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MYOFUNCTIONAL THERAPY IN ANTERIOR DEEP BITE AND TMD PATIENT- case report

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Abstract

Deep bite is perhaps one of the most common dental malocclusions seen in children as well as in adults and is very demanding to be treated successfully. A skeletal or dental overbite is caused by genetic or environmental factors, or a combination of both.

The ideal overbite in a normal occlusion may range from 2 to 4 mm. Mild deep bite typically requires no correction, unless correction for aesthetic reasons. Severe overbite, considered as a clinical problem may affect the temporomandibular joint, causes periodontal problems and tooth wearing, as well as traumatizing the incisive papilla or interfering with mastication function. Anterior deep bite could be caused by overeruption of upper and/or lower incisors or undereruption of posterior teeth.

Correction of deep overbite has always been challenging to orthodontists, especially in adult cases. There are different modalities in orthodontic treatment of this malocclusion. Deep bite correction can be treated with intrusion of incisors, extrusion of posterior teeth, combination of both, and orthognathic surgical modality.

The aim of this case report was to present treatment protocol for an adult patient with skeletal deep bite, Class II Division 1 malocclusion and temporomandibular disorder (TMD) managed with conventional orthodontics therapy combined with orofacial myofunctional exercises.

The modality of exercise therapy included improvement of proprioception, tonicity and mobility, working with the facial and cervical musculature, as well as with stomatognathic functions - respiration, mastication, deglutition and speech. The most important thing is to aid long-term retention.

***Keywords*:** anterior deep bite, TMD, myofunctional therapy

Introduction

Deep bite is defined as excessive vertical overlapping of the mandibular incisors by the maxillary incisors in centric occlusion. The incisal edges of the lower teeth should contact slightly at or above the cingulum of the upper teeth. The ideal overbite in a normal occlusion may range from 2 to 4 mm. Normal overbite is one third of the clinical crown height of the mandibular incisors due to differences in the crown lengths of the incisors [1].

Deep bite is perhaps one of the most common dental malocclusions seen in children as well as in adults and is most demanding to be treated successfully. According to Proffit and Fields (2007), "overbite more than 5 mm is found in nearly 20% of the children and 13% of the adults" [2].

Mild deep bite typically requires no correction, unless correction for aesthetics. Severe overbite, considered as a clinical problem may affect the temporomandibular joint, causes periodontal problems and tooth wearing, as well as traumatizing the incisive papilla or interfering with mastication function [3].

There are different modalities of orthodontic treatment of this malocclusion. However, any treatment must be based on patient's age, aetiology of malocclusion and analysis (dental casts and cephalometric) of each patient. A skeletal or dental overbite is caused by genetic or environmental factors, or a combination of both. Patients with skeletal deep bite usually have a horizontal growth pattern, the facial height is often short and are characterized by:

(1) Growth discrepancy of the maxillary and mandibular jawbones,
(2) Deficient mandibular ramus height,
(3) Convergent rotation of the jaw bases and

(4) Intrinsic and extrinsic growth rotation of the mandibula.

On the other side, patients with dental deep bite show: supraocclusion (overeruption) of the incisors, infraocclusion (undereruption) of the molars or combination of both. Other factors that can affect deep bite are premature loss of permanent teeth resulting in lingual collapse of the maxillary or mandibular teeth, alterations of tooth morphology and mesio-distal width of the anterior teeth [4,5].

Deep bite that is primarily caused by environmental factors can also be classified as acquired deep bite. It is well-known that dynamic equilibrium exists between the structures around the teeth (tongue, mentalis muscle, buccinator muscles and orbicularis oris muscle) and the occlusal forces, which assist in the balanced development and maintenance of the occlusion. Any environmental condition that disrupts this dynamic harmony can lead to a malocclusion, such as:

- A lateral tongue thrust or abnormal tongue posture causing infraocclusion of the posterior teeth,
- Tooth abrasion and
- Anterior tipping of the posterior teeth into extraction site.

Analysis of the lateral cephalometric radiograph showed that the dental and skeletal patterns of deep bite malocclusion were associated with decreased gonial angle, deep curve of Spee, decreased posterior maxillary dimension, downward rotation of the palatal plane and more forward position of the ramus. Beckmann *et al*. assessed alveolar and skeletal dimensions associated with overbite and lower facial height.

They suggested that a deeper bite coincided with smaller lower facial height, larger anterior alveolar and basal areas and retroinclination of the maxillary incisors. Bydass *et al.* showed the connection between depth of curve of Spee and overbite and overjet [6].

Extruded lower anterior teeth caused the deep curve of Spee and increased overbite; furthermore, there was association with decreased gonial angle [7].

El-Dawlatly *et al*. evaluated dental and skeletal variables in patients with deep bite malocclusion and showed that deep bite has multi-factorial aetiology and the greatest contributing factors are decreased gonial angle and exaggerated curve of Spee [8].

In a longitudinal study, Naumann *et al.* examined vertical components of the overbite change. Their research showed that on overbite change skeletal components were more effective than dental components; mandibula was more efficient than maxilla in changing the overbite [9].

Stimulating increased growth at the condylar cartilage to induce supplementary lengthening of the mandible has been demonstrated with functional treatment [10,11].

Symptoms such as pain in the masticatory system and temporomandibular joint dysfunction are common complaints in the patients with deep bite malocclusion. Craniomandibular or temporomandibular disorders are diagnosed by magnetic resonance imaging (MRI) as a non-invasive procedure, which provides a dynamic image of the condition of the soft tissue in the TMJ region. In cases of craniomandibular disorder associated with skeletal deformity, a three-dimensional computer tomograph modelling allows the orthodontists or surgeon to make accurate advance plans for further steps in treatment.

Correction of deep overbite has always been challenging to orthodontists, especially in adult cases. There are different modalities in orthodontic treatment of this malocclusion. Deep bite correction can be treated with intrusion of incisors, extrusion of posterior teeth, combination of both, and orthognathic surgical modality.

The ideal treatment protocol for an adult patient with skeletal deep bite Class II, Division 1 malocclusion and TMD has been managed with conventional orthodontic therapy combined with orofacial myofunctional exercises [12].

Exercise therapy has been indicated in the treatment of TMD patients. Sometimes this therapy is combined with other therapeutic modalities such as occlusal splint or individual myofunctional appliance [13].

Exercise therapy usually consists of passive and active movement of the mandibula, correction of body posture and relaxation techniques [14].

Patients with TMD present myofunctional disorders in deglutition, mastication and speech [15]. Changes in mastication as well as in other orofacial functions may provoke a significant change in mechanical load on the temporomandibular joint [16].

The modality of exercise therapy includes improvement of proprioception, tonicity, and mobility, working with facial and cervical musculature, as well as with stomatognathic functions -

respiration, mastication, deglutition and speech. Based on literature data, treatment of patients with TMD-myofascial pain gives much better results if the conventional orthodontic treatment is combined with myofunctional exercises [17].

Temporomandibular disorders (TMDs) can affect the quality of life, especially if they become chronic. Considering the controversy regarding the aetiology of the TMDs, this study aimed to assess the relationship of TMDs with dental malocclusion.

Case report

Treatment objectives

Orthodontic treatment of deep bite malocclusion with TMD is very complicated. The objectives in our treatment are: optimization of the orofacial muscle function, symmetry and control of mandibular movements, stimulating the lubrication of the TMJ, reducing the tension of the mandible elevator muscles, establishing adequate mandibular posture and relieving the pain as a basic aim in the myofunctional therapy.

Correction of TMD is priority in this orthodontic treatment. The other objectives are: correction of the Class II Division 1 malocclusion, obtaining an optimal overbite-overjet relationship and providing long-term retention.

Treatment diagnosis

A 26-year-old female patient complained of muscle spasm of the muscles of mastication, associated with pain in the right TMJ, cervical pain, and fatigue. Her face (frontal view) showed facial asymmetry, decreased lower facial height, competent lips with deep mentolabial fold and masticatory muscles tender to palpation (Fig.1).

The pain got worse in the last six months. This patient had significant dental history; 5 years ago she had malocclusion Class II Division 2, and was treated with orthodontic fixed appliance only in the maxilla. The orthodontic treatment lasted a bit longer than two years. Inappropriate orthodontics treatment led from one to another malocclusion (Class II Division 2 to Class II Division 1), and there were also TMDs.

Figure 1. Facial asymmetry, decreased lower facial height and deep mentolabial fold

Intraoral examination revealed limited mouth opening because of the pain on the right TMJ, non-coordinated mandibular movements to the left during speech, anterior deep bite (maxillary incisors completely overlapping mandibular incisors); OJ was 11 mm. Mastication was unilateral on the left side and deglutition was performed with notable effort of the perioral and mandibular elevator muscles. Angle classification was Class II Division 1 (Fig. 2).

Figure 2. Class II Division 1, deep bite and OJ is 11 mm

The panoramic radiograph showed that all teeth were present (excluding the third molars); TMJ space revealed normal size, shape and position of the condylar heads (Fig. 3). In the cephalometric assessment the ANB value of 5° suggested a Class II skeletal pattern with low mandibular plane angle. The maxillary incisors and NA were 5 mm and 14°.

The mandibular incisors and NB were 4 mm and 32°. The gonial angle was decreased, 120°.The horizontal grow pattern was diagnosed as a key factor in the etiology of patient's malocclusion.

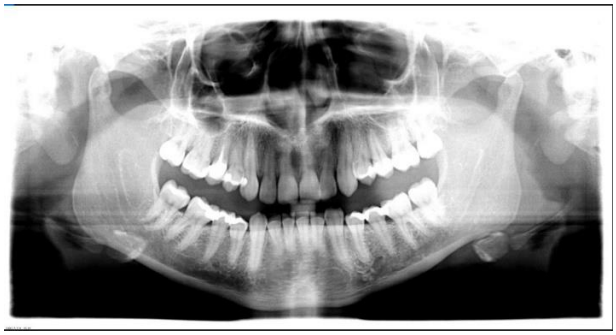

Figure 3. Panoramic radiograph of the patient

Treatment plan

Based on patient's symptoms, extraoral and intraoral examination as well as cephalometric analysis, our treatment plan included several phases:

1. Individual myofunctional appliance was made for bite correction, latero-position, relaxation of hypertrophic muscles with mesialization of mandibula. Bite reconstruction in the first phase was done with correction of OJ from 11 mm to 7 mm. Complete bite correction was not possible because of limited mouth opening and joint pain (Fig. 4 a, b).

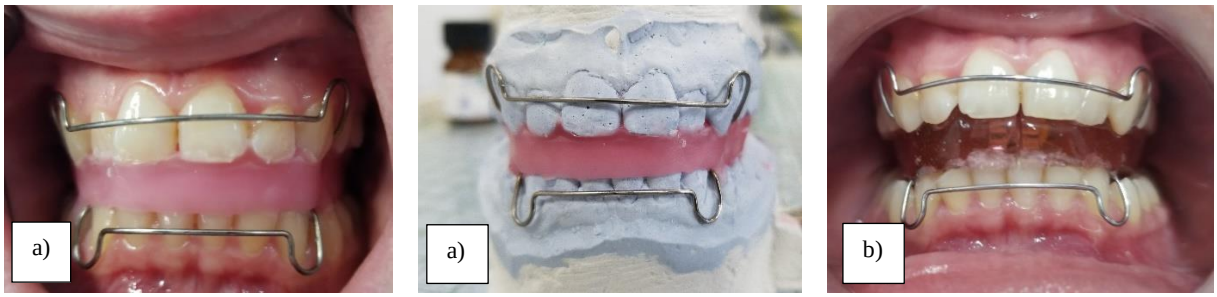

Figure 4. a) Bite reconstruction**, b)** Individual myofunctional appliance

2. The following myofunctional exercises were also ordered:
   - Myofunctional exercises started with 30 minutes relaxation of the shoulder and neck, including trapezius and sternocleidomastoid muscles combined with circular massage to the same muscle group.
   - Relaxation of the elevator muscles; the patient (10 times) passed the anterior and upper portion of the tongue along the region of palatine rugosity and of the alveolar papilla in a back-and-forth movement.
   - Improvement of the mobility of mandible in a manner that the patient was asked to protrude her tongue and move it slowly in a lateral direction towards the left and right lip commissures, repeating this movement 10 times.
   - Regarding chewing, the patient was instructed to masticate simultaneously on both sides to avoid condylar translation in the contralateral joint that occurs during mandibular laterotrusion.
   - The patient increased the time of mastication, so the food would be moistened and, and hence to avoid excessive tension during deglutition due to the effort involved in swallowing a triturated bolus.
3. In the second phase the treatment will be continued with another individual myofunctional appliance and bite reconstruction till 3-4 mm OJ. The patient received directions to regularly practice the exercises recommended for a long period.

Discussion

A successful treatment of deep bite requires a careful analysis of the factors contributing to the problems. During the treatment planning, considerations should be given to the soft tissue, skeletal pattern, stability, occlusal plane, treatment time and age of the patient.

Treatment with functional appliances has several well-established advantages. The selection of functional appliances depends on several factors involving patient factors, age and compliance and clinical factors. It seems that age is the only factor which was unfavourable for this functional treatment. Adults often need only correction of excessive overbite either due to its isolated nature or a demand for limited treatment. In adults, this treatment is often part of a periodontal, restorative and temporomandibular joint therapy. In the case described here, the patient reported a history of symptoms lasting a few years, but they got worse in the last six months.

This patient felt pain and hand masticatory difficulties. Based on literature data, these are the most common symptoms in patients presenting with TMD. Previous studies have demonstrated that many TMD patients present an irregular pattern of masticatory movements with a unilateral masticatory preference [18].

Persistence of the continuous pain in TMD patients, sometimes can lead to chronic fatigue and depression symptoms [12].

Many researchers have investigated TMD signs and symptoms, as well as the modalities of treatment and treatment's effect. Published studies have demonstrated that exercise therapy is effective in the treatment of TMD in cases of myofascial pain dysfunction syndrome, or in internal disorders of the TMJ. Repetitive mandibular mobility exercise was used in order to increase the circulation and to move synovial fluid through the articular surfaces and to provide nutrition and remove metabolites from the articular cartilage [19, 20].

The efficiency of exercise therapy confirmed in the reported case decreased the pain and improved the mandibular movements. During the interview, the patient described many physical and psychic changes. The most important of all is the joint pain had decreased after the first month of our treatment. The patient felt more comfortable with myofunctional appliance in the mouth and after practicing myofunctional exercises (Fig. 5).

Figure 5. Extraoral view with myofunctional appliance in the mouth

She said she enjoyed eating a meal, especially because she felt no pain. In addition, she noticed improved sleep quality and waking up without pain as well eagerness for social activities.

Conclusion

TMD is often presented with deep bite malocclusions. Despite the growing number of studies on TMD treatments, there is still no consensus regarding the best therapeutic technique and the real benefits of each one. Nonetheless, protocols that combined various techniques, such as orofacial myofunctional exercises combined with physiotherapy, or the use of an individual myofunctional appliance combined with orofacial myofunctional exercises, demonstrated better results than isolated treatments.

Priority in orthodontist's therapy in patients with TMD is to correct myofunctional and joint disorders; furthermore to decrease the pain and limited movement of mandibula. Due to myofunctional therapy as well as the classic orthodontic treatment, functional improvement was noticed in the orofacial myofunctional system as a whole. A clinically significant improvement of TMD findings was found after one year of orthodontic treatment. Even though age is a limitation, the good corporation with a patient can create a desirable outcome

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