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Prevalence of malocclusion among mouth breathing children: Do expectations meet reality?

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ABSTRACT

Objective: The aim of this study was to report epidemiological data on the prevalence of malocclusion among a group of children, consecutively admitted at a referral mouth breathing otorhinolaryngological (ENT) center. We assessed the association between the severity of the obstruction by adenoids/tonsils hyperplasia or the presence of allergic rhinitis and the prevalence of class II malocclusion, anterior open bite and posterior crossbite.

Methods: Cross-sectional, descriptive study, carried out at an Outpatient Clinic for Mouth-Breathers. Dental inter-arch relationship and nasal obstructive variables were diagnosed and the appropriate cross-tabulations were done.

Results: Four hundred and one patients were included. Mean age was 6 years and 6 months (S.D.: 2 years and 7 months), ranging from 2 to 12 years. All subjects were evaluated by otorhinolaryngologists to confirm mouth breathing. Adenoid/tonsil obstruction was detected in 71.8% of this sample, regardless of the presence of rhinitis. Allergic rhinitis alone was found in 18.7% of the children. Non-obstructive mouth breathing was diagnosed in 9.5% of this sample. Posterior crossbite was detected in almost 30% of the children during primary and mixed dentitions and 48% in permanent dentition. During mixed and permanent dentitions, anterior open bite and class II malocclusion were highly prevalent. More than 50% of the mouth breathing children carried a normal inter-arch relationship in the sagital, transversal and vertical planes. Univariate analysis showed no significant association between the type of the obstruction (adenoids/tonsils obstructive hyperplasia or the presence of allergic rhinitis) and malocclusions (class II, anterior open bite and posterior crossbite).

Conclusions: The prevalence of posterior crossbite is higher in mouth breathing children than in the general population. During mixed and permanent dentitions, anterior open bite and class II malocclusion were more likely to be present in mouth breathers. Although more children showed these malocclusions, most mouth breathing children evaluated in this study did not match the expected "mouth breathing dental stereotype". In this population of mouth breathing children, the obstructive size of adenoids or tonsils and the presence of rhinitis were not risk factors to the development of class II malocclusion, anterior open bite or posterior crossbite.

1. Introduction

The association between nasal respiratory impairment and dento-facial morphology has been studied for more than a century [1–3] and for decades it has been strongly accepted that inter-arch growth pattern can be influenced by an unbalanced muscular function on mouth breathers [4].

The knowledge that obstruction of nasal breathing most likely will perversely impact the facial growth even led some authors to propose classic terms to describe such patients as "adenoid faces" [5], "long face syndrome" [6] and "respiratory obstruction syndrome" [7].

A stereotype of these patients, therefore, can be drawn, where an anterior open bite [8], a reduced transversal dimension [9,10], associated or not with posterior crossbite [11], and a class II malocclusion [12–14] are expected.

However, as individual facial genotypes have different sensitivity on developing malocclusion, following the exposure to mouth breathing, a wide variety of inter-arch relationships can be found.

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The emphasis on this mouth breathing stereotype has been unfortunate because it implies that all patients with those clinical findings are mouth breathers and that nasal impaired respiration will ultimately result in this malocclusion. Besides that, one question arises: can we predict the outcome of these malocclusions based on the presence and on the type of airway obstructive cause which led to this deleterious habit?

Routinely, Ear, Nose and Throat (ENT) specialists and general clinicians use the diagnosis of the airflow blockage by adenoids and tonsils hyperplasia as a parameter to the establishment of the treatment planning [15]. Although this axiom has been used routinely by clinicians, it has not been sufficiently tested regarding the development of malocclusion.

The aim of this study was to report epidemiological data on the prevalence of malocclusion among a group of children, consecutively admitted at a referral mouth breathing ENT center. We assessed the association between severity of the obstruction by adenoids/tonsillar hyperplasia or the presence of allergic rhinitis and the prevalence of class II malocclusion, anterior open bite and posterior crossbite.

2. Patients and methods

2.1. Population

Four hundred and forty four children consecutively referred by pediatricians and primary care physicians to the Outpatient Clinic for Mouth-Breathers, at the Hospital das Clínicas at Federal University of Minas Gerais (UFMG), Brazil, between November of 2002 and November of 2007, with the chief complaint of mouth breathing were systematically evaluated by a multidisciplinary team comprised by ENT doctors, allergologists and orthodontists, in a single day visit.

Children whose mouth breathing could not be confirmed, those who have had previous orthodontic treatment or were younger than 2 years of age were excluded from the analysis. Therefore, the sample of this cross-sectional study totaled 401 patients.

All subjects were evaluated by otorhinolaryngologists to confirm mouth breathing resulting from at least one of the following airway pathologies: obstructive tonsillar hyperplasia, obstructive adenoidal hyperplasia and allergic rhinitis. The children whose obstruction by one of these conditions could not be diagnosed were classified as functional mouth breathers [16].

The participant's rights were protected, and informed consent and assent were obtained according to the Ethics Committee of the Federal University of Minas Gerais.

2.2. ENT data collection

An interview with children's parents, or guardians, asking about the quality of the children's sleep, snoring, oral breathing and throat infections, confirmed the "chief complaint" of mouth breathing. Parents were also asked if the child had been undergone an adenoidectomy or tonsillectomy earlier. Clinical ENT examination was performed by two of the authors (L.F. and H.B.), according to the following guidelines.

Palatine tonsil hypertrophy was classified by mouth examination according to the criteria of Brodsky and Koch [17] as follows: grade 0, tonsils limited to the tonsillar fossa; grade 1, tonsils occupying up to 25% of the space between the anterior pillars in the oropharynx; grade 2, tonsils occupying 25–50% of the space between the anterior pillars; grade 3, tonsils occupying 50–75% of the space between the anterior pillars; and grade 4, tonsils occupying 75–100% of the space between the anterior pillars.

Tonsils grade 0, 1 and 2 were considered as non-obstructive and those classified as grade 3 and 4 were named as obstructive [18].

Adenoids were assessed by flexible nasoendoscopy and were grouped into two categories based on nasopharyngeal obstruction ($<$75% and $\geq$75%). A cut-point of 75% was chosen to classify the blockage of the nasopharynx as obstructive or non-obstructive [19].

2.3. Allergological data collection

The allergological assessment, to diagnose allergic rhinitis, included a structured medical interview, physical examination, following the standard volar forearm skin prick method, as described elsewhere [20]. These exams were performed in 326 children under the supervision of one of the authors (J.P).

2.4. Dental data collection

The dental clinical examination was performed by a team of orthodontists, who worked together for at least 10 years, and were previously calibrated. The subjects were grouped by stage of dental development, according to the variation in primary and permanent teeth eruption, into deciduous, mixed and permanent periods.

The inter-arch occlusion dental classification was based on Barnett [21]:

Vertical: relationship was classified as (1) normal, (2) anterior open bite or (3) deep bite. An open bite was registered in cases that lacked any overbite, regardless of the amount. A deep bite was registered when more than half of the lower incisors were overlapped by the incisal edges of the upper incisors.
Transversal: relationship was classified as (1) normal, (2) posterior crossbite, without mandibular functional shift, and (3) posterior bite, with mandibular functional shift.
Sagital: relationship was classified as (a) normal occlusion, (b) class I malocclusion, (c) class II malocclusion and (d) class III malocclusion. During the deciduous and mixed dentitions, it was considered a class I dental relationship when the upper deciduous cuspid intercuspation was set between the lower deciduous cuspid and first deciduous molar. When in permanent dentition the Angle classification was followed.

2.5. Dental data comparison

A large number of studies on the prevalence of malocclusion in different populations have been published. These data served as a reference of what should be the distribution on inter-arch anomalies among a general population, where mouth and nasal breathers were sampled together [28–32,35–41].

2.6. Statistics

Epi-data was used to enter data. SPSS version 12.0 was used for the analysis. Descriptive statistics and univariate analysis in cross-tables are showed. The significance level of $p < 0.05$ was chosen. Normality of age distribution was tested using Kolmogorov–Smirnov test.

For each dental and ENT variable, the number of children with the diagnosed status (n) and its prevalence (%) are given.

For the purpose of statistical analysis, dental variables were binarily grouped according to the expected inter-arch relationships in mouth breathing subjects. Therefore the dependent variables examined were class II malocclusion, anterior open bite and posterior crossbite.

The independent ENT variables were the obstructive grade of tonsil and adenoids and the presence of rhinitis.