

Myofunctional therapy

Part 2: Prevention of dentofacial disorders

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Abstract

AirwayCentric approach to prevention of dentofacial disorders

The correct development of functions is important for the prevention of dentofacial disorders from the first days of life. The first and foremost function, to which all others are adapting, is nasal breathing. The AirwayCentric® method focuses on nasal breathing during early development and throughout childhood to promote: Neurobehavioural development and the brain, development of the craniofacial and respiratory complex, correct dental occlusion, proper and restful sleep and to improve performance and life overall. By working at the same time on orofacial functions and structures, many dentofacial disorders can be prevented.

KEYWORDS Airway Centric, Breathing, Prevention, Development, Sleep, Occlusion.

Introduction

Airway issues may be present at birth and are often observed in premature infants as difficulty with sucking, swallowing and breathing reflexes. A study from Stanford [Huang and Guilleminault, 2013] found that all preemies born before 34 weeks were mouth breathers, often the first sign of sleep disordered breathing (SDB). Therefore this section will focus on airway, breathing and sleep; awareness, implications, diagnosis and implications.

When the infant cannot obligate nose breathing during sucking and swallowing, breastfeeding is difficult or impossible. And yet, breastfeeding helps develop the airway and shrink tonsils and adenoids which are the main cause of airway restrictions in babies and children. Lactation consultants and occupational therapists who intervene to improve sucking, swallowing and breathing often have more of an emphasis on feeding than breathing. Latching on can be impeded by a tongue tie or tight lingual frenum referred to tethered oral tissues or TOTs. This is easily solved as early as the first few days of life.

Airway, breathing and sleep disorders in infants often begin with mouth breathing. Mouth breathing has been reported to

occur in 55–56.8% of infants in 2 studies [Felcar et al., 2010; Abreu et al., 2008a]. This is profound as mouth breathing on a continuous basis may lead to snoring and obstructive sleep apnoea (OSA). Mouth breathing is the first sign of SDB. Bonuck [2012] studied the effect of snoring, mouth breathing and OSA on neurobehavioural development. SDB at 6 months and 18 months significantly increased hyperactivity, emotional problems, conduct disorder and difficulties in peer-to-peer relationship at ages 4 and 7. There was a 20–60% increase of neurobehavioural problems at age 4 and 40–100% at age 7. Habitual snoring is reported in 3–12% of children with reports of snoring in 21–68% overall. Bonuck found that 10–21% of parents reported on their children's snoring. Guilleminault and his team at Stanford [Guilleminault and Huang, 2018] have identified other craniofacial features which have been confirmed by Boyd [2019] as Craniofacial Respiratory Complex (CFRC). Infants who are premature or exhibit SDB often have high narrow palates, tongue tie, retrognathic mandibles and maxillae.

According to Lieberman, Our faces have been shrinking, compared to early Homo sapiens and Neanderthal [Shaw, 2013], particularly in the last 200 years. Our midfaces are retruded predisposing for a closed airway.

Stupak [2018] and Guilleminault [2018] challenged earlier theories proposing that negative pressure changes in the airway precede or are causative of turbinate hypertrophy and enlarged adenoids. The narrowed airway and negative pressure lead to alterations in facial development and increased temporomandibular disorders (TMD) and SDB.

6–12 Months

The epiglottis descends between 6 and 18 months of age. Other mammals have a lock between palate and epiglottis protecting the airway and facilitating breastfeeding. Only in humans does the epiglottis descend. This descent, combined with a flexible pharynx and larynx, facilitates our ability to make a variety of sounds improving speech and enhancing communication. This descent also leaves a vulnerable 1–2 inches behind the tongue and soft palate where the airway is prone to collapse. Snoring and sleep apnoea may begin at this age particularly when the infants or toddlers are sleeping on their back.

Muscle tone

Narrowed airways are often present in retrognathic children with high narrow palates. All children should also be evaluated

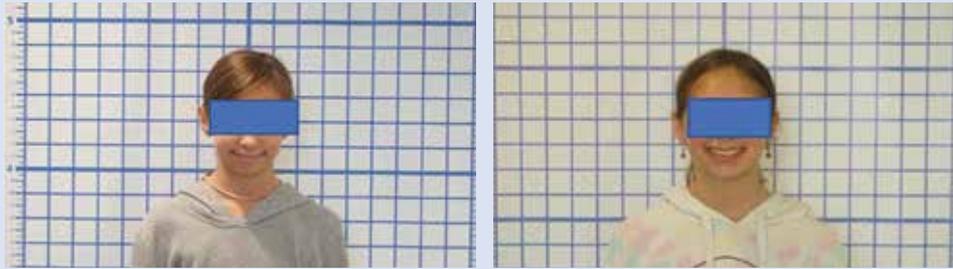


FIG. 1 This 11-year-old girl after 16 months treatment came to the observation with improved width of smile, tooth alignment, occlusal plane and dental midline, and her height had increased (4 inches taller).

All pictures courtesy of Jeremy Montrose, DMD.



FIG. 1A Comparison of physical and intraoral records, front view.



FIG. 1B Occlusal view at baseline and after 16 months of treatment: improved arch shape, tongue space and tooth alignment can be noticed.



for low muscle tone. Head lag during pull-to-sit is another sign of low tone and developmental disruption. Many children with habitual open mouth posture and low tongue position also exhibit low tone. The myofunctional therapist plays a key role in reestablishing muscle tone and function as well as proper oral rest posture. Following adenotonsillectomy, 51% of children still had OSA [Quinzi et al., 2020]. These will be children who are retrognathic with small airways and low muscle tone, with seemingly large tongues which look large because the musculature is either disorganized or not yet activated. By expanding the nasal cavities, palatal expansion will resolve

much of the OSA, but without myofunctional therapy symptoms do return.

In a study by Huang and Guillemainault [2018], 64 children were evaluated post-adenotonsillectomy: [Guillemainault and Huang, 2018; Rambaud and Guillemainault, 2012] 26 still had OSA and 35 were mouth breathers. Eighteen of the mouth breathers were chosen for the study: 9 out of 18 had myofunctional therapy, while the other 9 children did not. The results showed that apnea-hypopnea index (AHI) resolved in those children who underwent MFT and worsened in the control group. Most children with SDB will require guided

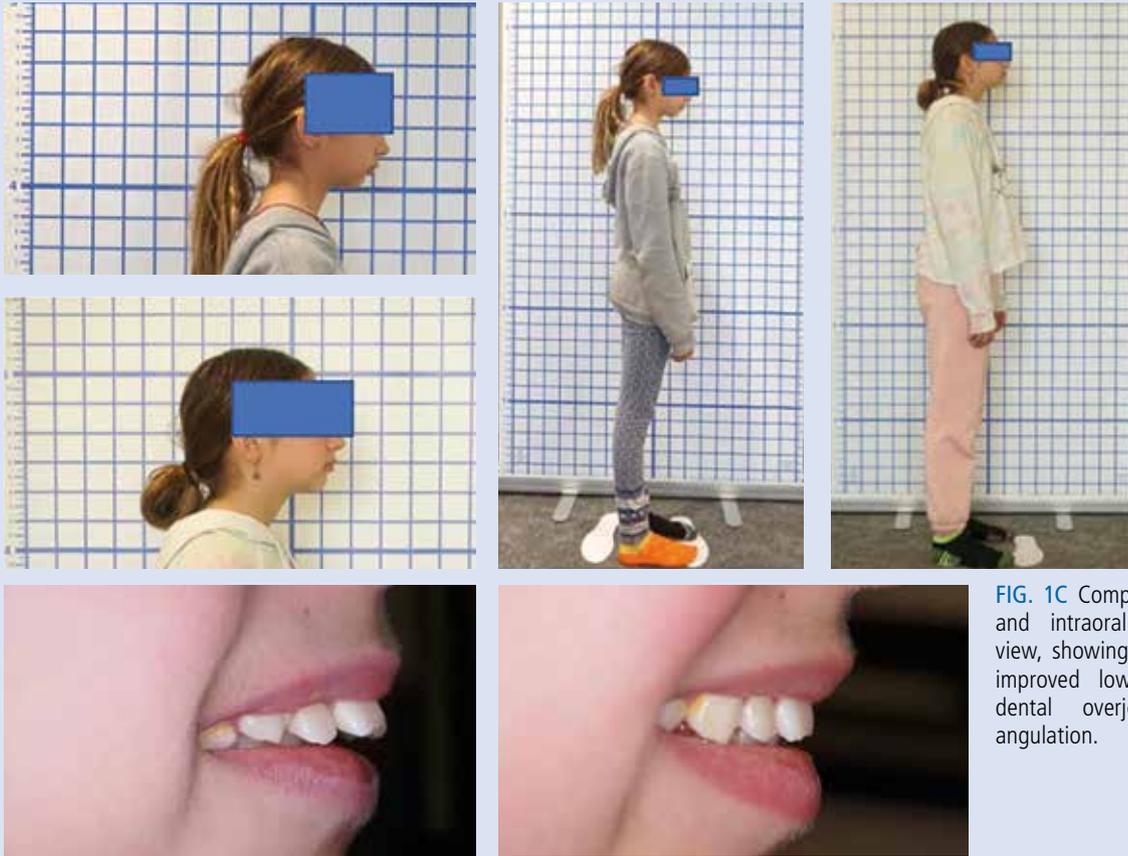


FIG. 1C Comparison of physical and intraoral records, lateral view, showing increased height, improved lower jaw position, dental overjet and incisor angulation.

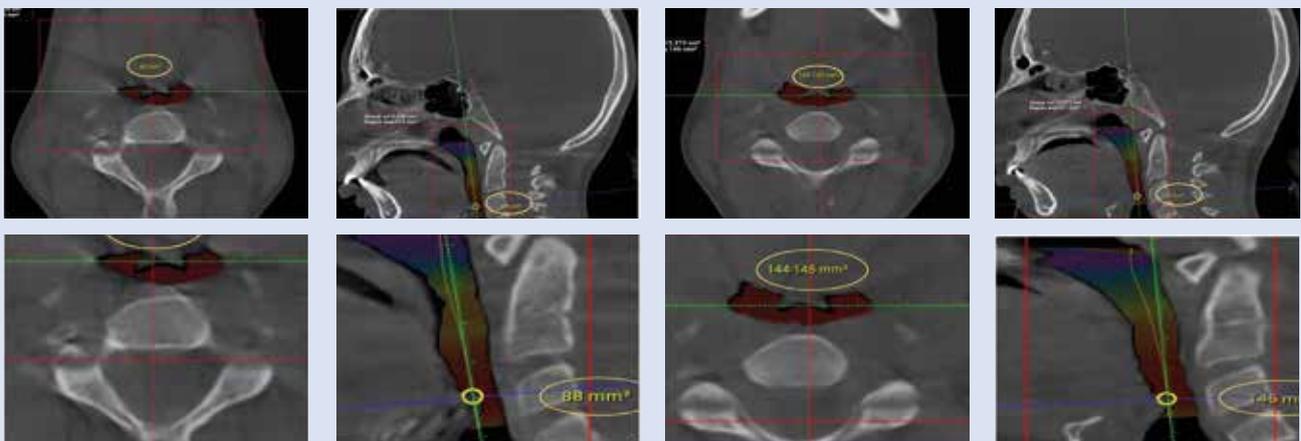


FIG. 1D Comparison of radiographic examinations, showing the narrowest part of airway increased from 88 mm² to 145 mm² (65% increase in area), that resulted in a significant reduction in upper airway resistance.

growth appliances or palatal expansion along with myofunctional therapy, although adenotonsillectomy is also helpful in many cases.

Growth and development

Children with narrowed airways and nasal obstruction will often have undiagnosed upper airway resistance syndrome (UARS) or OSA most often with mouth breathing and intermittent or habitual snoring. Over time a prolonged low tongue position, a forward head posture with rounded shoulders and cervical spine alterations will often lead to a long face or dolichocephalic facial pattern. This is often accompanied by a gummy smile, a bump on the nose and retrognathia. Crowding and crooked teeth are a symptom or

compensation of an airway problem with an underdeveloped mouth and epigenetic changes secondary to breathing issues daytime and nighttime. Nasal breathing can reverse this trend during early development and needs to be promoted through a multidisciplinary approach.

Failure to thrive is also reported in children with SDB due in part to lack of release of human growth hormone (HGH) which occurs during deep sleep. Once deep sleep is restored with airway development (AirwayCentric® Orthodontics), nasal breathing and myofunctional therapy, growth is accelerated.

TMD

Because the mandible positions itself, based on breathing demands, the symptoms of TMD often resolve after

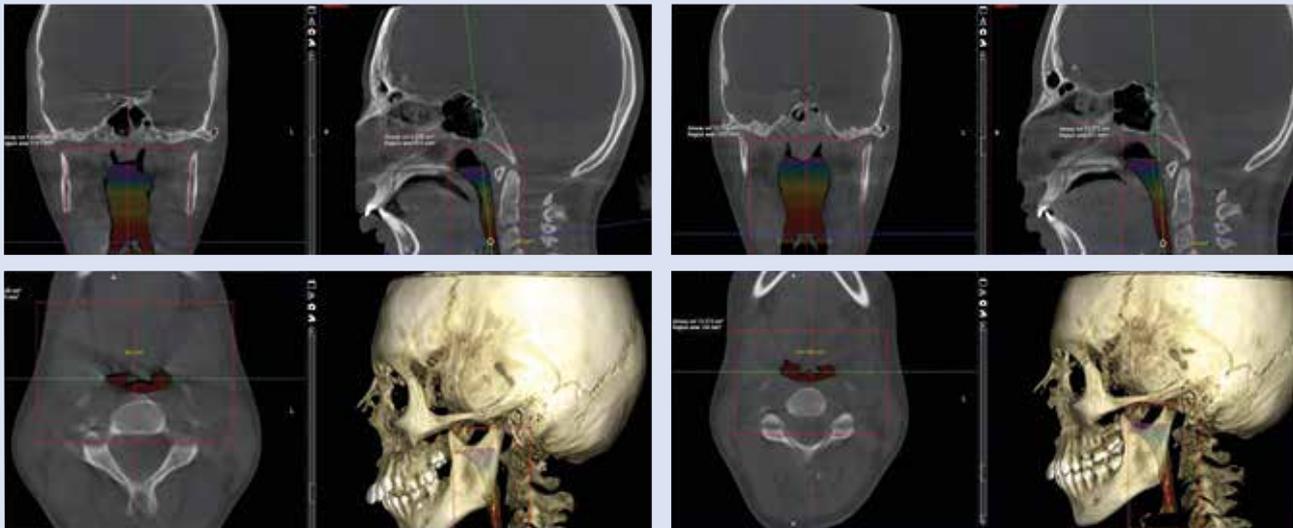


FIG. 1E CBCT showing the improved tongue position, jaw position, tooth angulation and airway volume.

Sleep, Breathing & Habit Questionnaire

Patient's Name: [Redacted] Age: 11 Date: 5/18/19

Please indicate if you experience any of the symptoms below by using this scale to measure the severity of these symptoms. If filling out for your child, please indicate if you have observed any of the following symptoms below:

0 - No Occurrence 1 - Occurs Rarely 2 - Occurs 2 to 4 times per week 3 - Occurs 5 to 7 times per week

1. <input checked="" type="radio"/> Snores	16. <input type="radio"/> Allergic symptoms	
2. <input type="radio"/> Interrupted snoring where breathing stops	17. <input type="radio"/> Ear infections	
3. <input type="radio"/> Labored, difficult or loud breathing at night	18. <input type="radio"/> Short attention span	
4. <input type="radio"/> Gasping for air while sleeping	19. <input type="radio"/> Trouble focusing	
5. <input type="radio"/> Mouth breathes while sleeping	20. <input type="radio"/> Difficulty listening/often interrupts	
6. <input type="radio"/> Mouth breathes during the day	21. <input type="radio"/> Hyperactive	
7. <input type="radio"/> Restless sleep	22. <input type="radio"/> ADD/ADHD	
8. <input type="radio"/> Grinds teeth while sleeping	23. <input type="radio"/> Sensory Issues	
9. <input type="radio"/> Talks in sleep	<i>Children Only (Below)</i>	
10. <input type="radio"/> Excessive sweating while sleeping	24. <input type="radio"/> Wets the bed (currently)	
11. <input type="radio"/> Wakes up at night	25. <input type="radio"/> History of bedwetting	
12. <input type="radio"/> Feels tired and/or irritable during the day	26. <input type="radio"/> Struggles in math at school	
13. <input type="radio"/> Headaches	27. <input type="radio"/> Struggles in reading at school	
14. <input type="radio"/> Frequent throat infections	28. <input type="radio"/> Avoidance behavior towards food or certain types of food	

Speech Questionnaire (children only)
Please check all that apply to your child

<input type="radio"/> Is it difficult to understand your child's speech?	<input type="radio"/> Gets frustrated when people can't understand speech?
<input type="radio"/> Difficult to understand over the phone?	<input type="radio"/> Speech sounds abnormal?
<input type="radio"/> Nasal speech?	<input type="radio"/> Sometimes omits consonants?
<input type="radio"/> Hoarseness?	<input type="radio"/> Uses M, N, NG instead of P, V, S, Z sounds?
<input type="radio"/> Others have difficulty understanding speech?	<input type="radio"/> Swallowing problems with liquids and solids getting into nose?

Sleep, Breathing & Habit Questionnaire

Patient's Name: [Redacted] Age: 12 Date: 3/19/20

Please indicate if you experience any of the symptoms below by using this scale to measure the severity of these symptoms. If filling out for your child, please indicate if you have observed any of the following symptoms below:

0 - No Occurrence 1 - Occurs Rarely 2 - Occurs 2 to 4 times per week 3 - Occurs 5 to 7 times per week

1. <input checked="" type="radio"/> Snores	16. <input type="radio"/> Allergic symptoms	
2. <input type="radio"/> Interrupted snoring where breathing stops	17. <input type="radio"/> Ear infections	
3. <input type="radio"/> Labored, difficult or loud breathing at night	18. <input type="radio"/> Short attention span	
4. <input type="radio"/> Gasping for air while sleeping	19. <input type="radio"/> Trouble focusing	
5. <input type="radio"/> Mouth breathes while sleeping	20. <input type="radio"/> Difficulty listening/often interrupts	
6. <input type="radio"/> Mouth breathes during the day	21. <input type="radio"/> Hyperactive	
7. <input type="radio"/> Restless sleep	22. <input type="radio"/> ADD/ADHD	
8. <input type="radio"/> Grinds teeth while sleeping	23. <input type="radio"/> Sensory Issues	
9. <input type="radio"/> Talks in sleep	<i>Children Only (Below)</i>	
10. <input type="radio"/> Excessive sweating while sleeping	24. <input type="radio"/> Wets the bed (currently)	
11. <input type="radio"/> Wakes up at night	25. <input type="radio"/> History of bedwetting	
12. <input type="radio"/> Feels tired and/or irritable during the day	26. <input type="radio"/> Struggles in math at school	
13. <input type="radio"/> Headaches	27. <input type="radio"/> Struggles in reading at school	
14. <input type="radio"/> Frequent throat infections	28. <input type="radio"/> Avoidance behavior towards food or certain types of food	

0 on all questions

Speech Questionnaire (children only)
Please check all that apply to your child

<input type="radio"/> Is it difficult to understand your child's speech?	<input type="radio"/> Gets frustrated when people can't understand speech?
<input type="radio"/> Difficult to understand over the phone?	<input type="radio"/> Speech sounds abnormal?
<input type="radio"/> Nasal speech?	<input type="radio"/> Sometimes omits consonants?
<input type="radio"/> Hoarseness?	<input type="radio"/> Uses M, N, NG instead of P, V, S, Z sounds?
<input type="radio"/> Others have difficulty understanding speech?	<input type="radio"/> Swallowing problems with liquids and solids getting into nose?

0 on all

FIG. 1F The questionnaire administered to the patient shows improved symptoms and quality of life.

AirwayCentric® Orthodontics and myofunctional therapy, as a properly developed maxilla frees the mandible, allowing it to come forward. Restorative sleep and increased oxygenation are healing of TMD as well.

Sleep

Nasal breathing prevents nasal disuse [Rambaud and Guilleminault, 2012]. The mucosa that lines the turbinates shrinks with nasal breathing and the nasomaxillary complex [Torre and Guilleminault, 2018] can achieve its full potential. A polysomnogram will measure the amounts of REM and nREM sleep as well as oxygen saturation levels in all sleep positions, supine and non supine. The goal in children is to develop the airway, restore tone and proper rest oral posture

while eliminating habits to prevent OSA and SDB. With ideal and prompt diagnosis and treatment these disorders may be prevented throughout life.

Overall quality of life

Sleep disordered breathing is associated with changes in the brain in children and adults. Earliest symptoms include attention deficit disorder (ADD) [Rosa et al., 2019; Paolantonio et al., 2019; Quinzi et al., 2018; Paglia, 2019], impulsivity, conduct disorder and-peer-to peer difficulty as well as anxiety, depression and panic attacks. Anxiety, ADD and depression often continue into adulthood as well as neurocognitive deficits with performance problems. This can continue as dementia and eventually Alzheimer's disease [Bredesen, 2017]. Therefore,

an early assessment and management of airway issues is of paramount importance as paediatric dentists are able to identify the anatomical and physiological phenotypes connected to breathing disorders that can lead to a proper and early diagnosis.

Case report

To better illustrate the power of allowing proper functions to guide growth and development, with the dental professionals as team leaders, an indicative case is illustrated below (Fig. 1).

This case was treated with only orofacial myofunctional therapy and a functional support appliance during sleep. No orthodontic hardware, fixed or removable expanders were utilised. This example demonstrates the power that functional change can have on the development of the jaws, midface, and airway which additionally results in improvements to teeth alignment and posture. Enhancements to the airway include increases in volume, tone, and minimum cross-sectional area (as measured with cone beam computerized tomography, or CBCT). These positive structural changes will commonly lead to subsequent improvements in sleep, behaviour and health which can be seen in the patient questionnaires.

Conclusion

A patent airway, day and night, is needed to achieve nasal breathing, proper rest oral posture and restful restorative sleep. Early childhood is the most important period of brain development and is dependent on high quality sleep with ideal oxygen levels. Early recognition of the signs and symptoms of SDB is crucial to ensure ideal brain development which is initially at the level of the prefrontal cortex and has implications in social relationship and behavior.

Restoration of nasal breathing with myofunctional therapy combined with AirwayCentric® orthodontics and ENT treatment will allow optimal orofacial and brain development.

Quality of life will improve with more energy, better mood and enhanced performance. If that's not enough, smiles and facial esthetics are also greatly improved.

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