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CASE REPORT

Treatment of a Class II Patient with Four Premolar Extractions and Driftodontics in the Lower Jaw

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ABSTRACT

The clinical examination of an 11.10-year-old girl in permanent dentition showed severe crowding, chewing problems and her right maxillary lateral incisor was in palatal position. The molars were in Class II relationship on both sides. An extraction treatment was planned. Upper second premolars and lower first premolars were extracted. Lower crowding was eliminated using physiological tooth movement called "driftodontics". Slots sized 0.022 inches and self-ligating brackets were used. The patient also used a high-pull headgear for anchorage and vertical control reasons for a short period. During the correction of the lateral crossbite, a posterior bite plate was used for anterior disarticulation and anterior bite ramps were used at the last stages of the treatment to ease the correction of the curve of Spee. Class I molar and canine relationships and normal overjet and overbite achieved with good alignment of both arches and dental midlines coincided with the facial midline. The treatment results were stable after 2 years of the retention period.

Keywords: Extraction, driftodontics

INTRODUCTION

Class II malocclusion is one of the most frequent treatment problems in orthodontic practice affecting one-third of the preadolescent patients (1). Many treatment techniques, such as extra-oral appliances, distalization mechanics, extraction protocols, and functional orthopedic appliances are available for altering the occlusal relationships of Class II malocclusions (2).

If an extraction treatment is indicated for any reason, the time of extraction should be decided. Frequently, the teeth are extracted following the placement of appliances. This common approach is to prevent the unwanted tooth movement to the extraction sites (3). However, it is sometimes better to use the benefits of physiological dental drift called as driftodontics. This approach was first proposed by Bourdet (4). A shorter period of appliance therapy should be expected due to a spontaneous alignment of the dentition with driftodontics (5-9).

In this case report, we presented the results and the 2-year follow-up of an 11.10-year-old female patient who was treated with 2 second premolar extractions in the upper jaw and 2 first premolar extractions in the lower jaw. Moreover, the lower jaw was left to driftodontics for 11 months.

CASE PRESENTATION

An 11.10-year-old female patient came to the clinic with a chief complaint of severe crowding, chewing problems, palatally positioned right maxillary lateral incisor and dissatisfaction regarding smile esthetics. The initial facial analysis indicated a convex facial profile with a symmetrical face (Figure 1). The upper midline was deviated to the right side probably due to the early loss of #53. There was a low asymmetric smile line due to the angulation of maxillary incisors.

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Figure 1. Pretreatment extraoral and intraoral photographs

Clinically, she experienced bad oral hygiene but no dental caries. The molars were in Class II relationship on both sides with an overjet of 1.5 mm and an overbite of 0.5 mm. The upper right molar was mesialized due to the early loss of #55 and the upper right canine was impacted in the vestibular region of the right lateral incisor, which could be buccally palpated. The upper right lateral incisor was in palatal position and had a crossbite relationship. The arch-length discrepancy was 14 mm for the upper and 9 mm for the lower jaw. The only teeth in contact were the first molars on both sides. None of the second molars had erupted yet. There were no signs or symptoms of temporomandibular disorder.

A cephalometric analysis indicated a skeletal Class II relationship due to a retrognathic mandible (ANB, 5.8; SNB, 75.6°), vertical facial growth pattern (Y-axis, 71,2°) with a steep mandibular plane angle (SN/GoGn, 37.6°; FMA, 34.2°) and retrusive maxillary incisors (U1-SN, 90.2°; Figure 2a, Table 1).

The panoramic radiograph was captured 2 months before the placement of appliances and the deciduous teeth #63 and #84 were extracted (Figure 2b).

Treatment Objectives

Based on the diagnostic records, the treatment objectives were as follows: (1**)** achieving Class I molar and canine relationships bilaterally, (2) relieving the crowding in maxillary and mandibular arches, (3) correcting upper lateral crossbites, (4) achieving ideal overjet and overbite, and (5) achieving occlusal stability.

Treatment Plan

Due to excessive crowding in both arches, we decided that an extraction treatment would be a more effective treatment modality for the patient. We decided to extract second premolars from the upper jaw due to the retroclined upper incisors and extract the first premolars from the lower jaw to resolve the excessive crowding and to level the deep curve of Spee of the mandibular dental arch. An occipital headgear was used to reinforce the molar anchorage and obtain vertical control as the patient had hyper-divergent growth pattern.

A second treatment plan could be distalization of the upper molars and gain space by stripping from the lower teeth and procli-

Table 1. Lateral Cephalometric Measurement

Cephalometric Measurement	Mean	Pretreatment	Post-treatment	Two Years After Treatment
VERTICAL ANALYSIS				
SN-GoGn	32˚±8˚	37.6 ˚	38.4 ˚	36.2 ˚
Saddle A.	123˚ ±5	115.8 ˚	118.5 ˚	116.1 ˚
Artikular A.	143˚±6	150.6 ˚	146.4 ˚	147.4 ˚
Gonial A.	130˚±7	125.4 ˚	128.1 ˚	127.2 ˚
Sum of interior angles	396˚±3	399.7 ˚	401.2 ˚	399.1 ˚
Jarabak (SGo-NMe)	59-63%	60.4%	64.1%	66.9%
ANS-Me/N-Me	55%	57.2%	58.8%	60.9%
Max. Height A.	60˚	64 ˚	56.4 ˚	56.5 ˚
Facial axis A.	90˚	81.3 ˚	83.3 ˚	83.3 ˚
S-Ar/Ar-Go(ramus)	75%	82.8%	77%	78.6%
Gonial ratio	75%	62.5%	62.9%	62.4%
FMA	25˚	34.2 ˚	33.6 ˚	32 ˚
Y Axis A.	59.4˚	71.2 ˚	71 ˚	69.9 ˚
Okl. Plane /SN	14˚	14.4 ˚	17.4 ˚	16 ˚
Okl. Plane/Mand. plane	18˚	23.2 ˚	21 ˚	20.2 ˚
SAGITTAL ANALYSIS				
SNA	82˚±2˚	81.5 ˚	81.5 ˚	81.3 ˚
SNB	80˚±2˚	75.6 ˚	78 ˚	78.4 ˚
ANB	2˚	5.8 ˚	2.5 ˚	3 ˚
Witt's	–1 mm	5.9 mm	0.9 mm	0.2 mm
Ant cran base	73 mm	66.3 mm	65 mm	64.8 mm
Mand. corpus length	80 mm	66.3 mm	68.4 mm	67.6 mm
Post cranial base	37 mm	33.9 mm	32.4 mm	33.9 mm
N-A per	–1 mm	–1.6 mm	–2.6 mm	–2.3 mm
Max. depth	90˚	87 ˚	88.1 ˚	88.3 ˚
SL	51 mm	40.8 mm	42 mm	44.5 mm
SE	22 mm	14.8 mm	15.5 mm	14.9 mm
DENTAL ANALYSIS				
U1-SN	103˚	90.2 ˚	108.3 ˚	108.3 ˚
U1-FH	112˚	95.7 ˚	115.9 ˚	115.2 ˚
U1-Pal. Plane	115˚	98.8 ˚	119 ˚	117.3 ˚
U1-NA	22˚	8.7 ˚	27.8 ˚	26.9 ˚
U1-NA	4 mm	0.4 mm	3.2 mm	3.4 mm
IMPA	90˚	87.8 ˚	87.1 ˚	87.3 ˚
L1-NB	25˚	23.1 ˚	25.2 ˚	24.8 ˚
L1-NB	4 mm	4.4 mm	5 mm	4.7 mm
Pog-NB	4 mm	1.2 mm	1.4 mm	1.4 mm
Holdaway ratio	1/1	0.3	0.3	0.3
Interincisal A.	131˚	142.3 ˚	123.4 ˚	125.3 ˚
SOFT TISSUE ANALYSIS				
Naso-labial A.	102 ± 8°	120	115.8	110.6
Holdaway A.	8°	15.2	12.8	14.2
Upper lip- E line	- 4 mm	–3.6	–4.6	–4.4
Lower lip-E line	- 2 mm	–1.9	–3	–1.8
Soft tissue convexity	168 ± 4°	117.8	121.7	119.5

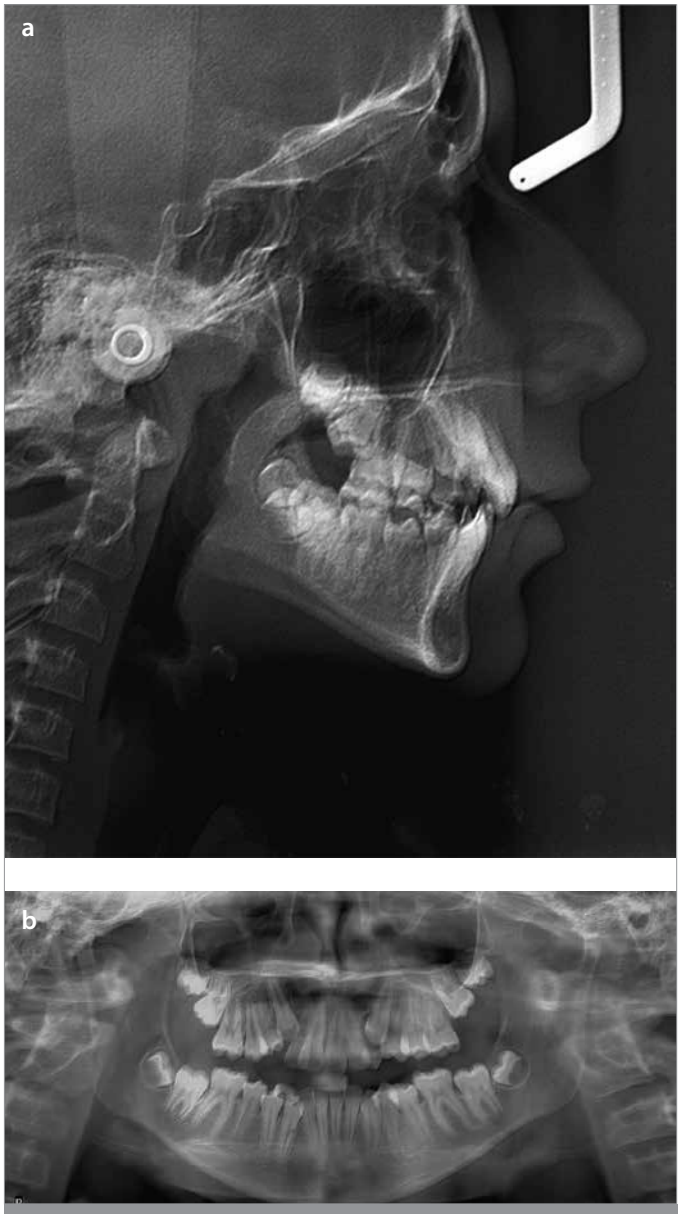

Figure 2. a, b. Pretreatment lateral cephalometric radiograph (a); pretreatment panoramic radiograph (b)

nation of the lower incisors. However, this nonextraction treatment modality could cause a tendency to anterior open bite and complicate the vertical control.

Written informed consent was obtained from the parents of the patient.

Treatment Progress

The maxillary first molars were banded, and the maxillary teeth #14, #11, #21, #22, and #24 were bonded using 0.022-inch Nexus™ active self-ligating brackets (Ormco, California, USA); #15 and #25 were extracted and the treatment was initiated using 0.013-inch CuNiTi (Damon, Ormco, California, USA). After 2 months, a 0.017×0.025-inch NiTi wire was applied (Figure 3a).

In month 4, bilaterally open coil springs were inserted on a 0.017×0.025-inch stainless steel (SS) arch wire to gain more space in the upper arch. The springs on the space of second premolars were active but the others were passive (Figure 3b). In addition, the patient was referred to her dentist for lower first premolar extractions.

In month 8, active self-ligating brackets were bonded on #13 and #23. A 0.016-inch CuNiTi was placed and a lace back for #13 was performed. She was wearing an occipital headgear 12 hours/per day (500 g) for anchorage and vertical control. The extraction of the teeth #34 and #44 was requested and the extraction spaces on the mandibular arch were left for physiological dental drift (driftodontics; Figure 4).

In month 9, a 0.016-inch CuNiTi arch wire was placed in the upper arch. Incisor crowding began to improve spontaneously by driftodontics in the lower arch (Figure 5).

In month 11, open coil spring active by one bracket width was placed on the 0.017 × 0.025-inch NiTi to gain space for #13.

In month 12, a 0.017×0.025-inch SS arch wire was placed and the open coil spring was activated with an arch wire stop. A

Figure 3. a, b . Extraction of #15 and #25 and initial alignment of upper teeth (a); at 4 months, gaining space with NiTi open coils (b)

Figure 4. At 8 months, using the occipital headgear

Figure 5. At 9 months, 0.016-inch CuNiTi arch wire for the upper arch and driftodontics for the lower arch

Figure 6. At 12 months, active open coil for #13, a removable bite plate and elastic chain for #12

Figure 7. At 14 months, alignment of #12

Figure 8. At 16 months, bracket bonding on the lower teeth

twin bracket was bonded on the palatal surface of #12 as an attachment and an elastic chain was tied from this attachment to the brackets of #11 and #13. A removable posterior bite plane was used for the palatally blocked #12 to jump the bite easily. She used that bite plate 24 hours a day including during meals (Figure 6). The headgear usage was discontinued.

In month 14, the crossbite was resolved for #12 and the use of bite plate was discontinued. A bracket was bonded after the elimination of the excess gingiva by an electrocautery device and a 0.014-inch CuNiTi was inserted (Figure 7).

In month 16, a 0.019×0.025-inch CuNiTi was placed in the upper arch and the lower teeth were bonded; a 0.013-inch CuNiTi was placed as an initial leveling arch wire (Figure 8).

In month 19, a 0.019×0.025-inch CuNiTi was placed in the lower arch (Figure 9).

In month 20, the molar tubes were bonded on all the recently erupted second molars. Anterior bite turbos were placed on the cingulums of #11 and #21 to enhance the leveling of the curve of Spee. A 0.016×0.016-inch NiTi arch wire for the upper arch and 0.016×0.025-inch CuNiTi wire for the lower arch were placed (Figure 10).

Figure 9. At 19 months, a 0.019×0.025-inch CuNiTi in the upper and lower arch

Figure 10. At 20 months, anterior bite ramps and bonding tubes on the second molars

In month 22, a 0.019×0.025-inch NiTi wire was placed in both arches (Figure 11).

In month 24, a 0.019×0.025-inch braided SS wire was placed in the lower arch and 0.021×0.025-inch NiTi in the upper arch. Triangular elastics (Kangaroo, 3/16″ 4.5 oz; Ormco) were used to enhance the leveling of the curve of Spee and seating the occlusion (Figure 12).

In month 26, the bracket of #33 was rebonded mesially, and the bracket of #11 was moved 1 mm gingivally. A 0.017×0.025-inch NiTi wire was placed in the lower arch (Figure 13a, b).

In month 28, the treatment was completed with 0.021×0.025-inch SS in the upper arch and 0.019 × 0.025-inch SS in the lower arch (Figure 14).

The case was debonded after 2.6 years of active orthodontic treatment (Figure 15). As a retention protocol, a 0.0215-inch Twist Flex wire was placed between #13 and #23 and a 0.032-inch Twist Flex wire between #34 and #44. The patient was instructed to wear the removable wraparound retainers for the first year at night-time only.

Treatment Results

Post-treatment records demonstrated the achievement of

Figure 11. At 22 months, 0.019×0.025-inch CuNiTi in the upper and lower arch

Figure 12. At 24 months, braided SS arch wires for the lower jaw and triangular elastics (yellow)

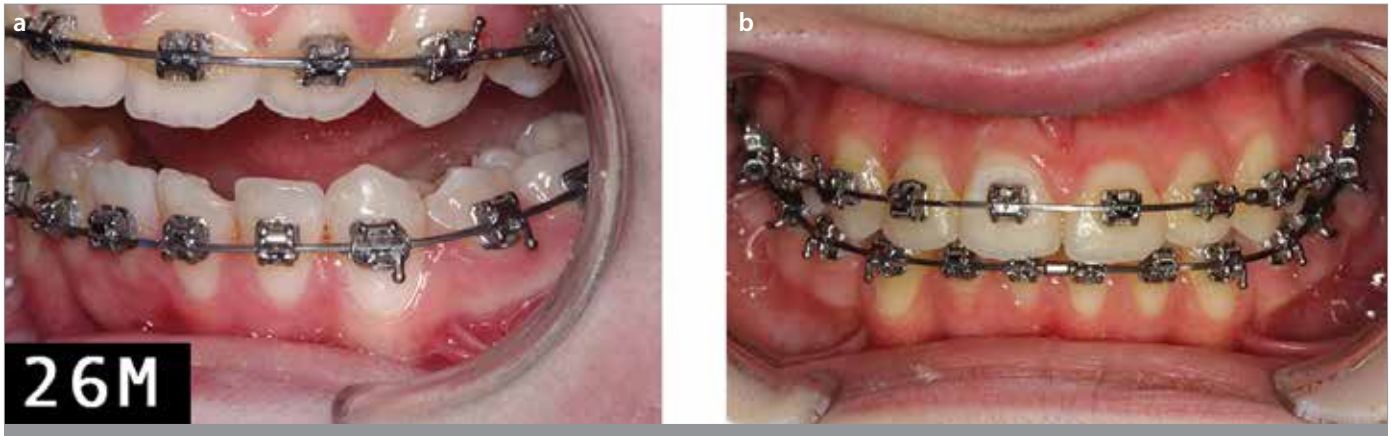

Figure 13. a, b. At 26 months, a. #33 mesially rebonded (a); #11 gingivally rebonded (b)

Figure 14. At 28 months, final arch wires

Figure 15. Post-treatment extraoral and intraoral photographs

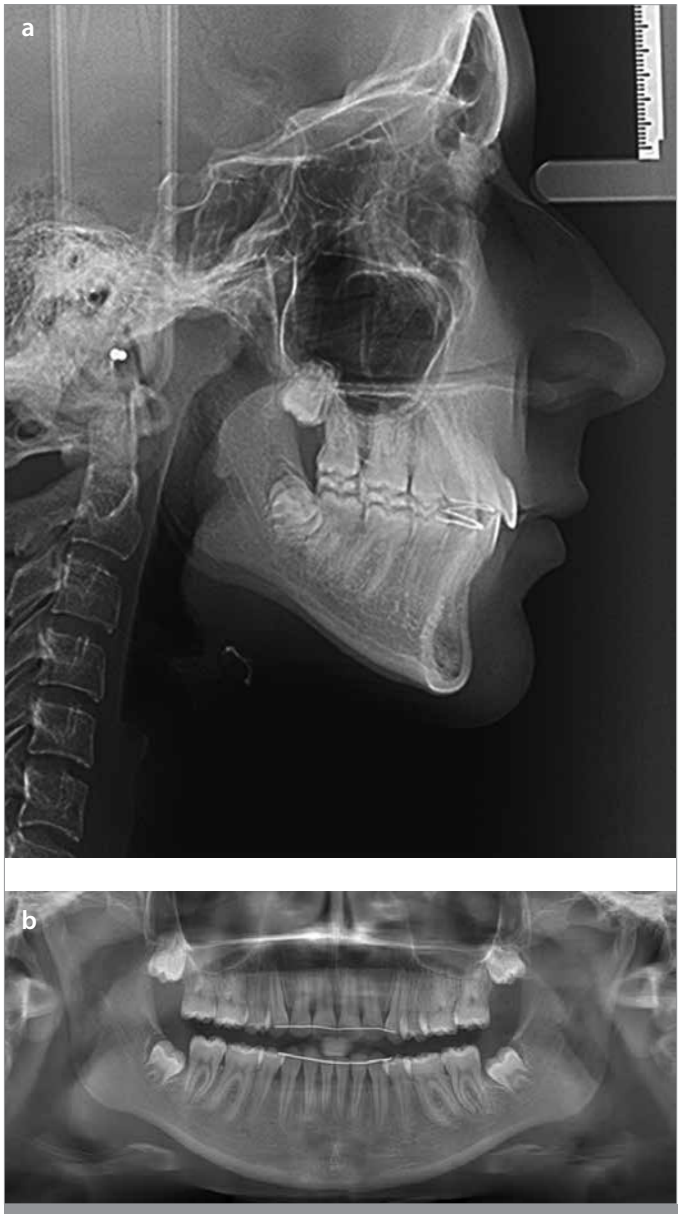

Figure 16. a, b. Post-treatment lateral cephalometric radiograph (a); post-treatment panoramic radiograph (b)

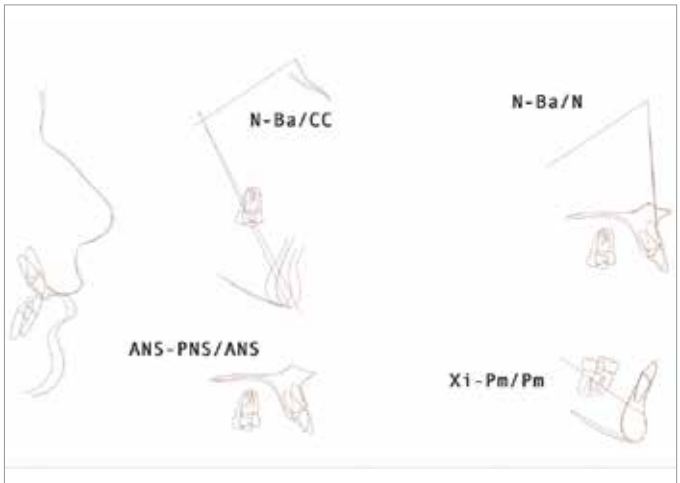

Figure 17. Lateral cephalometric superimpositions; black, pretreatment; red, post-treatment; green, 2 years after treatment

Class I molar and canine relationships and normal overjet and overbite. Both arches showed good alignment and dental midlines coincided with the facial midline. The anterior crossbite was corrected resulting in a good occlusion. The patient was satisfied with the tooth alignment and facial profile. The patient had a pleasant smile with good dental exposure. The cephalometric analysis indicated a decrease in ANB angle (2.5°). The final panoramic radiograph showed good root parallelism with no significant root resorption (Figure 16). The superimposition of the pretreatment and post-treatment cephalometric tracings showed that the treatment objectives were achieved (Figure 17). The lower third of the facial profile was improved as a consequence of a counterclockwise rotation of the mandible. The maxillary incisors were proclined (from 90.2° to 108.3°), and the nasolabial angle decreased from 120° to 115.8°. The cephalometric values, photographs, and superimpositions showed that the occlusion and teeth alignment were stable until 2 years after treatment (Figure 18, 19).

DISCUSSION

The patient had skeletal and dental Class II relationship with a convex profile, decreased overbite (0.5 mm), and maxillary incisor retrusion (U1-SN, 90.2°). Following a comprehensive clinical and database analyses, we devised a treatment plan involving extractions of the upper second premolars and lower first premolars to achieve a symmetrical buccal occlusion, teeth alignment in both jaws with ideal overbite and overjet and midline correction.

The space for the eruption was insufficient for the maxillary canines and maxillary right premolar. Since there was a high mandibular plane angle, it was important to control the vertical dimension of the anterior face. Several studies have shown that mandibular plane angle along with facial vertical dimension would decrease with extraction therapy by mesial movement of the molars (10-13).

Therefore, we decided to extract four premolars rather than perform distalization to gain space for alignment and to ease the vertical control. Extraction does not always mean a more retrusive or dished-in profile. The extent of crowding, soft tissue thickness and the final position of incisors affect the soft tissue profile (14). In our case, facial profile was not affected adversely by the closure of extraction spaces using adequate torque control of the upper incisors during leveling and consolidation. Incisors were initially uprighted and they were tilted labially during the treatment; this movement prevented the lip retrusion.

A high-pull headgear was used mainly to help the anchorage control but it also assisted the vertical control. Slight intrusion of the upper molars by the use of high-pull headgear allowed the mandible to rotate in the counterclockwise direction and decreased the anterior facial height, which also improves the Class II skeletal relationship (15). The high-pull headgear was used for 5 months and discontinued, as there was no need for external anchorage. Posterior bite plate was another tool that helped the vertical control, which was used for 24 hours/day during the correction of the crossbite of #12.

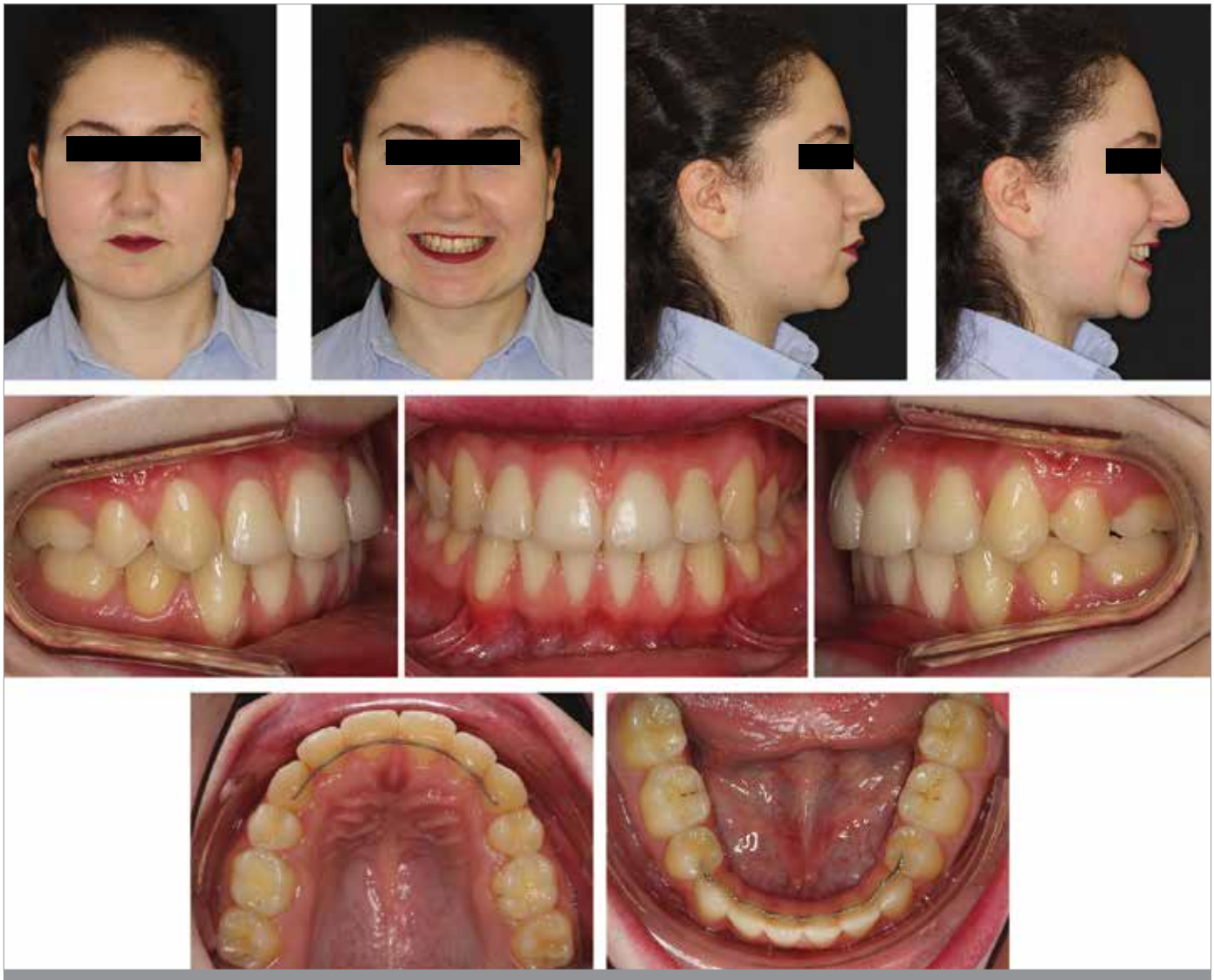

Figure 18. Extraoral and intraoral photographs 2 years after treatment

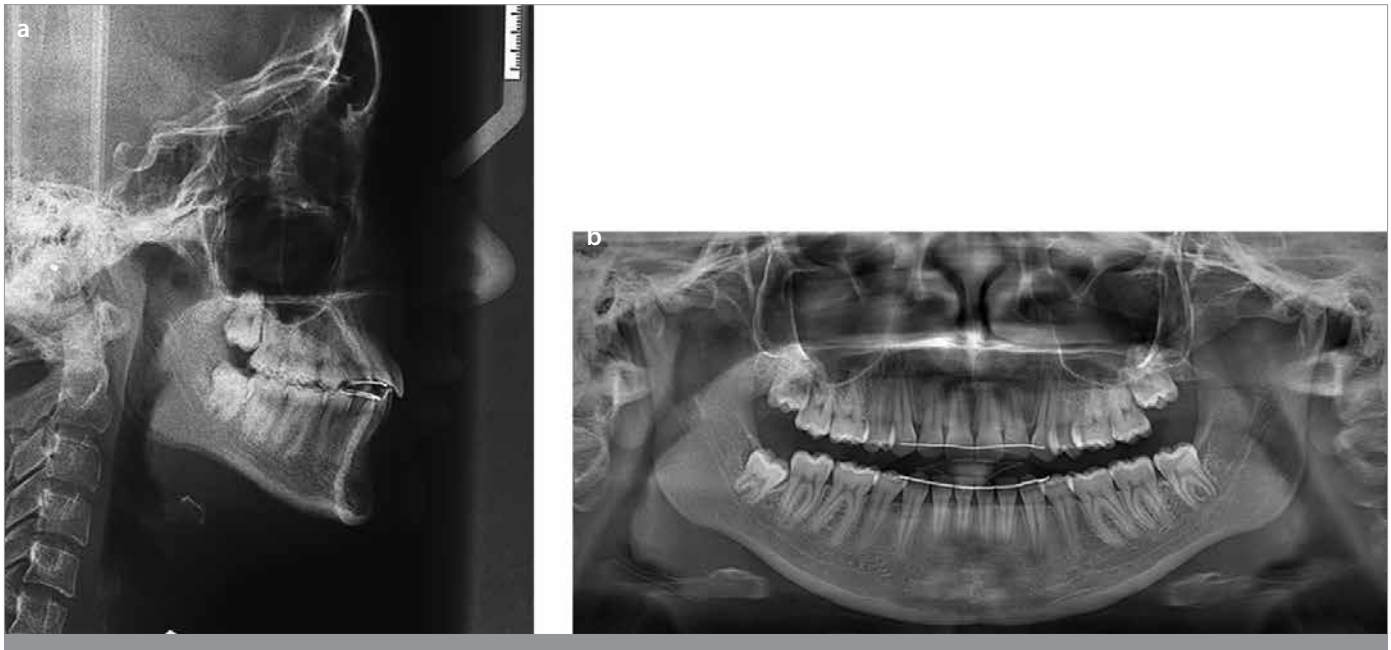

Figure 19. a, b. Lateral cephalometric radiograph 2 years after treatment (a); panoramic radiograph 2 years after treatment (b)

In the lower jaw, no effort was made for the teeth to move into the extraction spaces for 11 months. Almost all the extraction spaces in the mandible were closed by the spontaneous movement of canines, premolars, and molars referred as driftodontics. The braces were then bonded to correct the rotations and inclinations of the lower teeth and achieve appropriate interdigitation with the upper teeth. It is beneficial for the patients to have braces for a shorter period. This yielded in the ease of oral hygiene and prevented the side effects of orthodontic forces exerted on the teeth.

To decrease treatment time during leveling the curve of Spee, a bite ramp was used, which is an orthodontic attachment that is bonded on the palatal side of the maxillary central incisors. Posterior occlusal forces were inhibited by disarticulation of teeth and this yielded in the correction of the Spee easily.

Because of the esthetical concerns of the patient and the early loss of the Leeway spaces, the treatment was initiated before the second molars erupted. This ensured decrease in the arch wire thickness at the last stages of treatment and consequently, the treatment time increased.

CONCLUSION

A Class II patient with four premolar extractions can be treated without soft tissue retrusion. The skeletal pattern, final position of the incisors, amount of crowding and soft tissue characteristics are important factors in the decision of extractions. The physiological drift of the teeth after extractions referred as driftodontics is beneficial for the patient in terms of oral hygiene and prevention of the side effects of orthodontic treatment.

Ethic Committee Approval: N/A.

Informed Consent: Written informed consent was obtained from the parents of the patient.

Peer-review: Externally peer-reviewed.

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

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