Too Many Sleepless Nights

Looking at Obstructive Sleep Apea

By Valerie G. Kirk, MD, FRCPC

In this article:

1. What are the clinical features of obstructive sleep apnea (OSA)?
2. How is OSA diagnosed?
3. What are the treatment options?

Obstructive sleep apnea (OSA) is characterised by prolonged, partial, upper airway obstruction and/or intermittent complete obstruction that disrupts normal ventilation during sleep.[1] The upper airway obstruction in OSA may be due to either structural or functional abnormalities of the upper airway and the immediate consequence is abnormal gas exchange, resulting in hypoxemia and/or hypercapnia during sleep. It occurs in both children and adults, but only recently has the relationship between OSA and neurocognitive function in children been formally studied.

Ricky's Case

Ricky, 4, presents to your office for his annual checkup. You note that his growth percentiles are reduced from previous visits. His mother has not noticed a change in his eating or elimination habits, but is concerned about some recent behaviour problems. She believes her son is "overtired." On examination, you note that Ricky's tonsils are moderately enlarged. The remainder of the physical exam is normal. With further questioning, you elicit a history of nocturnal snoring most nights of the week. You are suspicious that his growth and behaviour problems are related to obstructive sleep apnea and refer him for evaluation.

What is the prevalence of OSA in children?

OSA occurs in children of all ages, but is most common in children of preschool age (1% to 3%).[2,3] Unlike the adult population, OSA occurs equally among boys and girls, with a significantly increased prevalence among African-American children.[4] There is also some evi-

Table 1
Children at high risk for OSA

- Those of preschool age.
- Those in the African-American population.
- Those with a genetic predisposition to OSA.
- Those with craniofacial abnormalities (*e.g.*, Down syndrome).*
- Those with neuromuscular disorders (*e.g.*, spina bifida, cerebral palsy).*

*Prevalence is as high as 50%

OSA: Obstructive sleep apnea

Table 2
Clinical features of OSA

- History of snoring.
- Difficulty breathing during sleep.
- Intermittant pausing during sleep.
- Snorting during sleep.
- Gasping during sleep.
- Restlessness (*i.e.*, frequent awakening).
- Excessive nocturnal diaphoresis.
- Enuresis.
- Irritability.
- Poor behaviour.
- Poor mood control.
- Difficulty concentrating.
- School performance problems.

OSA: Obstructive sleep apnea

dence to support a familial or genetic predisposition (Table 1).[5]

What are the clinical features of OSA?

Most children with OSA present with a history of snoring and difficulty breathing during sleep. Caregivers often report observing intermittent pauses, snorts, and gasping. If the child's respiratory regulatory system is intact, arousal from sleep may also occur. Although these arousals serve an important protective purpose, they may result in clinically significant symptoms of sleep deprivation.[6-8] Other clinical manifestations are listed in Table 2.

Although excessive daytime sleepiness is very common in adults with OSA, this is uncommon in young children with the disorder.

What are the complications of untreated OSA?

In general. Untreated OSA can result in a variety of medical and neurobehavioural sequelae (Table 3). Children with OSA may experience growth problems or failure to thrive. This is related to several factors, including reduced insulin-like growth factor release and increased caloric expenditure during sleep. It is reversible with treatment.

OSA can also cause significant cardiovascular complications, such as pulmonary hypertension and cor pulmonale in children, although these complications have become less frequent due to earlier recognition and appropriate treatment.

School performance. More recently, Gozal and others have described significant effects of OSA on school performance. A

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large cohort of first-grade students performing in the lowest 10th percentile of their class were tested and shown to have a high prevalence of sleep-disordered breathing (18%).[9] Treatment with adenotonsillectomy resulted in a significant improvement in school performance. This improvement did not occur in the subgroup that did not receive treatment.[9] Results of a subsequent evaluation in a cohort of junior high students by the same investigator suggest there may be a critical time for intervention and prevention of school performance problems in children with OSA.

Table 3
Complications of untreated OSA

- Growth problems.
- Pulmonary hypertension.
- Cor pulmonale.
- Decrease in school performance.

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Attention deficit hyperactivity disorder (ADHD). ADHD is a common pediatric developmental problem which is associated with many symptoms related to sleep deprivation, such as difficulty concentrating and poor mood control. In fact, there are several reports suggesting an increased prevalence of sleep-related problems in children with ADHD.[10-12] Trommer et al reported a significant increase in sleep problems, including reduced sleep time and frequent awakenings, in a group of 113 children with ADHD compared to controls.[10] These associations raise concerns regarding the possibility of misdiagnosis and/or co-diagnosis of primary OSA and ADHD and is currently an active area of clinical research.

How do you diagnose OSA?

The correlation between reported symptoms and the presence of OSA in children has consistently been shown to be very poor.[13,14] For this reason, the current reference standard test for investigating children with suspected OSA is observed overnight laboratory polysomnography. This is a multichannel recording of many physiological parameters (Table 4). High cost and limited availability of this specialised test often results in long waiting times. This has prompted fairly widespread use of abbreviated, ambulatory monitoring

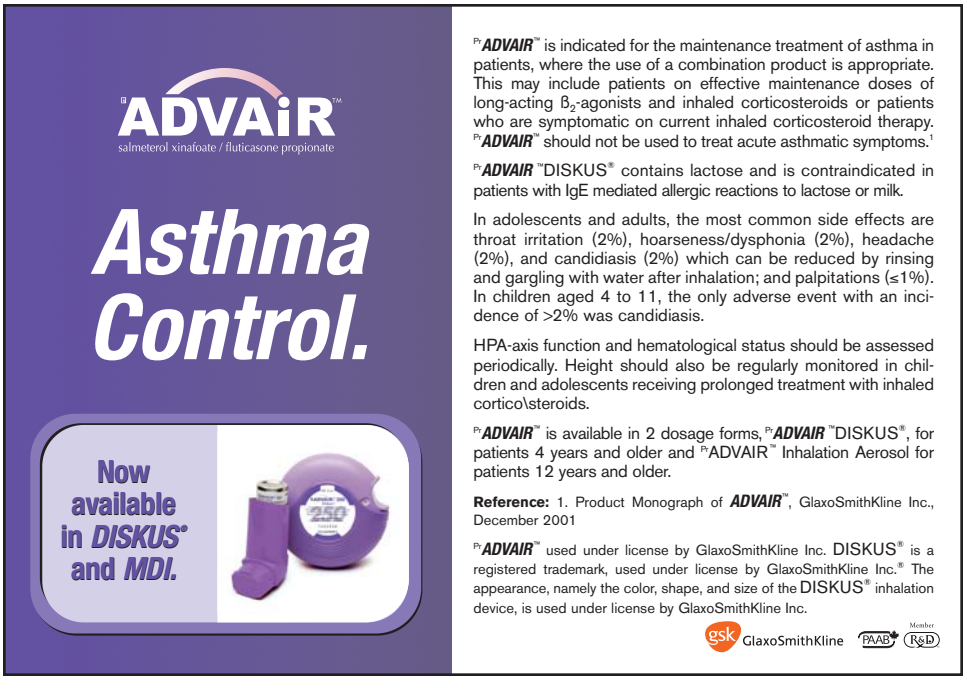

Table 4
Parameters measured by PSG

- Oxygen saturation.
- Carbon dioxide levels.
- Chest and abdominal wall motion.
- Airflow.
- Electrocardiography.
- Selective electromyography recordings.
- Electroencephalography.

PSG: Polysomnography

Table 5
Treatment options for OSA

- Surgical removal of tonsils and adenoids.
- Nasal continuous positive airway pressure.
- Topical nasal steroids.
- Craniofacial surgery.
- Uvulopalatopharyngoplasty.
- Tracheostomy

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devices, none of which have been systematically tested and validated for use in children. The American Thoracic Society guidelines for cardiorespiratory sleep studies in children suggest that portable, unattended monitoring systems may be adequate for the identification of OSA in otherwise healthy children, but that further study is needed.[1]

What are the treatment options?

The majority of children with OSA who are otherwise healthy can be effectively treated with surgical removal of the tonsils and adenoids, a procedure known as adenotonsillectomy (Table 5). The most frequent complication of adenotonsillectomy is postoperative bleeding (1% to 4%), which usually occurs four to seven days following surgery.[15,16] Postoperative airway obstruction and/or pulmonary edema are less frequent complications; however, some children are at high risk of respiratory compromise postoperatively and should be monitored closely in hospital for at least 24 hours. This includes children under two years, those with underlying complex medical disorders, such as Down syndrome or asthma, and those with a preoperative diagnosis of severe OSA.

When adenotonsillectomy is contraindicated or unsuccessful in treating OSA, children can be effectively treated with nasal continuous positive airway pressure (CPAP). Successful initiation of CPAP treatment in young children requires a multi-disciplinary approach at a centre with access to pediatric polysomnography facilities and clinical expertise in the management of sleep disordered breathing in children. Compliance with CPAP therapy varies from 50% to 100%.[17]

Additional therapies evaluated for the treatment of OSA in children include systemic and inhaled corticosteroids. Topical nasal steroids have also been formally evaluated and studies showed some reduction in the frequency of respiratory events with treatment.[18] It is not yet clear, however, if the reduction in respiratory events with topical steroids is clinically sufficient

enough for improvement without surgery or CPAP treatment.

Other, less common surgical and orthodontic procedures employed for the treatment of OSA in more complicated cases include craniofacial surgery, uvulopalatopharyngoplasty (UPPP), and jaw-positioning devices. None of these therapies have been evaluated as treatment for OSA in otherwise healthy children.

OSA is a significant and treatable cause of morbidity in children. Early diagnosis and treatment is dependent on clinicians maintaining a high index of suspicion in children with adenotonsillar hypertrophy, known risk factors for OSA, or snoring during sleep. Current first-line treatment is adenotonsillectomy, but children with known OSA undergoing this surgical procedure are at increased risk of postoperative airway complications and should be monitored carefully after surgery. Dx

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Practice pointer

For more information on sleep apnea, visit:

1. The American Sleep Apnea Association at *www.sleepapnea.org*
2. The National Sleep Foundation at *www.sleepfoundation.org*

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Take-home message

- OSA in children can be treated surgically by performing an adenotonsillectomy, but side effects may include postoperative bleeding, airway obstruction, and/or pulmonary edema.
- Adenotonsillectomy is contraindicated in children under two, those with other underlying complex medical disorders (*i.e.*, Down syndrome, asthma, *etc.*), or those with a pre-operative diagnosis of severe OSA. An alternative treatment is nasal continuous positive airway pressure (CPAP).
- Topical nasal steroids have also shown positive results in terms of treatment, but it is not clear if these results are significant enough to consider them an alternative to surgery or CPAP.

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