



ORIGINAL ARTICLE

Breathing mode influence on craniofacial development and head posture[☆]

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KEYWORDS

Breathing;
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Abstract

Objective: The incidence of abnormal breathing and its consequences on craniofacial development is increasing, and is not limited to children with adenoid faces. The objective of this study was to evaluate the cephalometric differences in craniofacial structures and head posture between nasal breathing (NB) and oral breathing (OB) children and teenagers with a normal facial growth pattern.

Method: Ninety-eight 7–16 year-old patients with a normal facial growth pattern were clinically and radiographically evaluated. They were classified as either nasal breathing (NB) or oral breathing (OB) patients according to the predominant mode of breathing through clinical and historical evaluation, and breathing respiratory rate predomination as quantified by an airflow sensor. They were divided in two age groups (G1: 7–9) (G2: 10–16) to account for normal age-related facial growth.

Results: OB children (8.0 ± 0.7 years) showed less nasopharyngeal cross-sectional dimension (MPP) ($p=0.030$), whereas other structures were similar to their NB counterparts (7.6 ± 0.9 years). However, OB teenagers (12.3 ± 2.0 years) exhibited a greater palate length (ANS-PNS) ($p=0.049$), a higher vertical dimension in the lower anterior face (Xi-ANS-Pm) ($p=0.015$), and a lower position of the hyoid bone with respect to the mandibular plane (H-MP) ($p=0.017$) than their NB counterparts (12.5 ± 1.9 years). No statistically significant differences were found in head posture.

Conclusion: Even in individuals with a normal facial growth pattern, when compared with NB individuals, OB children present differences in airway dimensions. Among adolescents, these dissimilarities include structures in the facial development and hyoid bone position.

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PALAVRAS-CHAVE

Respiração;
Desenvolvimento
craniofacial;
Postura da cabeça;
Crianças

Influência do modo de respiração sobre o desenvolvimento craniofacial a e postura da cabeça**Resumo**

Objetivo: A incidência da respiração anormal e de suas consequências no desenvolvimento craniofacial aumenta e não é limitada a crianças com fácies adenoideanas. O objetivo deste estudo foi avaliar as diferenças cefalométricas nas estruturas craniofaciais e na postura da cabeça entre crianças e adolescentes com respiração nasal (RN) e respiração bucal (RB) com padrão de crescimento facial normal.

Método: 98 pacientes com idades entre 7-16 anos com padrão de crescimento facial normal foram avaliados de forma clínica e radiológica. Eles foram classificados como pacientes com respiração nasal (RN) ou respiração bucal (RB) de acordo com a predominância do modo de respiração por meio da avaliação clínica e histórica e da predominância da frequência respiratória conforme qualificado por um sensor de fluxo de ar. Os pacientes foram divididos em duas faixas etárias (G1: 7 a 9) (G2: 10 a 16) para contabilizar o crescimento normal facial relacionado à idade.

Resultados: As crianças com RB ($8,0 \pm 0,7$ anos de idade) mostraram menor dimensão transversal nasofaríngea (MPP) ($p = 0,030$), ao passo que outras estruturas foram semelhantes a seus pares com RN ($7,6 \pm 0,9$ anos de idade). Contudo, os adolescentes com RB ($12,3 \pm 2,0$ anos de idade) mostraram maior comprimento do palato (espinha nasal anterior-espinha nasal posterior (ENA-ENP)) ($p = 0,049$), maior dimensão vertical na menor face anterior (Xi-ENA-Pm) ($p = 0,015$) e menor posição do osso hioide a respeito do plano mandibular (H-PM) ($p = 0,017$) que seus pares com RN ($12,5 \pm 1,9$ anos de idade). Não foram constatadas diferenças estatisticamente significativas na postura da cabeça.

Conclusão: Mesmo em indivíduos com padrão de crescimento facial normal, em comparação a indivíduos com RN, as crianças com RB apresentam diferenças nas dimensões das vias aéreas. Entre os adolescentes, essas dissimilaridades incluem estruturas no desenvolvimento facial e na posição do osso hioide.

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Introduction

Physiological breathing is often affected by anatomic or functional problems, causing the respiratory cycle to be initiated not only through the nose but also through the mouth.^{1,2} Compared to nasal breathing (NB) children, oral breathing (OB) children are at higher risk for restless sleep, diaphoresis and enuresis at night, and, in some cases, even sleep apnea syndrome. The low-quality sleep materializes as daytime sleepiness, irritability, and headaches³ likely to negatively impact academic performance. Further, the presence of hyponasal speech or speech alterations⁴ increases the likelihood of being classified with a learning disability. In fact, many of these children are misdiagnosed with attention deficit hyperactivity disorder (ADHD) and sometimes erroneously medicated.⁵

Several studies postulate that OB children exhibit characteristics of the typical adenoid facies: a decrease in the facial prognathism, a small nose and nostrils, a short upper lip, and an open mouth posture which may be the source for a backward and downward rotation of the mandible that causes an increase in the vertical development of the lower anterior face and a narrower anteroposterior upper airway dimension.^{1,6-8} These patients' muscle imbalance, owing to an anatomic recondition, may lead to cranio-cervical

hyperextension and kyphotic posture.^{9,10} There are also reports of different types of malocclusion, such as open bites, anterior and/or posterior crossbites, class II malocclusion,¹¹ constricted palates, and gummy smiles resulting in unattractive facial features.⁵ In addition, OB children often suffer from chronic gingivitis, periodontitis, candida infections,¹² dental erosion, and cavities.¹³ Due to the difficulty of breathing and chewing simultaneously for extended periods, masticatory efficiency decreases.¹⁴ This, in turn, leads to OB children's preference for soft and often-times non-nutritious foods that increase the possibility of malocclusions and cavities.

Published evidence is inconclusive, in part, because growth patterns have not been taken into account, as certain physical characteristics are shared by subjects with a predominant vertical growth pattern, who, in turn, are more likely to be OB children.¹⁵ In addition, decreased adenoids and occlusal maturation have not been used as classification parameters when comparing across subjects.⁸ Moreover, different diagnostic tools have been used to classify breathing modes.

The main objective of this research was to evaluate the cephalometric differences in craniofacial structures (*i.e.*, the form and position of the maxilla, mandible, upper airway, and hyoid bone) and head posture between NB and OB

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