CASE REPORT

Modifications of the marginal paradentium to a case of Angle Class III/1 malocclusion

IONELA TEODORA DASCĂLĂ1, MIHAELA JANA ŢUCULINĂ2, MIHAELA RĂESCU3, SANDA MIHAELA POPESCU4, CLAUDIA COREGA5, LIGIA Vaida6, ADRIANA BOLD7)

1) Department of Orthodontics
2) Department of Endodontics
Faculty of Dentistry, University of Medicine and Pharmacy of Craiova
3) Department of Preventive Dentistry, "Titu Maiorescu" University, Bucharest
4) Department of Oral Rehabilitation, University of Medicine and Pharmacy of Craiova
5) Department of Orthodontics, "Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca
6) Department of Dentistry, Faculty of Medicine and Pharmacy, University of Oradea
7) Department of Histology, Faculty of Medicine, University of Medicine and Pharmacy of Craiova

Abstract

Angle Class III malocclusions are not so frequently met but they raise big problems of treatment. The analyzed case represents a 14-year-old patient that came to the dental consulting room with an Angle Class III malocclusion determined by the excess of the somatotropic pituitary hormone and a gingival hyperplasia more emphasized at the level of inferior frontal teeth. The patient followed a fixed appliance treatment, the straight-wire technique. All along the treatment and after it, the hyperplasia and the gingival inflammation not only maintained but they even got worse. Thus, an improper hygiene associated with a severe Angle Class III malocclusion maintains and aggravates the gingivitis. The histological and immunohistochemical study of the gingiva revealed important epithelial modifications that led to an epithelial hypertrophy with a tendency toward acanthosis and to severe epithelial erosions. An inflammatory chronic process (rich in lymphocytes, plasma cells and macrophages full of angiogenesis vessels) and an intense reaction of the fibroblastic cells appeared in the gingival corium.

Keywords: Angle Class III/1 malocclusion, marginal paradentium, gingival hyperplasia, chronic inflammation.

Introduction

The growth and the development of the maxillary are influenced by genetic, endocrine, metabolic and functional factors. A malocclusion is defined by the abnormal position of the teeth or by an abnormal relation of the dental arches apart from the variety of morphological aspects that are considered to be normal [1].

The teeth that present malocclusions may cause psychosocial problems related to the dento-facial aesthetics, which may be affected [2], to disorders of the oral function (such as mastication, deglutition and speech) [3] and to a greater sensibility to trauma [4] and periodontal diseases [5].

The dental malocclusion is considered together with the dental caries, the gingival diseases and the dental fluorosis, one of the most frequent dental problems [6], commonly met to children and young people.

Angle Class III malocclusions have a small prevalence, representing (according to some specialists) only 2.3% of the total number of anomalies [7]. Angle Class III/1 malocclusions have a small percentage, only 7.37% of the total number of Angle Class III malocclusions [8] and occur because of a disorder in the growth harmony between the maxillary and the mandible, the mandible growing in excess.

Among the etiological factors involved in the Angle Class III malocclusion, the protrusive mandible is the most incriminated of all, being determined by an excess of secretion of the pituitary hormone together with the functional factor, which is also indirectly influenced by the hypophysis. In this case of Angle Class III/1 malocclusion, the paradentium is affected later on but in a more severe manner and the chronic marginal periodontal pathology begins in the area of the inferior frontal teeth [7, 8].
The study presents the case of a patient with Angle Class III/1 malocclusion associated with an intense inflammatory process of the marginal paradentium.

**Patient, Methods and Results**

The 14-year-old patient, T.B., from Craiova, over the average weight in accordance with the age and also hypersom came to the dental consulting room for an orthodontic treatment. He complained about the way his facial aesthetics and the following functions (masticator, deglutition, phonation, social integration and self-care) affected his social integration. The discussions with the patient revealed the same somatic and weight development to his parents. The facial examination points out a symmetric facies with an increased inferior floor and a reversed labial step. The oral examination highlighted a medium depth of the palatine vault, steep and well-perceptible alveolar arches, a big, palatine torus, a big, hypertonic tongue marked by impressions of the dental lingual areas, an increased tonus of orbicular and buccinators muscles and the interposition of tongue in the inter incisive zone. The patient suffered from frequent bleeding, inflammation and gingival hyperplasia in the frontal area, especially at the level of the frontal inferior teeth. This state is the result of a poor hygiene and of an incorrect teeth brushing (Figure 1). The alveolar-dental arch of the upper maxillary is formed of permanent teeth but it is undeveloped in the sagittal and transversal plane presenting teeth crowding in the frontal area and an infra-occlusion in the incisive area.

The mandible alveolar dental arch presents a well-developed alveolar base by lingualizing all the teeth and by dental crowding in the frontal area. The orthopantomogram reveals the presence of molars three buds and mesial dental reports. By investigating the study models, we noticed a reversed mesial molar and canine occlusion with a slight reversed sagittal in-occlusion and an inter-incisive frontal open occlusion. The initial cephalometric analysis emphasizes a normal development of the base of the upper jaw (SNA angle 83°) and a slight development of the mandibular base (SNB angle 88°). ANB angle of -5° shows the inter-maxillary gap from the sagittal plane and the FMA angle of 34° reveals a hyperdivergent type, thus a growth of the facial massif especially downward and forward and a severe prognosis of the development of the facial massif. The IMPA angle of 76° shows an inferior retraction, which explains the slight frontal dental mandibular crowding (Figures 2 and 3). The neuroendocrine investigation of the patient showed a slight hypophysis hyperfunction of the anterior lobe. Because of these investigations, from the orthodontic point of view, the patient was diagnosed with Angle Class III/1 malocclusion, anatomic protrusive mandible with an open frontal occlusion and reversed sagittal in-occlusion.

![Figure 1 – The macroscopic aspect of malocclusion and of the gingival inflammatory process.](image1)

![Figure 2 – Frontal radiology of malocclusion. The orthopantomogram.](image2)

![Figure 3 – Profile teleradiography that reveals the protrusive mandible with Angle Class III/1 malocclusion.](image3)

The treatment consisted of fixed therapy, the straight-wire method with II\textsuperscript{nd} class inter-maxillary elastic tractions and intra-extra-oral ones by applying the Delaire mask; the objectives were: the expansion of the alveolar dental arch of the upper jaw, the alignment of the frontal maxillary and mandibular teeth and the diminishing of the frontal open occlusion and of the reversed sagittal in-occlusion.

The interpretation of the final radiography after five years of orthodontic treatment and the comparison of the values of the angles with those from the initial radiography reveal the normalization of their values (SNB angle 85°, ANB angle -2°, FMA angle 28°, IMPA angle 89°).

As the gum presented areas of hyperplasia with severe inflammation and microhemorrhages, fragments of paradentium of 1–3 mm were taken (with the permission of the patients) and put into a solution of 10% neutral formalin and sent to the histopathology laboratory for a correct evaluation of the parodontal lesions that accompanied the Angle Class III/1 malocclusion. The biological material was processed using the histological technique of paraffin embedding. The immunohistochemical study involved the use of antibodies CD34 (IgG1, Epitomics, 1/100, Dako) in order to emphasize the endothelial cells, CD68 (IgG1, KP1, 1/100, Dako) to emphasize the macrophages, CD3 (gG1k, MIB-1, 1/100, Dako) for the study of B-lymphocytes, and CD20 (IgG2b k, DO-7, 1/50, Dako) to emphasize the B-lymphocytes.

The histopathological study revealed numerous modifications of the gingival epithelium passing from hypertrophy with a tendency toward acanthosis to more or less extended epithelial erosions (Figure 4). Sometimes, the epithelial erosions were profound, exceeding the basic layer and affecting even the basal membrane by setting a contact between the gingival corium and the external environment of the oral cavity (Figure 5).

An inflammatory chronic process (rich in lymphocytes,
plasma cells and macrophages full of angiogenesis vessels) appeared in the gingival corium (Figure 6).

The inflammatory cellular density varied from one area of the gingival corium to the other, which meant that there were different quantities of cellular antigens. The blood vessels became congested with parietal discontinuities, which explained the presence of microhemorrhages in the corium. The microvascular density increased because of the appearance of a great number of angiogenesis vessels in the superficial corium as well as in the profound one. There were also numerous fibroblasts in the corium with clustered collagen fibers that turned the corium into a young granulation tissue (Figure 7).

The immunohistochemical study of the inflammatory process allowed us to remark an irregular distribution of the T- and B-lymphocytes and of the macrophages.

Of all the three categories of cells that make part of the immune system, the T-lymphocytes were the most numerous. These lymphocytes had a relatively regular distribution in both the superficial corium and the profound one (Figures 8 and 9). Still, their number increased in the areas of epithelial erosion in comparison with the other areas. B-lymphocytes and the macrophages were less numerous and appeared in a heterogeneous way (Figures 10 and 11). The use of the CD34 antibody allowed us to emphasize a compact vascular network that was mainly made up of neoformed tiny vessels, which were most of the time congested (capillaries, arterioles, venules) (Figures 12 and 13). The microvascular density, although well developed in all areas, was bigger in the area in which the gingival epithelium had erosions. It often correlated to the intensity of the local inflammatory process.

Figure 4 – The image of the hypertrophic gingival epithelium that presents a tendency towards acanthosis associated with a strong inflammatory reaction in the corium. HE staining, ×100.

Figure 5 – Microscopic image of an area of profound epithelial erosion that reveals areas where even the basal membrane of the epithelium was damaged as a result on the interaction between the conjunctive tissue of the corium and the oral cavity. We can also notice the presence of an inflammatory chronic process mainly composed of lymphocytes and plasma cells. Trichromic Goldner–Szeckeli staining, ×200.

Figure 6 – A strong infiltrated corium with lympho-plasma round cells. Trichromic Goldner–Szeckeli staining, ×100.

Figure 7 – A strongly infiltrated superficial corium with inflammatory cells and numerous newly formed blood vessels, fibroblastic conjunctive and collagen cells that present a young tissue of granulation. HE staining, ×200.
Discussion

Children that present Angle Class III malocclusions, because of the excessive growth of the mandible, are difficult to treat. Before and after the use of the fixed orthodontic treatment the patient should not only be “made aware” of the importance of the oral hygiene but also “motivated” in order to prevent the various parodontal diseases [9, 10]. Some studies reveal that the frequency of the gingivitis is directly proportional with the lack of a proper oral hygiene. Thus, some researchers recommend that all along the treatment, the patient should
benefit of a professional hygiene of the teeth made by the doctor every three months or every six or 12 months after a regular examination of the teeth [11, 12]. The hyperplastic gingivitis with bulb-like papillae and a tunnelled gingival edge was also noticed during puberty [13]. In our case, the patient had the same hyperplastic gingivitis when he first came to the dentist; it probably appeared during puberty and was aggravated by the proper lack of hygiene and by the Angle Class III/1 malocclusion. The gingivitis maintained especially at the level of the frontal teeth all along the orthodontic treatment despite his efforts to brush his teeth correctly and the various parodontal treatments used by the dentist [14].

The relation between malocclusions and parodontal pathology was intensively studied in the second half of the XXth century. The clinical experience and the reports of some clever observers highlighted the fact that malocclusions and the wrong positions of the teeth may lead to various pathological states of the paradentium [15].

Still, the results of some clinical studies are contradictory. Thus, some researchers found a positive association between the malocclusion and the paradontal health [16, 17], while others did not consider malocclusion to be a cause of paradontal lesions [18, 19]. Buckley LA (1981) proved that malocclusion was less important in the development of the inflammatory lesions of the paradentium in comparison with the dental plaque and the odontolite [20].

We consider that the dento-maxillary anomalies, which make it difficult to maintain a dental hygiene, are the main factors for the appearance of the gingivitis. Yet, there are many other factors from the oral cavity that affect the paradentium and that can act both in a cumulative and simultaneous way. This is also our case, where the gingival inflammation maintained even after the correction of the malocclusion.

According to some authors, the detailed examination of the health state of the paradentum to patients with malocclusions will reveal a gingival inflammation to each tooth examined and even destructive lesions of the paradentium [5]. We consider that an early detection and proper treatment of malocclusion are important in the etiology of the paradontal disease. Maintaining a healthy dentition with teeth aligned in their arches is a critical anatomic and functional factor since an abnormal position of the teeth may lead to an increase of the places where the food may be retained and may hinder the proper dental hygiene finally leading to the appearance of various parodontal lesions [21].

Our histological and immunohistochemical study revealed the presence of some microscopic lesions to the level of the marginal paradentium. We consider that the erosions of the surface epithelium and the presence of the chronic inflammatory process were influenced by the bacterial biofilm from the oral cavity, which intensified its activity because of an improper hygiene. There is a well-known fact that the oral cavity contains over 700 different species of bacteria [22]. The content of the bacterial microflora differs from one person to another [23], as well as from one place of the oral cavity to another to the same person [24]. Thus, we consider that in the case of our patient we had to deal with a very aggressive bacterial microflora, which maintained even after the correction of the malocclusion.

Conclusions

Our case confirms the fact that Angle Class III/1 malocclusions are the result of an excess of the hypophysary hormone, a severe anomaly, associated with the lack of a proper oral hygiene; all these aspects worsen and maintain the gingivitis.

Contribution Note

All the authors equally contributed to the drawing up of the present paper.

References


**Corresponding author**
Adriana Bold, Associate Professor, MD, PhD, Department of Histology, University of Medicine and Pharmacy of Craiova, 2 Petru Rareş Street, 200349 Craiova, Romania; Phone 0726–141 110, e-mail: adriana.bold@yahoo.com

Received: May 27, 2013

Accepted: November 22, 2013