Original Article

Effects of skeletally anchored Class II elastics: *A pilot study and new approach for treating Class II malocclusion*

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ABSTRACT

Objective: To evaluate the skeletal, dentoalveolar, and soft tissue effects of skeletally anchored Class II elastics and compare them with a matched control group treated by a monobloc appliance for the correction of skeletal Class II malocclusion due to mandibular retrusion.

Materials and Methods: Twelve patients (6 girls, 6 boys) were randomly divided into two groups. In the elastics group, six patients (12.9 $\pm$ 1.5 years of age; 3 boys, 3 girls) were treated with skeletally anchored Class II elastics. Two miniplates were placed bilaterally at the ramus of the mandible and the other two miniplates were placed at the aperture piriformis area of the maxilla. In the monobloc group (3 boys and 3 girls; mean age, 12.3 $\pm$ 1.6 years), patients used the monobloc appliance. The changes observed in each phase of treatment were evaluated using the Wilcoxon matched-pair sign test. Intergroup comparisons at the initial phase of treatment were analyzed by the Mann-Whitney *U* test.

Results: There were statistically significant group differences in Co-Gn, B-VRL, U1-PP, U1-VRL, Ls-VRL, with significant increases in these parameters in the elastics group ($P < .05$). The mandibular incisors were protruded in the monobloc group (5.45 $\pm$ 1.23°), whereas they were retruded in the elastics group (–3.01 $\pm$ 1.66°; $P < .01$).

Conclusions: The undesirable dentoalveolar effects of the monobloc appliance were eliminated by using miniplate anchorage. Favorable skeletal outcomes can be achieved by skeletal anchorage therapies which could be an alternative to treat skeletal Class II patients with mandibular deficiency. (*Angle Orthod.* 2017;87:505–512)

KEY WORDS: Skeletal anchorage; Class II; Activator; Functional treatment

INTRODUCTION

Class II malocclusion is one of the most common orthodontic conditions,affecting approximately 30% of the population.[1,2] Skeletal Class II malocclusion can be caused by maxillary protrusion, mandibular retrusion, or a combination of both.[3] Among these, mandibular retrusion is the most common.[4] There are many kinds of removable and fixed functional appliances available for treating this malocclusion; the primary purpose of these appliances is to stimulate mandibular growth by forward positioning of the mandible.[5–7]

Although the efficiency of removable and fixed functional appliances has been shown by many authors, unfavorable dental side effects, such as labial tipping of mandibular incisors, retrusion of maxillary incisors, distal and intrusive movement of maxillary posterior teeth, and mesial movement of the mandibular dentition, have been reported. These may limit the skeletal effects of functional appliances.[7–11] Recently, some authors demonstrated different approaches to overcome this problem. Aslan et al.[12] used the Forsus Fatigue Resistant Device (FRD) combined with miniscrew anchorage. Unal et al.[11] and Celikoglu et al.[10] used the Forsus FRD appliance with miniplate anchorage inserted in the mandibular symphysis to increase the anchorage of the mandibular dentition and avoid tipping of the mandibular incisors. However, no study used skeletal anchorage to increase the anchorage of

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Figure 1. Miniplates inserted in maxilla and mandible.

the maxillary dentition and avoid retrusion of the maxillary incisors.

The aim of this pilot study was to evaluate the skeletal, dentoalveolar, and soft tissue effects of skeletally anchored Class II elastics and compare the findings with a matched control group treated with a monobloc appliance for the correction of skeletal Class II malocclusion due to mandibular retrusion.

MATERIALS AND METHODS

Ethical approval of this prospective clinical study was obtained from the local ethics committee of Antalya Education and Research Hospital. The parents of the patients signed an informed consent before inclusion in the study. The sample consisted of 12 patients exhibiting skeletal Class II malocclusion with mandibular retrognathia. Patient selection criteria included the following: full Class II molar relationship, a minimum 5 mm overjet, horizontal or normal growth pattern, minimal crowding, no extracted or missing permanent teeth (excluding third molars), evidence of being in an active growth period (peak stage of pubertal growth determined according to the methods of Björk[13] and Grave and Brown[14]), and no history of previous orthodontic treatment.

Fifteen patients who met the inclusion criteria were included in the study. However, one of them was excluded from the monobloc group due to poor oral hygiene and lack of cooperation, and two patients were excluded from the elastics group because of excess mobility of the miniplates. The study was carried out on the 12 remaining patients (6 girls, 6 boys). Because the treatment protocol involved surgical procedures in one group and some patients could not afford the surgery, a fully randomized procedure could not be performed. Six patients (12.9 $\pm$ 1.5 years of age; 3 boys, 3 girls) who accepted surgical intervention were assigned to the elastics group and treated with skeletally anchored Class II elastics. In those patients, two miniplates (Stryker, Leibinger, GmbH & Co KG, Freiburg, Germany) were placed bilaterally at the ramus of the mandible and another two miniplates were placed at the aperture piriformis area of the maxilla under local anesthesia by a surgeon. The miniplates were adjusted and fixed by three miniscrews (diameter, 2 mm; length, 7 mm; Figure 1). Class II elastics of 500 gf were used bilaterally between miniplates and changed daily by the patients (Figure 2). Six patients (3 boys and 3 girls, mean age 12.3 $\pm$ 1.6 years) were treated with the monobloc appliance (Figure 3). The patients were instructed to use the appliance 24 hours per day except during meals. In both groups, patients used their elastics and appliances until a Class I canine and molar relationship was achieved and the increased overjet was eliminated. Mean duration of treatment

Figure 2. İntraoral view of miniplate-anchored Class II elastics.

was 0.68 ± 0.05 years for the elastics group and 0.65 ± 0.09 years for the monobloc group.

Standardized lateral cephalograms were taken within 2 weeks of treatment start (T1) and at treatment end (T2; immediately after correction of the increased overjet) using the same cephalostat (Planmeca Co, Helsinki, Finland). The cephalograms were taken in a natural head position with the teeth in centric occlusion.[15,16] A line passing through tuberculum sellae (intersection of the mandibular contours of the anterior clinoid processes and the anterior wall of the sella) and wing point (intersection of the contour of ala major with the jugum sphenoidale) was used as the horizontal reference line (HRL) and a perpendicular line passing through tuberculum sellae as the vertical reference line (VRL) (Figure 4). Twenty-seven angular and linear measurements were performed on the cephalograms (Figures 5 and 6) and [Table 1]. Measurements were calculated using the Dolphin Imaging Plus version 11.8 software package (Dolphin Imaging and Management Solutions, Chatsworth, Calif).

Statistical Analyses

All radiographic measurements were repeated 2 weeks later by the same author (S.O.) to estimate the repeatability of the measurement technique. The paired *t*-test did not show any significant differences between the first and second assessments ($P > .05$) nor did the Houston[17] test reveal any random measurement error (coefficient values were over 0.927).

Because of the small sample size, nonparametric tests were used in this study. The changes observed in each phase of treatment were evaluated using the Wilcoxon matched-pair sign test. Intergroup comparisons at the initial phase of treatment were analyzed by the Mann-Whitney *U* test. All statistical analyses were performed using the IBM SPSS software program (IBM

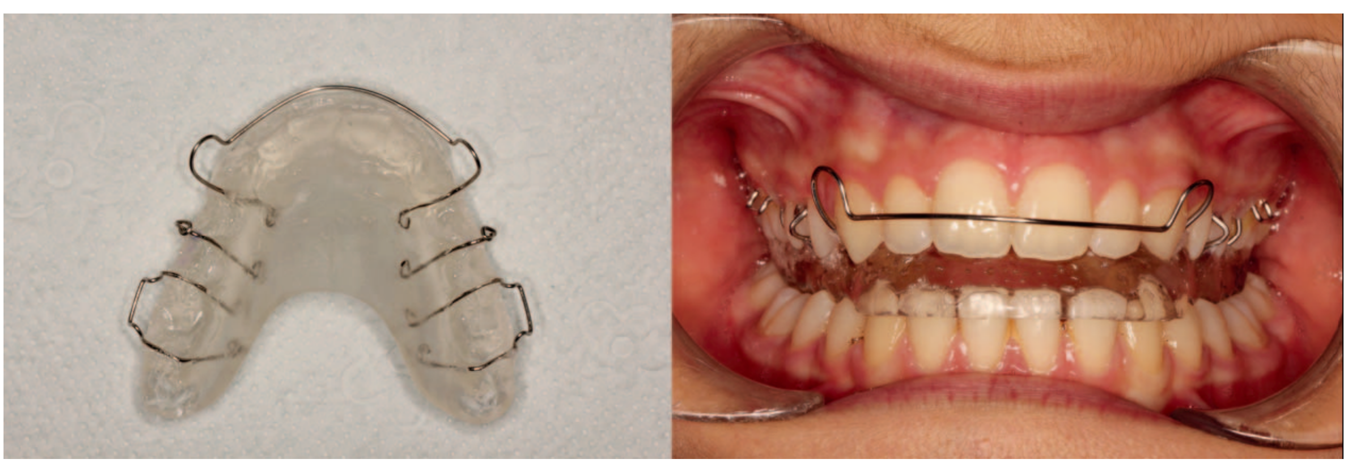

Figure 3. Design and intraoral view of monobloc appliance.

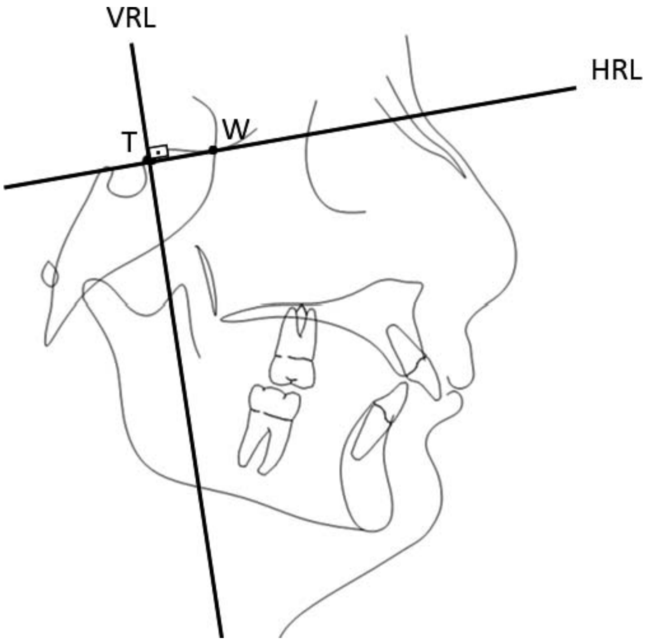

Figure 4. Reference planes used in the study.

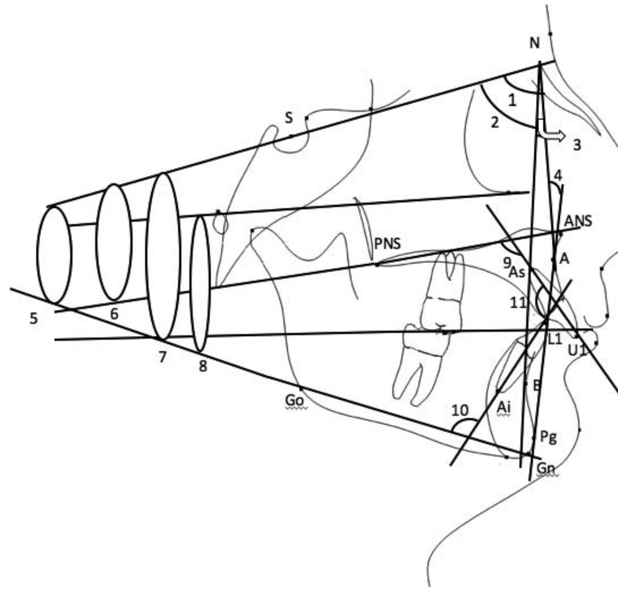

Figure 5. Angular measurements used in the study (in degrees): (1) SNA, (2) SNB, (3) ANB, (4) convexity, (5) SN-GoGn, (6) SN-PP, (7) SN-OP, (8) FMA, (9) U1-PP, (10) IMPA, and (11) U1-L1.

SPSS version 21.0, IBM Corp, Armonk, NY). The significance level was set at $P < .05$ for all tests.

RESULTS

Two of eight patients were excluded because of mobility of the miniplates. The success rate of the miniplates was found to be 90.6% (29 of 32 miniplates). During the use of miniplates, no other side effects (eg, breakage, infection) were encountered.

Intragroup Comparison

Results of the Wilcoxon signed rank test are shown in Table 2. In the elastics group, maxillary measurements of SNA and Co-A showed no significant changes ($P > .05$). Correction of the malocclusion was due mainly to mandibular changes ($P < .05$). The following were significant findings: decrease in maxillomandibular measurements, posterior rotation of the mandibular and occlusal planes, and forward movement of the upper lip and soft tissue pogonion (all $P < .05$). Retrusion of the mandibular incisors, protrusion of the maxillary incisors, and a decrease in overjet and overbite were observed (all $P < .05$).

In the monobloc group, maxillary measurements showed no significant changes except for A-HRL (1.78 ± 0.87 mm; $P < .05$). However, increases in mandibular measurements were evident, as were retrusion of the maxillary incisors, protrusion of the mandibular incisors, and decreased overjet and overbite (all $P < .05$). Statistically significant were the decrease in maxillomandibular measurements, increase in vertical measurements (except for SN-PP), and forward displacement of the lower lip and soft tissue pogonion (all $P < .05$).

Intergroup Comparison

Results of the Mann-Whitney *U* test are shown Table 3. Statistically significant differences were observed between groups in the Co-Gn, B-VRL, U1-PP, IMPA,

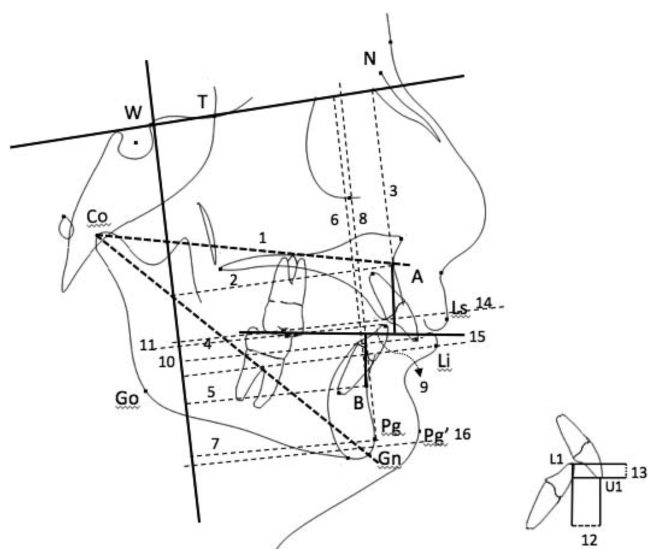

Figure 6. Linear measurements used in the study (in millimeters): (1) Co-A, (2) A-VRL, (3) A-HRL, (4) Co-Gn, (5) B-VRL, (6) B-HRL, (7) Pog-VRL, (8) Pog-HRL, (9) Witts, (10) U1-VRL, (11) L1-VRL, (12) overjet, (13) overbite, (14) Ls-VRL, (15) Li-VRL, and (16) Pog(s)-VRL.

Table 1. Summary of Cephalometric Landmarks and Definitions

	Abbreviation	Definition
1	SNA (°)	Angle between the lines sella-nasion and nasion–A-point
2	Co-A (mm)	Effective maxillary length between condylion and A-point
3	A-VRL (mm)	Distance between A-point and vertical reference line
4	A-HRL (mm)	Distance between A- point and horizontal reference line
5	SNB (°)	Angle between the lines sella-nasion and nasion–B-point
6	Co-Gn (mm)	Effective mandibular length between condylion and gnathion
7	B-VRL (mm)	Distance between B-point and vertical reference line
8	B-HRL (mm)	Distance between B-point and horizontal reference line
9	Pog-VRL (mm)	Distance between pogonion and vertical reference line
10	Pog-HRL (mm)	Distance between pogonion and horizontal reference line
11	ANB (°)	Angle between the lines A-point–nasion and nasion–B-point
12	Convexity (°)	Angle between nasion–A-point and A-point–pogonion
13	Wits (mm)	Drawn perpendiculars from points A and B onto the occlusal plane and measured distance between these two points
14	SN-PP (°)	Angle between sella-nasion and palatal plane
15	SN-OP (°)	Angle between sella-nasion and occlusal plane
16	SN-GoGn (°)	Angle between sella-nasion and mandibular plane
17	FMA (°)	Angle between Frankfurt horizontal and mandibular planes
18	U1-PP (°)	Angle between palatal plane and long axis of maxillary incisor
19	IMPA (°)	Angle between mandibular plane and long axis of mandibular incisor
20	U1/L1 (°)	Angle between maxillary incisor axis and mandibular incisor axis
21	U1-VRL (mm)	Distance from maxillary incisor tip to vertical reference line
22	L1-VRL (mm)	Distance from mandibular incisor tip to vertical reference line
23	Overjet (mm)	Distance from the mandibular incisor to maxillary incisor tips on the sagittal plane
24	Overbite (mm)	Distance from mandibular incisor to maxillary incisor tips on the vertical plane
25	Ls-VRL (mm)	Distance from upper lip to vertical reference line
26	Li-VRL (mm)	Distance from lower lip to vertical reference line
27	Pog(s)-VRL (mm)	Distance from soft tissue pogonion to vertical reference line

U1-VRL, L1-VRL, Ls-VRL, and Li-VRL measurements ($P < .05$). Increases in the Co-A and B-VRL measurements were greater in the elastics group ($P < .05$). In the monobloc group, mandibular incisor protrusion was noticeable, whereas retrusion was found in the elastics group ($P < .01$). A significant protrusion of the lower lip was found in the monobloc group, whereas a significant protrusion of the upper lip was found in the elastics group ($P < .01$).

DISCUSSION

Correcti skeletal Class II malocclusion due to mandibular retrusion with functional appliances is a common treatment approach in young patients.[19] As in other functional appliances, the monobloc may produce significant undesirable dentoalveolar changes, predominantly flaring of the mandibular incisors.[18] To overcome this major side effect and to enhance the skeletal contribution, temporary anchorage devices have been applied by clinicians.[10–12,20–21] In this prospective clinical study, a new intraoral skeletal anchorage treatment for stimulation of mandibular growth was compared with monobloc treatment, which is frequently used to treat skeletal Class II malocclusion.

Timing appliance therapy to occur at the peak of the pubertal growth spurt has been shown to be crucial, contributing more skeletal effect for molar and overjet correction in the treatment of Class II division 1 malocclusions.[22] Franchi et al.[23] reported significantly greater increases during the pubertal peak in total mandibular length and mandibular ramus height compared with treatment before puberty. Thus, the maturation stage of the patients included to our study was MP3cap (capping of the epiphysis on the diaphysis of the medial phalanx of the middle finger) before treatment.

The outcomes demonstrated that no statistically significant change in the SNA angle was found in either of the two treatment groups ($P > .05$). This finding is in accordance with the results of others[12,19,24–26] On the other hand, several studies have reported that treatment with various functional appliances in growing patients demonstrated a high-pull headgear effect on the maxilla.[24–26] This contradiction may be related to variation of sample groups, treatment start ages of patients, and different treatment mechanics. The increase in another maxillary parameter, Co-A, was not found to be statistically significant in the groups ($P > .05$). According to Bilgiç et al.,[27] this may be related to the lack of change in condylar growth in the sagittal direction. However, Karaçay et al.[8] reported a significant increase in Co-A that was probably caused by adaptive growth of the condyle.

Table 2. Comparison of Changes Observed in Each Group

	Elastics Group			Monobloc Group		
	(T1), Mean/SD	(T2), Mean/ SD	*P*	(T1), Mean/ SD	(T2), Mean/ SD	*P*
Maxillary measurements						
SNA (°)	79.53 ± 0.66	79.45 ± 1.07	.753	80.86 ± 0.92	80.21 ± 1.09	.248
Co-A (mm)	79.56 ± 2.17	80.65 ± 1.59	.173	81.93 ± 4.39	82.40 ± 4.31	.248
A-VRL (mm)	57.08 ± 6.07	59.40 ± 5.81	.028	57.10 ± 9.61	56.93 ± 9.43	.753
A-HRL (mm)	50.51 ± 7.18	52.33 ± 6.99	.028	50.68 ± 3.92	52.46 ± 4.34	.028
Mandibular measurements						
SNB (°)	73.28 ± 0.76	76.53 ± 1.17	.027	74.98 ± 1.20	77.38 ± 1.38	.028
Co-Gn (mm)	96.91 ± 2.58	103.98 ± 2.13	.028	101.88 ± 4.86	105.78 ± 5.37	.028
B- VRL (mm)	47.35 ± 10.12	52.18 ± 8.87	.028	47.50 ± 9.22	49.53 ± 9.47	.027
B- HRL (mm)	81.18 ± 7.71	83.41 ± 7,42	.027	82.18 ± 4.58	85.01 ± 4.08	.027
Pog-VRL (mm)	50.73 ± 9.81	52.81 ± 9.96	.028	48.91 ± 11.57	50.83 ± 12.67	.028
Pog-HRL (mm)	93.53 ± 5.88	96.46 ± 5.85	.027	95.26 ± 5.77	97.98 ± 5.78	.027
Maxillomandibular measurements						
ANB (°)	6.25 ± 0.63	2.88 ± 1.11	.028	5.88 ± 0.76	2.68 ± 0.87	.028
Convexity (°)	11 ± 2.63	5.08 ± 3.30	.028	9.65 ± 3.16	3.05 ± 2.54	.028
Wits (mm)	5.61 ± 0.69	2.18 ± 1.20	.027	5.36 ± 0.62	2.76 ± 0.52	.028
Vertical measurements						
SN-PP (°)	3.60 ± 0.53	3.40 ± 1.05	.60	3.43 ± 0.4	2.76 ± 0.84	.141
SN-OP (°)	16.41 ± 3.16	17.18 ± 3.34	.027	18.10 ± 2.45	19.46 ± 2.83	.028
SN-GoGn (°)	31.63 ± 2.07	32.46 ± 1.72	.249	32.56 ± 2.76	33.78 ± 2.60	.028
FMA (°)	24.35 ± 0.76	25.35 ± 0.72	.028	25.51 ± 1.43	26.41 ± 1.12	.028
Dentoalveolar measurements						
U1-PP (°)	112.25 ± 3.23	116.85 ± 4.61	.028	114.16 ± 2.21	111.8 ± 2.60	.046
IMPA (°)	96.86 ± 2.66	93,85 ± 1.35	.028	94.06 ± 2.13	99.51 ± 1.69	.028
U1/L1 (°)	123.95 ± 2.07	125.03 ± 2.11	.173	121.26 ± 1.23	123.55 ± 2.7	.116
U1- VRL (mm)	61.85 ± 9.17	64.98 ± 7.78	.028	60.73 ± 12.27	58.13 ± 11.88	.028
L1- VRL (mm)	63.55 ± 8.18	62.83 ± 8.32	.027	65.91 ± 4.75	69.35 ± 4.23	.028
Overjet (mm)	7.98 ± 1.55	3.18 ± 0.50	.028	6.76 ± 1.31	2.95 ± 1.10	.028
Overbite (mm)	5.11 ± 1.00	2.58 ± 1.05	.028	5.43 ± 1.81	1.88 ± 1.62	.028
Soft tissue measurements						
Ls-VRL (mm)	70.36 ± 6.60	71.58 ± 6.43	.027	70.28 ± 11.61	69.66 ± 11.54	.463
Li-VRL (mm)	64.58 ± 8.02	64.03 ± 7.85	.249	65.68 ± 10.61	67.38 ± 11.65	.027
Pog (s)-VRL (mm)	60.88 ± 8.66	64.38 ± 8.06	.028	57.48 ± 12.53	59.16 ± 12.28	.027

In our study, the forward and downward displacement of the mandible was increased, represented by the SNB angle and Co-Gn, B-VRL, B-HRL, Pog-VRL, and Pog-HRL distances ($P < .05$). These findings are similar to those reported in previous studies examining functional appliances.[10,18,27] However, a statistically significant difference between the groups was observed, in which there was a greater increase in the sagittal movement of point B and Co-Gn length. Furthermore, the amount of mandibular advancement was doubled in the elastics group (B-VRL, 4.83 ± 1.81 mm; Co-Gn, 7.06 ± 0.88 mm) compared with the monobloc group (B-VRL, 2.03 ± 1.41 mm; Co-Gn, 3.90 ± 1.33 mm) in the present study. This difference may be associated with using more stable anchorage units and less anchorage loss in the miniplate-anchored Class II elastics group, which can be attributed to the forces being applied directly from maxillary to mandibular bones and not teeth. The angle of convexity, ANB angle, and Wits appraisal were decreased in both groups, all improvements in maxillomandibular relationships. However, the intergroup difference was not statistically significant ($P > .05$). As in the current study, maxillomandibular improvement was achieved in several studies.[10,11,27]

Most previous studies using various functional appliances have reported that the SN-GoGn angle was unchanged.[8,9,26] Conversely in our study, this angle was insignificantly increased in the elastics group and slightly increased in the monobloc group. This could have been due to extrusion of the mandibular posterior teeth in the monobloc group. Nevertheless, the difference between the two groups was not significant.

Dentoalveolar side effects of tooth-borne functional appliances, such as the monobloc, have been reported by several authors.[7,25,26] In the present study, a significant protrusion of the mandibular incisors was found in the monobloc group ($P < .05$). However, in the elastics group, significant retrusion of these teeth was observed ($P < .05$). Functional appliances with skeletal anchorage have been reported to eliminate mandibular incisor protrusion and retrusion of maxillary incisors during Class II treatment.[10,11] The difference between

Table 3. Statistical Evaluation of Changes Obtained in Monobloc and Skeletal Anchorage Groups

	Elastics Group, Mean ± SD	Monobloc Group, Mean ± SD	*P*
Maxillary measurements			
SNA (°)	−0.083 ± 0.96	−0.65 ± 0.27	.180
Co-A (mm)	1.08 ± 1.86	0.46 ± 0.93	.699
A-VRL (mm)	2.31 ± 1.34	−0.16 ± 1.52	.065
A-HRL (mm)	1.81± 0.79	1.78 ± 0.87	.988
Mandibular measurements			
SNB (°)	3.25 ± 0.89	2.40 ± 0.90	.093
Co-Gn (mm)	7.06 ± 0.88	3.90 ± 1.33	.026
B-VRL (mm)	4.83 ± 1.81	2.03 ± 1.41	.015
B-HRL (mm)	2.23 ± 1.03	2.83 ± 1.16	.240
Pog-VRL (mm)	2.08 ± 0.90	1.91 ± 1.50	.589
Pog-HRL (mm)	2.93 ± 0.84	2.71 ± 0.80	.394
Maxillomandibular measurements			
ANB (°)	−3.18 ± 0.84	−3.20 ± 0.85	.937
Convexity (°)	−5.63 ± 2.57	−6.73 ± 1.65	.485
Wits (mm)	−3.40 ± 0.92	−2.60 ± 0.63	.180
Vertical measurements			
SN-PP (°)	−0.20 ± 0.89	−0.68 ± 1.01	.394
SN-OP (°)	0.76 ± 0.26	1.36 ± 0.75	.093
SN-GoGn (°)	0.83 ± 1.57	1.21 ± 0.49	.589
FMA (°)	0.86 ± 0.58	1.10 ± 0.63	.485
Dentoalveolar measurements			
U1-PP (°)	4.60 ± 2.40	−2.33 ± 1.87	.002
IMPA (°)	−3.01 ± 1.66	5.45 ± 1.23	.002
U1/L1 (°)	1.08 ± 1.59	2.28 ± 2.62	.485
U1-VRL (mm)	2.05 ± 1.68	−2.60 ± 1.45	.002
L1-VRL (mm)	−0.71 ± 0.47	3.43 ± 1.68	.002
Overjet (mm)	−4.80 ± 1.18	−3.81 ± 0.67	.180
Overbite (mm)	−2.53 ± 1.31	−3.55 ± 0.48	.240
Soft tissue measurements			
Ls-VRL (mm)	1.21 ± 0.56	1.45 ± 1.90	.041
Li-VRL (mm)	−0.55 ± 0.99	1.60 ± 1.37	.015
Pog (s)-VRL (mm)	3.50 ± 2.18	1.81 ± 1.03	.240

the two groups in posttreatment maxillary incisor position was noticeable ($P < .01$). Consistent with the literature, maxillary incisor retrusion was observed in the monobloc group.[8,18,27] On the other hand, protrusion of these teeth was observed in the elastics group. This situation can be explained by the contact of the labial surfaces of the mandibular incisors with the palatal surfaces of the maxillary incisors as the mandible moves forward under the influence of the intermaxillary elastic forces.

In both treatment groups, soft tissue pogonion moved forward significantly ($P < .05$), improving the facial soft tissue convexity. A slight retrusion of the maxillary lip was observed in the monobloc group. Turkkahraman et al.[21] indicated that this finding was attributed to heavy distal forces acting on the maxillary arch and resultant retrusion of the maxillary incisors. In addition, these findings are similar to the soft tissue findings of previous studies.[8,11,27] However, protrusion of the lower lip was found in the monobloc group, whereas a slight retrusion was found in the elastics group ($P < .05$). This difference might be related to the posttreatment inclination of the mandibular incisors. On the other hand, some studies reported forward movement of the lower lip with skeletal-anchored functional appliances.[10,11] This contradictory finding may be related to the variance in soft tissue reference lines, treatment start time, soft tissue thickness, and different treatment mechanics.

Although the miniplate-anchored Class II elastics may be preferred as a treatment method by many orthodontists and patients, this new method has some disadvantages. First, miniplate-anchored treatment involves two surgeries and an increased orthodontic treatment cost, which many patients could not afford. For this reason, a full randomization could not be performed. Thus, we included those patients in the monobloc group. Another disadvantage of the miniplate technique is that further operations are needed in the case of breakage or mobility of miniplates. Similar to the success rates of miniplates observed in this study (90.6%), Turkkahraman et al.[21] (33 of 35 miniplates, 94.3%) and Unal et al.[11] (38 of 42 miniplates, 91.5%) reported similar success rates.

Both the study and control groups in the present study were small—a limitation of this study. However, we evaluated a treatment approach for correcting mandibular retrusion not previously reported. Further prospective clinical studies with larger sample sizes are needed to more fully explore and confirm our findings.

CONCLUSIONS

- Effective mandibular length was significantly greater in the miniplate-anchored Class II elastics group than in the patients treated with the monobloc.
- Mandibular incisor retrusion was observed in the miniplate-anchored Class II elastics group, whereas mandibular incisor protrusion was found in the monobloc group. Reduction in overjet and overbite were found in both treatment groups.
- The undesirable dentoalveolar effects of the monobloc appliance were eliminated by the use of miniplate anchorage. Favorable skeletal outcomes can be achieved by skeletal anchorage therapy, which might be an alternative approach for treating skeletal Class II patients with mandibular deficiency.
- Further studies and clinical trials with a larger sample size are recommended to confirm the results of this pilot study.

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