CASE REPORT

Non-extraction Treatment of Class II Division 2 Malocclusion with Cover Bite: A Case Report

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ABSTRACT

Increased overbite has always been a challenging orthodontic problem in treating most periodontal-associated problems. This case report described the management of a class II division 2 malocclusion with cover bite without extraction. A 19-year-old female patient came with a chief complaint of irregularities on the anterior teeth. A fixed appliance was placed without extraction. The patient was instructed to use intermaxillary elastic band class II to correct the canine and molar relation. Treatment time was 16 months. A class I canine and molar relation with good interdigitation was achieved. The treatment of class II division 2 malocclusion without extraction in the adult patient showed promising results.

Keywords: Angle Class II Malocclusion, Class II Malocclusion, Malocclusion Class II Division 2, Orthodontic Treatment

INTRODUCTION

Over the last decade, adults' awareness of orthodontic treatment needs increased, demanding high-quality treatment, increased efficiency, and reduced costs in the shortest possible time.[1] One of the most common malocclusions is class II division 2 - retroclinated central incisor and proclinated lateral incisor with a deep bite. A severe class II division 2 malocclusion sign is a covered lower incisor (deep overbite).[2]

An Angle's class II division 2 (II/2) malocclusion severe phenotype with an extremely deep overbite is called cover-bite, or "Deckbiss" in early German description. Other distinctive occlusal variations are skeletofacial hypodivergence, dentoalveolar retrusion of the mandible, increased bony chin projection, reduced mesiodistal tooth size, retroclination of maxillary incisors, and at least 100% overbite, covering at least one mandibular incisor in the occlusion.[3] The etiology is highly hereditary.[2,4]

According to Von-Ber-Linden's malocclusion classification, class II division 2 has three stages of severity in incisor relation: 1) Type A - upper central and lateral incisor retroclinated, but not in severe degree, 2) Type B - upper lateral incisor overlapping and upper central incisor retroclinated 3) Type C - central and lateral upper incisor retroclinated and overlapping with upper canine.

The factors affecting malocclusion class II are dental, skeletal, and genetic. A reduction of the face height with a class II skeletal relation is often found in malocclusion Class II. This causes a continued eruption of the incisor exceeding the normal, so a deep bite occurs. A retroclinated incisor causes the lower lip to cover more than one-third of the incisor crown, called a high lower lip line.[5]

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Some researchers have indicated that the chief complaints of patients with class II division 2 malocclusion were dissatisfaction with their facial appearance and a gummy smile.[6-14] Thus, facial appearance and smile dissatisfaction were often the main reasons for visiting an orthodontist.[6,11,14,15]

Several treatment options are available to correct a class II division 2 malocclusion case, depending on the skeletal jaw's growth and severity and the base discrepancy in the anteroposterior and vertical direction. In class II patients with mild-to-moderate skeletal differences, orthodontic camouflage may be a good treatment choice, which involves intrusion and proclination of the upper incisors during the initial treatment phase. Unlocking the malocclusion by permitting a modification in the path of closure in the mandible may allow and correct a molar relationship.[16] Bhardwaj R et al. used fixed functional appliances. Class II elastics (rubber bands) were used, which have the same effect of advancing the mandible forward.[16]

In our case report, a mono-block (anterior bite plane) was used that acted as an anterior bite plate to help mandibular advancement, similar to Shrestha et al.'s orthodontic treatment choice.[17] There are a variety of orthodontic appliances that can be used with the same orthodontic treatment goal.

CASE REPORT

A 19-year-old female came to Rumah Sakit Gigi dan Mulut Universitas Airlangga with the chief complaint of an undesired appearance that led to the patient's lack of self-confidence. The undesired appearance was caused by the protrusive upper teeth and crowding of the lower teeth with increased visibility of the central maxillary incisors and decreased mandibular incisors visibility when smiling.

Extraoral examination revealed symmetric face, convex profile, mesoprosop face, deep labio mental sulcus, prominent and competent lips with normal speech function (Figure 1).

Intraoral examination revealed a bilateral ½ unit class II canine and molar relationship, crowding, palatally inclined central upper incisors, and labially inclined lateral upper incisor with a deep traumatic overbite (cover-bite Figure 2).

Overjet and overbite were 2.5 mm and 7 mm, respectively. The upper midline shifted 1 mm to the right. The arch length deficiencies were -5 mm on the maxillary arches, -3 mm on the mandibular arch, and an exaggerated lower curve of spee. The oral mucosa, tongue, and palate depth were normal. The patient has good oral hygiene (Figure 2).

Orthopantomography revealed that the alveolar bone level was normal. There was the presence of a full complement of permanent teeth. All third molars were impacted. Complete teeth, no caries, and no pathological lesions were noted (Figure 3). The cephalometric analysis revealed protrusive maxilla (SNA 89°), normognathic mandible (SNB 81°), skeletal class II relationship (ANB 8°) with a vertical growth pattern (Y-axis growth 68°). The upper central incisors were retroclined (UI to NA angle 10°), and the lips were prominent (Figure 4 and Table 1).

Treatment Objectives

The treatment objectives for this patient were: (1) to establish a class I molar and canine relationship; (2) to achieve normal overbite and overjet; (3) to eliminate crowding; and (4) to improve facial esthetics.

Treatment Progress

The treatment procedures started with the placement of the slot 0.022 MBT bracket. The upper arch was initially banded on the first molars and bonded from the

Figure 1. Pre-treatment facial photographs. **(A)** and **(B)** front side facial photograph; **(C)** lateral facial photograph.

second premolar to the second premolar, with archwire progression starting from 0.012 NiTi.

Mono-block (anterior bite plane) was fabricated and inserted to help mandibular advancement. It also acted as an anterior bite plate to correct the deep bite. (Figure 5A). The placement of the bracket in the lower jaw was not yet possible because of the cover-bite. After two months, the lower jaw bracket was bonded and banded using NiTi 0.012 and Niti 0.016, which were engaged on the upper arch (Figure 5B).

When the upper and lower leveling were completed five months later, the interproximal reduction was performed on both sides of the upper canine and premolars. Stainless steel archwire 0.016 x 0.016 were then placed to distalize the premolars and continued with the retraction of the canines

Table 1. Cephalometric analysis

Parameters	Norm	Pre	Post
SNA (°)	82	89	89
SNB (°)	80	81	83
ANB (°)	2	8	6
NA – Apog (°)	-8,5 to 10	16	14
AB – Npog (°)	-4.6	-13	-12
Y- Axis (°)	59.4	68	69
I –NA (°)	22	10	18
I –NB (°)	25	24	33
Wits (mm)	-1	4	3
Nasolabial Angle (°)	100 to 110	79	90
Upper lips – E line (mm)	-2 to -3	+3	+2
Lower lips – E line (mm)	-1 to -2	0	+1
Upper lips – S line (mm)	0	+6	+5
Lower lips – S line (mm)	0	+3	+2

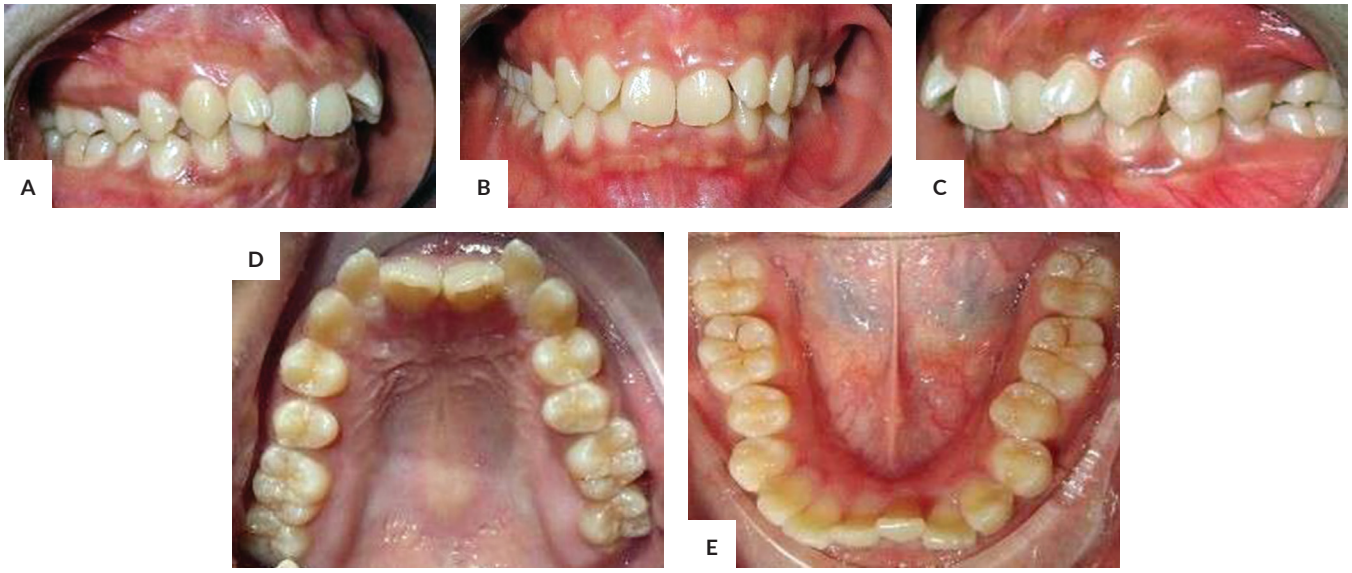

Figure 2. Pre-treatment intraoral photograph. **(A)** intraoral right relation showed ½ unit Class II canine and molar relationship; **(B)** intraoral front relation showed cover bite; **(C)** intraoral left relation showed ½ unit Class II canine and molar relationship **(D)** upper arch; **(E)** lower arch.

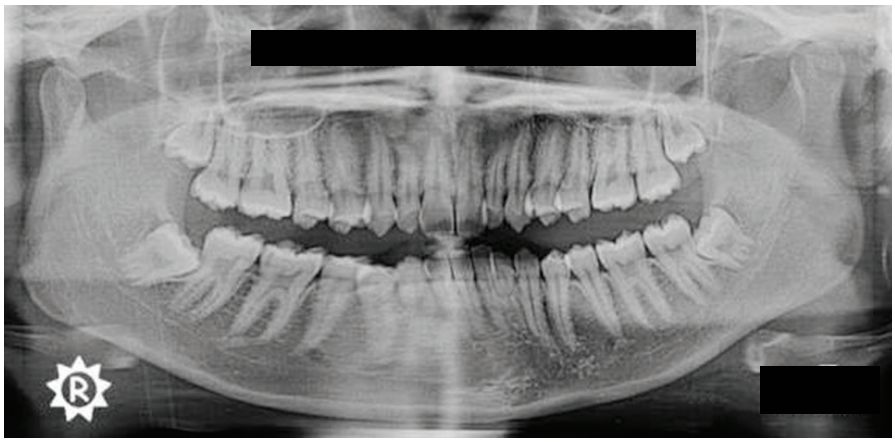

Figure 3. Pre-treatment orthopantomography.

using elastomeric chains. The interproximal reduction was also made on the anterior teeth of the lower jaw. Correction of the crowding and curve of spee were made using 0.016 and 0.016 x 0.016 reverse NiTi. The posterior teeth were ligated continuously with ligature wire (Figure 6A). After canine retraction, the anterior retraction was made with 0.016 x 0.022 stainless steel archwire with T-loop (Figure 6B). The patient was instructed to use an elastic band to correct the class II relation for the duration of the treatment.

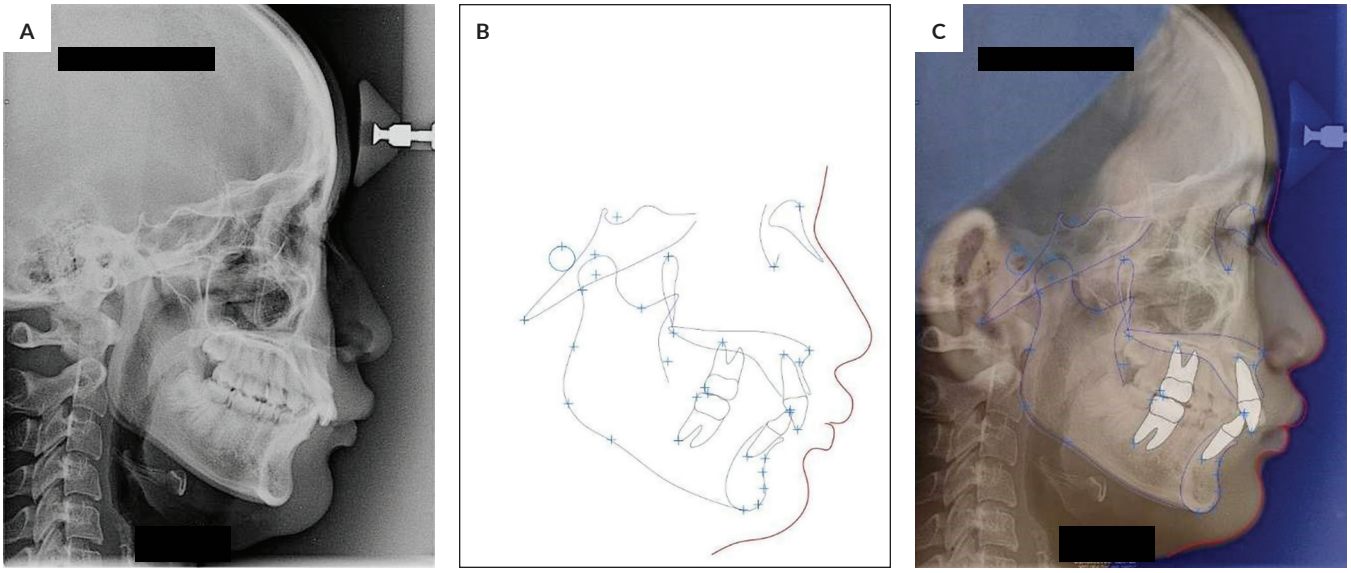

Figure 4. **(A)** Pre-treatment lateral cephalograph; **(B)** Pre-treatment lateral cephalograph tracing using OrthoVision 2D Software; **(C)** Superimposed of pre-treatment lateral cephalograph tracing and lateral extraoral photograph using OrthoVision 2D Software.

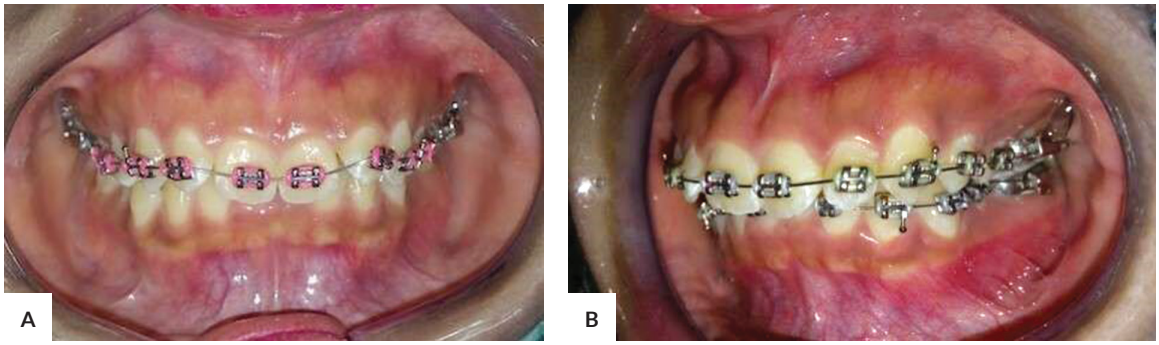

Figure 5. **(A)** Placement on the upper jaw; **(B)** Two months after placement on the lower jaw.

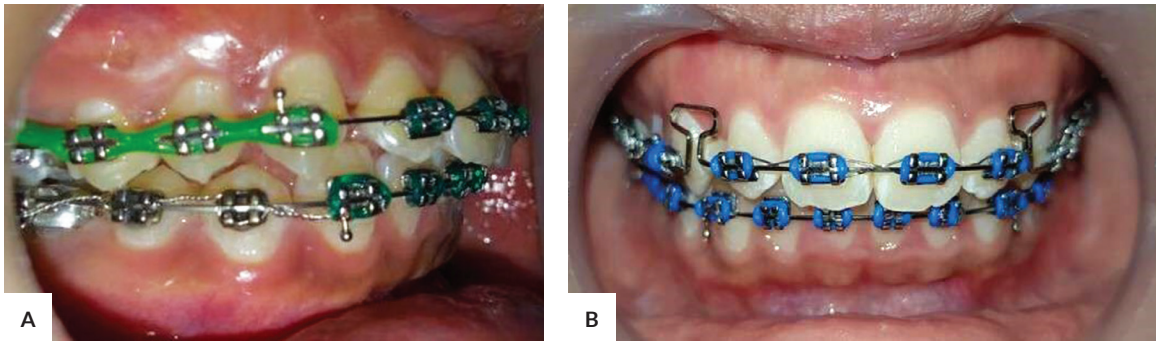

Figure 6. **(A)** Correction of the curve of spee and canine retraction; **(B)** Anterior retraction with T-loop.

RESULTS

After 16 months of active treatment, class I canine and molar relation with good interdigitation was achieved. Normal overjet, overbite, and an ideal arch shape were achieved. The patient felt satisfied with the treatment. Face and smile esthetics improved with the patient feeling confident after the treatment (Figure 7).

The treatment of malocclusion class II division 2 aimed to correct the relation of the incisors, crowding, local deviation, buccal segment relation, deep anterior overbite, and retroclination.

Malocclusion can be treated by decreasing the incisal overbite and correcting the incisal inclination. In this case report, malocclusion class II division 2 treatment without extraction to correct crowding and the deep overbite was performed with good esthetic results.

The post-treatment panoramic figure (Figure 8) shows root parallelism with no abnormalities on the underlying tissues. Cephalometrically, ANB angle decreased from 8° to 6° because of the change in SNB angle from 81° to 83°, indicating the autorotation of the mandible. There was no change in the SNA angle. There was an increase in the lower lip length. Upper and lower incisors were proclined relative to cranial and apical bases. This proclination helped correct deep bite and sagittal discrepancy by allowing the mandible to move forward (Figures 9 and 10).

For retention, Hawley retainers were placed on the upper and lower jaws. The patient was instructed to wear them full time for one year.

Figure 7. Post-treatment facial and intraoral photograph. **(A)** and **(B)** front side facial photograph; **(C)** lateral facial photograph; **(D)** intraoral right relation shows Class I molar and canine relationship; **(E)** intraoral front photograph shows corrected overbite; **(F)** intraoral left relation shows Class I molar and canine relationship **(G)** upper arch; **(H)** lower arch.

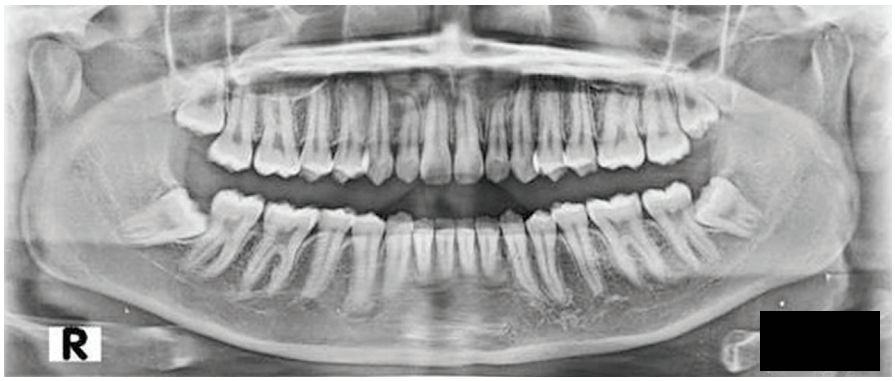

Figure 8. Post-treatment orthopantomography.

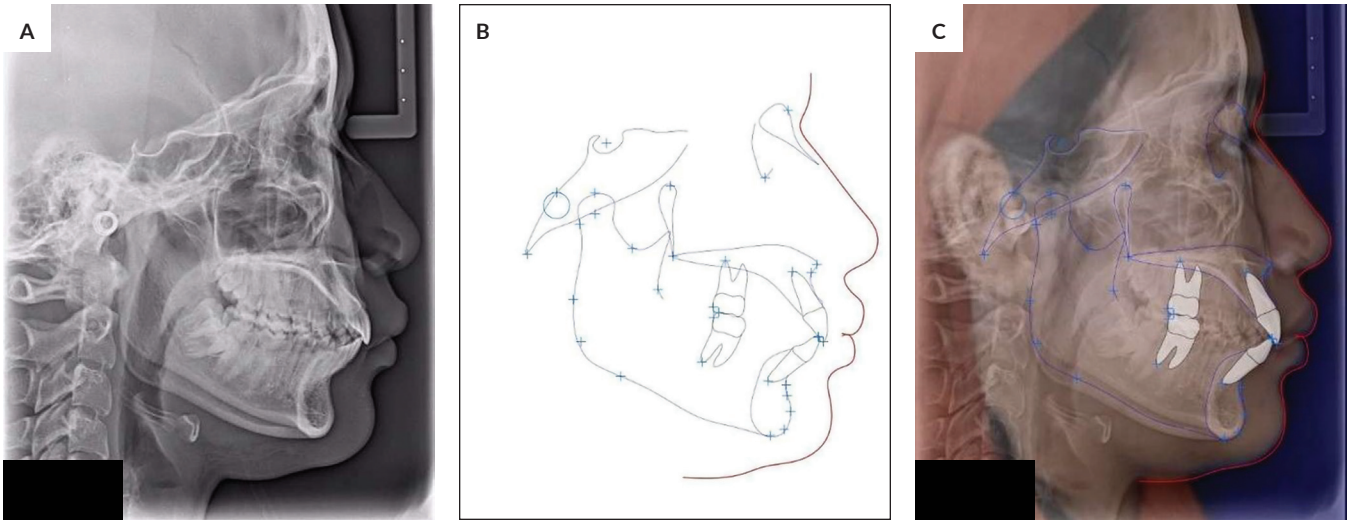

Figure 9. **(A)** Post-treatment lateral cephalograph; **(B)** Post-treatment lateral cephalograph tracing using OrthoVision 2D Software; **(C)** Superimposed of post-treatment lateral cephalograph tracing and lateral extraoral photograph using OrthoVision 2D Software.

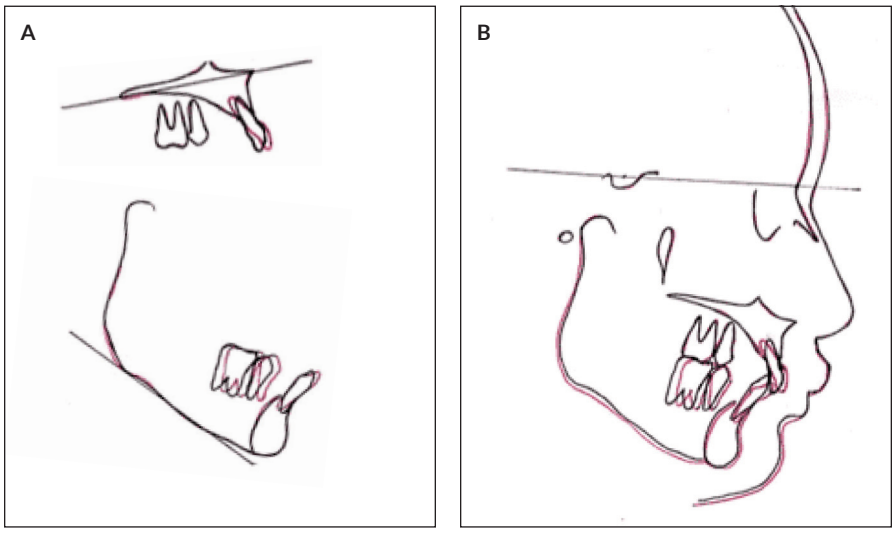

Figure 10. Superimposition of pre- and post-lateral cephalograms. **(A)** Maxillary changes and mandibular changes. **(B)** Overall skeletal and dental changes.

DISCUSSION

Indication for a patient to undergo camouflage orthodontic surgery is based on the severity of the orthodontics alone. Diagrams called "envelope of discrepancy" show at least a semiquantitative limitation in orthodontic treatment.[18] The anteroposterior, vertical, and transverse range in millimetric treatment possibilities in orthodontics can be expressed in these diagrams. Treatment possibilities mean the amount of tooth movement that can be accomplished by orthodontics alone, orthodontics plus dentofacial orthopedics with or without skeletal anchorage, or orthodontics plus orthognathic surgery.

Envelope discrepancy shows the limits of tooth movement or the dental compensation needed.[19] For class II malocclusion patients with mild-to-moderate skeletal differences, dental compensation would be a good treatment choice. Standard treatment procedures include flaring of incisors, interproximal tooth reduction, and extractions.[20]

Non-extraction is preferred for arch length deficiencies of less than 5 mm.[21] In our case report, the arch length deficiency of our patient was less than 5 mm, and therefore non-extraction was considered.

Asakawa et al. treated a girl with class II division 2 malocclusion - class II on the right and class I on the left at the first molars. The right and left canines were class II and 8 mm mandibular crowding without extraction. They stated that proper overjet and overbite could not be obtained if the patient was treated with a premolar or incisor extraction. In a class II division 2 malocclusion, decompensating the incisors by proclining them may unlock the mandible, permitting the advancement and modification of the path of closure of the mandible and aids in correcting a class II skeletal dental relation, especially in young individuals.[22]

According to Ackerman, proclining the anterior is preferred over extraction of the teeth to correct crowding in patients with a balanced profile and no lip strain.[23] In our case report, our patient's incisors were proclined, followed by interproximal reduction and retraction.

A deep overbite can block the lower arch bracket. Thus, the bracket placement is first performed in the upper jaw. After ensuring no possibility of bracket interference, placement of the bracket in the lower jaw may be carried out.

Basic knowledge of orthodontic treatments to correct deep bite such as extrusion of posterior teeth, flaring of anterior teeth, intrusion of upper and lower incisors using bite plate, reverse curve archwires, step bands on the archwire is essential.[24,25]

The use of a mono-block (anterior bite plane) works for anterior placement of the mandible, correct deep bites and midline discrepancies, eliminating crowding, and obtaining good torque and root axial inclinations.[23]

Uribe and Nanda stated that the treatment protocol for Class II division 2 patients includes extraction of the upper premolars to relieve crowding, with simultaneous correction of the deep bite by the intrusion of the upper and lower incisors.[20] Intrusion mechanics were performed using either a preformed nickel-titanium Connecticut Intrusion Arch8 (CIA) or CNA beta-titanium archwires. The Uribe and Nanda case was full unit class II that needed extraction to relieve crowding and achieve a Class I canine relationship. Space closure can be accomplished with a CNA mushroom-loop wire or CNA T-loops. When the spaces were completely closed after the retraction with a T-loop, the wire was left in the mouth for one to two additional visits to correct the axial root inclinations of the anterior and posterior teeth.[20]

In our case report, the overjet was 2.5 mm. Camouflage treatment without extraction was selected due to the overjet and arch length discrepancy. The molar and canine relationship was ½ unit of Class II. The mono-block and a class II elastic were applied to mediate the anterior mandibular movement. The effect of the mono-block was to reduce the deep bite. The intrusion effect was added using a 0.16 x 0.16 reverse NiTi. The retraction mechanics in our case were to use elastomeric chains and a T-loop.

Class II elastics are auxiliary forces classified as active elements in a fixed appliance system.[23] They have been used in correcting class II malocclusion since the early days of orthodontic treatment.[26] The vertical force can extrude the mandibular molars and maxillary incisors, leading to the rotation of the occlusal plane, and may also adversely affect the smile line.[27] Class II elastics or inter-maxillary traction was incorporated to transfer anchorage from one arch to another. Class 2 molar relationship is corrected via the mesial movement of the buccal dentoalveolar segment with elastics.[28]

Camouflage treatment was performed without extraction to treat our patient with a class II division 2 malocclusion. The maxillary incisors were proclined, followed by interproximal reduction and retraction. The advanced mandible was obtained with elastic class II and a mono-block. In addition to facilitating anterior mandibular movement, a mono-block had the effect of reducing the deep bite. Intrusion arches were used to prevent the side effects of elastics in the upper incisors.

CONCLUSION

Treatment of malocclusion class II division 2 without extraction in an adult patient showed promising results. The treatment attempted was to potentiate a more forward growth and development of the mandible. The mono-block (anterior bite plane) worked for anterior placement of the mandible to correct the deep bite, eliminate crowding, and obtain good torque and root axial inclination.

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Statement of Authorship

All authors participated in data collection and analysis and approved the final version submitted.

Author Disclosure

All authors declared no conflicts of interest.

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