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Mini Review

Adenoid and tonsil hypertrophy in children and facial malformations

Abstract

The controversy over the effect of nasal breathing in musculoskeletal facial development has continued over the decades. Although today it is better understood how facial bones grow and the hormonal effect on them, further well-controlled studies with larger populations are still needed to establish a direct relationship between obstruction of the upper airway and poor facial development.

Keywords: adenoid hypertrophy, tonsil hypertrophy, nasal obstruction, adenoid facies, facial malformations, craniofacial growth

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Introduction

The controversy over the influence of nasal breathing on facial bone development has continued for decades and otolaryngologists are often questioned on this subject. The pharynx is a segment of the airway whose walls are soft and shaped primarily by the constrictor muscles and tongue, which attributes a very dynamic character. This tract is also delimited by the adenoids, tonsils and the lingual tonsil forming part of the lymphatic Waldeyer's ring, which is normal and common to all human beings. The development of the adenoids starts at 3years old and continues until 5years of age whereafter a progressive shrinkage may be expected. They have an immunocompetent role as a first line of defence for the human body, consequently, growth is influenced by the environment, infections and allergic factors. An enlarged adenoid contributes to obstruction of nasal breathing, which can manifest itself as nocturnal snoring, mouth breathing, nasal discharge and serous otitis, often of chronic nature. Also, tonsil hypertrophy may lead to the obstruction of the airway mainly at night, during sleep and could also potentially influence the muscular development of the face, as some researchers have claimed, generating myofunctional variations as hypotonia of the orofacial musculature and the tongue adopting a low position in the mouth, which may apparently contribute to malformation of the jaw and its rotation backward or forward, as well as hard palate malformation and therefore an abnormal facial development, which may constitute what is known as adenoid facies, characterized by an elongated face with mouth ajar and anteverted upper lip. Hypertrophy of a particular tissue, either adenoid or tonsil, could potentially generate a specific cephalometric pattern as suggested recently.[1,2]

This debate began more than a century ago and became more interesting in the early 1970's, when authors like Quick & Gundlach[3] began to question whether adenoid hypertrophy was associated with a high palatal vault and a narrow nasopharynx or conversely, that these two conditions generated that enlarged adenoids caused symptoms of nasal obstruction. The emergence of cephalometric studies enabled the growth of the face to be examined with scientific rigor and those researchers conducted a study in 113 children admitted to hospital for malocclusion. Patients were selected according to whether their facial shape was wide or elongated, then measurements of the shape of the palate and its position in the skull were taken in order to establish if there was a statistically significant relationship between facial growth pattern, the shape of the palatal vault and nasal obstructive symptoms. They concluded that people with elongated faces have a narrow maxillary arch and hard palate located more posteriorly, a closer nasopharynx and an increased incidence of nasal obstructive symptoms. They also stressed that when these features exist in a particular growth pattern, inevitably are associated with the presence of adenoid facies. However despite the coexistence of these factors, a direct cause-effect relationship was not established between them.[3] Linder-Aronson[5] simultaneously reported the relationship between the presence of adenoid tissue and features like retrusion of the maxilla and mandible relative to the cranial base, tendency to narrow dental arches, crossbite, recumbent maxillary and mandibular incisors, short mandibular dental arch, increased anterior facial height and low tongue position. In a subsequent investigation involving a group of 24 children after adenoidectomy, he concluded that besides the normalization of nasal breathing, craniofacial morphology approached the media.[48] Solow & Tallgren[9] examined the association between craniofacial morphology, posture of the head and cervical spine, finding that the extension of the head relative to the cervical spine was connected to a long posterior and short anterior facial height, a wide angle at the base of the skull and a narrow nasopharyngeal space.[9] Many other studies have been conducted since then and the level of interest has increased thereby ensuring that many other researchers continue this study in an attempt to establish a direct relationship between airway obstruction and craniofacial growth. Among them in an interesting recent study by Indriksone & Jakobsone[10,11] which evaluated the influence of the craniofacial morphology in the dimensions of the upper airway in 276 healthy adults between 17 and 27years of age, using cone beam computed tomography, taking into account the volume of the oropharyngeal airway and nasopharyngeal level, the minimum cross-sectional area and the presence of adenoid tissue. They concluded that craniofacial morphology alone does not have a significant influence on the size of the airway.[10,11] In another study, conducted by Souki[12] and collaborators in 749 brazilian children, the importance of the teething stage was studied. They concluded that mouth breathers could be expected to have a more vertical facial morphology than nasal breathers, however, they also found that in younger children with primary dentition, measurements of the anterior facial height and the total length of the mandible were lower, which, they stated, could be related to the stage of maturation rather than the mode of respiration.[12] On the other hand, Ung[13] and colleagues conducted a study in 49 children from 10 to 16years of age in order to determine the breathing pattern and its influence on dentofacial development. Here, they evaluated nasal flow, oral flow and total flow separately and compared flow resistance and nasal power. The majority exhibited oronasal or nasal breathing and the variability of respiratory patterns throughout single days, and even between days, made this determination extremely complex; Eventually they concluded that nasal air resistance and nasal power are not directly correlated with dental or skeletal variables.[13] Being closely related to obstruction of the airway, it is important to mention breathing disorders during sleep, most notably the apnea-hypopnea obstructive sleep syndrome which is characterized by habitual snoring and breathing pauses, plus enuresis, poor school performance, failure to thrive etc., and in which have also been reported some musculoskeletal facial changes. Among these are posterior slope of the mandibular plane angle, the height of the face and the adoption of a lower position of the hyoid bone with respect to nasal breathers. It is also interesting to note that a change in the hormone production associated with somatic growth in general, and in particular with the bones of the face, has been observed. After adenotonsillectomy, which is the first surgical choice to try to improve or even cure the obstruction of the airway, this hormonal change reverts and improves the production of growth factor similar to insulin (IGF-1) and its protein binding, but not the growth hormone directly. This normalization can result in accelerated mandibular growth after surgery and the closure of the mandibular angle, but not the maxilla. However, compensation apparently appears mostly in children who have this surgery before 5years of age.[14–20]

Is important to mention that in many cases, investigations have been conducted in children with severe airway obstructions, however, this is not the usual situation, since many of the children evaluated in daily practice have normal periods and others of exacerbation associated to infectious or allergic factors, that are currently successfully treated with nasal sprays of topical anti-inflammatory steroids[21–23] which also improve the obstruction related to the allergic response. So it is necessary to consider complex variables such as the frequency and intensity of the airway obstruction and its duration as well as the moment of establishment, since it is well known that the rate of growth during development is variable and of course, it is also necessary to consider genetically related individual susceptibility, which is another variable that adds complexity to the interpretation of results.

Conclusion

Craniofacial growth is complex and it involves a harmonious interaction between adjacent development sites, which in turn have a different organization and growth pattern in response to hormonal stimulation, depending upon the particular genetics involved. Although there has been a lot of research to elucidate the effect of the mode of breathing on facial growth, and even on the impact of disordered breathing during sleep, no direct relationship between nasal obstruction and facial malformation has yet been established. Questions involving genetics and the influence of the environment remain unanswered. Resolution of these issues will allow us to better understand the correlations and determine exactly what the key factors are for bad facial development in some and not in others.

Well-controlled studies using larger populations in order to clarify the direct relationship between facial growth and nasal breathing are thus far lacking and these need to take full account of the fundamental considerations that the airway is both dynamic and three dimensional.

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Conflicts of inteterst

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References

1. Smith RM, Gonzalez C. The relationship Between nasal obstruction and craniofacial growth. *Pediatr Clin North Am*. 1989;36(6):1423–1434.
2. Franco LP, Souki BQ, Cheib PL, et al. Are distinct etiologies of upper airway obstruction in mouth-breathing children Associated With Different cephalometric patterns? *Int J Pediatr Otorhinolaryngol*. 2015;79(2):223–228.
3. Quick CA, Gundlach KK. Adenoid facies. *Laryngoscope*. 1978;88(2Pt 1):327–333.
4. Linder-Aronson S. Adenoids. Their effect on mode of breathing and nasal air flow and Their relationship to características of the facial skeleton and the denition. A biometric, rhino-manometric and radiographic study on cephalometro-Children with and without adenoids. *Acta Otolaryngol*. 1970;265(Suppl):1–132.
5. Linder-Aronson S. Respiratory function in relation to facial morphology and the dentition. *Br J Orthod*. 1979;6(2):59–71.
6. Linder-Aronson S. The relation Between nasorespiratory dentofacial morphology and function. *Am J Orthod.* 1983;83(5):443–444.
7. Linder-Aronson S, Woodside DG, Hellsing E, et al. Normalization of scoring position after adenoidectomy. *Am J Orthod Dentofacial Orthop*. 1993;103(5):412–427.
8. Linder-Aronson S, Woodside DG, Lundstrom A. Mandibular growth direction following adenoidectomy. *Am J Orthod*. 1986;89(4):273–284.
9. Solow B, Tallgren A. Head posture and craniofacial morphology. *Am J Phys Anthropol*. 1976;44(3):417–435.
10. Indriksone I, Jakobsone G. The Influence of Craniofacial morphology on the upper airway dimensions. *Angle Orthod*. 2014;85(5):874–880.
11. Indriksone I, Jakobsone G. The upper airway dimensions in different sagittal craniofacial patterns: a systematic review. *Stomatologija.* 2014;16(3):109–117.
12. Souki BQ, Lopes PB, Pereira TB, et al. Mouth breathing children and cephalometric pattern: does the stage of dental development matter? *Int J Pediatr Otorhinolayngol.* 2012;76(6):837–841.
13. Ung N, Koenig J, Shapiro PA, et al. A quantitative assesment of respiratory patterns and their effects on dentofacial development. *Am J Orthod Dentofacial Orthop*. 1990;98(6):523–532.
14. Peltomaki T. The effect of mode of breathing on craniofacial growth - revisited. *Eur J Orthod.* 2007;29(5):426–429.
15. Sousa JB, Anselmo-Lima WT, Valera FC, et al. Cephalometric assessment of the mandibular growth pattern in mouth-breathing children. *Int J Pediatr Otorhinolaryngol.* 2005;69(3):311–317.
16. Sørensen H, Solow B, Greve E. Assessment of the nasopharyngeal airway. A rhinomanometric and radiographic study in Children with adenoids. *Acta Otolaryngol*. 1980; 89(3-4):227–232.
17. Aydogan M, Toprak D, Hatun S,et al. The effect of recurrent tonsillitis and adenotonsillectomy on growth in childhood. *Int J Pediatr Otorhinolaryngol*. 2007;71(11):1737–1742.
18. Behlfelt K, Linder-Aronson S, Neander P. Posture of the head, the hyoid bone, and the tongue in Children with and without enlarged tonsils. *Eur J Orthod*. 1990;12(4):458–467.
19. Bonuck KA, Freeman K, Henderson J. Growth and growth biomarker Changes after adenotonsillectomy: systematic review and meta-analysis. *Arch Dis Child.* 2009;94(2):83–91.

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20. Zettergren-Wijk L, Forsberg CM, Linder-Aronson S. Changes in dentofacial morphology after adeno-/ tonsillectomy in young Children with obstructive sleep apnea - a 5-year follow-up study. *Eur J Orthod*. 2006;28(4):319–326.
21. Vontetsianos HS, Davris SE, Christopoulos GD, et al. Improved somatic growth following adenoidectomy and tonsillectomy in young children. Possible pathogenetic-mechanisms. *Hormones(Athens).* 2005;4(1):49–54.
22. Zicari AM, Occasi F, Montanari G, et al. Intranasal budesonide in Children Affected by persistent allergic rhinitis and Its effect on nasal patency and Nasal Obstruction Symptom Evaluation (NOSE) score. *Curr Med Res Opin*. 2015;31(3):391–396.
23. Bhargava R, Chakravarti A. Role of Aqueous nasal spray for management of adenoidal hypertrophy in children. *J Laryngol Otol.* 2014;128(12):1060–1066.

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