

## Case Report

## CLASS II DIVISION 1 MALOCCLUSION THERAPY WITH THE HELP OF EXTRAORAL HEADGEAR APPLIANCE WITH CERVICAL PULL – CASE REPORT

Konstantinos Papadopoulos<sup>1</sup>, Tatjana Perović<sup>2,3</sup>

<sup>1</sup>Specialistic Orthodontic Practice, Katerini, Greece

<sup>2</sup>Faculty of Medicine, University of Niš, Serbia

<sup>3</sup>Dental Clinic, Department of Orthodontics, Niš, Serbia

**Abstract.** Case report of a ten-year-old boy with a Class II division 1 malocclusion is presented. Non extraction treatment was undertaken with the use of cervical headgear appliance. The treatment time was 25 months. The results of non-extraction orthodontic treatment was the sagittal correction of skeletal Class II malocclusion as well as the reduction of overjet and overbite. The effects of the cervical headgear were mainly in the skeletal level.

**Key words:** Class II division 1 malocclusion, Cervical headgear appliance

### Introduction

The use of extraoral forces in the treatment of Class II division 1 malocclusion was introduced for the first time in 1800. Since then, many studies have reported on its treatment effects.

Kloehn [1] established that the use of the cervical headgear could achieve an inhibition of maxillary growth in the correction of the mentioned malocclusion.

In the following years, the effects of the cervical headgear application on the craniofacial complex has been proved by a great number of experimental [2, 3] and clinical studies [4–10]. Many investigators have stated that in treating patients with cervical headgear the mandible is rotated back because of the excessive extrusion of the upper first molars [11, 12].

Because of this negative effect many orthodontists abandoned the use of cervical pull and continued with the use of high pull or combination pull, especially in the patients with vertical growth pattern.

Forces which have been applied in the headgear treatment are the following: 1. Low forces of 150–250 grams per side can be applied for a distal movement of upper molars [13–14], 2. Heavy forces of 450–500 grams per side to produce more skeletal effect or to provide a reliable maxillary posterior anchorage system [15–18].

### Treatment Objectives

- Redirection of maxillary growth
- Correction of distal sagittal relationship to Class I
- Overbite correction and overjet reduction to normal values
- Establishment of normal torque and inclination of the teeth with well-coordinated dental arch forms
- Improvement of soft tissue relationship and patient's facial appearance.

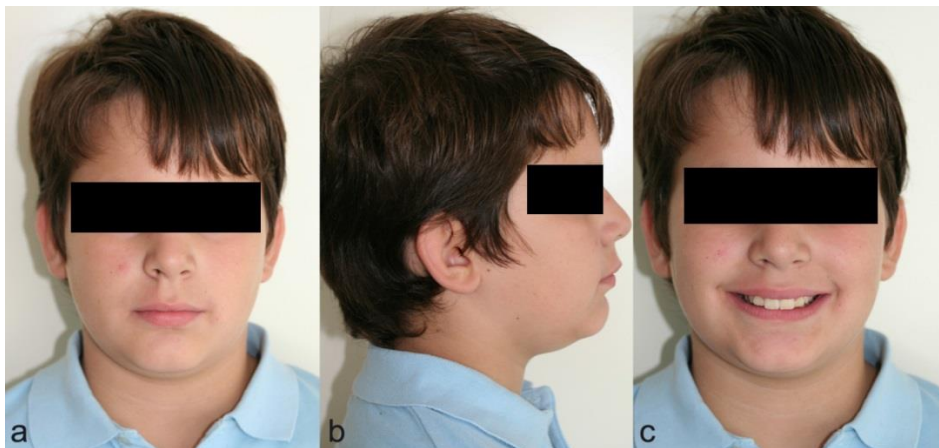
### Case Report

The case of a 10-year-old boy with Class II division 1 malocclusion is presented. The chief complaint was excessive protrusion of the maxillary anterior teeth. A similar malocclusion existed in his mother as well, which shows an inherited etiology of this orthodontic problem. The patient's motivation was largely internal, and he decided to cooperate with the nonextraction cervical headgear treatment.

### Diagnosis

The patient's face was symmetric and soft tissue profile was the convex one. The lips were competent because of the soft tissue enlargement. Mentolabial sulcus was strongly distinctive. The height of the lower third of the face was reduced. There was a reduced nasolabial angle (Fig. 1 a–c). The patient had a Class II division 1 malocclusion in the permanent dentition. There was an excessive protrusion of the upper incisors. Overjet was 9mm and a deep, impinging overbite, with a moderate maxillary and mild mandibular crowding (Fig. 2 a–e).

<sup>\*</sup>Correspondence to: Konstantinos Papadopoulos, DDS, PhD  
Specialistic Orthodontic Practice, Katerini, Greece  
Kassandrou 49, 60100 Katerini, Greece  
E-mail: kl\_papadopoulos@yahoo.gr  
Received January 5<sup>th</sup>, 2016 / Accepted February 23<sup>rd</sup>, 2016



**Fig. 1** Patient's facial appearance before therapy a) "en face", b) profile, c) smile

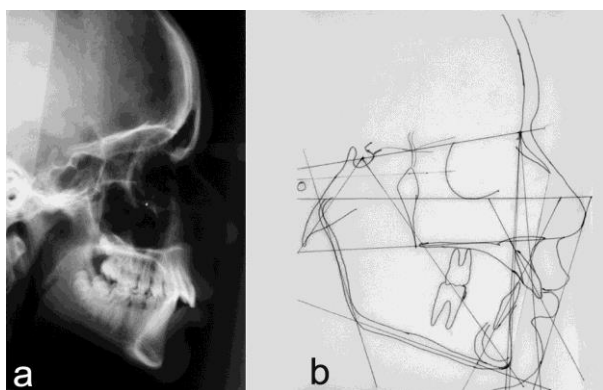


**Fig. 2** Intraoral photographs before therapy a) occlusion "en face", b) occlusion-right profile, c) occlusion-left profile, d) lower dental arch appearance, e) upper dental arch appearance.

The measurements of the lateral head radiograph showed the following (Table 1):

**Table 1** Cephalometric analysis results

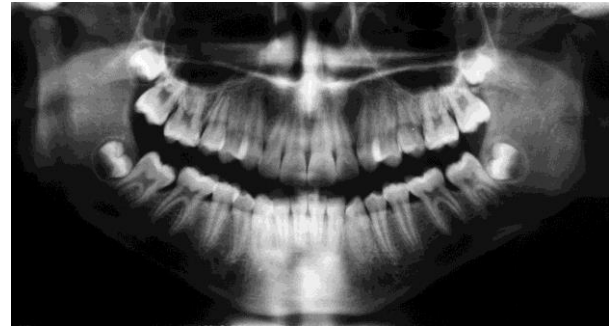
Measurements	Avg.	Min.	Max.	Initial	Final
<b>Skeletal anteroposterior</b>					
NSBa	131°			133°	134°
FH – SN	6°	4°	8°	10°	12°
FH – NA	88°			94°	91°
FH – NPog	87.8°	82°	95°	87°	88.5°
SNA	80°	76.2°	83.8°	85°	82°
SNB	78°	75°	81°	77°	78°
ANB	2.8°	0.5°	5.1°	8°	4°
<b>Skeletal Vertical</b>					
FH – MP	23°	17°	28°	20°	21°
SN – MP	32°	30°	34°	29°	29°
SN – PP	8.5°	7°	10°	5.5°	7°
NSGn	68°	63°	72°	65°	68°
Y – AXIS	59.4°	53°	66.2°	56°	58°
Upper face height	44%	44%	45%	48%	45%
Lower face height	56%	55%	56%	52%	55%
<b>Dental relationships</b>					
AB – FOP	90.1°	80.75°	96°	74°	80°
FOP – PP	11.3°	9.6°	13.8°	7°	5°
U1 – FH	110°	105°	115°	116°	108°
U1 – PP	110.2°	105°	115°	114°	105°
U1 – APog	22°	19°	25°	39°	24°
Dist1 – APog	2.7 mm	-1 mm	+5 mm	8mm	3.5mm
L1 – FH	65°	60°	70°	63°	55°
L1 – MP	91.4°	-8.5°	+7°	96°	105°
L1 – FOP	72.3°	68.6°	76.7°	66°	58°
L1 – APog	23°	20°	26°	16°	25°
Dist L1 – APog	0 mm	-2 mm	+3 mm	3.5 mm	0 mm
U1 – L1	135.4°	139°	150°	128°	128°
<b>Soft tissues</b>					
Dist UL – EP	-2 mm	-3 mm	-1 mm	0.5mm	-3 mm
Dist LL – EP	-1 mm	-2 mm	0 mm	0 mm	-2mm



**Fig. 3** a) Lateral head radiograph before therapy;  
b) Cephalometric tracing before therapy.

Skeletal Class II malocclusion (ANB 8°), maxillary protrusion (SNA 85°, angle Lande 94°). A forward rotation of the mandible with the angle FMA 20° and SN-MP 29°. Horizontal type of growth lower face height 52%. Labial inclination of the upper incisors U1-

APog 39°, linear 9mm. Reduced interincisive angle of 128° (Table 1, Fig. 3). Panoramic radiogram has shown the existence of the third molars (Fig. 4)



**Fig. 4** Panoramic radiograph before therapy.

### Treatment plan

Treatment goals included the inhibition and redirection of maxillary growth, correction of Class II malocclusion, overjet and overbite reduction and establishing normal torque and inclination of the teeth. The final goal was improvement in the relation between soft tissue and patient's profile. Priority in the treatment planning was the correction of the skeletal deformation with a modification of growth because the patient was in the beginning of the pubertal growth spurt. Cervical headgear (Kloehn type) was applied with the inner bow of the facebow expanded 8 to 10mm and placed in molar headgear tube. To prevent the extrusion of molars the outer bow was long and bent upward 15° to 20°. The force applied during the first week was 250 g per side, in order to be more comfortable for the patient. After that the applied force was enlarged to 450 g per side. Patient was urged to wear the headgear 14 to 16 hours a day.

### Treatment progress

After 10 months of treatment with cervical headgear, correction of the sagittal relation of the molars was achieved (Class I). The maxillary first molars were distalized and that was a sign of dentoalveolar effect of the appliance. Posterior spaces in the maxillary arch were needed to resolve the problems of crowding and incisors protrusion. However, since the fourth month of treatment, there has been noticed a reduction in overjet with a simultaneous overbite correction. Fixed appliances were placed in the upper and lower jaw and the patient was wearing the headgear only at night. The retraction of the premolars and canines started when the position of the upper first molars was stable. Once the premolars and canines were fully retracted with lacebacks, the incisors were retracted with T-loops, bent to a 0,016×0,022 stainless steel arch wire. Treatment results have been accomplished during a period of 25 months. For the retention, the invisible plastic retainers were used in the upper and lower jaw.



### Treatment results

Treatment has led to the facial aesthetic improvement with an obvious correction of the position and the

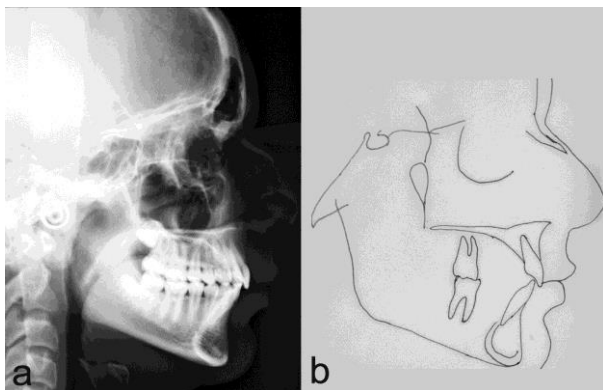
relationship between the upper and lower lip (Fig. 5 a–c), Class I canine and molar relationships were present, overjet reduction from 9mm to 2mm and normalization of overbite (Fig. 6 a–f).



**Fig. 5** The patient's appearance after therapy a) "en face", b) profile, c) smile



**Fig. 6** Intraoral photographs after therapy a) occlusion - "en face", b) occlusion-right profile, c) occlusion-left profile, d) lower dental arch appearance, e) upper dental arch appearance, f) smile



**Fig. 7** a) Lateral head radiograph after therapy;  
b) cephalometric tracing after therapy.

Cephalometric measurements (Table 1) have shown a significant amount of skeletal and dental changes. Reduction of ANB angle from  $8^\circ$  to  $4^\circ$  and SNA angle from  $85^\circ$  to  $82^\circ$ . The lower third of the face was increased NSGn from  $65^\circ$  to  $68^\circ$ . Correction in the inclination and position of upper incisors (U1-FH from  $116^\circ$  to  $108^\circ$ , U1-PP from  $114^\circ$  to  $105^\circ$ , U1-Apog from  $39^\circ$  to  $24^\circ$ , and DistU1-APog from 8mm to 3,5mm. Labial inclination of lower incisors L1-FH from  $63^\circ$  to  $55^\circ$ , L1-MP from  $96^\circ$  to  $105^\circ$ , and interincisal angle remained the same (U1-L1  $128^\circ$ ) (Fig. 7).

Radiographic examination indicated satisfactory root paralleling without any loss of tissue (Fig. 8).



**Fig. 8** Panoramic radiograph after therapy.

## Discussion

Treatment results indicate the validity of cervical headgear use in patients with Class II div.1 malocclusion, in which case it is necessary to achieve inhibition of maxillary growth and ensure the normal growth of the mandible. With the use of this appliance there is no need for maxillary first premolar extractions which makes the cervical headgear preferable to the patient. Cervical headgear showed a greater effect in distal tipping of the upper first molars and changes in the rotation of the distal part of the maxilla. However, the impact of this type of appliance on the rotation of jaws was reversible because after cervical headgear treatment and the continued growth of the maxilla and mandible the forward rotation remained [4].

Other authors also consider that there is a significant change in the rotation, but the change is related to the inclination of the frontal part of the maxilla [9, 10].

Reduction in the convexity of facial profile was mentioned by all the authors who proved with longitudinal studies the changes from the beginning to the end of the treatment [6, 8, 14, 17] and the same was observed in our patient too.

The disadvantage in this appliance is mainly related to the dependence of the outcome of the treatment on the patient's compliance.

## Conclusion

The main treatment planning for the patients with skeletal Class II malocclusion associated with maxillary protrusion is the modification, inhibition of maxillary growth and distal movement of the upper first molars. This can be achieved by an application of cervical headgear and extraoral vector of force acting through the center of resistance of the upper first molars. In this case report inhibition of maxillary growth and distal movement of the upper first molars was achieved by the combination of skeletal and dentoalveolar effects of the appliance.

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