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Pneumopedics: Non-surgical upper airway remodeling for pediatric obstructive sleep apnea

Currently, the management of pediatric obstructive sleep apnea (OSA) remains undecided. Often, the tonsils and adenoids are surgically removed but this intervention does not always produce the desired outcome, and alternatives must be sought. On the other hand, continuous positive airway pressure (CPAP) is often contra-indicated in pediatric OSA, unlike adult OSA. However, mandibular advancement devices (MADs) are often used as alternatives to CPAP in adult OSA. Therefore, alternative solutions to pediatric OSA are also required. Biomimetics is a science that studies natural models and uses these designs and processes to solve human health issues. For example, in modern humans (*Homo sapiens sapiens*), the natural design includes 32 teeth, which are symmetrically-arranged within the human craniofacial architecture. This structural pattern is achieved through developmental processes (e.g. temporo-spatial patterning) that are encoded within the human genome, including growth and development of the mandible and eruption of the teeth. Studies have shown that the growth and development of the mandible can be modified in 2D and 3D studies. In fact, monozygotic twins respond to removable appliances that reposition the mandible during growth favorably. However, not all pediatric devices are effective in mandibular repositioning during growth, and careful selection is mandatory. In responsive cases, however, both pre-formed and customized devices are cost effective. In fact, significant changes in upper airway morphology have been induced in children using these techniques. It is concluded that this pneumopedic approach may be considered for non-surgical upper airway remodeling in pediatric cases of obstructive sleep apnea.

Recent Publications

1. Singh G D and Clark W J (2001) Localization of mandibular changes in patients with class II division 1 malocclusions treated using twin block appliances: Finite-element modeling. American Journal of Orthodontics and Dentofacial Orthopedics 119(4):419-425.
2. Elfeky H Y, Fayed M S, Alhammadi M S, Soliman S A Z and El Boghdadi D M (2018) Three-dimensional skeletal, dentoalveolar and temporomandibular joint changes produced by twin block functional appliance. Journal of Orofacial Orthopedics DOI: 10.1007/s00056-018-0137-1.
3. Condò R, Perugia C, Bartolino M and Docimo R (2010) Analysis of clinical efficacy of interceptive treatment of class II division 2 malocclusion in a pair of twins through the use of two modified removable appliances. Journal of Oral Implantology 3(3):11-25.
4. Pavoni C, Cretella Lombardo E, Lione R, Bollero P, Ottaviani F and Cozza P (2017) Orthopaedic treatment effects of functional therapy on the sagittal pharyngeal dimensions in subjects with sleep-disordered breathing and class II malocclusion. Acta Otorhinolaryngologica Italica 37(6):479-485.
5. Cozza P, Polimeni A and Ballanti F (2004) A modified monobloc for the treatment of obstructive sleep apnoea in paediatric patients. European Journal of Orthodontics 26:523-530.

Biography

G D Singh holds three doctorates, including Doctor of Dental Medicine; a PhD in Craniofacial Development, and a DDSc in Orthodontics. He was invited to relocate to the Center for Craniofacial Disorders, USA where he led a NIH-funded program of craniofacial/cleft lip and palate research. Currently, he is a Board Member of the American Sleep and Breathing Association, a member of the World Sleep Federation, an Academic Fellow of the World Federation of Orthodontists, and Fellow of the International Association for Orthodontics, where he was awarded prizes in 2005, 2013 and 2014. He has published over 200 articles and books in the peer-reviewed medical, dental and orthodontic literature, and has lectured in Australia, Asia, Europe, Africa and North America. Currently, he is President of Vivos BioTechnologies, Inc.

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