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Original article

Craniofacial features of subjects with adenoid, tonsillar, or adenotonsillar hypertrophy

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ABSTRACT

Objective: To analyze the craniofacial features in children with adenoid hypertrophy, tonsillar hypertrophy, and adenotonsillar hypertrophy.
Materials and methods: 20 patients with adenoid hypertrophy (AG), 20 subjects with tonsillar hypertrophy (TG) and 20 patients with adenotonsillar hypertrophy (ATG) were selected. A control group (CG) of 20 children with non-obstructive adenoids or tonsils was also obtained. Kruskal-Wallis test and Tukey's post hoc tests were used to compare the angular and linear measurements obtained from the lateral cephalograms.
Results: No significant differences were observed between AG and CG. Conversely TG exhibited smaller ANB and OVJ values and a larger SNB value when compared to both CG and AG, larger Go-Me, Ar-Gn and Ar-Go measures and a smaller NSGn angle with respect to AG. ATG showed a smaller ANB angle in comparison with CG and AG, larger Ar-Gn and Go-Me values when compared to AG, a smaller SNB angle and a larger NSGn angle with respect to TG.
Conclusions: Subjects with tonsillar hypertrophy showed an increased length of the mandibular ramus, a more horizontal growth direction, an increased length of the mandibular body, a more anterior mandibular position and a smaller sagittal discrepancy between the maxilla and the mandible than subjects with adenoid hypertrophy.

1. Introduction

The palatine tonsils, together with adenoids and lingual tonsils, are parts of the Waldeyer's ring. This is a complex of lymphoid tissue encircling the pharynx which has an important role in the immunologic defence of the body.[1] In general lymphoid tissues develop rapidly after birth, reach their maximum size in early childhood, begin to regress around 8-10 years of age and are usually completed atrophied by 12-14 years. In some children excessive growth of lymphoid tissues can lead to obstruction of the pharyngeal airway space which may cause breathing problems.[2]

Adenoid hypertrophy is one of the most frequent causes of upper respiratory obstruction and, consequently, mouth breathing in children. Prolonged mouth breathing leads to muscular and postural alterations, which in turn, may cause alterations on the morphology, position and growth direction of the jaws.[3–8] On the other hand grossly enlarged tonsils may create an obstruction in the oropharyngeal space and may displace the tongue excessively in a downward and forward direction to maintain an adequate respiratory space

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posteriorly.[1,9–12] However, there are still some doubts if tonsillar hypertrophy may determine significant alterations in the growth of the maxilla and the mandible.[4,9–12]

Most investigations refer to changes in facial growth resulting from respiratory obstruction due to enlarged adenoids or tonsils.[1,3,5,6,8,11–14] Studies comparing skeletal effects of adenoid hypertrophy with those of tonsillar hypertrophy by means of classical cephalometric investigations are rare in the literature [4,15] and there is no agreement as to the specific influence of enlarged tonsils or adenoids on craniofacial growth.

Trotman et al.[15] evaluated the association of lip posture, sagittal airway size and tonsil size with facial morphology. Larger adenoid size was characterized by an en bloc backward rotation of the maxilla and the mandible relative to the cranial base, by a shorter mandibular body, and by a more vertical facial growth direction. Larger size of the tonsils was associated with more forward relocation and rotation of the maxilla and the mandible relative to the cranial base, with an increase in mandibular length and with a more horizontal growth of the face.

On the contrary Sousa et al.[4] found that the pattern of craniofacial growth in children with isolated adenoid hypertrophy was similar to that observed in subjects with adenotonsillar hypertrophy. Both groups showed a retrognathic mandible, skeletal Class II disharmony and an increased mandibular plane angle. No significant differences were found between the two groups except for the length of mandibular ramus which was significantly larger in children with adenotonsillar hypertrophy aged 7-10 years.

The aim of this study was to compare the skeletal features of subjects with adenoid hypertrophy with those of children with tonsillar and adenotonsillar hypertrophy.

2. Materials and methods

Lateral cephalograms from the files of 1603 patients who received treatment at the Department of Orthodontics of the University of Rome "Tor Vergata" since 2001 were analyzed. The films were selected on the basis of the following inclusionary criteria: (1) 6-10 years of age; (2) pre-pubertal stage of skeletal maturity according to the cervical vertebral maturation method (CS1 or CS2)[16]; (3) pre-treatment lateral cephalograms of good quality; (4) adenoid or tonsillar hypertrophy detectable on the lateral film; 5) no history of adenoidectomy and/or tonsillectomy; 6) no history of previous orthodontic therapy.

Lymphoid tissue hypertrophy was assessed on the lateral cephalogram. Adenoid tissue appears as a somewhat convex prominence attached to the roof and the posterior wall of the nasopharynx and facing the superior surface of the soft palate[10,17], while palatine tonsils appear as an oval-shaped shadow in the oropharyngeal space dorsal to the root of the tongue.[1,9,12]

Sagittal nasopharyngeal and oropharyngeal airway size, adenoid size and tonsil size were measured by tracing the reference points and lines illustrated in Fig. 1. The following measurements were performed:

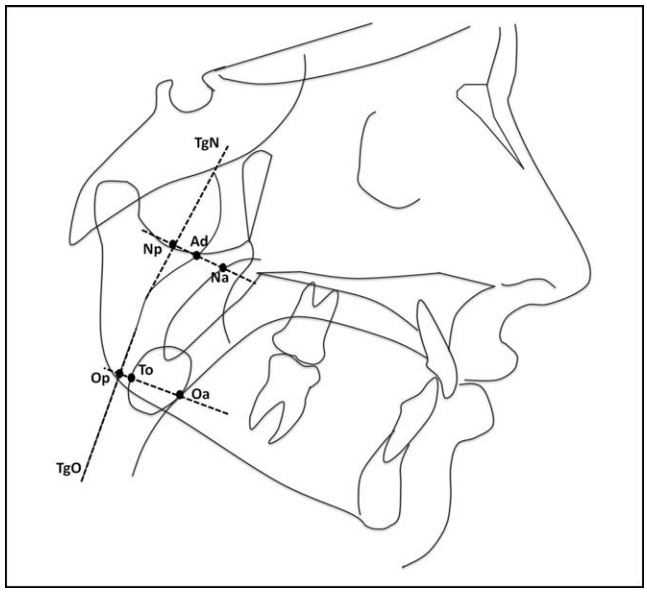

Fig. 1 – Reference points and lines on lateral cephalogram for measurements describing pharynx, adenoids and tonsils. TgN (Tangent nasopharynx): line passing through the most superior and the most inferior point of the adenoid shadow, which represents the posterior wall of the nasopharyx without adenoids. Ad (Adenoidal point): the most anterior point on the anterior outline of the adenoid shadow (nearest point to the soft palate). Ad-TgN (Perpendicular nasopharynx): Line perpendicular to TgN passing through Ad. Np (Nasopharynx posterior): intersection of the lines Ad-TgN and TgN. Na (Nasopharynx anterior): intersection of the posterior outline of the soft palate and the line Ad-TgN. TgO (Tangent oropharynx): tangent line to the posterior wall of the oropharynx. To (Tonsillar point): the most posterior point of the posterior outline of the tonsillar shadow (the nearest point to the posterior wall of the oropharynx). To-TgO (Perpendicular oropharynx): Line perpendicular to TgO passing through To. Op (Oropharynx posterior): intersection of the lines TgO and To-TgO. Oa (Oropharynx anterior): intersection of the line To-TgO and the posterior outline of the tongue (or the anterior outline of the tonsils).

Total Nasopharyngeal Airway Space (TNAS): the distance from Nasopharynx posterior (Np) to Nasopharynx anterior (Na);

Adenoid Size (AS): the distance from Np to Adenoidal point (Ad);

Total Oropharyngeal Airway Space (TOAS): the distance from Oropharynx posterior (Op) to Oropharynx anterior (Oa);

Tonsil Size (TS): the distance from Tonsilar point (To) to Oropharynx anterior (Oa).

The percentage of adenoids or tonsils obstruction in the pharyngeal airway space was derived mathematically as follows: (AS/TNAS)x100 and (TS/TOAS)x100. Four degrees of pharyngeal obstruction were detected:

Obstructive adenoids: when AS was larger than 50% of TNAS;

Non-obstructive adenoids: when AS was equal to or smaller than 50% of TNAS;

Obstructive tonsils: when TS was larger than 50% of TOAS;