Original Article

A comparison of treatment results of adult deep-bite cases treated with lingual and labial fixed appliances

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ABSTRACT

Objectives: To compare the cephalometric treatment results of adult deep-bite cases after labial and lingual fixed orthodontic treatment.

Materials and Methods: A total of 102 patients underwent lingual orthodontic treatment and complete records were evaluated. The following inclusion criteria were used: patients who had Angle Class I or mild Class II malocclusion; comprehensive orthodontic treatment that did not include intrusion mechanics or any extractions; patients with an initial overbite of more than 3.7 mm. Thirteen patients met the inclusion criteria. These cases were matched with the same number of patients according to age with a labial orthodontic treatment group. Pre- and post-treatment cephalometric radiographs were evaluated. Independent *t* test or Fisher exact tests were performed to assess the differences between the groups.

Results: Proclination of the upper incisors was higher in the labial group. Incisor mandibular plane angle (IMPA) showed an increase of 1.2° in the lingual group and 9.7° in the labial group. Lower incisor edge was approximately in a stable sagittal position in the lingual group but significant lower incisor proclination was seen in the labial group. The lower incisors were intruded (-1 mm) in the lingual group but lower incisors were minimally extruded (0.3 mm) in the labial group. No significant difference was found in the movements of upper and lower molars for both groups.

Conclusions: The nature of lower incisor movement involved less protrusion in lingual orthodontics than the labial treatment. Lingual orthodontic treatment is a better option in adult cases where intrusion of lower incisors without labial tipping is desired. (*Angle Orthod.* 2021;91:590–596.)

KEY WORDS: Deep-bite; Lower incisor intrusion; Lingual orthodontics

INTRODUCTION

Treatment options for the deep overbite malocclusion depend on whether the patient is actively growing. In non-growing patients, the dentoskeletal responses to bite opening are minimal to none, so every adult patient with a deep overbite necessitates an extensive treatment plan that determines whether the overbite should be corrected by dentoalveolar compensation or orthognathic surgery. This decision is based on the initial amount of deep overbite, facial type, smile line, incisor display, and demand of the patient.

The upper incisor display generally decreases and lower incisor display increases with age. For this reason, intrusion of lower incisors is usually preferred during the correction of deep overbite in adult cases. From a biomechanical point of view, conventional intrusion mechanics and labial fixed orthodontics cause labial tipping of incisors, which does not always give favorable treatment results. To achieve pure intrusion without any tipping, interradicular mini-screws should be placed but, in some cases, the mini-screw might touch the root during intrusion and induce unwanted root resorption or screw loss.[1]

In lingual orthodontics, the force application point to the center of resistance changes and a lingual tipping force is created during intrusion movement.[2] Lingual brackets on the upper anterior teeth act like a bonded anterior bite plane and cause a reduction in the overbite. Intrusive forces exerted by lingual brackets are predominantly physiologic and these forces are

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produced by the patient's muscular system along the line of the center of resistance of the incisors.[3]

There are some biomechanical and laboratory studies[2–6] and case reports[7] related to lingual orthodontics but only a small number of clinical studies[8–14] have compared the clinical results comprehensively. There is a need to differentiate the movements of anterior teeth in deep bite patients between labial and lingual orthodontics. Therefore, the aim of this study was to compare the cephalometric treatment results for non-growing deep-bite patients after labial and lingual orthodontic treatment, mainly focusing on the movements of anterior teeth.

MATERIALS AND METHODS

This study was approved by Başkent University Institutional Review Board (Project number: D-KA 20/23).

The complete pretreatment records (radiographs, medical records and plaster models) of 102 patients who underwent lingual orthodontic treatment at Başkent University's clinic were retrospectively examined and the following inclusion criteria were applied: (1) Patients with ANB angle between 0 and 4°, (2) Patients who had Angle Class I or mild Class II malocclusion, (3) Completed orthodontic treatment that did not include any active intrusion arches or any extractions, (4) Patients with an initial overbite of more than 3.7 mm, (5) Non-growing patients, (6) No previous orthodontic treatment or orthognathic surgery, (7) No temporomandibular joint dysfunction. After the initial selection of the cases, 13 patients (nine females and four males, mean age: 35 ± 12.07 years) met the inclusion criteria. These patients were matched with the same number of cases according to age who had orthodontic treatment with labial appliances (10 females and three males, mean age: 32 ± 13.77 years). The total study group consisted of 26 patients.

The brackets of the lingual treatment group were STb lingual brackets (Ormco, Glendora, CA, USA) with 0.018-inch slots. The arch wire sequences were almost the same for all of the patients in the lingual treatment group as follows: 0.014-inch nickel-titanium (NiTi), 0.016-inch titanium molybdenum alloy (TMA), 0.0175 × 0.0175-inch TMA and 0.017 × 0.022-inch TMA. The brackets of the labial treatment group were Victory series brackets (3M Unitek, Monrovia, CA, USA) with 0.018-inch slots. The arch wire sequences were nearly the same for all patients in the labial group as follows: 0.014-inch NiTi, 0.016 × 0.016-inch NiTi, 0.016 × 0.022-inch NiTi, and 0.016 × 0.022-inch stainless steel (SS).

Similar mechanics were used for both treatment groups. Minimal interproximal reduction was performed in both groups to provide space and resolve the Bolton discrepancy when necessary. Bilateral inter-maxillary Class II elastics were used by two patients in the lingual group and three patients in the labial group. One of the patients in the lingual group used Class II elastics for 4 months and the other used these elastics for 3 months. In the labial group, the first patient used Class II elastics for 5 months, the second patient for 3.5 months, and the third patient for 6 weeks. All patients in both groups used settling elastics vertically on average for 3 months for the finishing phase.

The treatment results were evaluated using lateral cephalometric radiographs. All lateral cephalograms (Veraviewepocs 2D, Morita, Irvine, CA, USA) were in digital format and taken before treatment (T1) and after treatment (T2). All identifiable information of the patients was replaced by identification numbers by one author, and the other author traced the radiographs with Dolphin Imaging software (Version 11.5 Premium, Patterson Dental, Chatsworth, CA, USA). All bilateral anatomical structures were traced at the middle of the two images. A horizontal reference plane (HRP) was created 7° to Sella-Nasion plane and a vertical reference plane (VRP) perpendicular to HRP was created from Sella point. Landmarks and reference planes used in this study are shown in Figure 1. Differences for T1–T2 linear and angular measurements were recorded.

Statistical Analysis

The data were entered into SPSS software (Statistical Package for Social Science, Windows Version 23.0, Chicago, IL, USA). A power analysis was performed based on a prior study;[15] to detect a 1-mm difference for incisor intrusion, a sample of at least 13 subjects in each group would provide 80% power with $\alpha \leq 0.05$.

The Mann-Whitney *U*-test was used for comparing the data obtained from the space analysis between the groups. Independent *t* tests or Fisher exact tests were performed for all cephalometric variables to assess the differences between lingual and labial treatment groups with a *P* value of .05 to determine statistical significance. Two weeks after the initial tracing, 18 randomly selected cephalograms were retraced by the same author. Intraclass correlation coefficients were calculated for method error. All values were between 0.92 and 1.00.

RESULTS

There were no significant differences for the gender, age, and treatment duration between the groups ($P =$ .989, $P =$ .551, and $P =$ .881 respectively) (Table 1). When the dental casts of the patients were examined,

Table 1. Patient Baseline Characteristics[a]

	Lingual Group (X ± SD)	Labial Group (X ± SD)	*P*
Chronological age, y	35.07 ± 1.8	32.0 ± 2.9	.551
Gender			
Male	4	3	.989
Female	9	10	
Treatment duration, y	1.72 ± 0.69	1.75 ± 0.46	.881
Space analysis, mm			
Maxilla	−1.8 ± 1.4	−2.2 ± 1.5	.458
Mandible	−2.4 ± 1.6	−2.7 ± 1.3	.482

[a] SD indicates standard deviation; X, mean.

generally mild crowding (up to 3 mm) was found in both groups and there was no significant difference for the space analysis between the groups for maxilla and mandible ($P = .458$ and $P = .482$, respectively) (Table 1). When pretreatment values of the groups were evaluated, almost all variables showed similarities between the groups except L1 Tip-VRP ($P = .038$).

Skeletal measurements and their statistical analyses are shown in Table 2 and intergroup differences were not statistically significant ($P > .05$). There were no statistically significant differences for the vertical measurements (GoGn/SN and FMA) between the treatment groups but ANS-Me distance significantly increased in both groups with treatment ($P < .05$) (Table 2).

Mandibular and maxillary dental movements were evaluated in vertical and sagittal directions. Labial inclinations of the upper incisors (U1-NA, U1-SN, U1-PP) were increased with treatment in both groups but a significantly higher increase was observed in the labial group compared to the lingual group ($P < .05$) (Table 3). When the vertical movement of the upper incisors was evaluated by the U1Tip-HRP measurement, the intergroup difference was statistically significant and intrusion of the upper incisors was found in the lingual group ($P < .05$) (Table 3).

The upper and lower incisor tips relative to the vertical reference plane (U1 Tip-VRP and L1 Tip-VRP) showed an increase in the labial group which indicated the protrusion of the lower and upper incisors in the labial group ($P < .05$) (Tables 3 and 4); the intergroup differences were significantly higher in the labial group.

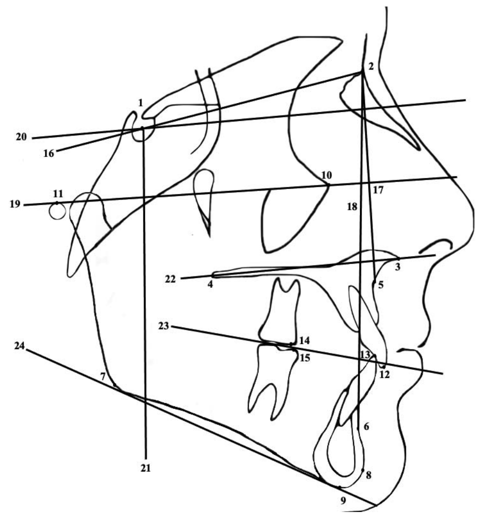

Figure 1. Landmarks and reference planes used in this study. (1) Sella (S); (2) Nasion (N); (3) Anterior nasal spine (ANS); (4) Posterior nasal spine (PNS); (5) A point; (6) B point (7) Gonion (Go); (8) Pogonion (Pog); (9) Menton (Me); (10) Orbitale (Or); (11) Porion (Po) (12) Tip of maxillary 1(U1); (13) Tip of mandibular 1 (L1); (14) Mesiobuccal cusp tip of maxillary first molar; (15) Mesiobuccal cusp tip of mandibular first molar; (16) Sella-Nasion plane (SN); (17) NA plane (NA); (18) NB plane (NB); (19) Frankfort horizontal plane (FH); (20) Horizontal reference plane/7° to SN (HRP); (21) Vertical reference plane (VRP); (22) Palatal plane (PP); (23) Occlusal plane (OP); (24) Mandibular plane (MP).

Table 2. Skeletal Measurements and Their Statistical Evaluation[a–c]

Measurements	Groups	T1 (X ± SD)	T2 (X ± SD)	*P*[a]	T2–T1	*P*[b]
SNA, °	Lingual	82.3 ± 4.2	82.7 ± 4.5	.309	-0.4 ± 1.2	.518
	Labial	80.1 ± 2.7	80.1 ± 2.5	.460	0 ± 1.3	
SNB, °	Lingual	79.1 ± 4.3	79.2 ± 4.4	.573	0.13 ± .81	.216
	Labial	77.6 ± 2.3	77 ± 2.1	.107	−0.6 ± 1.3	
ANB, °	Lingual	3.2 ± 1.9	3.4 ± 2.1	.414	0.25 ± 1	.886
	Labial	2.8 ± 1.7	3.2 ± 1.2	.153	0.35 ± 0.8	
Wits Appraisal, mm	Lingual	1.8 ± 2.8	1.2 ± 2.8	.127	−0.6 ± 1.3	.221
	Labial	0.8 ± 2.8	0.5 ± 2.4	.568	−0.3 ± 1.5	
GoGn/SN, °	Lingual	28.8 ± 6.1	28.8 ± 6.1	.985	0 ± 1.4	.5
	Labial	27.9 ± 4.9	28.7 ± 5	.247	0.72 ± 2.1	
FMA, °	Lingual	24.5 ± 3.7	24.7 ± 4.4	.785	0.2 ± 2.7	.896
	Labial	23.1 ± 4	23.6 ± 4.6	.504	0.5 ± 2.8	
ANS-Me, mm	Lingual	64.5 ± 4.5	66.2 ± 4.5	.028*	1.7 ± 2.5	.889
	Labial	62.9 ± 5.7	64.9 ± 6.5	.009*	2 ± 2.3	

[a] Intragroup comparisons between pre- and posttreatment measurements.
[b] Intergroup comparisons between posttreatment-pretreatment differences.
[c] SD indicates standard deviation; T1, pretreatment; T2, posttreatment; X, mean.
* Significant difference between pre- and posttreatment ($P < .05$).

Table 3. Maxillary Dental Measurements and Their Statistical Evaluation[a–c]

Measurements	Groups	T1(X ± SD)	T2 (X ± SD)	P[a]	T2–T1	P[b]
U1-NA, °	Lingual	19.9 ± 5.1	20.2 ± 5.1	.779	0.3 ± 3	.005*
	Labial	17.1 ± 8.2	23.4 ± 5.6	.023*	6.2 ± 6	
U1-NA, mm	Lingual	4 ± 1.4	3.8 ± 1.6	.157	−0.2 ± 1.2	.010*
	Labial	3.2 ± 2.2	4.1 ± 1.8	.127	0.9 ± 1.9	
U1-SN, °	Lingual	102.3 ± 8.6	103 ± 8.6	.584	0.7 ± 4.3	.008*
	Labial	97.3 ± 8.4	103.5 ± 6.6	.022*	6.2 ± 8.4	
U1-Palatal Plane, °	Lingual	111.3 ± 5.1	111.5 ± 5.2	.908	0.2 ± 3.7	.001*
	Labial	107 ± 8.5	113.7 ± 7.1	.006*	6.7 ± 7.1	
U1 Tip- HRP, mm	Lingual	72.0 ± 7.2	70.9 ± 6.7	.207	−1.1 ± 2.8	.010*
	Labial	70.9 ± 3.6	70.3 ± 4.6	.347	−0.6 ± 2.1	
U1 Tip-VRP, mm	Lingual	67.8 ± 7.2	69 ± 7.5	.147	1.2 ± 1.2	.004*
	Labial	65.5 ± 5	69.6 ± 5	.069	4.1 ± 2	
U6- HRP, mm	Lingual	66.7 ± 4.46	67.8 ± 4.75	.914	1.1 ± .75	.137
	Labial	63.53 ± 4.15	63.98 ± 3.98	.193	0.45 ± .83	
U6 long axis-SN, °	Lingual	78.28 ± 6.14	78.71 ± 7.1	.828	.43 ± 6.8	.432
	Labial	76.48 ± 6.87	77.87 ± 4.81	.358	1.39 ± 6	
U6- PP, mm	Lingual	23.18 ± 1.85	24.07 ± 2.22	.659	.89 ± .86	.237
	Labial	22.13 ± 3.3	23.47 ± 3.02	.25	1.34 ± 1.01	
Overjet, mm	Lingual	4.1 ± 1.1	3.5 ± 1	.082	−0.6 ± 1.2	.425
	Labial	3.9 ± 1.3	3.1 ± 0.4	.065	−0.8 ± 1.2	
Overbite, mm	Lingual	4.1 ± 0.3	1.9 ± 0.7	.001*	−2.2 ± 0.5	.454
	Labial	4.3 ± 0.5	2.4 ± 0.4	.001*	−1.9 ± 0.7	

[a] Intragroup comparisons between pre- and posttreatment measurements.
[b] Intergroup comparisons between posttreatment-pretreatment differences.
[c] SD indicates standard deviation; T1, pretreatment; T2, posttreatment; X, mean.
* Significant difference between pre- and posttreatment ($P < .05$).

Table 4. Mandibular Dental Measurements and Their Statistical Evaluations

Measurements	Groups	T1 (Mean)	T2 (Mean)	P[a]	T2–T1	P[b]
L1-NB, mm	Lingual	4.7 ± 2.3	5 ± 2.2	.404	0.3 ± 1.1	.001*
	Labial	2.9 ± 1.6	5.6 ± 1.5	.001*	2.7 ± 1	
L1-NB, °	Lingual	23.2 ± 5.6	24.8 ± 5.4	.195	1.6 ± 3.9	.001*
	Labial	19.3 ± 5.4	28.7 ± 5.4	.001*	9.4 ± 4	
IMPA, °	Lingual	92.8 ± 6.3	94.1 ± 5.1	.306	1.2 ± 4.1	.001*
	Labial	90.8 ± 7.4	100.5 ± 6.8	.001*	9.7 ± 4.7	
L1-APog, °	Lingual	22.7 ± 3.9	24.1 ± 3.1	.191	1.4 ± 3.7	.001*
	Labial	20.4 ± 4.7	29.3 ± 4.3	.001*	8.9 ± 4.3	
L1-APog, mm	Lingual	1.5 ± 1.2	1.8 ± 1.3	.502	0.3 ± 1.2	.001*
	Labial	0 ± 1.3	2.2 ± 1.3	.001*	2.2 ± 1.3	
L1 Tip-HRP, mm	Lingual	67.5 ± 6.7	68.6 ± 6.3	.173	1.1 ± 2.6	.181
	Labial	65.4 ± 3.8	68 ± 4.4	.001*	2.6 ± 1.9	
L1 Tip-VRP, mm	Lingual	67 ± 6.4	67.2 ± 6.9	.771	0.2 ± 1.7	.002*
	Labial	62 ± 4.8	64.2 ± 4.8	.003*	2.2 ± 1.9	
L1-MP, mm	Lingual	40.3 ± 2.9	39.3 ± 2.8	.030*	−1 ± 1.4	.023*
	Labial	37.3 ± 3.2	37.6 ± 3.2	.460	0.3 ± 1.3	
Interincisal Angle, °	Lingual	133.5 ± 8.2	131.3 ± 8.8	.239	−2.2 ± 6.2	.001*
	Labial	141 ± 10	124.7 ± 9.9	.001*	−16.3 ± 10	
L6-HRP, mm	Lingual	67.53 ± 4.28	67.49 ± 4.88	.871	−.04 ± .83	.299
	Labial	64.63 ± 4.13	64.02 ± 4.23	.259	−.61 ± 1.17	
L6 long axis-MP, °	Lingual	81.18 ± 5.68	80.78 ± 3.56	.364	−.4 ± 6	.112
	Labial	82.98 ± 6.14	83.55 ± 7.75	.417	.57 ± 5.3	
L6-MP, mm	Lingual	30.53 ± 2.67	30.85 ± 2.72	.216	.32 ± .77	.335
	Labial	28.87 ± 3.16	29.34 ± 3.64	.134	.47 ± 1.5	

[a] Intragroup comparisons between pre- and posttreatment measurements.
[b] Intergroup comparisons between posttreatment-pretreatment differences.
[c] SD indicates standard deviation; T1, pretreatment; T2, posttreatment; X, mean.
* Significant difference between pre- and posttreatment ($P < .05$).

The amount of overjet decreased in both groups but the difference was not significant between groups (Table 3). In both groups, overbite significantly decreased as a result of treatment ($P < .05$) and the intergroup differences were not statistically significant (Table 3).

Labial tipping of lower incisors (L1-NB, IMPA, and L1-APog) was significantly increased in the labial group compared to the lingual group ($P < .05$) (Table 4). IMPA showed an increase of 1.2° in the lingual group and 9.7° in the labial group; the intergroup difference was statistically significant ($P < .05$). The lower incisor tip was approximately in a stable sagittal position (L1-APog difference: 0.3 mm, NS) in the lingual group but significant lower incisor labial tipping (L1-APog difference: 2.2 mm) was seen in the labial group.

The vertical movement of the lower incisors was determined from lower incisor tip to mandibular plane (L1 tip-MP). This distance was decreased in the lingual group (-1 mm), which showed the intrusion of lower incisors, and increased in the labial group (0.3 mm) which showed a minimal extrusion ($P < .05$) (Table 4).

Intergroup differences for interincisal angle were significantly lower in the labial group (-16.3 mm) than the lingual group (-2.2 mm) (Table 4). This measurement also showed the labial tipping of the lower and upper incisors was higher in the labial group.

No significant difference was found in the movements of upper and lower molars (Tables 3 and 4).

DISCUSSION

Lingual orthodontic treatment has some biomechanical advantages such as arch expansion, less protrusion of incisors, and bite opening. Spontaneous bite opening occurs when the lower incisors come into contact with the upper lingual brackets.[16] In the current study, STb brackets were used as the lingual appliances, which were smaller in size compared to other lingual brackets. Though these brackets were small, they had bite-opening effects but they did not have important skeletal effects. Cephalometric analysis confirmed that there was no statistically significant difference for the vertical measurements between the treatment groups. The mandibular plane angle was not significantly altered in either group. Deguchi et al.[10] compared Class II extraction cases treated with lingual (STb) and labial appliances and similarly found no significant increase in vertical dimensions.

Gorman et al.[17] stated that the correction of overbite was usually achieved by bite opening occurring from the lower incisors touching on the upper incisor lingual brackets, which allowed extrusion of the posterior teeth and it has been proposed that a combination of incisor intrusion and molar extrusion takes place with lingual orthodontics. Barthelemi et al.[13] evaluated 45 extraction or non-extraction cases with different malocclusions treated with customized lingual appliances (CLA).

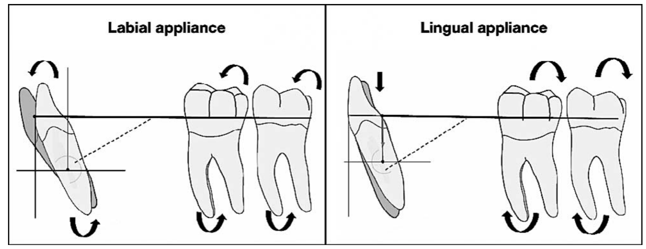

Figure 2. Different effects of the lingual and labial orthodontic forces on the lower incisor and molars.

They found the lower incisors were 1.4 mm intruded and lower molars were 0.8 mm extruded. The lower incisors were intruded 1 mm in the current lingual group but minimal extrusion (0.3 mm) was found for the labial group. The lower molars were not significantly extruded in either group but more extrusion of upper molars was observed in the lingual group. The bite opening mechanism was mostly provided by lower incisor intrusion and mild upper molar extrusion in the lingual group while, in the labial group, it was provided by incisor proclination. This difference can be attributed to the different point of the force application between the two treatments and the bite plane effect caused by the upper incisor brackets in lingual treatment (Figure 2). The distance between the center of resistance and point of the force application is shorter when using lingual brackets; this situation produces different tooth movements.[3]

A three-dimensional FEM study[6] compared the biomechanical response of incisors with lingual and labial force applications. The results suggested that lingual force application can generate more optimal tooth movement in intrusion and subsequent stress distributions in the periodontal ligament. Also, Geron et al.[3] presented a mathematical model to compare labial and lingual intrusive/extrusive forces on incisor movements. They found that moments created with lingual appliances were always smaller than with labial appliances, with less side effects of labial or lingual tipping of the crown. Those results support the current findings of less proclination of incisors with lingual appliances.

Gorman and Smith[9] compared the treatment effects of labial and lingual fixed appliances and a total of 120 patients were divided in six groups. No significant differences in cephalometric measurements were found in the treatment effects between labial and lingual appliances, but significant differences were found when the cases were grouped according to the extraction pattern or the different practitioners. The different results in the current study can be attributed to the type of the patients selected that only included adult non-extraction deep bite cases in the current study.

Soldanova et al.[11] compared changes in the lower arch after orthodontic treatment between labial appliances and two-dimensional (2D) lingual appliances. They found a significant difference for the position of the lower incisor relative to the A-Pog line ($P = .032$). A change in the position of the L1 to A-Pog line within an interval of $\pm$ 2 mm was assumed to be stable and they found that 96% of lingual patients and 72% of the labial patients were with that stable interval. T2–T1 differences for this parameter was 0.3 mm for the current lingual group and was 2.2 mm for the current labial group ($P < .05$). The current study showed similar and, therefore, possibly more stable results for the lingual technique. Also, IMPA increased significantly in the labial group and this increase was above the normal limits. As the incisor angles changed less with lingual appliances, it might be interpreted that more stable treatment results can be obtained with lingual orthodontic treatment.

In a previous study, maxillary incisor movements were examined by a theoretical analysis applied using lingual and labial forces for different inclinations (-35°, -20°, 0°, 20°, 45°).[18] It was found that, in lingual orthodontics, it was more difficult to create proclination of the maxillary incisors especially when they were initially in an upright position (0°) or in a slightly retroclined position (0° to 20°). Alouini et al.[14] evaluated effectiveness of CLA in creating upper incisor palatal root torque in cases with Angle Class II/2 malocclusion. They applied SS wire with an extra torque bend of 13° and found CLA could create incisor palatal root torque even in cases in which lingually oriented forces were applied incisally. In both groups of the current study, patients had slightly retroclined upper incisors at the beginning of the treatment because of the deep overbite malocclusion. Proclination and protrusion were found to be quite high in the labial group and the magnitudes of change were higher in the labial group. Therefore, especially in patients with more retroclined upper incisors at the beginning of the treatment, it may be necessary to give extra torque to the upper incisors with lingual treatment. Miniscrews inserted between the roots of the central and lateral incisors on the labial side and bonded esthetic buttons on the labial surface of the upper incisors can be another option to gain good lingual root torque in deep overbite cases.

A limitation of this study was its relatively small sample size because of the application of strict inclusion criteria to the lingual group. A sample of at least 13 subjects for both groups was required and provided 80% power to detect a 1-mm difference in incisor intrusion. Another limitation was the retrospective structure of the study. Further prospective studies with larger sample sizes are needed.

CONCLUSIONS

- Lingual therapy can be a good treatment alternative in adult patients with deep-bite malocclusion, especially if lower incisor intrusion is desired.
- Lingual orthodontic treatment can be preferred instead of labial treatment, especially in patients who have proclined incisors at the beginning of the treatment and in whom proclination is not desired for incisors during treatment.

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