

Correction of an adult Class II division 2 individual using fixed functional appliance: A noncompliance approach

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Abstract

This case report describes the application of fixed functional appliance in the treatment of an adult female having Class II division 2 malocclusion with retroclination of upper incisors. Fixed functional appliance was used to correct the overjet after the uprighing of upper incisors. Fixed functional appliance was fitted on a rigid rectangular arch wire. Application of fixed functional appliance achieved a good Class I molar relationship along with Class I canine relationship with normal overjet and overbite. Fixed functional appliance is effective in the treatment of Class II malocclusions, even in adult patients, and can serve as an alternate choice of treatment instead of orthognathic surgery. This is a case; wherein, fixed functional appliance was successfully used to relieve deep bite and overjet that was ensued after leveling and aligning. We demonstrate that fixed functional appliance can act as a “noncompliant corrector” and use of Class II elastics can be avoided.

Keywords: Adult orthodontics, fixed functional appliance, noncompliance approach

Introduction

Since the reintroduction of Emil Herbst's functional appliance as a mandibular advancement appliance in Class II cases by Hans Pancherz, fixed functional appliances have enjoyed a credible amount of success and popularity.^[1,2] Generally, fixed functional appliances have been primarily advocated in the management of recessive mandible in growing individuals;^[3,4] we present a case report, wherein, fixed functional appliance was used as a “Class II noncompliant corrector” in an adult with no use of Class II elastics. This case report describes the treatment of an adult female having Class II division 2 malocclusion with severe crowding and retroclination of upper incisors. Nonextraction approach

to treatment with fixed functional appliance was advocated for the correction of overjet. The case showed minimal or no change posttreatment. This case report emphasizes the use of fixed functional appliance in adults as a “Class II noncompliance corrector.”

Case Report

A 21-year-old female reported with irregularly placed upper and lower front teeth, and she was also concerned with her small chin. On clinical examination; extraorally, she exhibited convex profile, normal nasolabial angle, recessive chin, decreased lower anterior facial height, hypodivergent growth pattern, brachy face, and increased gingival display [Figure 1a-c]. Intraoral examination revealed Class II molar relation, deep traumatic bite, and lingually displaced lower right lateral incisor [Figure 2a-e]. Cephalometric examination [Figure 3 and Table 1] showed a Class II skeletal pattern (SNA, 76°; SNB, 71°; ANB, 5°) with posterior placement of the mandibular condyle in the glenoid fossa (saddle angle, 122°; articular angle 145°), hypodivergent pattern (maxillomandibular angle, 18°), and decreased lower anterior face height (52 mm). Although the patient exhibited short mandibular body length (Go-Pog, 67 mm), it was the posterior placement of the condylar head in the glenoid fossa which amplified the severity of Class II.

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Treatment objectives

The following were the treatment objectives;

- Unraveling of crowding to achieve leveling and alignment of teeth
- Correction of traumatic overbite and to establish normal overjet and overbite
- Correction of hypodivergent growth pattern
- Correction of gummy smile to pleasing smile
- Correction of Class II molar relationship
- Correction of skeletal Class II pattern to orthognathic profile.

Treatment plan

To achieve the objectives, two treatment options were presented to the patient;

Orthognathic surgery

Unraveling of crowding with orthodontic treatment; once the alignment is achieved, the case will be assessed for the auto-unlocking of the mandible; if there is no unlocking, bilateral sagittal split osteotomy will be carried out for the advancement of the mandible. The patient refused this treatment based on the morbidity associated with orthognathic surgery, as well as the additional financial burden incurred from surgery.

Fixed functional appliance

After unraveling of crowding with orthodontic treatment, fixed functional appliance will be used to correct the overjet. Patient was made aware of the drawbacks of the

fixed functional appliance (pseudo-advancement) and the possibility of relapse over a period of time. Patient accepted this treatment option.

Case management

After formal consent of the patient, a second treatment plan was adopted. The molars were banded, and the remaining teeth were bonded with 0.022" preadjusted edgewise appliance (MBT prescription, Gemini brackets, 3M Unitek Orthodontic Products, Monrovia, CA, USA). After initial leveling was accomplished with 0.016" nickel-titanium (Ni-Ti) archwires in the upper and lower arch. 0.16 × 0.025" Ni-Ti was placed for further unraveling of crowding (Orthoforce G4-Ni-Ti, G and H Wire Company, Hanover, Germany). Leveling and aligning were completed at 6 months. Once the proper axial inclination of the teeth was achieved, 6 mm of overjet was evident in the anterior region with Class II molar relation bilaterally with no self-correction of overjet [Figure 4a-c].

Table I: Cephalometric analysis

Measurement	Normal	Pre-treatment	Post-retention
SNA	82° ± 2°	76°	77°
SNB	80° ± 2°	71°	75°
ANB	2°	5°	2°
FMA	25° ± 4°	22°	27°
Go-Pog	74±5 mm	67mm	67mm
Saddle angle	123 ± 5°	122°	120°
Articulare angle	143 ± 6°	145°	148°
Gonial angle	128 ± 7°	126°	122°
Maxillomandibular angle	18-22°	18°	22°
IMPA	90°	91°	93°
Lower Anterior Face Height	53-61 mm	52mm	60mm
Interincisal angle	130°-135°	148°	134°
U1 – NA	22°, 4mm	10°, 2.5mm	18°, 3.5
L1 – NB	25°, 4mm	16°, 3mm	24°, 4.0
E line – U lip		4.5 mm	1.8 mm
E line – L lip		6.0 mm	2.0mm



Figure 1: (a-c) Pretreatment extraoral photos

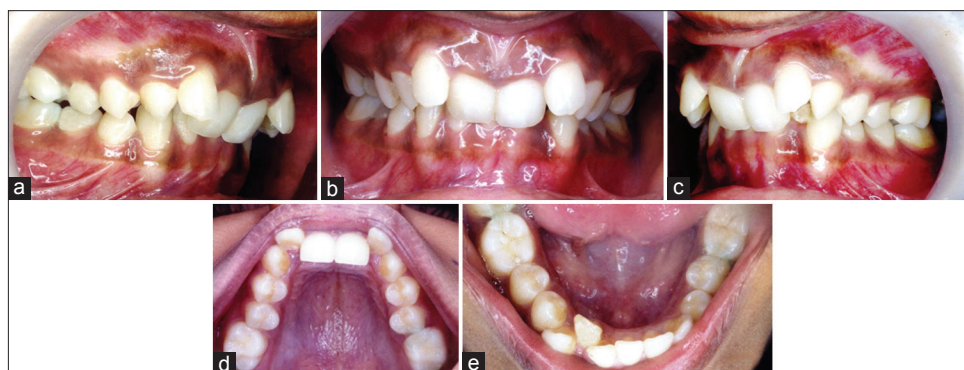


Figure 2: (a-e) Pretreatment intraoral photos

0.021 × 0.025" stainless steel upper and lower archwires were placed with lingual crown torque in the anterior section of the lower archwire to counter buccal flaring of lower anterior teeth. An attempt was made to use Class II elastics; however, the patient was noncompliant and refused to wear elastics. The Jasper Jumper (American Orthodontics, 1714 Cambridge Avenue, Sheboygan, WI 53082-1048, USA) fixed functional

appliance was placed from headgear tube of upper first molar and hooked to the lower archwire in between first premolar and canine, on either side [Figure 5a-d]. A transpalatal arch was placed on the upper first molars to counter the buccal flaring of the molars. The fixed functional phase lasted for 9 months.

Settling of the occlusion was carried out on 0.016" stainless steel in the upper and lower arches with settling elastics over a period of 3 months. After 18 months of initial bracket placement, the promulgated objectives were achieved. A good Class I molar relationship was achieved along with Class I canine relationship with normal overjet and overbite [Figure 6a-c]. Extraoral photographs and cephalometric analysis showed good outcomes. Three years postretention cephalometric analysis showed an increase in the lower anterior facial height with a mild decrease in saddle and gonial angle, and an increase in articular angle indicating favorable forward relocation of the mandible. Lower anterior face height was increased from 54 to 60 mm. The incisor mandibular plane angle (IMPA) showed a mild increase from 89° to 92° indicating mild labialization of lower anterior teeth. Normal interincisal angle was established.



Figure 3: Pretreatment lateral cephalograph



Figure 4: (a-c) Intraoral photos after leveling and aligning. Molars were in Class II relationship with 6 mm anterior overjet

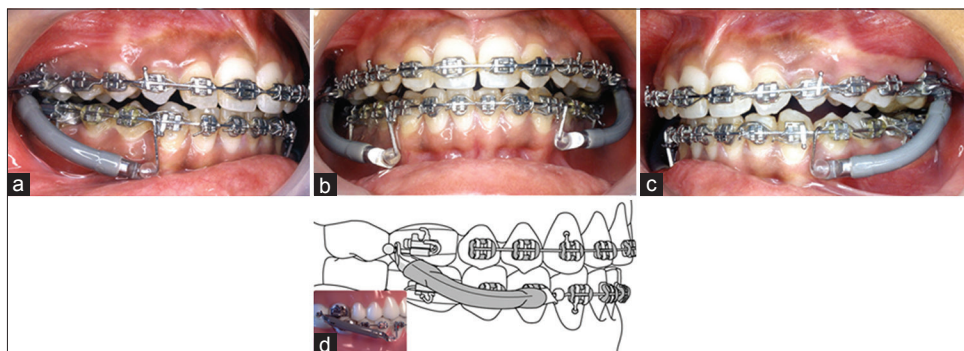


Figure 5: (a-d) Jasper Jumper hooked from upper first molar headgear tube to lower archwire in between canine and first premolar (d - Reprinted with permission from American Orthodontics, 1714 Cambridge Avenue, Sheboygan, WI 53082-1048, USA)



Figure 6: (a-c) Posttreatment intraoral photos after debanding

Retention regime of the patient was planned by instructing the patient to wear a maxillary and mandibular full wrap around Begg retainer for 24 h a day for 2 years, and only at night, for another 6 months. Removable retainers were given for reinforcement of retention with upper retainer having inclined plane for the retention of overjet correction. In addition, fixed lingual retainer was bonded from canine to canine both in upper and lower arches.

Discussion

Patient was diagnosed to be a severe skeletal Class II, with a short corpus length of the mandible, and functional posterior positioning of condyles due to retroclination of upper incisor teeth. The treatment plan advocated achieved excellent facial and occlusal results. The most significant change was an improvement in the recessive chin. Esthetic objectives were achieved with a reduction in severity of facial convexity, the face becoming more orthognathic, lower face height increased; traumatic bite was eliminated with normal overjet and overbite. The patient was pleased with the treatment outcome. The achieved correction showed minimal or no changes [Figures 7a-c and 8a-e]. All results were confirmed by superimposition of pretreatment and postretention cephalogram tracings [Figures 9 and 10]. Achieving proper interdigitation is one of the key factors for long-term stability of the corrections brought by treatment.^[5,6]



Figure 7: (a-c) Postretention extraoral photos

Several authors have reported that Class II correction using a fixed functional appliance anchored onto the lower archwire occurred mainly through dentoalveolar movement, which cause flaring of the lower anterior teeth leading to an unstable occlusion.^[6,7] Heinig and Göz^[8] studied the effects of Forsus Nitinol Flat Spring® (NFS) in adolescent skeletal Class II patients over a functional period of 4 months. They deduced that the corrections achieved by the spring were a combination of skeletal and dental effects, with the dental effects contributing to 66% of the changes. In this case, uprighting of the upper incisors revealed the actual overjet discrepancy; no unlocking of the mandible was noticed, hence, fixed functional appliance was used to correct the overjet. The fact that lower incisors were retroclined provided an incentive to place the fixed functional appliance such that the retroclined lower incisors could be uprighted, and subsequently, overjet could be resolved.

Cope *et al.*^[7] hypothesized that the mechanism for Class II correction by means of the Jasper Jumper was primarily due to basal restraint of the maxilla, dentoalveolar retraction of the maxillary dentition, increased growth at the mandibular condyle, downward and forward remodeling of the glenoid fossa, and lateral expansion of the maxillary molars. Karacay *et al.*^[9] compared the skeletal and dental effects of Forsus Nitinol Flat Spring® (NFS) and Jasper Jumper for the correction of adolescent Class II, division 1 malocclusions. They concluded that both appliances had similar effects and caused mandibular growth, as well as displacement, restraining effect on the maxilla, intrusion, and distalization of the maxillary molars, extrusion, and mesialization of the lower molars, palatal tipping with extrusion of maxillary incisors and labial proclination of the mandibular incisors. In this case, there was mesialization of lower molars, downward-forward movement of the lower dentoalveolar component leading to the increase in lower anterior face height, and subsequent improvement in the facial soft tissue profile.

The patient was reluctant to wear Class II elastics for the correction of overjet that ensued after leveling and aligning.

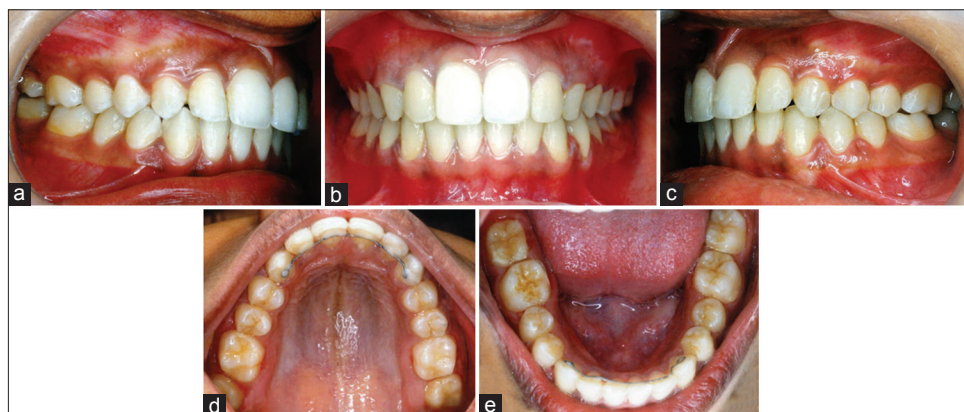


Figure 8: (a-e) Postretention intraoral photos



Figure 9: Postretention lateral cephalograph

The main reason cited by the patient for not wearing elastics was the long duration associated with the wearing of elastics (about 9 months). However, the patient became compliant in wearing settling elastics during the final phase of treatment, this could be attributed to several factors; (a) the patient's objective of opting orthodontic treatment was achieved and hence desired to complete the treatment at the earliest, (b) the duration of wearing elastics was smaller in comparison to long-term duration of Class II elastics requiring minimum compliance, and (c) the settling elastics were worn only at night.

Although, the results brought could be achieved by Class II elastics, however, fixed functional appliance such as "Jasper Jumper" provides a noncompliance way of correcting the discrepancy with minimal compliance of wearing Class II elastics. Moreover, fixed functional appliances' higher force (approximately 200 g, significantly higher than heavy Class II elastics), and elicitation of push-force in comparison to pull-force of Class II elastics on the lower dentoalveolar component which brings dentoalveolar changes more pronounced than Class II elastics.^[10]

Summary

Fixed functional appliance is effective in the treatment of Class II malocclusions, even in adult patients, and can serve as an alternate choice of treatment, especially those who refuse orthognathic surgery.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients

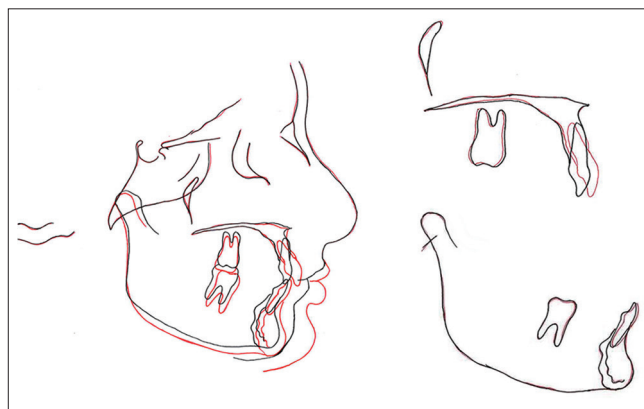


Figure 10: Superimposition of pretreatment and postretention lateral cephalographs. Black = Pretreatment, red = Postretention

understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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