Working together in identification and treatment of sleep-disordered breathing (SDB)

Nicole Cavalea, MS, discusses the need for comprehensive management of SDB

The role of pediatric dentists and orthodontists in identification and treatment of sleep-disordered breathing (SDB) has become increasingly important as research provides us with more information. Open-mouth breathing patterns, postural abnormalities of the mouth and tongue, and structural development of the oral cavity and airway are often first recognized by pediatric dentists and orthodontists.

The increase in mouth breathing is associated with less time spent with tongue to the palate and, therefore, with narrowing of the maxilla and an increased facial height. This downward and backward rotation of the maxilla and mandible is a powerful predictor of SDB as well as TMJD and malocclusion. Early identification of mouth breathing is therefore recommended as early as the first year of life.[1] A narrow maxilla leads to increased nasal resistance, which promotes mouth breathing and subsequently SDB. Premature infants are much more likely to present at 1 to 2 years of age with a high and narrow hard palate, abnormal nasal resistance, and mouth breathing, all of which promote the development of an abnormally long, inferior third of the face. Orthodontists and pediatric dentists are the specialists that can recognize these risk factors and bring them to parental attention.[2]

Improper oral resting posture of the tongue will have a negative influence of the oral cavity and airway. The anatomy of the upper airway in turn guides the growth and development of the nasomaxillary complex, mandible, temporomandibular joint, and ultimately, the occlusion of the teeth; thus, malocclusion and facial dysmorphism may be the result of compensation for a narrowed airway.[1] Short lingual frenulum is a known factor in altering orofacial growth particularly impacting development of the maxilla due to the low placement of the tongue. It leads to the abnormal development of a high and narrow hard palate, and secondarily, mouth-breathing during sleep.[3]

Obstructive sleep apnea (OSA) has become increasingly recognized as a notable health concern in children given its consequences on behavior, function, and quality of life. Statistically, 40% of children who suffer from SDB develop ADD, ADHD, and/or a learning disability. Additionally, if a child is diagnosed with SDB in the first 5 years of life and is left untreated, he/she is 60% more likely to require special needs education by age 8.

Most children with OSA have difficulty breathing through the nose. Allergic rhinitis is the most commonly cited disease, followed by hypertrophy of the tonsils and adenoids.

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Orofacial and pharyngeal muscles are involved in important functions, including breathing, with the vital role of maintaining airflow. Any upper airway (UA) obstruction may induce changes in neuromuscular function in order to ensure the passage of air. The most common consequence of UA obstruction is mouth breathing, a functional adaptation that may affect craniofacial growth and development during childhood. Another possible consequence is obstructive sleep apnea (OSA). Myofunctional treatment is aimed at correcting abnormal breathing patterns and muscular dysfunction that may impair upper airway patency.[4]

Adenotonsillectomy and palatal expansion have established their roles in the treatment of OSA after demonstrating considerable improvement related to adenoid or tonsillar hypertrophy, maxillary or mandibular deficiency, and orthodontic or craniofacial abnormalities. However, the implementation of other modalities such as myofacial reeducation also plays a crucial role in the optimization of sleep disordered breathing, as maladapted orofacial functions may be irreversible or present insufficient improvement even when their original cause is eliminated.[4] If nasal breathing is not restored, despite short-term improvements after adenotonsillectomy (T&A), continued use of the oral breathing route may be associated with abnormal impacts on airway growth and possibly blunted neuromuscular responsiveness of airway tissues, both of which may predispose to the eventual return of upper airway collapse in later childhood or in the full blown syndrome of OSA in adulthood.[5]

There are several etiologic factors that have been linked in varying degrees to the development of SDB in children. A visual assessment of the following characteristics can indicate the need to co-treat with an orofacial, myofunctional therapist: forward tongue protrusion during resting, speech, and/or swallow, open mouth breathing posture, weak lip seal, postural changes to face, open bite, distorted speech, jaw instability, dark eye circles.[5] Guilleminault C, Sullivan SS. Towards restoration of continuous nasal breathing as the ultimate treatment goal in pediatric obstructive sleep apnea. short lingual frenulum, long face, and a high narrow palate.

Co-treatment goals of the myofunctional therapist are to: First, determine the nature of the postural imbalances that are present and how they affect craniofacial development and functional ability. Next, correct muscular imbalances of the lips, tongue, and jaw through exercises meant to re-pattern, coordinate, and strengthen these areas involved. Children with OSA were found to have relative impairments in orofacial functions and lesser muscular coordination.[4] The therapist activates and strengthens the oral facial muscles of mastication to support the mandible and the genioglossus at night. Approximately 30% of OSA patients have poor genioglossus muscle responsiveness to airway narrowing during sleep.[6] The tongue muscles are trained to achieve palatal tongue rest position (aiding in correct tongue posture during rest, speech, and swallow). Proper placement and precision are taught in regard to the function of swallowing. When swallowing correctly, the client is instructed to voluntarily place his/her tongue against the roof of the mouth while bringing lips together and creating a suction to swallow. Finally, correct nasal breathing, along with a proper resting oral posture is established. Achieving proper nasal breathing will result in improving lung volume, increasing nitric oxide through the body, improvement in sleep, and the reduction of allergies and illnesses.

To restore efficiency in breathing, first, the myofunctional therapist will educate the client on proper nasal/diaphragmatic breathing. Once coherence is established, the client will learn a series of exercises that focus on the biomechanical and biochemical aspects of breathing. Biochemically, the client is instructed to breathe in a way that creates a desire for air (such as narrow, light breaths). This technique will decrease the clients sensitivity for CO2, therefore creating a larger threshold to eliminate sleep disturbances. Biomechanically, the client is instructed on ways to practice techniques that maximize breathing skills. For example, the client learns deep, slow breathing through the nose, where the air effectively expands the diaphragm. Treatment will last anywhere from 4-6 months, with exercises and practice daily.

In a retrospective study,[7] 24 teenagers who had previously been diagnosed with SDB between the ages of 3½ and 7 and had been treated appropriately with adenotonsillectomy and orthodontia and also had been instructed to commence myofunctional reeducation. Recurrence of OSA occurred in 13 subjects. Each of these presented with oral-facial hypotonia and mouth breathing during sleep. In contrast, the subjects with normal breathing at long-term follow-up had normal oral-facial tone, nasal breathing during sleep, and had completed myofunctional therapy. This study illustrates the importance of myofunctional treatment as an adjunct treatment of SDB children.[7] More recently, a series of studies on the application of myofunctional therapy of SDB in children from Stanford University showed that the addition of myofunctional therapy to adenotonsillectomy or palatal expansion reduced the risk of recurrence of SDB.[4]

Comprehensive management of SDB requires and integrated effort of the sleep physician, otolaryngologist, allergist, orthodontist, pediatric dentist, and myofunctional therapist.

In conclusion, research indicates that successful treatment of SDB depends on the collaboration of multi-disciplinary teams aimed at identification and treatment of SDB. Comprehensive management of SDB requires and integrated effort of the sleep physician, otolaryngologist, allergist, orthodontist, pediatric dentist, and myofunctional therapist. OP

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