Pediatric Sleep Disordered Breathing

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A NOTE FROM THE AUTHOR

As a health care professional, I am pleased to present a contribution into the body of research and recommendations surrounding this topic.

I seek to educate and work toward a thoughtful reassessment of the role of medical and dental professionals in providing evidence-based treatment and counseling for patients. This article contains timely information and recommendations that professionals can utilize in their practice and share with their patients. In order to ensure we are offering the best care, it is important to be informed about choices, issues, products and devices that patients may be interacting with. This resource can help guide our patients using relevant resources to try to encourage an increased focus on their oral and overall health.

Signed,

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The American Academy of Pediatrics recommends that preschoolers get 10 to 13 hours of sleep a day including naps, but does not indicate how the hours should be split up[1]. The fact so little is known about this vital life process is alarming. Dr. Tracy Riggins, a developmental psychologist at the University of Maryland has commented on the fact that little is known about sleep and yet children's development is tracked with growth charts and percentiles of growth. Preschoolers who skip naps are worse at a memory game than those who take a nap even after they "catch up" on sleep the following night.

In recent years, sleep-disordered breathing (SDB) and pediatric obstructive sleep apnea (POSA) have received more public attention and are now at the forefront of significant medical concern and areas of research[1]. Sleep disordered breathing refers to a spectrum of sleep-related breathing abnormalities that include snoring, upper airway resistance syndrome, obstructive hypopnea syndrome, and obstructive sleep apnea (OSA). Given the high prevalence of comorbidities including neurocognitive dysfunction, cardiovascular complications, and obesity, SDB in children is a timely public health concern.

Initially, the same parameters used to diagnose OSA in adults were applied to children[2]. Concurrent with the improved recognition of POSA comes the realization that because of the robust neurological development throughout childhood, young children are particularly susceptible to the effects of SDB, and that symptoms and polysomnographic characteristics of OSA in childhood are substantially different compared to those of adults. This realization has led to refinements in how pediatric SDB and POSA are evaluated[2]. The neurobehavioral consequences of POSA in children include symptoms such as hyperactivity, inattention, irritability, and loss of appetite, which may translate to growth disturbances and poor school achievement[3].
A cross-sectional study by Halbower et al. shows

that severe POSA has an effect on Intelligence Quotient and executive functioning in children aged 6 to 16 years[4]. Signs of untreated sleep apnea in school-aged children include behaviors associated with learning disabilities, such as poor school performance due to misdiagnosed attention deficit hyperactivity disorder, aggressive behavior, developmental delay, bedwetting, and even failure to thrive[2]. Studies have noted other severe outcomes of undiagnosed/untreated POSA including brain damage, seizures, coma, and cardiac complications[2]. Patients with POSA are also at a greater risk of experiencing respiratory complications, including respiratory arrest after receiving general anesthesia or sedation[4].

Although the most common etiology of POSA remains adenotonsillar hypertrophy, in young children the surge in childhood obesity has been a significant increase in the prevalence of POSA in all children, including adolescents. Treatment often includes adenotonsillectomy (AT), the first line of therapy for POSA[6], however, surgical therapy frequently falls short, particularly in obese children, as shown in a retrospective study by Bhattacharjee et al[7]. Thus, treatment often includes the use of positive air-way pressure (PAP), weight loss in obese

children, and additional treatment strategies including dental therapies.

"Dentists have the opportunity to play a prominent role in multidisciplinary teams that routinely treat children with POSA after proper physician assessment and diagnosis."

Dentists have the opportunity to play a prominent role in multidisciplinary teams that routinely treat children with POSA after proper physician assessment and diagnosis. Approximately 12 to 15 percent of children are affected by SDB, with the highest prevalence in preschool-aged children between the ages of 3 and 5 years[8]. Both sexes are affected equally[9,10,11]. However, following puberty POSA tends to be predominant in males[12]. Habitual snoring (snoring more than 3 nights per week) is common and does not mean that the child has OSA. Snoring affects 3 to 12 percent of children, however, prevalence rates of POSA are more difficult to define given the variable diagnostic methods and criteria used for definition[6]. Several epidemiologic studies report wide prevalence rates ranging from 0.8 percent to 24 percent, but most report a true prevalence of POSA between 1 to 5 percent of all children[5]. Due to the lack of resources to adequately diagnose POSA, both POSA and SDB remain undiagnosed in a significant percentage of children[2]. Because children may present with less signs and symptoms when compared to adults with OSA, there is an overarching concern that OSA in many children remain undiagnosed[2].

In addition to the aforementioned risk factors of POSA, and of particular relevance given current demographic trends, obesity adds significantly to the risk of POSA[13,14]. As obesity prevalence rates have increased recently, there has been a concomitant observed increase in POSA[21]. For every increase in body mass index (BMI) by 1 kg/m2, the risk of POSA increases by 12 percent [9]. Sleep disordered breathing occurs within a range from snoring to severe OSA[3,15].

Studies indicate that 34 percent of all children snore, therefore, it is important to distinguish primary snoring from snoring associated with POSA.

Since it is clear that the etiology of POSA is multifactorial, the net result likely involves changes in the compliance of the musculature of the upper airway, as well as total cross-sectional area of the upper airway. Obstruction of the upper airway during sleep could also be the result of malformations in the maxilla, mandible, and other facial structures[16]. Patients with distinct craniofacial characteristics including a long, narrow face, high and narrow arched palate, and retrognathia have been noted in various studies using cephalometry and dental casts of patients with OSA[16]. It is estimated in the literature that African American children are four to six times more prone to experience POSA in comparison with Caucasian children[9].

Generally, the first line of therapy in the treatment of POSA consists of surgically removing the hypertrophic adenoids and tonsils[17]. Although AT is considered the first-line surgical therapy, it has proven to have diminishing results in some long-term studies. Studies have revealed that, over the long term, 50 percent of children with obesity and 10 to 20 percent of children without obesity will still have residual signs and symptoms of POSA following an AT[18,19,20]. In children with POSA, a multicenter study by Bhattacharjee et al. showed a 27 percent cure rate with AT, therefore, this is not a cure-all procedure[7]. Moreover, obesity significantly reduces the efficacy of AT in treating POSA [10,22]. Given recent findings, it is becoming more apparent that additional surgical and/or nonsurgical strategies are indicated to resolve POSA.

Distraction osteogenesis, by way of rapid maxillary distraction combined with an AT, has proved to be successful in treating children with OSA with the following facial features: high arched palate and a unilateral or bilateral posterior crossbite in patients who are at least 5 to 16 years old (before the cartilage becomes bone). As discussed previously, syndromic

patients may benefit from mandibular distraction osteogenesis by expanding the bones in the mandible via internal or external fixation (external fixation results in more scarring)[7,9]. These distraction strategies work by allowing increased space for the tongue to lie so that it does not fall posteriorly and obstruct the oropharynx. Rapid maxillary distraction may be performed in congruence with mandibular distraction osteogenesis when the patient has reached the age of adolescence (approximately 12 to 13 years)[21].

As measures to diagnose POSA have evolved, so have treatment modalities, including several nonsurgical approaches that in some cases replace or serve as an adjunctive to AT. Because obesity is the second most common cause of POSA, weight reduction is a common nonsurgical recommendation for these patients. However, other therapeutic strategies may be used concurrently to address the patient's POSA while weight reduction is pursued. Nonsurgical treatment options include PAP, myo-functional therapy, and if indicated, maxillary expansion along with other dental/orthodontic treatment[2,22]. This highlights the need for multidisciplinary approaches to the treatment of POSA. Teams consisting of primary care physicians, otolaryngologists, sleep medicine physicians, myofunctional therapists, and dentists (including general dentists, pediatric dentists, and orthodontists) have become much more common[2]. This approach focuses on prevention and early intervention in the treatment of POSA, with the goal of establishing or reestablishing effective nasal breathing in affected patients. Therapy with PAP is often considered the next treatment strategy if AT is not effective or if POSA remains unresolved after AT[22].

The AAPD guidelines pertaining to dentists who treat children advise that "all children/adolescents should be screened for snoring" and referred to a qualified medical professional[6]. Polysomnography should be performed in children/adolescents with snoring symptoms/signs of (POSA), "weight loss is recommended in addition to other therapy in patients who are overweight or obese," and "intranasal corticosteroids are an option for children with mild (POSA) in whom AT is contraindicated or for mild postoperative (POSA)."

The AAPD's recommendation for the timing of the first dental visit and the establishment of a dental home places the dentist in an important position to both screen and monitor their pediatric patients for signs and/or symptoms of SDB and POSA.

The AAPD guidelines serve as the preeminent standards for dentists treating children, and it is notable that the guidelines focus on the screening, clinical assessment, and then referral to medical specialists for workup and diagnosis. With further dental involvement in the patient's care, and based on the recommendation of the patient's physician, other treatment modalities may then be discussed. It is essential that dentists adhere to the AAPD guidelines when treating children and dentists who treat children conduct a thorough history and clinical screening for sleep-related breathing disorders. As recommended by the AAPD guidelines, the parents of pediatric patients should be asked if their children exhibit any symptoms of POSA.

Pediatric obstructive sleep apnea is highly prevalent in children and is associated with numerous health-related complications. Of equal concern is the likelihood that POSA will remain undiagnosed or diagnosis will be delayed in many children, given the paucity of available pediatric polysomnography laboratories. If POSA is left untreated, there are several potential harmful consequences, including attention or behavioral problems, reduced academic performance, cardiovascular disease, and growth/nutritional concerns ranging from failure to thrive or to obesity[1].

Given the high prevalence of POSA in children, providers and parents should work together to screen and refer appropriately.

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