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ORIGINAL ARTICLE / ОРИГИНАЛНИ РАД

# Changes during treatment of Class III malocclusion by Y appliance and appliance with screw according to Bertoni

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**SUMMARY**

**Introduction/Objective** Class III malocclusion is caused by changes in skeletal and/or dentoalveolar structures with a typical mesial relationship of posterior teeth. The "Y" appliance and the appliance with screw according to Bertoni can be used in treating Class III malocclusion caused by maxillary retrognathism in the period of mixed dentition. The aim of the study was to determine and compare changes on skeletal and dentoalveolar structures in patients with Class III malocclusion treated with the Y appliance and the appliance with screw according to Bertoni.

**Methods** Forty patients with Class III malocclusion were included in this study. The sample was divided into two groups, with 20 patients in each group. The including criteria were maxillary retrognathism, the period of mixed dentition, and pubertal growth. The excluding criteria were mandibular prognathism, patients with genetical predisposition for skeletal Class III malocclusion, patients with cleft lip and palate or craniofacial syndrome, and the period of permanent dentition. The appliances which caused most changes on the maxilla were used in this study because all patients had a deficiency of maxillary growth. Anamnesis, clinical and functional testing, study casts analysis, analysis of orthopantomograms, lateral cephalograms, extraoral and intraoral photos were done for each patient. Therapeutic effects were analyzed on study casts and lateral cephalograms after this phase of orthodontic treatment.

**Results** The main dentoalveolar effect was protrusion of the upper incisors. Skeletal effects were not significant.

**Conclusion** The Y appliance and the appliance with screw according to Bertoni caused greater changes on dentoalveolar structures compared to skeletal changes.

**Keywords:** Class III malocclusion; Y appliance; Bertoni screw

## INTRODUCTION

Class III malocclusion is an orthodontic problem in the sagittal direction with a mesial relationship of the posterior teeth. The cause of this malocclusion could be the changes in skeletal and/or dentialveolar structures [1]. The skeletal form of Class III malocclusion can be caused by maxillary retrognathism and underdeveloped maxilla, mandibular prognathism and overdeveloped mandible, and a combination of these two changes. Patients with skeletal Class III malocclusion caused by maxillary retrognathism have a typical concave profile and backward position of the maxilla and the upper lip [1]. The maxilla is underdeveloped in the sagittal and the transversal direction. Patients with cleft lip and palate and some syndromes (Apert, Crouzon) often have a mesial bite due to insufficient growth of the maxilla. The frequency of this malocclusion increases over time [2, 3]. The prevalence of skeletal mesial bite in deciduous dentition is 23%, in mixed dentition 30%, and in permanent dentition 34% [1].

The "Y" appliance is an active removable orthodontic appliance. This appliance has an acrylic plate cut in the shape of the letter "Y", with two screws in the area of the canines. the main effect of the appliance is protrusion of the upper incisors if a patient turns both screws at the same time. This appliance is useful in the treatment of patients with Class III malocclusion caused by maxillary retrognathism during mixed dentition [4].

The appliance with screw according to Bertoni is an active, mobile orthodontic appliance. This appliance has a special screw which acts in two directions – the sagittal and the transversal one. The appliance is useful in the treatment of patients with insufficient growth of the maxilla. The screw can consist of two or three guides. One screw causes a protrusion of the upper incisors, while the other one or two screws (depending on the design) cause transversal expansion of the upper dental arch. A patient turns the screws one after the other and not simultaneously [4].

The aim of this investigation was to determine and compare skeletal and dentoalveolar changes in patients with Class III malocclusion treated with the Y appliance and the appliance with screw according to Bertoni.

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## METHODS

In this retrospective study, 40 patients of the Department of Orthodontics, School of Dental Medicine, University of Belgrade, were included. The study was approved by the Ethics Committee, School of Dental Medicine, University of Belgrade, Serbia (No. 10/1). None of the patients had previous orthodontic treatment. This sample included patients with a decreased value of the ANB angle (less than 2°) caused by maxillary retrognathism (the SNA angle less than 82°).

The patients were divided into two following groups: group I – patients treated with the Y appliance (20 patients) (Figure 1), and group II – patients treated with the appliance with a screw according to Bertoni (20 patients) (Figure 2). The Y appliance and the appliance with a screw according to Bertoni were worn 16–18 hours during the day. In the Y appliance the screws were turned at the same time, while in the appliance with a screw according to Bertoni the screws were turned at different times. The appliance with a screw according to Bertoni was used in patients with a narrow upper arch and retrusion of the upper incisors, while the Y appliance was used in patients with retrusion of the upper incisors without deficient growth of the maxilla in the transversal direction. The active phase of treatment lasted 18 months.

These appliances can be used during the treatment of skeletal Class III malocclusion caused by maxillary retrognathism.

All the patients were in the period of mixed dentition, during the pubertal growth spurt period. The average chronological age in group I was nine years and two months, and in group II it was nine years and nine months. The dental age was determined according to Demirjian's method. The average dental age in group I was nine years and seven months, and in group II it was nine years and 11 months. The skeletal age was estimated by Baccetti method of cervical vertebral maturation [5]. In group I, three patients (15%) were in stage 1, 11 patients (55%) were in stage 2, and six patients (30%) in stage 3. In group II, four patients (20%) were in stage 1, 12 patients (60%) were in stage 2, and four patients (20%) in stage 3. The average duration of orthodontic treatment was 17 months in group I and 20 months in group II. Chronological, dental, and skeletal age, the duration of treatment, and sex distribution are shown in Table 1.

The inclusion criteria were maxillary retrognathism, the period of mixed dentition, positive overjet, mesial byte, and age in correlation with the best period for treatment for each appliance. The exclusion criteria were patients with cleft lip and palate or some craniofacial syndrome, mandibular prognathism, permanent dentition, late age for this kind of treatment or premature contact during the movement of the mandible from physiological rest to the central occlusion. No patients withdrew from the therapeutic procedure. Only patients with a complete treatment protocol were included in this study. Patients with a genetic predisposition to this malocclusion were not included.

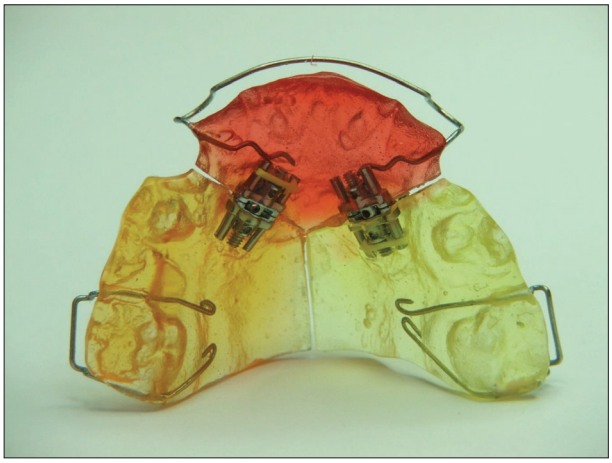

**Figure 1.** The "Y" appliance

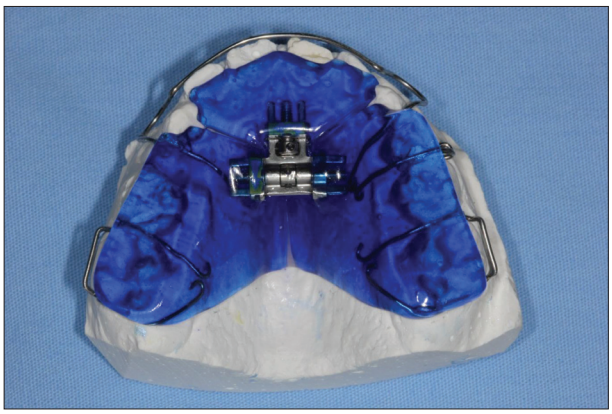

**Figure 2.** The appliance with a screw according to Bertoni

The diagnostic procedure had been done for each patient before the orthodontic treatment. The procedure included anamnesis, clinical and functional testing, study casts analysis, analysis of orthopantomograms, lateral cephalograms, and extraoral and intraoral photos. Lateral cephalograms and study casts were done after this phase of orthodontic treatment to assess therapeutic effects of each appliance used.

### Cephalometric parameters

The following parameters were included and analyzed:
- angle SNA – sagittal position of the maxilla;
- angle SNB – sagittal position of the mandible;
- angle ANB – relationship between the maxilla and the mandible in the sagittal direction;

**Table 1.** Chronological, dental, and skeletal age, treatment time, and distribution by sex

| Appliance | Chronological age | Dental age | Skeletal age | Treatment time | Sex | |
|---|---|---|---|---|---|---|
| | | | | | Male | Female |
| Y<br>n = 20 | 9 years 2 months | 9 years 7 months | Stage 1 (n = 3)<br>Stage 2 (n = 11)<br>Stage 3 (n = 6) | 17 months | 11 | 9 |
| Bertoni<br>n = 20 | 9 years 9 months | 9 years 11 months | Stage 1 (n = 4)<br>Stage 2 (n = 12)<br>Stage 3 (n = 4) | 20 months | 13 | 7 |

**Table 2.** Parameters in the sagittal direction – changes during treatment with different appliances

| Parameter | T1 x ± SD | T2 x ± SD | Δ (T2-T1) x ± SD | Significance[a] at T1 | Significance[a] at T2 | Significance[b/c] | Significance[d] | Significance[e] |
|---|---|---|---|---|---|---|---|---|
| SNA (°) | | | | | | | | |
| Y app n = 20 | 76.6 ± 1.96 | 77.9 ± 1.86 | 1.3 ± 0.66 | | | p = 0.000* | p < 0.001* | |
| Bertoni app n = 20 | 76.8 ± 1.83 | 77.85 ± 1.92 | 1.05 ± 1.84 | 0.660 | 0.939 | p = 0.000* | p < 0.001* | |
| SNB (°) | | | | | | | | |
| Y app n = 20 | 79 ± 1.92 | 79.45 ± 1.7 | 0.45 ± 1.85 | | | p = 0.089 | p = 0.004* | |
| Bertoni app n = 20 | 79.2 ± 2.12 | 79.5 ± 1.93 | 0.3 ± 2.06 | 0.159 | 0.204 | p = 0.078 | p = 0.307 | |
| ANB (°) | | | | | | | | |
| Y app n = 20 | -2.4 ± 1.09 | -1.55 ± 1.19 | 0.85 ± 0.99 | | | p = 0.065 | p = 0.000* | p = 0.007* |
| Bertoni app n = 20 | -1.8 ± 1.95 | -1.35 ± 1.64 | 0.45 1.92 | 0.450 | 0.033* | p = 0.123 | p = 0.102 | p = 0.012* |

*statistically significant difference;
[a]monofactorial variance analysis;
[b]two-factor analysis of the variance, factor time;
[b/c]two-factor analysis of the variance, factor time-group;
[d]t-test;
[e]Wilcoxon matched-pairs test

– angle SpP/MP – vertical position of the maxilla;
– angle SN/SpP – vertical position of the mandible;
– angle SN/MP – relationship between the maxilla and the mandible in the vertical direction;
– sum of angles of Bjork's polygon – type of facial growth;
– relationship between the anterior and the posterior facial height – type of facial growth;
– distance Sna–A' – length of the maxillary corpus;
– distance Pg'–Go' – length of the mandibular corpus;
– distance Cd'–Go' – height of the mandibular ramus;
– angle I/SpP – inclination of the upper incisors;
– angle i/MP – inclination of the lower incisors.

Manual drawing and analysis of the lateral cephalogram was performed. Computer analysis was not done. The measurements were made by one impartial researcher. The researcher had no insight into which group of patients he was analyzing.

### Statistical analysis

Statistical analysis included mean values, maximum and minimum values, and standard deviation, as a part of standard descriptive statistical analysis. Two-factor analysis of the variance with repeated measuring was used in relation to the factor time and factor time and group allocation. ANOVA, Wilcoxon matched pairs test and Student's t-test were used for determining the statistical significance of acquired differences. PASW Statistics for Windows, Version 18.0 (SPSS Inc., Chicago, IL, USA) was used.

## RESULTS

### Parameters in sagittal direction

Both appliances caused increased values of the SNA angle. We used a two factor analysis of the variance with repeating measuring to determine effects of the two removable appliances on the sagittal position of the maxilla before and after orthodontic treatment. Statistically significant differences between these two periods were evaluated in both groups. The values of the SNB angle increased in both groups of patients. Statistically significant difference was determined only in the group of patients treated with the Y appliance. Increased value of the SNB angle is a direct consequence of the mandibular growth, which is very intense at this age. The ANB angle increased significantly in both groups. Student's t-test and Wilcoxon matched pairs test indicated significant differences in both groups (Table 2).

### Parameters in vertical direction

Value of the SN/SpP angle increased in both groups of patients. When we compared the two groups of patients, only the Y appliance caused statistically significant changes of the SN/SpP angle during treatment. The SN/MP angle increased insignificantly in both the group treated with the Y appliance and the Bertoni's screw. When we compared groups after treatment, we evaluated significant changes. Both appliances caused an increase of the SpP/MP angle. Statistically significant differences existed in both groups when we compared values before and after treatment (Table 3).

### Parameters of maxillary and mandibular development

With both appliances, the length of the maxilla increased significantly during treatment. Two-factor analysis of the variance with repeated measurements determined statistically significant differences in the pretreatment and post-treatment values of the length of the maxilla. The length of the mandible increased in both groups. Height of the mandibular ramus increased in both treated groups of

**Table 3.** Parameters in the vertical direction – changes during treatment with different appliances

| Parameter | T1 x ± SD | T2 x ± SD | Δ (T2-T1) x ± SD | Significance[a] at T1 | Significance[a] at T2 | Significance[b/c] | Significance[d] |
|---|---|---|---|---|---|---|---|
| SN/SpP (°) | | | | | | | |
| Y app n = 20 | 11.75 ± 1.55 | 12.75 ± 1.48 | 1 ± 1.21 | | | p = 0.228 | p = 0.002* |
| Bertoni app n = 20 | 11.20 ± 2.14 | 11.6 ± 2.23 | 0.4 ± 2.02 | 0.005* | 0.001* | p = 0.334 | p = 0.136 |
| SN/MP (°) | | | | | | | |
| Y app n = 20 | 36.85 ± 5.02 | 38.9 ± 4.34 | 2.05 ± 2.39 | | | p = 0.245 | p = 0.001* |
| Bertoni app n = 20 | 36.25 ± 4.83 | 37.85 ± 4.12 | 1.6 ± 2.23 | 0.587 | 0.769 | p = 0.173 | p = 0.003* |
| SpP/MP (°) | | | | | | | |
| Y app n = 20 | 25.05 ± 4.86 | 26.15 ± 4.26 | 1.1 ± 1.86 | | | p = 0.999 | p = 0.016* |
| Bertoni app n = 20 | 24.75 ± 4.18 | 25.55 ± 3.92 | 0.8 ± 3.23 | 0.891 | 0.549 | p = 0.712 | p = 0.012* |

*statistically significant difference;
[a]monofactorial variance analysis;
[b]two-factor analysis of the variance, factor time;
[b/c]two-factor analysis of the variance, factor time-group;
[d]t-test

**Table 4.** Maxillary and mandibular development – changes during treatment with different appliances

| Parameter | T1 x ± SD | T2 x ± SD | Δ (T2-T1) x ± SD | Significance[a] at T1 | Significance[a] at T2 | Significance[b/c] | Significance[d] |
|---|---|---|---|---|---|---|---|
| Cmax (mm) | | | | | | | |
| Y app n = 20 | 46.87 ± 2.04 | 48.35 ± 2.11 | 1.48 ± 0.75 | | | p = 0.000* | p < 0.001* |
| Bertoni app n = 20 | 45.1 ± 2.17 | 46.2 ± 2.05 | 1 ± 1.93 | 0.471 | 0.690 | p = 0.014* | p < 0.001* |
| Cmand (mm) | | | | | | | |
| Y app n = 20 | 73.55 ± 3.72 | 74.75 ± 3.48 | 1.2 ± 0.94 | | | p = 0.941 | p < 0.001* |
| Bertoni app n = 20 | 71.1 ± 3.43 | 72.2 ± 3.18 | 1.1 ± 2.67 | 0.742 | 0.970 | p = 0.726 | p = 0.114 |
| Rmand (mm) | | | | | | | |
| Y app n = 20 | 54.15 ± 2.37 | 54.95 ± 2.23 | 0.8 ± 0.95 | | | p = 0.771 | p = 0.001* |
| Bertoni app n = 20 | 53.1 ± 2.25 | 53.85 ± 2.02 | 0.75 ± 2.11 | 0.092 | 0.075 | p = 0.675 | p = 0.043* |

*statistically significant difference;
[a]monofactorial variance analysis;
[b]two-factor analysis of the variance, factor time;
[b/c]two-factor analysis of the variance, factor time-group;
[d]t-test

patients. Statistically significant differences determined by a comparison of both groups of patients were also evaluated (Table 4).

## Parameters of facial growth

Sum of angles of Bjork's polygon increased in both groups of patients. There were no significant differences between groups during treatment. The relationship between the anterior and posterior facial height decreased in the group treated with the appliance with Bertoni's screw, while it increased in the group treated with the Y appliance. There were no statistically significant changes between the groups and during treatment (Table 5).

## Dentoalveolar parameters

The I/SpP angle was decreased in both groups of patients. Two-factor analysis of variance with repeated measurements determined a statistically significant difference in the group treated with the Y appliance and the appliance with Bertoni's screw. When comparing effects of treatment, significant differences existed in both treated groups. The i/MP angle increased in the group treated with the appliance with Bertoni's screw, while the Y appliance caused insignificant decrease of this angle. Statistically significant changes in both groups were evaluated with two-factor analysis of the variance with repeated measurements (Table 6).

**Table 5.** Parameters of facial growth – changes during treatment with different appliances

| Parameter | T1 x ± SD | T2 x ± SD | Δ (T2-T1) x ± SD | Significance[a] at T1 | Significance[a] at T2 | Significance[b/c] | Significance[d] |
|---|---|---|---|---|---|---|---|
| Σ Bjork (°) | | | | | | | |
| Y app n = 20 | 394.05 ± 4.5 | 395.05 ± 4.26 | 1 ± 2.34 | 0.359 | 0.669 | p = 0.599 | p = 0.071 |
| Bertoni app n = 20 | 394.7 ± 4.14 | 395.5 ± 3.83 | 0.8 ± 3.26 | | | p = 0.634 | p = 0.142 |
| SGo/NMe × 100 (%) | | | | | | | |
| Y app n = 20 | 63.73 ± 1.7 | 64.3 ± 2.84 | 0.57 ± 1.74 | 0.237 | 0.132 | p = 0.328 | p = 0.555 |
| Bertoni app n = 20 | 63.5 ± 2.2 | 63.1 ± 2.36 | 0.4 ± 2.45 | | | p = 0.423 | p = 0.478 |

*statistically significant difference;
[a]monofactorial variance analysis;
[b]two-factor analysis of the variance, factor time;
[b/c]two-factor analysis of the variance, factor time-group;
[d]t-test

**Table 6.** Dentoalveolar parameters – changes during treatment with different appliances

| Parameter | T1 x ± SD | T2 x ± SD | Δ (T2-T1) x ± SD | Significance[a] at T1 | Significance[a] at T2 | Significance[b/c] | Significance[d] |
|---|---|---|---|---|---|---|---|
| I/SpP (°) | | | | | | | |
| Y app n = 20 | 71.3 ± 2.81 | 68.7 ± 3.06 | 2.6 ± 1.05 | 0.420 | 0.015* | p = 0.000* | p < 0.001* |
| Bertoni app n = 20 | 72.2 ± 2.53 | 70.1 ± 2.37 | 2.1 ± 1.87 | | | p = 0.007* | p < 0.001* |
| i/MP (°) | | | | | | | |
| Y app n = 20 | 90.15 ± 2.83 | 90.05 ± 2.46 | 0.1 ± 1.07 | 0.406 | 0.705 | p = 0.000* | p = 0.681 |
| Bertoni app n = 20 | 89.7 ± 2.18 | 90.1 ± 2.45 | 0.4 ± 1.67 | | | p = 0.012* | p = 0.437 |

*statistically significant difference;
[a]monofactorial variance analysis;
[b]two-factor analysis of the variance, factor time;
[b/c]two-factor analysis of the variance, factor time-group;
[d]t-test

## DISCUSSION

Early treatment of skeletal Class III malocclusion caused by maxillary retrognathism can provide correct occlusion, functional stability, and acceptable facial aesthetics. At the same time, we can avoid the need for a later complex and expensive orthodontic treatment or combined orthodontic and surgical treatment [6]. For this reason, most important are effects on the skeletal structures of the maxilla. It was very important to determine the scope of changes on skeletal and dentoalveolar structures depending on the used appliances and the mechanism of their application. All patients in this study were in the period of pubertal acceleration of growth, without earlier orthodontic treatment. Patients included in this study were treated at the Department of Orthodontic, School of Dental Medicine, University of Belgrade. The standard diagnostic procedure included anamnesis, clinical and functional examinations, analysis of study casts, orthopantomograms and lateral cephalograms, and extraoral and intraoral photos. All the patients were divided into two groups according to type of used appliance: group I treated by the Y appliance and group II treated by a removable appliance with a screw according to Bertoni. In some cases, fixed appliance 4 × 2 can be used, for example in patients with an allergic reaction to materials used for mobile appliances, in patients with epilepsy or in patients with cancer who need frequent and repeated MRI. Also, for significant anterior growth of the maxilla and skeletal effects, Fränkel functional regulator type III can be used in early treatment [7–10].

Position and development of the maxilla were analyzed using the values of SNA and SN/SpP angles and the Cmax linear distance, which determined the length of the maxilla. An increase of the maxillary corpus length was a result of simultaneously intensive pubertal growth and effects of an orthodontic appliance. Stimulation of the sagittal growth of the maxilla caused forward-moving of point A. This moving caused an increased SNA angle. Also, both appliances caused an expansion of the upper dental arch, which was in correlation with posterior rotation of the mandible and the distal movement of point B [8, 9, 11]. Vertical position of the maxilla was changed according to an increased value of the SN/SpP angle [12, 13].

There was far less effect on the mandible than on the maxilla. The Y appliance and the appliance with a screw according to Bertoni did not have any influence on the position of the mandible, because these appliances were located only on the maxilla. These devices were used precisely because the essence of the problem was the underdevelopment of the maxilla.

The relationship between the maxilla and the mandible was evaluated by values of angles ANB and SpP/MP. Both appliances caused significant increase in value of the ANB angle, so it changed skeletal Class III malocclusion to

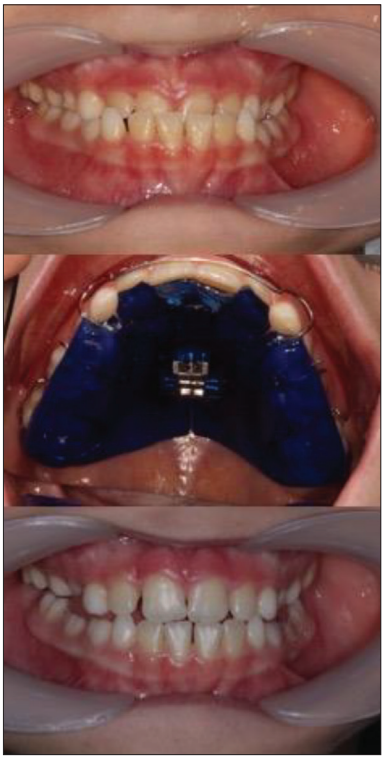

**Figure 3.** Intraoral photos before and after treatment with appliance with a screw according to Bertoni

**Figure 4.** Intraoral photos before and after treatment with the Y appliance

skeletal Class I thanks to the anterior movement of point A [14, 15]. The increased value of the ANB angle was a consequence of the increased SNA angle [9, 16, 17]. The Y appliance and the appliance with a screw according to Bertoni mostly affected dentoalveolar structures, while skeletal changes were minimal [4, 18, 19].

Facial growth was analyzed by the Björk and Jarabak method. Generally, treatment with both appliances caused a slight backward facial rotation and a tendency towards the vertical facial growth [8, 20, 21, 22].

Position of the upper incisors was evaluated by the I/SpP angle. Mostly, patients with Class III malocclusion (except patients with real mandibular prognathism) had normoinclination of the upper incisors [8, 12]. Used appliances changed inclination of the upper incisors, with protrusion of these teeth [21, 22]. It was a consequence of design of these appliances, which were located only on the upper dental arch. Dentoalveolar effects that corrected the overjet were a protrusion of the upper incisors and a retrusion of the lower incisors [14, 23, 24]. Retrusion of the lower incisors was not a consequence of orthodontic treatment. It was some kind of dentoalveolar compensation. Active mobile appliances caused more intense changes on dentoalveolar structures, with severe proclination of the upper incisors [9, 13, 16] (Figures 3 and 4).

Changes in dentoalveolar and skeletal structures are accompanied by an improvement in overall facial aesthetics, which has been confirmed by numerous studies [14, 18, 25, 26].

## CONCLUSION

This study indicates that the Y appliance and the appliance with a screw according to Bertoni caused more dental changes during treatment of Class III malocclusion caused by maxillary retrognathism. Treatment with the Y appliance and the appliance with a Bertoni's screw mostly caused changes in dentoalveolar structures. These two appliances contributed to the correction of negative overjet due to the protrusion of the upper incisors. The use of these removable appliances can be useful in the early correction of skeletal Class III malocclusion. Active mobile appliances, Y appliance and the appliance with a screw according to Bertoni, did not cause significant changes on skeletal structures of the craniofacial complex.

**Conflict of interest:** None declared.

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# Промене током третмана малоклузија класе III применом апарата *Y* и апарата са шрафом по Бертонију

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**САЖЕТАК**

**Увод/Циљ** Малоклузије III класе могу бити узроковане променама на скелетним и/или дентоалвеоларним структурама са мезијалним односом у регији бочних зуба. У раном третману класе III изазване максиларним ретрогнатизмом може се користити апарат *Y* и апарат са шрафом по Бертонију.

Циљ овог истраживања је био да се утврде и упореде скелетне и дентоалвеоларне промене код пацијената са класом III који су лечени применом апарата *Y* и апарата са шрафом по Бертонију.

**Методе** У истраживање је укључено 40 пацијената. Цео узорак подељен је у две групе, са по 20 пацијената у свакој групи. У студију су укључени пацијенти код којих је узрок мезијалног загрижаја био максиларни ретрогнатизам, у мешовитој дентицији и пубертетском убрзању раста. Нису укључени пацијенти са правим мандибуларним прогнатизмом, особе са генетском предиспозицијом за настанак мезијалног загрижаја, пацијенти са расцепом усне и непца или неким краниофацијалним синдромом, као ни пацијенти са сталном дентицијом. Изабрани су апарати чија се примена базира на изазивању промена на структурама горње вилице. За пацијенте је урађена анамнеза, клиничко и функционално испитивање, анализа студијских модела, анализа ортопантомографског снимка и профилног цефалограма, као и екстраоралних и интраоралних фотографија. Терапијски ефекти анализирани су на студијским моделима и профилним цефалограмима урађеним после ове фазе ортодонтског третмана.

**Резултати** Главни дентоалвеоларни ефекат била је протрузија горњих секутића. Скелетни ефекти нису били значајни.

**Закључак** Апарат *Y* и апарат са шрафом по Бертонију изазивају значајне промене на дентоалвеоларним структурама у поређењу са скелетним структурама, где су промене биле мање уочљиве.

**Кључне речи:** малоклузије III класе; апарат *Y*; апарат са шрафом по Бертонију