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ORIGINAL STUDY

The interrelation between otorhinolaryngology and orthodontics in solving malocclusion and facial dysmorphisms caused by chronic adenotonsillitis

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ABSTRACT

OBJECTIVES. The aim of this study was to reevaluate the implication of early diagnosis of chronic adenoid syndrome and tonsillar hypertrophy in the prophylaxis and control of facial and dental deformities in children.

MATERIAL AND METHODS. The authors conducted a prospective study on 42 paediatric patients with chronic adenoid syndrome admitted in the ENT and Orthodontic Departments of "Sf. Spiridon" Emergency Hospital and "Sf. Maria" ENT Paediatric Department, Iasi, treated in collaboration with orthodontic and logopaedic specialists, with follow-up on the improvement of symptomatology and morphofunctional deficiencies.

RESULTS. Late diagnosis and treatment of the obstructive adenoid hypertrophy can cause difficulty in managing cases, consequently maintaining the aesthetic deficiencies and morphofunctional disorders within a follow-up period of 2 years. Furthermore, we present the chronic complications due to obstructive adenoid hypertrophy (rhinosinusal and ear-related diseases, obstructive sleep apnea), as well as the progression of these cases after interdisciplinary approach.

CONCLUSION. Chronic adenoiditis and tonsillar hypertrophy can increase the incidence of malocclusion in children, as well as causing changes in length and shape of the upper jaw and mandible, resulting in maxillofacial deformities.

KEYWORDS: chronic adenotonsillitis syndrome, facial deformities, malocclusion.

INTRODUCTION

The ENT and orthodontic literature has long emphasized the causal link between malocclusion and chronic adenotonsillitis syndrome. The particular aspects related to the condition and disorders in the somatic development of children remained unchanged over time, mouth-breathing being considered the main cause of these changes.

There are different ways to classify malocclusions developed over the years, the most common used classification being the one described by Edward H. Angle in 1890. The Angle's malocclusion classification is based on the relative position of the permanent maxillary first molar. According to this classification, there are three classes of malocclusion: Class I – the mesiobuccal cusp of the upper first permanent molar occludes with the mesiobuccal grove of the inferior first molar, with an incorrect line of occlusion due to rotations or malposed teeth; Class II (the mesiobuccal cusp of the lower first permanent molar occludes distal to the position of the upper permanent first molar; proses known as overjet) with two subtypes - Division 1 (proclined upper central incisors, with a secondary important overjet) and Division 2 (retroclined upper central incisors and proclined or normally inclined upper lateral incisors; secondary minimal or increased overjet); Class III (the mesiobuccal groove of the lower first molar occludes anterior to the mesiobuc-

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Table 1. The symptomatology of the studied cases.

Symptoms	*No. of cases*
Adenoid facies	42
Deficient height-weight development	27
Nasal ventilation disorders	42
Closed rhinolalia	31
Cervical chronic implant adenopathy	33
Dental implant defects	32
Ogival palatal arch and rhinosinusal development disorders	28
Cranio-facial and stature-weight dysmorphia	27
Intellectual somatopsychic asthenic disorders	17

Table 2. Types of treatment applied.

Treatment type	*No. of cases*
Adenoidectomy	32
Adenotonsillectomy	10
Correction of dental disorders	32
Speech therapy	3
Postoperative respiratory reeducation	42

cal cusp of the maxillary first molar; negative overjet). All these entities have as result a facial dysmorphism.

All patients diagnosed with a dento-maxillary anomaly, especially Class II Division 1 Angle malocclusion, should also be referred to the ENT specialist to evaluate and diagnose the specific conditions and managing them before the orthodontic treatment[1,2].

The aim of this study was to reassess the involvement of early diagnosis of chronic adenotonsillar syndrome in preventing and treating paediatric facial and dental dysmorphia. The existing symptomatology in the studied group was characteristic for the adenoid syndrome, this study focusing especially on the facial dysmorphism and its therapeutic approach.

MATERIAL AND METHODS

A prospective study was carried out on a group of 42 paediatric patients with chronic adenoid syndrome hospitalized and treated in the ENT Clinic of "Sf. Spiridon" Emergency Hospital and Paediatric ENT Clinic of "Sf. Maria" Hospital in Iasi, in 2020. In this group, 32 children presented associated dento-maxillary anomalies, the treatment being carried out in the Paediatric Dentistry Clinic, Orthodontics Department. It is important to specify the fact that most children first presented to the dentist, from where they were directed to the ENT specialist to treat the chronic adenoiditis. Of the 42 patients studied, 32 had manifestations of chronic adenoiditis, 10 had chronic adenotonsillitis along with dental defects and facial dysmorphism. The age distribution showed a prevalence of 27 cases between 10-14 years, 10 cases at the age of 6-10 years, respectively 5 cases at 14-16 years. Regarding gender, an increase in frequency was observed in males (28 cases) compared to 14 cases in females (2/1).

The clinical characteristics were intricate, often with various correlations (Table 1).

All documented cases benefited primarily from an ENT consultation in association with flexible nasal endoscopy (FNE), orthodontic and imaging examination to emphasize the facial and dental pathological aspects.

For each orthodontic patient, specific measurements were made on the study model (Nance perimetry, Walla analysis, Tweed total space analysis), orthopantomography and profile teleradiography (Steiner analysis, Tweed analysis).

The treatment applied in these cases was surgical adenoidectomy in 32 cases and adenotonsillectomy in 10 cases. To 32 cases presenting dental changes, palatal arch defects and facial bones development disorders, orthodontic treatment was added. In all cases, post-operative respiratory reeducation was carried out and in 3 cases with phonation disorders, speech therapy was also applied (Table 2).

RESULTS AND DISCUSSIONS

During the growing phase of child development, active immunological processes can cause a physiological and fluctuating hypertrophy of the tonsils and adenoids, especially during the first 4 to 6 years. Enlargement of palatine tonsils and adenoids is considered the most common factor contributing to upper airway obstruction in children.

The obstruction reduces the depth of the oropharynx, causing a lowered position of the hyoid bone, which forces the tongue forward and causes a compensatory change in the child's breathing pattern. In addition, upper airway obstruction and altered breathing pattern can potentially affect the child's dento-facial growth. There is an increase in the depth of the palatal arch, a narrowing of the upper dental arch, an increase in overjet, and an increase in the anterior open bite and the posterior crossbite[3-6].

Corresponding to the scientific literature and therapeutic protocol applied in ENT clinics, the ablation procedure was performed in all cases diagnosed with chronic adenoiditis or chronic adenotonsillitis, followed by the resolution of facial and dental dysmorphisms by the orthodontic specialists.

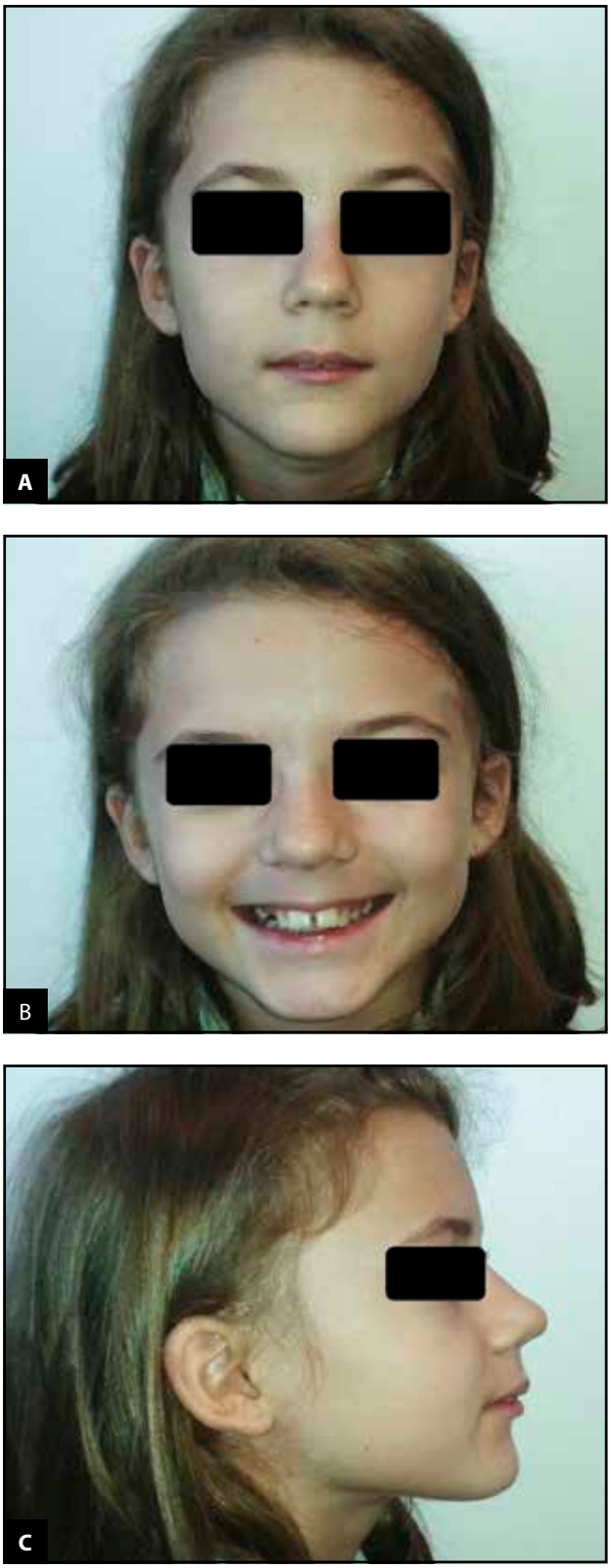

Figure 1. Facial changes **(A, B,C)** - extraoral clinical examination: dark circles around the eyes, flat cheekbones, small nostrils, lip incompetence, interposition of the lower lip behind the upper incisors, gingival smile, transient diastema **(A,B)**; convex profile, increased nasolabial angle **(C)**.

It is important to mention the ENT-Orthodontist collaboration in the correct early diagnosis of this type of pathology that is quite common in childhood, with functional and aesthetic consequences if it is delayed until adolescence and even adulthood. We mention the role of respiratory reeducation, through respiratory gymnastics instituted promptly, important in learning the correct nasal breathing instead of oral breathing, which will help achieve superior results in terms of time and quality of orthodontic treatment.

In the case of all 32 patients diagnosed with dento-maxillary anomalies associated with ENT disorders, the measurements performed on the study models revealed dimensional changes, more frequently in the maxillary arch. The maxillary arch was frequently narrowed, V or U-shaped, due to jaw compression. The lack of space on the arch, as well as the associated vicious habits, led to the presence of dental crowding, located especially in the anterior area of the arch, as well as the upper molars. Occlusion measurements, as well as computerized interpretation of the profile teleradiographs frequently revealed the presence of class II malocclusions, especially division 1, caused by dento-maxillary anomaly of class II skeletal with maxillary retrognathism. The orthodontic management was performed after the ENT treatment was completed, as recommended also by the specialty literature[7-10].

The selection of methods and means of orthodontic treatment was made according to the age and gender of the patients, as well as the type and severity of the abnormality. For patients in the stage of mixed dentition or young permanent dentition, two types of appliances were used: mobile (palatal plates with screw and inclined plane) and functional (Twin Block) appliances. Patients with permanent dentition were treated using fixed orthodontic appliances[11-14].

We present a case in which a multidisciplinary approach allowed the correction of mouth breathing, rhonchopathy, as well as facial and dental dysmorphism, in a 10-year-old patient. Initially, she was scheduled to a dental consultation which assessed the pathological aspects, after which she was referred to an ENT specialist. The ENT consultation revealed, with the help of FNE, a chronic adenotonsillitis (which would cause changes in the development of her facial structure), dental dysmorphism as well as rhonchopathy, formulating a surgical solution in the form of adenotonsillectomy. The favourable postoperative evolution was followed by postoperative gymnastics and taking over by orthodontists for specific treatment.

The dental consultation highlighted the facial changes of the dental arches and dentition. During the extraoral clinical examination, dark circles around the eyes, flat cheekbones, small nostrils, lip incompetence, interposition of the lower lip behind the upper incisors, bimaxillary crowding were noticeable (Figure 1A,B). The profile appearance showed other specific changes such as convex profile, increased nasolabial angle (Figure 1C).

Figure 2. Intra-oral clinical examination: **A**. Excessive incisor display, narrowed maxillary arch, "V"-shaped maxillary arch, midline diastema; **B**. Trapeze mandibular arch, mandibular incisor crowding; **C, D.** Class II, division 1 Angle malocclusion, increased overjet, lateral right side cross bite.

The intra-oral clinical examination revealed changes in size, position and functionality of the elements of the stomatognathic system, consecutive to the presence of chronic adenotonsillitis (Figure 2).

The initial orthopantomography in this case showed signs of dental crowding, located especially in the maxilla, due to the reduction of the transverse dimension of the arch (Figure 3). The computerized interpretation of the

Figure 3. Initial orthopantomography - signs of dental crowding, located especially in the maxilla, due to the reduction of the transverse dimension of the arch.

Figure 4. Initial profile teleradiography – dento-maxillary anomaly class II, skeletal malocclusion class II1, upper overbite, lower backbite.

Table 3. The results of the Steiner analysis on the profile teleradiography before the orthodontic treatment.

Measurement	Normal value	Patient pretreatment value
SNA (Sella – Nasion- A point angle)	82±2	82.0°
SNB (Sella – Nasion – B point angle)	80±2	75.3 °
ANB (A point – Nasion – B point angle)	2±2	6.7 °
SND (Sella – Nasion – D point angle)	76±3	73.6°
Lower incisor NB angle (Lower incisor axis and Nasion – B point line angle)	25±4	13.2°
Upper incisor NA angle (Upper incisor axis and Nasion-A point angle)	22±4	31.1°
Distance of lower incisor from Nasion –B point line	4±1	0.5 mm
Distance of upper incisor from Nasion –A point line	4±1	4.5 mm
Interincisal angle (Upper and lower incisors axis angle)	130±5	129.0°
Cranium mandibular angle: SNaGoGn (Sella – Nasion and Gonion-Gnathion lines angle)	32±5	30.7°
Cranium occlusal angle (Sella- Nasion and occlusal plane angle)	14±3	17.4°
SE: distance between S point and projection of TMJ point on Sella – Nasion line	22±3	13.6 mm
SL: distance between S and projection of Pogonion point on Sella –Nasion line	51 ±5	40.5 mm
Nm - Li – Pgc angle (Nasal middle – Lower lip most anterior point – soft tissue Pogonion)	180±5	181.6°
Holdaway: Difference between lower incisor border Nasion-B point line distance and Pogonion point and Nasion – B point line distance	1±3	2.5 mm

profile teleradiography (Lightning Ceph Software) with the help of the Steiner cephalometric analysis showed the presence of the sagittal skeletal gap, with mandibular retrognathism, as well as the dental malpositions specific to Angle class II malocclusion, division 1 (Figure 4, Table 3).

Next, we present the solving method of the case step by step until the final result, which will strengthen the protocol suggested and applied in the study conducted.

Figure 5. Twin Block Appliance (William J. Clark. Twin Block Functional Therapy: Applications in dentofacial orthopaedics. Mosby-Wolfe; 1995[15]).

Figure 6. Post Twin Block – better dental arch form and dental alignment.

Figure 7. Post Twin Block – correction of the class II malocclusion, reduced overjet.

Figure 8. Orthopantomography after Twin Block.

Figure 9. Profile teleradiography after Twin Block treatment – improvement in skeletal and dental relations.

Table 4. The results of the Steiner analysis on the profile teleradiography after the Twin Block stage of orthodontic treatment.

Measurement	Normal value	End of Twin Block treatment stage value
SNA (Sella – Nasion- A point angle)	82±2	81.7°
SNB (Sella – Nasion – B point angle)	80±2	78.0°
ANB (A point – Nasion – B point angle)	2±2	3.7 °
SND (Sella – Nasion – D point angle)	76±3	77.2°
Lower incisor NB angle (Lower incisor axis and Nasion – B point line angle)	25±4	14.6°
Upper incisor NA angle (Upper incisor axis and Nasion-A point angle)	22±4	26.2°
Distance of lower incisor from Nasion –B point line	4±1	1.3 mm
Distance of upper incisor from Nasion –A point line	4±1	3.0 mm
Interincisal angle (Upper and lower incisors axis angle)	130±5	135.5°
Cranium mandibular angle: SNaGoGn (Sella – Nasion and Gonion-Gnathion lines angle)	32±5	28.6°
Cranium occlusal angle (Sella - Nasion and occlusal plane angle)	14±3	14.1°
SE: distance between S point and projection of TMJ point on Sella – Nasion line	22±3	13.2 mm
SL: distance between S and projection of Pogonion point on Sella –Nasion line	51 ±5	46.5 mm
Nm - Li – Pgc angle (Nasal middle – Lower lip most anterior point – soft tissue Pogonion)	180±5	181.6°
Holdaway: Difference between lower incisor border Nasion-B point line distance and Pogonion point and Nasion – B point line distance	1±3	3.1 mm

A two-stage treatment plan was followed. An initial stage, to reduce the skeletal and dental sagittal gap, as well as to improve the shape of the arch, was achieved with the help of a Twin Block functional device (Figure 5, Figure 6). At the end of the first stage of the treatment, the alignment of the dental arches has improved significantly, while the static occlusion examination showed that the sagittal molar and canine landmarks have normalized; likewise, the positive sagittal malocclusion (the overjet has decreased to a great extent), so that the interposition of the lower lip behind the upper incisors was no longer possible (Figure 6, Figure 7).

Orthopantomography and profile teleradiography at the end of the first stage of treatment showed an important correction of the dento-alveolar disharmony through crowding, as well as the significant reduction of the skeletal and dental sagittal gap (Figure 8, Figure 9, Table 4).

The second stage of the treatment was carried out with a bimaxillary fixed orthodontic appliance (Dentaurum GmbH), Roth prescription, 0.022 bracket slot, which lasted 15 months. The final facial appearance (face and profile), the alignment of the arches and the static and dynamic occlusion should be noted.

The cooperation of the patient during the functional stage further allowed wearing the fixed device for a shorter period. (Figure 10, Figure 11).

CONCLUSIONS

1.This study aims to update the knowledge on facial and dental dysmorphisms related to adenotonsillitis in children and the role of mouth breathing, as well as some infectious-allergic complications.

2. Changes in development of facial bones and dentition (dental implantation defects, ogival arch, upper dental horseshoe elongated antero-posteriorly) requires a multidisciplinary ENT-Orthodontic approach.

3. Cases with pre-existing velar insufficiency (short veil and relative nasal obstruction) should be carefully evaluated to avoid further surgery related phonatory complications (nasal voice).

4. Chronic adenotonsillitis is often associated with skeletal class II dento-maxillary anomalies and angle class II malocclusion, division 1, chronic rhonchopathy and sleep apnea.

Figure 10. The facial appearance at the end of the second stage of treatment – fixed bimaxillary appliance (15 months).

Figure 11. Occlusion at the end of treatment. Improved facial appearance and aesthetics.

5. Typical adenoid facies and retroversion of the upper incisors can lead to social stigmatization of children (bullying), also exposing teeth to trauma related pathology.

6. ENT treatment for nasal obstruction should be carried out before starting the orthodontic treatment. Pedodontics. and speech therapy evaluation are also important in achieving the best therapeutical outcome.

7. Prophylaxis of chronic adenotonsillitis, early diagnosis and appropriate resolution of dental and facial dysmorphisms can greatly improve quality of life if applied in a timely manner, providing a normal social and cognitive development.

Conflicts of interest: The authors declare that there are no conflicts of interest.

Contribution of authors: All authors had equal contributions.

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