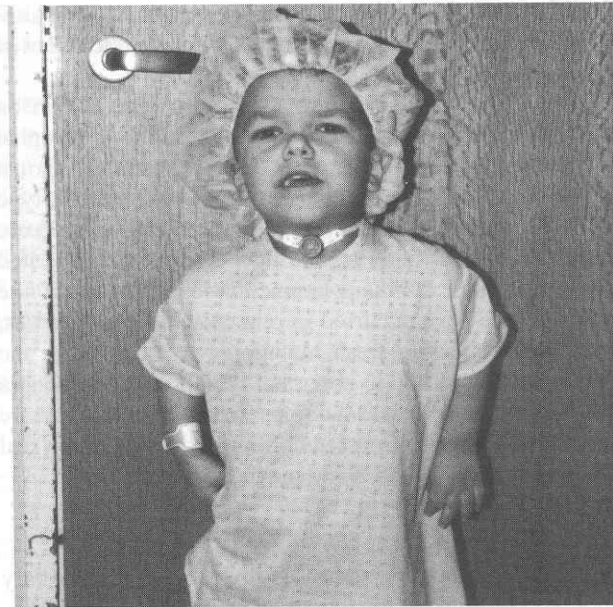


Achondroplasia



Achondroplasia. FIG. 1. A young infant with achondroplasia. His head and ventricles are large, although his head circumference is within normal limits for a child with achondroplasia. He had a history of apneic spells and had "trimming" of his epiglottis. During a later tonsillectomy he presumably had a vagally-mediated asystolic arrest.

hypoxemia or hypercapnia and can be present in childhood. Thoracic cage constriction improves over time, and adults have an almost normal chest wall configuration. Obstructive



Achondroplasia. FIG. 2. The same patient at 7 years of age. He has had a tracheostomy in the interval, as well as surgical straightening of his tibias and fibulae.

Neuromuscular Disorders

- Muscular Dystrophy
- Cerebral Palsy
- Spinal Muscular Atrophy
- Congenital Myotonic Dystrophy

Glycogen Storage Diseases

- Hunter's Syndrome
- Hurler's Syndrome
- Morquio Syndrome

Mucopolysaccharidosis



Genetics

- Risk for OSA is higher in first degree relatives of patients with OSA

Signs and Symptoms of OSA in Children

- BMI at or above the 95th percentile for age and gender
- Craniofacial abnormalities
- Nasal obstruction
- “Kissing” tonsils
- Intermittent vocalization during sleep
- Parental report of restlessness, difficulty breathing, or struggling to breathe while sleeping
- Night terrors
- Child sleeps in unusual positions
- Child with new onset enuresis
- Parent or teacher comments of daytime sleepiness, distractibility, aggression, or irritability
- Child difficult to arouse at usual awakening time

From: Practice Guidelines for the Perioperative Management of Patients with Obstructive Sleep Apnea by the American Society of Anesthesiologists

Polysomnography

- Also known as a “sleep study”
- Helps to determine the presence and severity of OSA
- Keys factors reported are AHI and oxygen saturation nadir

Apnea-Hypopnea Index

- Defined as the number of discrete obstructive events per hour

Oxygen Saturation Nadir

- Lowest level of oxygen saturation as measured by pulse oximetry

Severity of OSA

- Normal AHI 0-1 Oxygen Saturation Nadir > 92
- Mild AHI 2-4
- Moderate AHI 5-10
- Severe AHI > 10 Oxygen Saturation Nadir < 80

Why is this so important?

- Severity of OSA can help predict postoperative morbidity and mortality
- Recurrent hypoxemia in children is associated with increased sensitivity to opiates

Post Operative Pain Management

- Sensitivity to opiates is increased with increasing severity of OSA
- Lower preoperative oxygen nadir is associated with increased sensitivity to opiates
- Children with comorbidities are at increased risk for adverse events

Opioid Sensitivity

- Not just an increased likelihood of adverse events due to opioid administration
- An actual increased sensitivity to the analgesic effects of opioids
- So, lower doses are used because lower doses are needed, not because we are afraid higher doses will cause adverse events
- Opioid dosing should be decreased by 50% in children with severe OSA/oxygen saturation nadir < 85%, and carefully titrated to effect

Non-opioid Analgesics

- Acetaminophen-may be given orally, rectally , or intravenously
- There are no real studies in children to suggest that intravenous acetaminophen is superior to oral acetaminophen
- There are studies that show that oral acetaminophen given preoperatively is more effective that rectal acetaminophen given intraoperatively
- While use of NSAIDs has historically been thought to increase the risk of bleeding, the use of oral nonaspirin NSAIDs is recommended

Other Comfort Measures

- Ice bag to throat
- Cold liquids, popsicles, etc
- Distraction-TV, computer games
- Parental presence in PACU (also helps to differentiate agitation/fear from pain in younger children)

What about Codeine?

- Just say no!
- 10% of patients cannot metabolize codeine to morphine and get no pain relief
- Another 10% are poor metabolizers and get limited relief which can lead to excessive administration or addition of other pain relievers found in the home to these children
- 1 – 2 % are ultra metabolizers and are at risk of death due to overdose even if given the “correct” dose

Level of Post Operative Care

- Who goes where?
- Home
- Inpatient floor
- Intensive Care Unit

Postoperative Planning

Schwengel DA et al. Perioperative management of children with obstructive sleep apnea. Anesth Analg 2009;109:60-75.

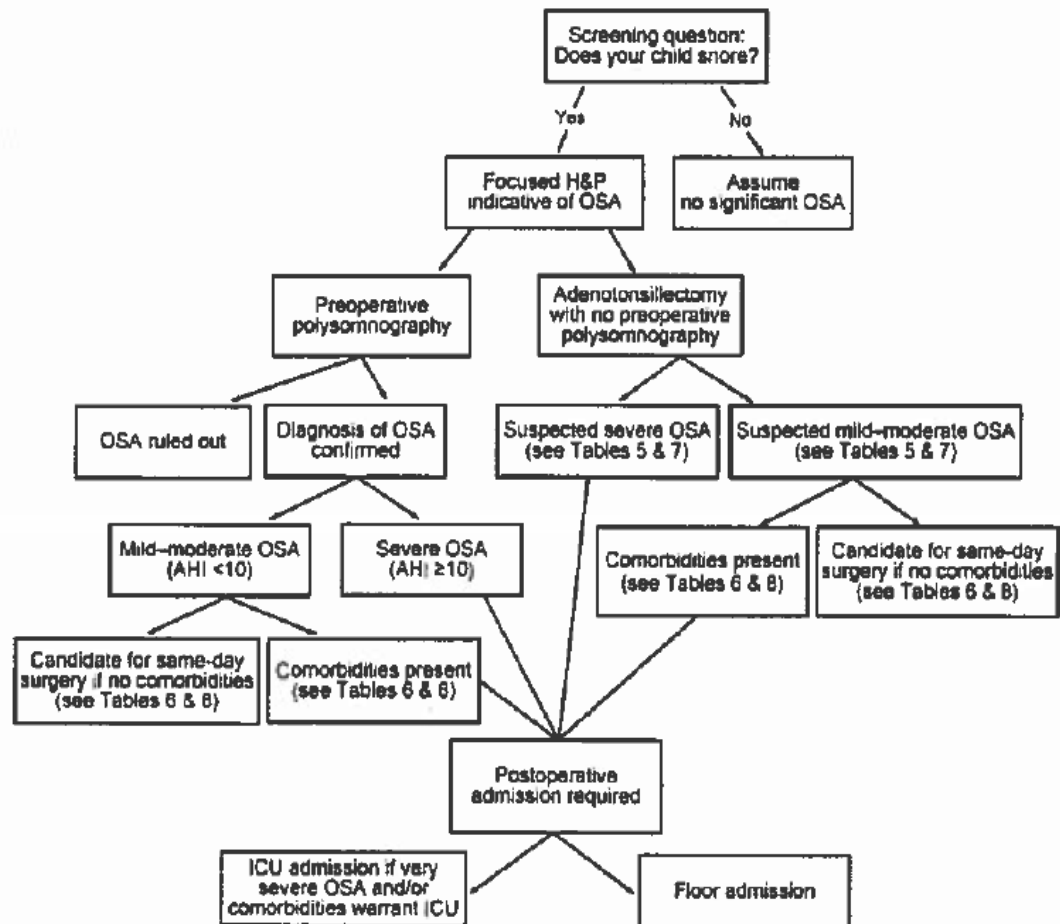


Figure 3. Algorithm for risk assessment and disposition planning.

Comorbidities

- Cardiac complications
- Craniofacial disorders
- Neuromuscular disorders
- CP
- Trisomy 21
- FTT
- Morbid obesity
- Prematurity
- Sickle cell disease
- Genetic/metabolic/storage disease
- Chronic lung disease

Post Operative Care

- Not all children with OSA are having a T & A
- The guidelines for opioid administration and post operative monitoring are not just for T & A patients
- Airway surgery or major surgery are indicators of increased risk of morbidity/mortality
- High dose oral opioids, parenteral opioids, or neuraxial opioids are also indicators of increased risk

Conclusions

- Children with moderate to severe OSA are at increased risk for adverse perioperative events
- OSA may not be diagnosed in children, and a high index of suspicion is needed
- Careful preoperative assessment, intraoperative management, and postoperative care can decrease this risk