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CASE REPORT

Treatment of a Class II Case with Palatally Inserted Distalization Mechanics in an Epilepsy Patient

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ABSTRACT

This case report describes the protocol employed in the treatment of a patient with Class II malocclusion with mechanics including palatally positioned miniscrews. Treatment included the distalization of maxillary posterior teeth with mechanics including 2 miniscrews positioned on the palatal side. After a certain amount of distalization was achieved, the maxillary arch was bonded with Roth prescription brackets while the appliance was still active. When leveling of the upper arch was finished, the appliance was kept in the mouth as a retention device while the mandibular arch was bonded to continue treatment, which lasted for a total of 15.5 months. Mandibular and maxillary fixed retainers were placed at the end of active treatment. Pretreatment and post-treatment records revealed that vertical and sagittal skeletal cephalometric findings were not affected. Miniscrew anchorage used during distalization is an effective non-extraction treatment option for dental Class II malocclusion correction.

Keywords: Class II, distalization, miniscrew, epilepsy

INTRODUCTION

In 1899, Edward Angle made the first classification of orthodontic malocclusions based on the anteroposterior relationships of upper and lower teeth (1). According to his classification, upper and lower first permanent molars' relationship was examined: 3 types of malocclusions were determined, one of which was Class II malocclusions. Dental Class II malocclusions can be treated with different methods depending on the problem of the patient such as extractions, surgery, or a non-extraction approach, which often requires distalization of the maxillary teeth using various methods. Distalization can be achieved with the aid of extraoral appliances, intraoral molar distalizers, fixed functional appliances, elastics, use of miniscrews, or combinations of the above.

Systemic and dental problems have a significant effect on treatment planning in orthodontics as in other science branches. In extraction cases, dentures can be decisive on which tooth to extract, while systemic diseases can affect the whole treatment plan (2).

In patients with bleeding disorders, surgical procedures and chronical irritations from orthodontic appliances (which may cause bleeding) should be avoided (3). In patients with other chronic disorders such as diabetes mellitus and asthma, different considerations such as avoiding removable appliance usage in asthma patients (such that the airway is not narrowed) must be taken into account (4).

Epilepsy is a group of neurological diseases characterized by epileptic seizures (5). It is defined as two or more seizures that are not provoked and are not due to an acute disturbance of the brain; it is a sign of underlying brain dysfunction, rather than a single disease. There are many different types of epilepsies; therefore, the treatment and prognosis varies. This neurological disease can sometimes affect the neuromuscular structure and/or due to the seizures, patients may get injured and dysfunctions/disabilities can be observed. When

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Table 1. Lateral cephalometric values of pretreatment and posttreatment of the patient

VERTICAL	PRE	POST
Go-Me-SN	32˚	32˚
Saddle a.	119˚	115˚
Artikuler a.	143˚	149˚
Gonial a.	130˚	125˚
Sum of inner angles	392˚ L	389˚ L
Jarabak	%67 L	%66 L
ANS-Me/N-Me	%53 L	%54
Max. Height a(CF-N/CF-A)	53˚ L	55˚ L
Facial Axis a(N-Ba/Pt-Gn)	93˚ L	93˚ L
S-Ar/ramus ratio	%82 H	%77
Gonial ratio (a/b)	%76	% 75
FMA	25 ˚	24˚
Y axis a. (FH-SGn')	60˚	59˚
Occlusal plane/SN, degrees	19˚ H	17˚
Occlusal plane/mandibular plane, degrees	13˚ L	14˚ L
Palatal plane/SN, degrees	7˚	7˚
Palatal plabe/mandibular plane, degrees	26˚	25˚
SAGITAL	**PRE**	**POST**
SNA	82˚	83˚
SNB	79˚	80˚
ANB	3˚	3˚
Witt's	–2 mm	–2 mm
Anterior Cranial Base	64 mm	65 mm
Mand. Corpus Length	72 mm	73 mm
Ant cran base/m. corpus	64/72	65/73
Post cran. base	36 mm	37 mm
N per-P A	–2 mm	–1 mm
Max depth	88˚	89.5˚
SE	18 mm	20 mm
SL (pog)	44 mm	47 mm
Upper Incisors	**PRE**	**POST**
I-SN	112˚	108˚
I-FH	114 ˚	110˚
I-Pal. plane	124 ˚	120˚
I-NA	25 ˚	23˚
I-NA	5 mm	3.7 mm
Lower incisors	**PRE**	**POST**
IMPA	92 ˚	93˚
I-NB	22 ˚	24˚
I-NB	5 mm	5 mm
Pog-NB	1 mm	2 mm
Holdaway	5/1	5/2
I-I	128 ˚	132˚
Soft Tissue Values	**PRE**	**POST**
Nazolabial A.	101˚	99˚
Holdaway A.	12˚	10˚
Upper lip- E line	–4 mm	–5 mm
Lower lip-E line	–3 mm	–2.4 mm
Soft Tissue convexity	162˚	164˚

FMA: functional mandibular advancer; SNA: Sella-Nasion-A point; SNB: Sella-Nasion-B point; ANB: A point-Nasion-B point; FH: Frankfort Horizontal

epilepsy affects patients' coordination, it is a wise decision to treat the patients with methods in which patient cooperation is not a necessity (6). Medication for epilepsy may vary from patient to patient. Some of the drugs used in the treatment of epilepsy contain carbamazepine and piracetam. Carbamazepine is digested in the liver and it has side effects such as blurred vision or double vision, continuous back and forth eye movements, tiredness and dizziness, loss of interest or pleasure, and behavioral changes (especially in children). Carbamazepine also makes tissues more prone to fibrous hyperplasia and may cause xerostomia.

The objective of the present article is to present the non-extraction treatment for a patient presenting with epilepsy, maxillary sagittal deficiency, and a dental Class II relationship.

CASE PRESENTATION

Diagnosis and Etiology

A 12-year 6-month-old girl was referred for orthodontic treatment with the chief complaint of prominent maxillary canines. The medical history of the patient revealed epilepsy disease and she was actively using drugs containing carbamazepine and piracetam. Related to her epileptic condition, the patient was unable to use her left arm properly. She also suffered from scoliosis.

A soft tissue assessment in the frontal view showed a symmetric face with well-balanced vertical proportions, and a slight deviation on the tip of the nose was observed. Only the left eye showed sclera, which was the result of minimal asymmetry. At the rest position, there was insufficient tooth display. Patient had a low symmetric smile line and thin lips. Facial and dental midlines were coincident with each other. A profile assessment indicated that the patient had competent lips. Both upper and lower lips were behind Steiner's (S) and Ricketts' (E) lines. She had a convex soft tissue profile. The 45° profile, also known as the ¾ profile picture, revealed that the patient had sufficient zygomatic bone support (Figure 1). No signs or symptoms of temporomandibular dysfunction were observed.

The patient had good oral hygiene. There was Class II molar and canine relationships on both sides. No functional shift of the mandible was detected. The maxillary midline was coincident with the mandibular and facial midlines. The overjet was 5 mm and the overbite was 2 mm. Five millimeters of crowding was measured in the maxillary arch with both canines in infraocclusion, and 1 mm of excess was measured in the mandibular arch. Depth of Spee was measured as 2 mm. There was also a Bolton discrepancy of 2 mm in favor of the mandibular dentition (Figure 2).

A panoramic radiograph showed normal root anatomy. According to the International Dental Federation (FDI), also known as ISO 3950 dental notation, teeth numbers 18 and 28 were congenitally missing and teeth numbers 38 and 48 were in germ form. According to international caries detection and assessment system (ICDAS) criteria, ICDAS II type of decay was detected on the mesial side of tooth number 26 (Figure 3a).

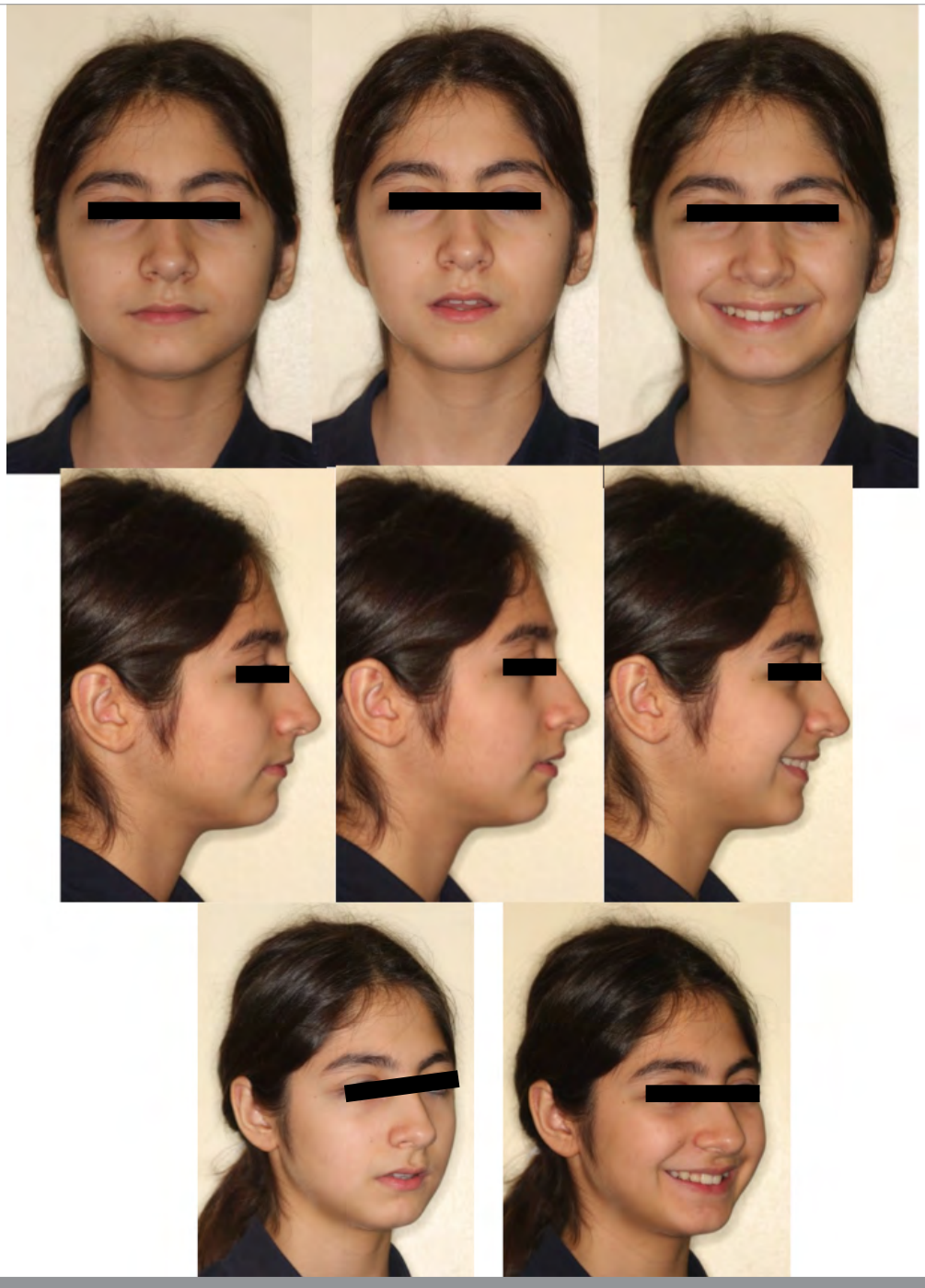

Figure 1. Pretreatment extraoral photographs of the patient

The cephalometric analysis of the patient revealed that she was in the post-peak stage. Measurements indicated an orthognathic growth pattern with compatible vertical dimensions, a skeletal Class I, protrusive upper and lower incisors, and a convex profile (Figure 3b, Table 1).

The aim of the treatment was to correct the 1) sagittal and 2) occlusal problems and 3) incisal relations while improving the overjet and overbite relations. Additionally, the aim was to 4) improve the smile esthetics of the patient by providing appropriate spaces for tooth alignment.

Treatment Alternatives

The patient had skeletal Class I and dental Class II relationship. Since the Class II malocclusion is only a dental issue, the treatment needed to be planned accordingly. The patient's profile, vertical facial pattern, and the amount of crowding suggested a non-extraction approach.

Treatment Progress

The correction of the dental Class II malocclusion was achieved with the distalization of the maxillary teeth. For maxillary teeth distalization, mechanics including 2 miniscrews were positioned

Figure 2 . Pretreatment intraoral photographs of the patient

on the palatal side. A conical miniscrew (Ti-6Al-4V, Grade 5, TM Trimed, Ankara, Turkey) 1.8 mm in diameter and 8 mm in length was used. The screws were inserted into the palate under local anesthesia according to the Anatomical Guidelines for Miniscrew Insertion by Ludwig et al. (7). Radiographic landmark studies demonstrate that the thickest vertical bone repositories are located 3–4 mm distal to the incisive foramen and 3 mm paramedian to the palatal suture. Further, the screw should be inserted perpendicularly to the palatal surface; to achieve optimal retention and effectiveness, it should be angled toward the incisor roots. Silicone impressions (Zhermack Zetaplus; Badia Polesine, Italy) were taken from the patient for the preparation of the distalization mechanics in the laboratory. Cast models were prepared and caps of the miniscrews were transferred into the model. The appliance was prepared with a 1.1-mm-thick stainless steel wire, molar tubes that are used in Teuscher appliances, and coils with a thickness corresponding to the 1.1-mm-thick wire. When the distalization mechanics were ready, they were inserted into the patient's mouth. Bands were bonded to the molars and miniscrews were bonded to the appliance with glass–ionomer cement (3M; Minnesota, USA). The parts of the wire in the premolar region were bonded to the first premolars with a flowable composite (3M; Minnesota, USA). While the mechanics were applied, they were already active. Therefore, no more activation was required during insertion (Figure 4). The patient and her parents were informed about the procedure, features, purpose, effects, and appliance maintenance. Informed consent was received from the patient's parents. In order to avoid soft tissue inflammation on the palate, the patient was instructed to brush the transmucosal portion of the miniscrew. On the following appointment (after 1 month), the maxillary arch was bonded with Roth prescription brackets possessing 0.022-inch slots. The arch was levelled, without engaging the left lateral and canine and after continuing alignment with 0.012, 0.014, 0.016, and 0.016×0.016-inch nickel-titanium (Ni-Ti) archwires. During the second appointment, the bondings on the premolars were removed. On the 0.016 Ni-Ti archwire, both left lateral and canine were included in the arch. On the 0.016×0.016 archwire, the distalization device was activated by adding a flowable composite to the mesial side of the left distalization part. After 7 months, the mandibular arch was also bonded with the brackets. The initial wire was 0.014 Ni-Ti and then it was continued with 0.016 and 0.016×0.016 Ni-Ti sequence. The desired amount of distalization was achieved at this point, and the appliance was kept in the mouth as a retention device. Then, 0.016×0.022 stainless steel wires were inserted on both the upper and lower arches during the 11th month of treatment. To close the spaces, chain elastics were used for both the arches during the 13th month and second-order bends were planned for the upper left lateral and canine tooth. Unfortunately, the patient needed surgery for her scoliosis and treatment had to be concluded. Mandibular and maxillary fixed retainers were provided for retention at the debonding appointment.

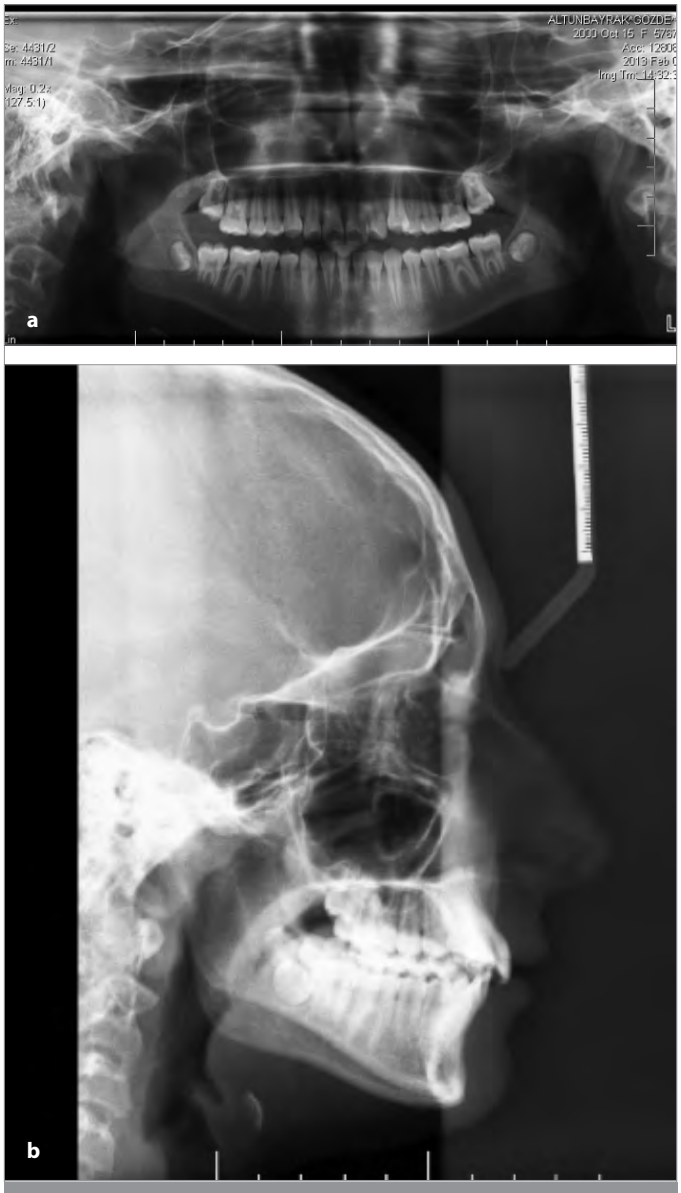

Figure 3.a, b . Pretreatment panoramic x-ray (a), lateral cephalometric x-ray (b)

Figure 4. Intraoral photographs after appliance adaptation

Case Assessment

The profile of the patient did not have major changes, but the lip support was improved with the effective alignment of the incisor teeth, as evidenced by the post-treatment extraoral photographs (Figure 5). Class I canine and molar relationships, a normal overjet and overbite, and midline coincidence were achieved (Figure 6). Tooth roots appeared well-aligned, except for the upper left canine when assessed radiographically (Figure 7a). The proclination of the incisors in both the arches decreased, but negligible changes were observed in the vertical dimension. There was approximately no change in the sagittal position of the A and B points. The cephalometric superimpositions and extraoral photographs showed that the growth of the patient continued (Figure 7b, 8)

DISCUSSION

This case report presents the successful treatment of an epileptic orthodontic patient with molar distalization with the help of miniscrews and distalization mechanics. The post-treatment frontal photographs reveal adequate gingival display, which endorsed the non-extraction approach. In addition, the patient's profile in the finishing extraoral photographs revealed that the new position of the incisors supported the lips favorably and appropriately. The debate regarding treatments with extraction approaches is still ongoing. Extraction approaches might induce unfavorable dentoalveolar side effects, which may be tilting of the occlusal plane, molar extrusion, maxillary and mandibular midline deviation, and secondary skeletal changes in the frontal plane.

Obtaining spaces for effective alignment of the teeth on the upper arch and gaining Class I molar and canine relations were achieved with the distalization of the maxillary posterior teeth. The distalization could have been accomplished with various methods like using extraoral distalization mechanics like headgears or using Class II elastics, which require patient compliance, or using fixed functional appliances or with the help of miniscrews (8). Intermaxillary elastics or fixed appliances have some advantages and disadvantages, depending on their specific case. In the treatment of patients who have physical difficulty like neuromuscular diseases or adolescent patients, noncompliance mechanics could be decisive in delivering an acceptable result (9).

In non-extraction treatments, intraoral appliances can be used to distalize the maxillary molars, which enable 1- or 2-mm distalization per month. These appliances may cause side effects like tipping and mesialization of premolars, protrusion of maxillary incisors, increase in overjet, and decrease in overbite (10). In the present case report, mechanics with 2 miniscrews were used to distalize the posterior segments, starting from the molars. Miniscrews acted as the distalizing anchor in these mechanics, which were direct anchorage units. Therefore, unwanted incisor proclination or premolar mesialization did not occur during molar distalization. Further, no molar anchorage loss or occlusal tilting occurred during subsequent premolar distalization of this case.

The insertion place of the miniscrew is consequential for 2 main reasons. If the insertion is done on an anatomically inappropriate site, it can adversely affect the vascularization and innervation (7). Further, the insertion site of the miniscrew is important since it determines whether the anchorage will be direct or indirect (11).

Figure 5. Extraoral photographs after orthodontic treatment

Here the miniscrew was inserted 3-4 mm distal to the incisive foramen and 3 mm paramedian to the palatal suture and was stable throughout treatment. The insertion of a miniscrew on the palate was favorable on the basis of the employed biomechanics and the sufficient bone thickness present in this area. Distalization with miniscrews can also be done with miniscrews at buccal sides generally between premolars or between second premolar and first molars. This option is risky since it may cause root resorption by misplaced application of the screw or resorption through distalization of the premolar teeth (12). This option was also unfavorable for this patient because few materials at the buccal sides were desired to overcome the negative effects of a possible seizure.

The stability of the miniscrews and the success of miniscrew-integrated treatments are dependent on factors, which can be classified into 3 main groups (13). The success is affected by patient-dependent, doctor-dependent, and material-related factors. Patient-dependent factors are the thickness and density of the bone and oral hygiene, whereas miniscrews insertion technique and angle, arranging the distance to the roots of the adjacent teeth, the amount of force applied, and ultimately, the clinicians' experience are doctor-related factors. Miniscrew design and features of the miniscrew surface are factors that are dependent on the material. The miniscrew used in this case was 1.8 mm in diameter and 8 mm in length.

In the present case, a force of approximately 150 g was applied for distalizing the upper first molar, while the optimum force previously suggested ranged from 100 to 240 g. This patient's second molar was not erupted at that stage of the treatment and

Figure 6 . Intraoral photographs after orthodontic treatment

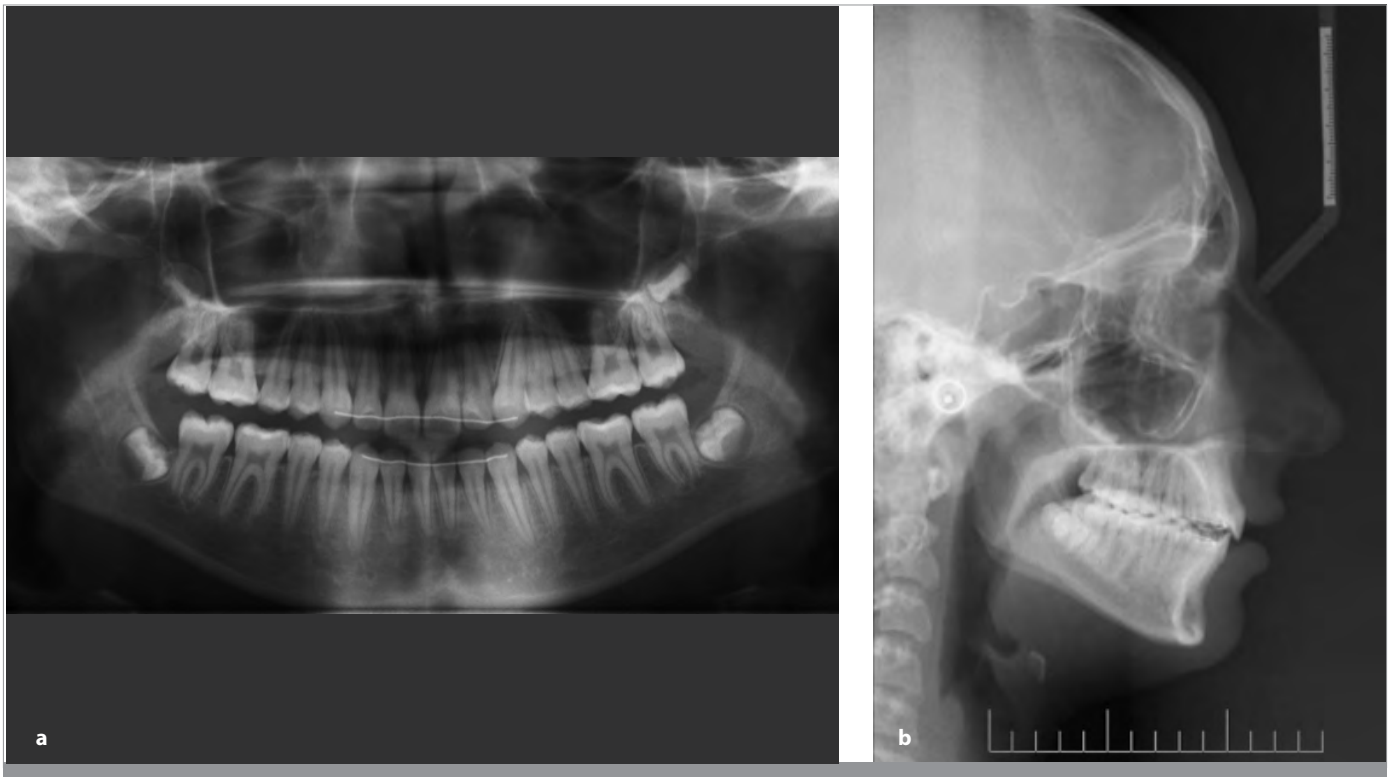

Figure 7. a, b. Post-treatment panoramic x-ray (a), lateral cephalometric x-ray (b)

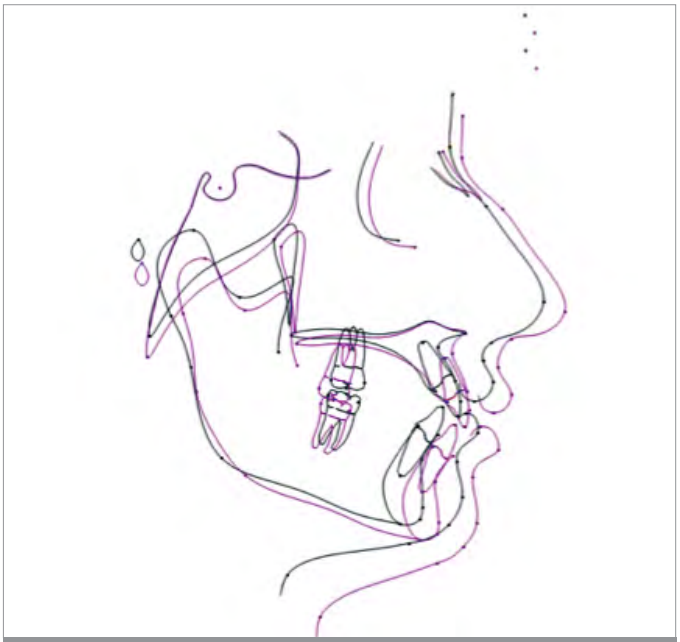

Figure 8. Cephalometric superimposition pretreatment (black) and post-treatment (red) tracing

this enabled the application of a rather lesser force. This level of force was sufficient to distalize the first molar (14).

The miniscrew was used as a direct anchorage unit, which helped starting the distalization of the molars at the beginning of the treatment and, therefore, shortening the overall treatment time by starting to open the space for canines since the beginning.

The distalization of the arch can be done as an entire segment in 1 step or it can be done in 2 steps, namely, molar distalization followed by premolar distalization. In the present case, the preference was to distalize the molars first. Premolars were bonded with the composite at the beginning of distalization to allow all the distalizing force to affect the molars. Later on, bondings on the premolars were removed because of which the premolars connectively followed the molars. This cannot be classified either as a 2-step or a 1-step process since the processes were dependent on each other. A total distalization of 4.1 mm and 2.7 mm at the left and right sides was achieved, respectively. The growth pattern of the present case was normal. The distalized teeth moved parallel to the functional occlusal plane and, hence, the distalization did not have an adverse effect on the vertical dimension.

The amount of distalization in the present case was similar to the other findings of recent studies. The distalization distance indicated in an animal study was 1.8–10.7 mm (15). According to Sugawara et al. (16), the average amount of distalization of the mandibular first molars was 3.5 mm at the crown level and 1.8 mm at the root level.

CONCLUSION

Cephalometric superimpositions revealed no adverse effects in the vertical and sagittal skeletal planes of the treatment with a non-extraction and miniscrew anchorage approach for distalization.

Ethics Committee Approval: N/A.

Informed Consent: Written informed consent was obtained from patients' parents who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - S.S.H.S.; Design - S.S.H.S., M.T.; Supervision - M.T.; Data Collection and/or Processing - M.O.; Analysis and/or Interpretation - S.S.H.S.; Literature Search - S.S.H.S., M.O.; Writing Manuscript - S.S.H.S., M.O.; Critical Review - M.T.

Conflict of Interest: No conflict of interest was declared by the authors.

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