# Therapies for Children with Obstructive Sleep Apnea

Christopher Cielo, DO[a], Lee J. Brooks, MD[b,*]

**KEYWORDS**

• Children • Obstructive sleep apnea • Adenotonsillectomy • Positive airway pressure
• Polysomnography

**KEY POINTS**

- The mainstays of therapy for obstructive sleep apnea in children are adenotonsillectomy and positive airway pressure.
- Nonsurgical therapies, including anti-inflammatory medications, dental devices, and weight loss, may be useful in specific circumstances.
- Airway surgery has been shown to be effective in children with craniofacial abnormalities, but not in the general pediatric population.
- Children with Down syndrome, craniofacial abnormalities, obesity, or Prader-Willi syndrome are at increased risk for obstructive sleep apnea syndrome and may require more frequent polysomnography and specific therapies.

## DIAGNOSIS OF OBSTRUCTIVE SLEEP APNEA SYNDROME IN CHILDREN

Obstructive sleep apnea syndrome (OSAS) in children is a "disorder of breathing during sleep characterized by prolonged partial upper airway obstruction and/or intermittent complete obstruction (obstructive apnea) that disrupts normal ventilation during sleep and normal sleep patterns."[1] Symptoms vary by age in children with OSAS, and may include neurobehavioral problems in younger children, daytime sleepiness or headaches in older children, and habitual snoring with or without observed apnea at any age. The sequelae of untreated OSAS in children includes excessive daytime sleepiness,[2] neurocognitive impairment and behavioral problems,[3,4] blood pressure dysregulation,[5] diastolic hypertension, and less commonly pulmonary hypertension and failure to thrive.[6] Risk factors for OSAS in children include adenotonsillar hypertrophy,[7] neuromuscular disorders,[8] craniofacial abnormalities,[9] and obesity.[10]

History and physical examination alone are unreliable for predicting the presence and severity of OSAS in children.[11,12] The gold standard for evaluating sleep apnea in the pediatric population is overnight, attended, in-laboratory polysomnography. Children who snore on a regular basis and for whom parents report observed apnea, sleep enuresis, sleeping while sitting or with the neck in a hyperextended position, cyanosis, headaches on awakening, daytime sleepiness, attention-deficit/hyperactivity disorder, or learning problems should be referred to a sleep specialist or for polysomnography. Children who habitually snore and have physical findings including underweight or overweight, tonsillar hypertrophy, adenoidal facies, micrognathia or retrognathia, high-arched palate, failure to

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[a] Division of Pulmonary Medicine, The Children's Hospital of Philadelphia, Colket Building, 11th Floor, 3501 Civic Center Boulevard, Philadelphia, PA 19104, USA; [b] Division of Pulmonary Medicine, Sleep Center, The Children's Hospital of Philadelphia, University of Pennsylvania, 9 Northwest 50 Main Building, 34th and Civic Center Boulevard, Philadelphia, PA 19104, USA
* Corresponding author.
*E-mail address:* brooksl@email.chop.edu

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thrive, or hypertension should also be referred for polysomnography.[13] Evidence-based guidelines defining OSAS severity in children do not exist, and the polysomnogram must be interpreted in the clinical context of each individual case. The decision to treat OSAS in children involves consideration of both the severity of clinical signs and symptoms and the polysomnographic findings. Many therapies, both surgical (**Table 1**) and nonsurgical (**Table 2**), are available for select groups of children.

## SPECIFIC THERAPIES

### *Adenotonsillectomy*

Tonsillectomy is a surgical procedure in which the peritonsillar space between the tonsil capsule and muscular wall is dissected, completely removing the tonsil. When performed in conjunction with surgical removal of the adenoids, this procedure is referred to as *adenotonsillectomy*. If a child has OSAS and has adenotonsillar hypertrophy, adenotonsillectomy is usually recommended as the first-line treatment.[13]

In most children, adenotonsillectomy is effective in treating OSAS and improving quality of life. Relative contraindications include very small tonsils/adenoids, morbid obesity with small tonsils/adenoids, bleeding disorders refractory to treatment, and medical instability. The rate of complete resolution of OSAS after adenotonsillectomy depends on many factors. Retrospective studies have found that adenotonsillectomy is highly effective in reducing the apnea-hypopnea index (AHI) and 25% to 71% of children have a postoperative AHI of less than 1 event per hour.[14–16] Older age, obesity, and higher preoperative AHI are negative predictors of successful resolution of OSAS after adenotonsillectomy.[11,14,16]

Treatment of obstructive sleep apnea (OSA) is cost-effective. Adenotonsillectomy has been associated with a reduction in health care costs by one-third, a 39% reduction in emergency department visits, and 60% fewer hospital admissions.[17] The efficacy of treating OSAS with adenotonsillectomy has not been compared with tonsillectomy or adenoidectomy alone, but in children without enlarged tonsils, particularly those younger than 1 year, adenoidectomy is often performed without tonsillectomy.

Adenotonsillectomy is a relatively safe procedure, and as many as 93% of patients have no intraoperative or postoperative problems.[18] The most common complications include pain and poor oral intake, with more severe complications including hemorrhage, dehydration, infection, respiratory complications, and atlantoaxial subluxation. The rate of major complications, including

**Table 1**
**Surgical therapies for OSAS in children**

| Therapy | Population | Benefits | Risks/Challenges |
|---|---|---|---|
| Adenotonsillectomy | Children with enlarged tonsils and/or adenoids | Highly effective<br>Well-tolerated in most children | Common adverse effects include pain, decreased oral tolerance, rare hemorrhaging, respiratory complications |
| Partial tonsillectomy | Children with enlarged tonsils with or without adenoids | Shorter recovery time and fewer postoperative complications than adenotonsillectomy | Efficacy in treating OSAS less-established<br>Effect of tonsillar regrowth on OSAS unknown |
| Tracheostomy | Children with severe OSAS and no other therapeutic option | Highly effective | Requires increased level of support at home<br>Increased risk of significant complications |
| Bariatric surgery | Select obese teenagers for whom other therapies have failed | Small studies show high short-term success rate in select populations | Significant complications<br>No long-term efficacy data<br>Success varies by center/type of surgery |
| Craniofacial surgery (mandibular distraction osteogenesis, lip-tongue adhesion) | Children with micrognathia, craniosynostosis, other craniofacial conditions | Highly effective in select population | Minimal long-term follow-up data<br>Success varies by center/type of surgery<br>Significant complications |