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VERTICAL CONTROL OF OVERBITE IN MIXED DENTITION BY TRAINER SYSTEM

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ABSTRACT

Purpose. The purpose of this study is to follow-up the biometrical and skeletal vertical changes in patients with deep overbite in mixed dentition after a functional orthodontic treatment with Trainer System™ is conducted.

Material and Methods. 32 patients (20 girls and 12 boys) with deep overbite in mixed dentition were followed-up. An orthodontic treatment with Trainer System™, including Trainer for kids (T4K)-blue, T4K-red and Myobrace was conducted. The recommended time for wearing the appliances was 8-12 hours, mostly at the night and 1–2 hours total time during the day. All the patients were photo-documented. Impressions, panoramic radiographs and lateral cephalograms were taken before the beginning of the treatment and at the end of every single step in relation with every change of appliances. Comparative biometrical and cephalometric analyses were made. The data was statistically processed.

Results. The comparative biometrical analyses showed reduction of overbite with 2.5 - 3.5 mm after the end of the orthodontic treatment. 62% of cases showed relapse from 0.5 to 1 mm. After the end of the orthodontic treatment an inclination of upper and lower incisors and changes with M/SN, Ì/F, ANB, SNA, SNB values were established.

Conclusions. If untreated during the growing period, deep overbite leads to serious functional disorders, pathologic abrasion and myo-articular problems. Myofunctional Trainer System™ is successfully applied in the management of deep overbite in growing kids with early mixed dentition. The design of appliances helps the right positioning of tongue and jaws, removes bad habits, harmonizes tooth arches, corrects the vertical problems.

Key words: deep overbite, Trainer System™, mixed dentition, myofunctional appliance.

INTRODUCTION

Deep bite is characterized with increased overbite (OB) and is one of the most frequently seen malocclusions next to crowding. In centric occlusion usually normal overbite is 2–3 mm or 30% percent or 1/3 rd of the clinical crown height of the mandibular incisors [1-4]. The term „overbite" applies to the distance which the maxillary incisal margin closes vertically past the mandibular incisal margin [4].

The correction of deep overbite is highly desirable if the overbite affects the facial esthetics and impairs the dental health of an individual. Furthermore the deep overbite malocclusion has been linked to the periodontal disease induction.

Functional appliances have been extensively reported in the literature as an alternative for treating malocclusions, as they may stimulate jaw growth and development in preadolescent patients [2, 5-12]. Over the years series of functional appliances, which cause skeletal and dento-alveolar changes were created for treatment of deep bite. Some of them are Activators, Bionator, Frankel's regulator etc. In 1992 Myofunctional Research Co, Australia developed new concept for functional appliances, called Trainers ™. Nowadays Trainer System™ is one of the most effective appliances in early mixed dentition for tooth eruption guidance and correction of myofunctional habits.

AIM

The aim of this study is to follow-up the biometrical and skeletal vertical changes in patients with deep overbite after a functional orthodontic treatment with Trainer System™ system is conducted.

MATERIAL AND METHODS

32 deep overbite patients (20 girls and 12 boys) in early mixed dentition and average age 8.32 were followed-up. An orthodontic treatment with Trainer System™, including Trainer for kids (T4K)-blue and T4K-red and Myobrace was conducted. (Fig. 1) The recommended time for wearing the appliances was 8–12 hours, mostly at the night and 1–2 hours total time during the day.

Fig. 1. Trainer – T4K-blue, T4K-red, Myobrace

All the patients were photo-documented by Canon EOS – 550D Camera with Sigma EM-140 DG Ring Flash. The photo documentation protocol included profile and frontal facial photos and intraoral photos of the occlusion (frontal and lateral), both tooth arches and occlusal planes. On every 3-month period this protocol was performed (Fig. 2.1 and Fig. 2.2).

Fig. 2.1 Photo-documentation protocol – before the beginning of the treatment

Fig. 2.2 Photo-documentation protocol – after the end of the treatment

Dental impressions of each tooth arch before the beginning of the treatment, before a new appliance was placed and at the end of the treatment were taken with alginate material.

Panoramic radiographs and lateral cephalograms were taken before the beginning of the treatment and at the end of every single step in relation with change of appliances. The vertical dimensions could be measured by a various methods, but one of the most common is to measure the Frankfort Mandibular Plane Angle (M/F). Another ways of measuring the vertical dimension are the angles between Mandibular plane and Spinal and Occlusal Planes (M/SpP and M/Occ) on lateral cephalograms. Comparative biometrical and cephalometric analyses were made and changes with M/SN, M/F, ANB, SNA, SNB values were established. The data was statistically processed (Fig. 3).

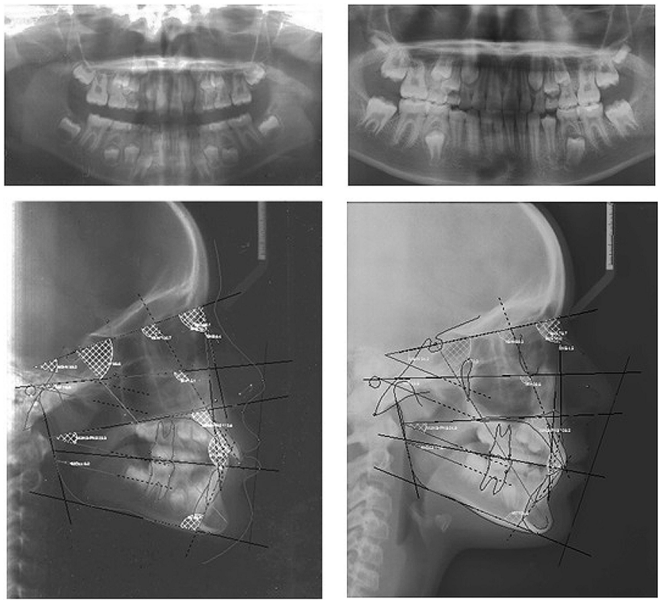


Fig. 3.
Panoramic and cephalometric analyses

As the vertical overbite is either described in millimeters or as the percentage of mandibular incisor crown length overlapped by maxillary central incisors, for the needs of comparative biometrical analyses, all the patients were divided into 4 groups (codes) according to the degree of overlap (Fig. 4):

Code 1 – Overbite <1/3

Code 2 – Overbite from 1/3 to 2/3

Code 3 – Overbite > 2/3

Code 4 – Traumatic overbite (where upper/ lower incisal edges traumatize the gingiva).

In this study only patients with codes from 2 to 4 with erupted first molar teeth were included (0% code 1, 12.5% code 2, 81% code 3 and 6.5% with code 4).

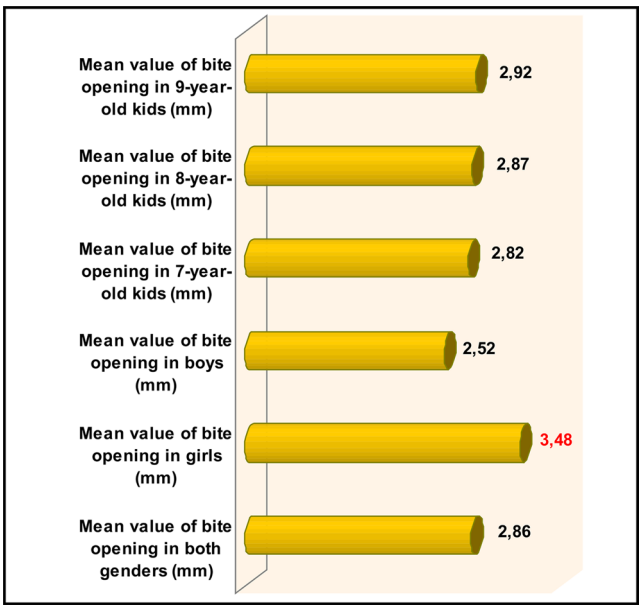
Fig. 4. The groups (codes) for evaluation of the patients

RESULTS

The results showed there are no statistically significant differences in the reduction of overlap according to age and gender.

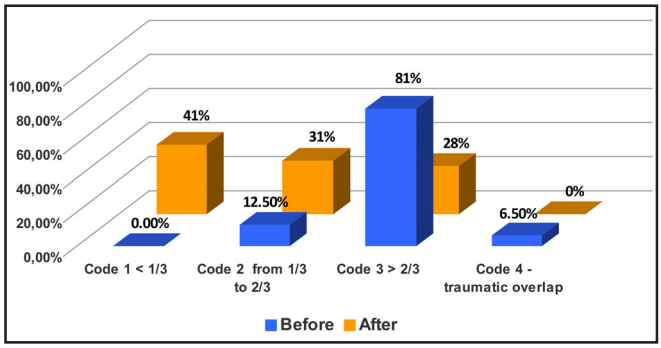
The values range from 2.52 mm in group of boys to 3.5mm in the group of girls. (Fig. 5) The comparative biometrical analyses showed reduction of the overbite with 2.5–3.5 mm after the end of the orthodontic treatment. 62% of cases showed relapse from 0.5 to 1mm. After the end of the orthodontic treatment an inclination of upper and lower incisors and changes with M/SN, M/F, ANB, SNA, SNB values were established.

Fig. 5. Mean values of opening the bite in kids after orthodontic treatment with Trainer System™



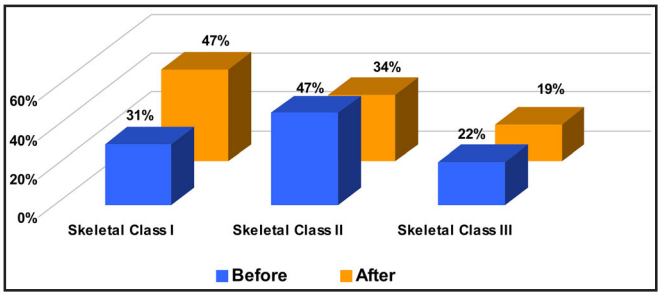
The treatment was finished with 41% normal occlusion patients, 31% with code 2, 28% – code 3 and NO patients with traumatic occlusion (Fig. 6).

Fig. 6. Division of the groups (codes) before and after treatment



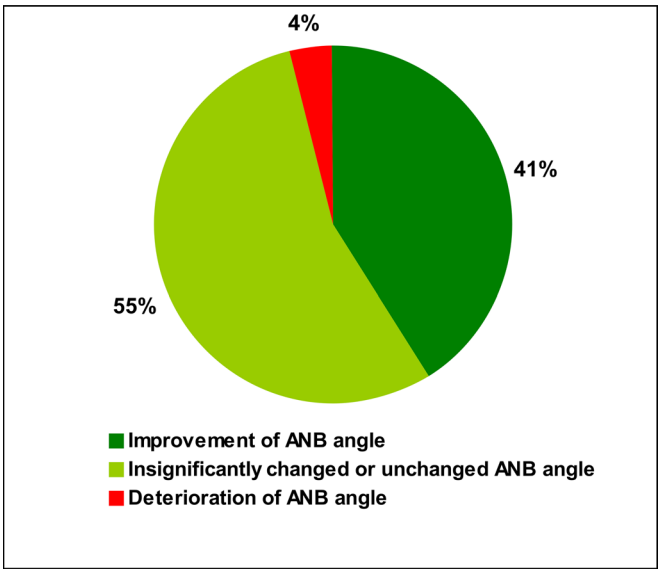
At the end of the treatment 47% of the patients became with Skeletal Class I in comparison with 31% before the treatment. The patients with Skeletal Class II and III were reduced respectively to 34% and 19% after the treatment (Fig. 7).

Fig. 7. Changes in Skeletal Class before and after the treatment



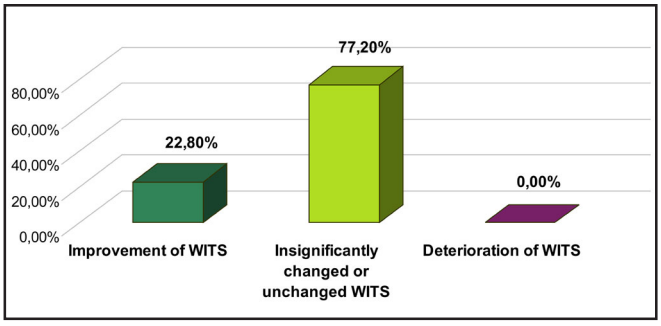
Results showed there is an improvement of ANB angle in 41% of cases, in 55% of cases there is no changes and only 4 % with deterioration (Fig. 8).

Fig. 8. Changes in ANB angle after orthodontic treatment with Trainer System™



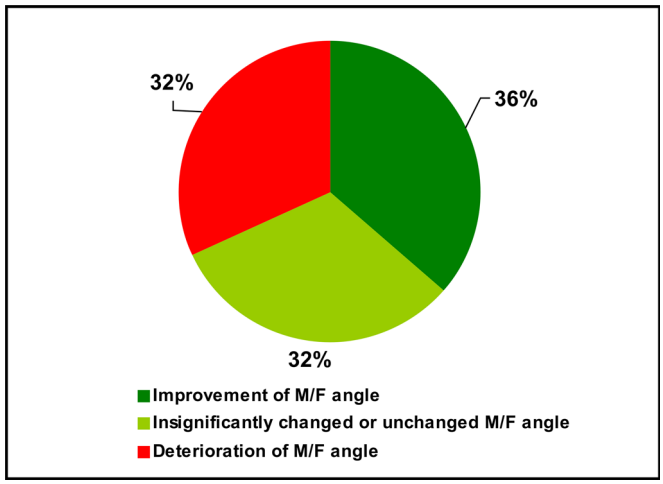
Wits analyses showed 0% deterioration, 77.5% without changes and 22.5% improvement (Fig. 9).

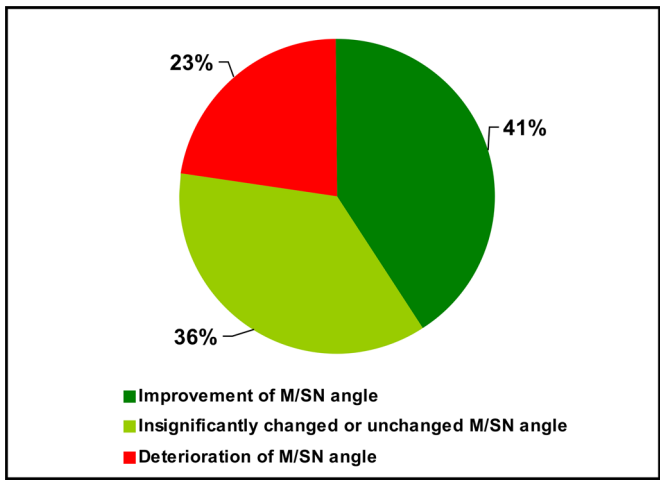
Fig. 9. Changes in WITS after orthodontic treatment with Trainer System



Changes in Mandibular according to Frankfurt and Spinal planes showed that there was an increased lower facial height in 36% to 41% of the cases (Fig. 10).

Fig. 10. Changes in M/F and M/SN angle after orthodontic treatment with Trainer System™





DISCUSSION

After the application of T4K a vertical growth of the patients and significant decrease of the overlap in the frontal teeth was observed. We consider that T4K should be recommended as a useful appliance for stimulating the vertical growth in hypodivergent patients and patients with dento-alveolar deep bite.

Trainer appliances have tooth channels and labial bows which guide the erupting teeth into the correct alignment. The Trainer's tongue tag trains the tongue of the patient to stay in the roof of the mouth, improving myofunctional habits while the lip bumpers discourage overactive lip muscle activity. The soft, phase 1 appliance is more flexible in order to adapt to a wide range of malocclusions and the harder, phase 2 appliance, which usually follow after 6 to 9 months of Phase 1 use, achieves better tooth alignment [13].

As a second phase Myobrace Trainer, which has tooth slots, was used in patients who needed teeth alignment.

These functional appliances change the posture of the mandible into a forward position and stimulate transverse development by encouraging patients to chew correctly while using the jaw muscles, helping patients breathe

through their nose [8, 9, 11, 12, 14].

The survey shows a significant increase of Class I patients at the end of the functional treatment, reduction of Class II and Class III patients, which comes to support the thesis about orthopedic effect of the Trainer appliances.

Reduction of overbite was achieved by disarticulation, functional balance of the muscle activity and teeth eruption control till the formation of permanent dentition is finished.

According to Angle [15], almost every malocclusion has some soft tissue involvement. Another study showed that early treatment with an orthopedic appliances is successful in 80% of malocclusions; the remaining 20% require fixed appliances [14]. The leveling of the Occlusal plane and the lower jaw unblocking by disarticulation, achieved by Trainer appliances, make the alignment and the correction of mild crowding in the frontal teeth possible (Fig. 11).

The muscle activity and particularly the tongue position and function have a great impact on the dentition. They both can lead to a deterioration of the orthodontic correction or even to recurrence of the original problem if not alleviated [16].

Although these prefabricated functional appliances have demonstrated to produce skeletal and dental improvement in deep overbite patients, which has been shown in our research by the change of angles M/SN and M/F from the cephalometric analyses and the reduction of the overbite by 2.5–3.5 mm, measured on casts [4, 5, 9, 13, 17, 18].

Fig. 11. Treatment progress in a 7-year old girl patient who came in our Orthodontic Clinic, Sofia, Bulgaria with her parents. Their chief compliant were the crowded lower frontal teeth and the deep overbite which traumatized upper incisive papilla. The extraoral clinical examination displayed an ovoid symmetric face and mild convex profile due to retrognathic mandible. Intraorally, a Class I molar and canine relationship was evident. A 3.5 mm overjet and 7 mm overbite with mild crowding in the lower arch (2 mm) were present (Fig. 2.1).

Cephalometric analysis revealed a skeletal Class II discrepancy due to a retrusive mandible with ANB angle of 5.76 degrees and skeletal Class I according to Wits analysis (-0.54). The upper incisors were inclined (Fig. 3).

The panoramic radiograph revealed all the permanent teeth are existing (Fig. 3).

The treatment plan consisted of two or three Trainer appliances for reduction of the overlap and for gaining enough space for eruption of the permanent teeth.

First appliance was T4K- blue, which the patient worn approximately one year, every night and one or two hours during the day. Next treatment step was T4K-red, which is harder and not so flexible. It was worn 9 months with the same wearing protocol. The third part of the treatment was Myobrace appliance for final correction and teeth alignment. The appliance was used also for retention but only at the night (Fig. 11).

After the end of the treatment the overbite was reduced to 3mm, the overjet was eliminated (Fig. 2.2).

The extraoral appearance of the patient after the end of the treatment was improved. The comparative cephalometric analysis showed almost skeletal Class I with ANB angle of 4.27 degree and -0.8 degree according to Wits analysis (Fig. 3).

CONCLUSIONS

If untreated during the growing period, deep overbite leads to serious functional disorders, pathologic abrasion and myo-articular problems. Myofunctional Trainer System™ is successfully applied in the management of deep overbite in growing kids with early mixed dentition. The design of appliances helps the right positioning of tongue and jaws, removes bad habits, harmonizes tooth arches, corrects the vertical problems.

Abbreviations:

F – Frankfurt plane
M – Mandibular plane
OB - overbite
SN – Spinal plane
T4K – Trainer for kids

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