OPEN ACCESS

Saudi Journal of Oral and Dental Research

Abbreviated Key Title: Saudi J Oral Dent Res
ISSN 2518-1300 (Print) |ISSN 2518-1297 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com/sjodr

Case Report

Correction of Unintended Aftermath of Fixed Functional Appliance in Class II Division 1 Malocclusion – A Case Report

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DOI: 10.36348/sjodr.2020.v05i03.007 | **Received:** 14.02.2020 | **Accepted:** 21.02.2020 | **Published:** 18.03.2020

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Abstract

The knowledge of orthodontic appliances used for correction of skeletal and dental deformities is essential for the success of orthodontic treatment. The simplest problems during the treatment phase can lead to complicated situation and solving that requires proper and thorough knowledge of its working capacity and biomechanics. The following is a case which was treated with an Orthopedic appliance (FORSUS) which lead to an unforsaken situation and treating that to achieve ideal skeletal and dental stability.

Keywords: Orthodontics, Orthopedic, Appliance, Biomechanics, Skeletal.

INTRODUCTION

Angle's Class II is the most common malocclusion reported when compared to Class I or Class III. Research suggests that Mandibular Retrognathism is the most common underlying cause rather than maxillary prognathism [1]. It has been reported that the effectiveness of functional therapy depends on both the treatment timing (skeletal maturity at the start of functional therapy) and the type of functional appliance used [2].

Ruf and Pancherz[7,10], Konik *et al.* [6] and Kinzinger and Diedrich [8] stated that the treatment of late adolescents and young adults with rigid fixed functional appliances such as the Herbst or functional mandibular advancer resulted in correction of the both skeletal and dental parameters in Class II malocclusion. However, the changes produced by semi-rigid fixed functional appliances might be different from those produced with rigid devices.

Occasional incidences happen that change the phase of the routine treatment plan. This article presents a case report of an adolescent skeletal class II patient who was treated with a fixed functional appliance (FORSUS-Fatigue Resistance Device) which succumbed to an untoward reaction that was eventually treated with appropriate measures.

Diagnosis and treatment planning

A 15years old boy reported with a complaint of forwardly placed upper front teeth and a small lower jaw. Clinical examination revealed mesomorphic body type, symmetric face with an average mandibular plane angle and a marginally decreased lower facial height. He had a convex facial profile, a posterior divergent face and an acute nasolabial angle. Though he exhibited lip competency at rest, there was evident lip trap during the functional examination. He had acceptable smile aesthetics though incisor exposure on smile was compromised owing to severe proclination (Fig: 1).

Intra-oral examination revealed normal soft tissue. Patient presented with dentoalveolar Class II division 1 malocclusion, unilateral posterior crossbite (right, complete deep bite), increased overjet (8mm), constricted upper and lower arch forms. Examination of dentition revealed clinically missing upper and lower right second premolar in the arch with exaggerated curve of Spee.

Visual treatment objective was found to be positive indicating the patient to be subjected to a functional appliance.

Radiographic Examination revealed Impacted upper and lower right second premolar. There was no evident dental pathology. The crown formation of all third molars was nearing completion.

Cephalometric interpretation

The lateral cephalogram showed the SNA value to be 83° and SNB to be 76° with an ANB value of 7° signifying a skeletal Class II discrepancy primarily the result of a retrognathic mandible. The Wits appraisal of 5 mm corroborated this fact. Vertical skeletal evaluation revealed a mild decreasing facial height ratio and a maxillo-mandibular plane angle of 22°. Dental analysis showed upper incisor inclination to SN at 129°. The lower incisor to mandibular plane angle was at 101°, signifying a severe proclination of the maxillary and mandibular incisors. The lower incisor is ahead when evaluated against the A-Pog line by 6mm. The lower lip was retrusive to the aesthetic plane by 5mm. Cervical vertebral staging revealed deceleration. Hence the case was diagnosed as Angle's Class II division 1 malocclusion on a Class II skeletal base attributing to orthognathic maxilla and retrognathic mandible on an average mandibular plane angle with proclined and crowded upper and lower teeth, unilateral posterior crossbite, increased overjet, deep bite, impacted upper and lower right second premolar.

Treatment objectives

- Correction of soft tissue profile
- Correction of class II skeletal pattern
- Correction of retrognathic mandible
- Correction of cross bites
- Correction of deep bite &Level the curve of spee
- Achieve a Class I incisor relationship with ideal overjet and overbite
- Achieve a Class I molar relation
- Retention with periodic reviews to monitor any relapse tendency
- Review the eruption of third molars

Treatment plan

- Impacted upper and lower right second premolar and erupted upper and lower left first premolar was extracted.
- Owing to the severe upper and lower anterior proclination, a two-phase treatment was planned which corrected the dentoalveolar component initially followed by correction of skeletal problem later.

Phase i: (pre-functional levelling, aligning and space closure)

- Fixed Preadjusted edgewise appliance with MBT prescription (MBTTM.022").

Phase ii: (growth modification)

- Functional appliance: Fixed functional (FORSUS fatigue resistant Device, 3M Unitek).

Prognosis for stability

The most important factor for maintaining the skeletal correction using growth modification procedure is the presence of a good and well interdigitated occlusion. The corrected anterior deep bite should be retained well with a good edge-centroid relationship and proper inter-incisal angle. Achievement of lip competency would aid in retaining the overjet reduction.

Treatment progress

Treatment was commenced after extraction of the premolars. Phase I treatment was started with 0.022MBT pre-adjusted edgewise appliance, 0.016 Niti archwire was placed in both upper and lower arches.

Later, Archwires were upgraded to 0.016×0.022 Niti till 0.019×0.025 Niti. Once levelling and aligning was completed retraction was performed with 0.017×0.025 S.S Tear drop loop.

After space closure 0.021×0.025 Stainless Steel was placed in upper and lower arch and fixed functional appliance, FORSUS was advocated for the required skeletal correction (Fig: 2). Crimps were added bilaterally, so as to allow reactivation of FORSUS.

Once the FORSUS is engaged, it is mandatory to subject the patient to routine review (every 4weeks) to prevent any untoward reactions. However, the patient failed to report for more than 6 months which resulted in unwanted movements in the teeth (Fig: 3) and also a change in the condylar position which was evident in the Orthopantomograph (Fig: 4).

TREATMENT RESULTS

Following two phase treatment with FORSUS, the skeletal component of the malocclusion was successfully corrected but due to unintended effects on the dentoalveolar component, patient presented with Class III molar relation with reverse overjet, crossbite and anteriorly displaced condyle which was eventually rectified with further orthodontic intervention.

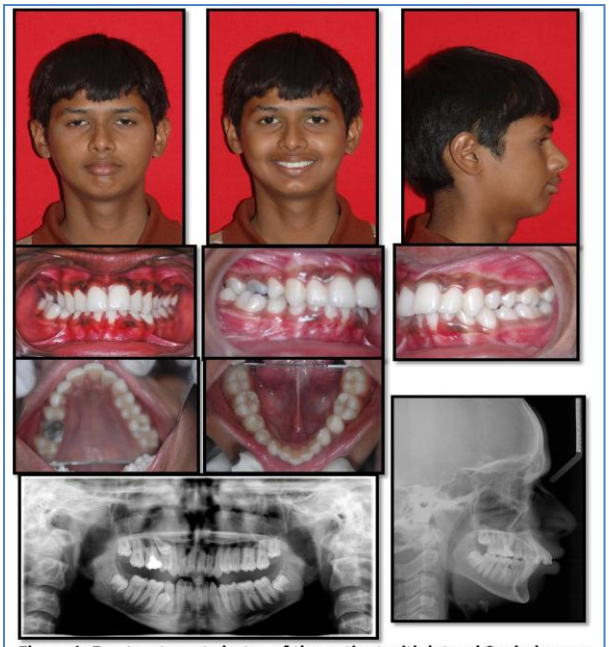

Figure 1: Pre-treatment photos of the patient with lateral Cephalogram and Orthopantomogram.

Figure 2: Showing FORSUS placement after Phase I therapy.

Figure3: Showing Unintended effect of FORSUS. See the anterior as well as posterior crossbite with buccal flaring of lower molars because for force delivery of FORSUS and archwire flexure.

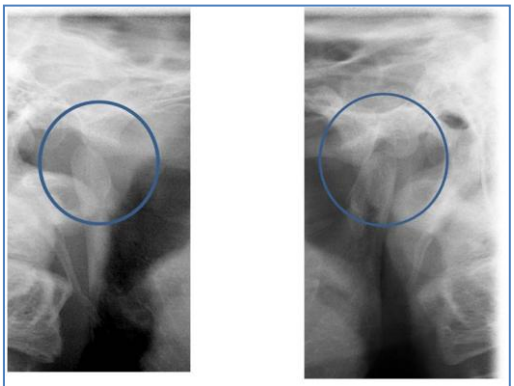

Figure 4 : Showing condylar position after unintended FORSUS effect.

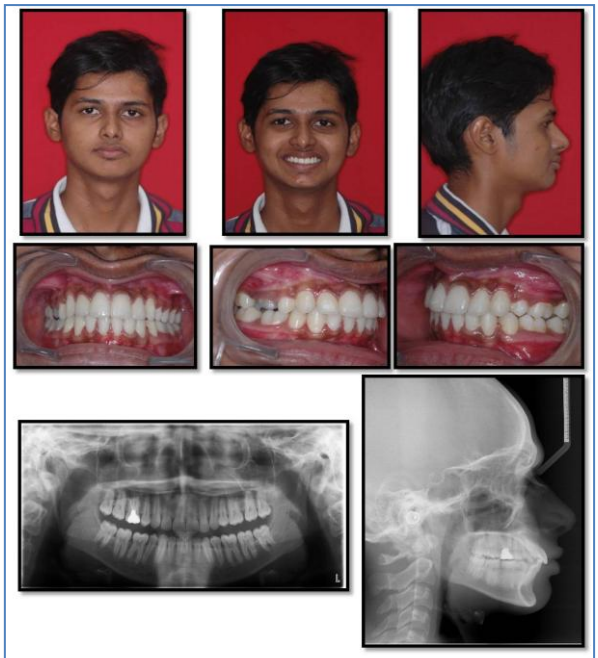

Figure 5: Post treatment photos showing good improvement in the patients profile and skeletal base.

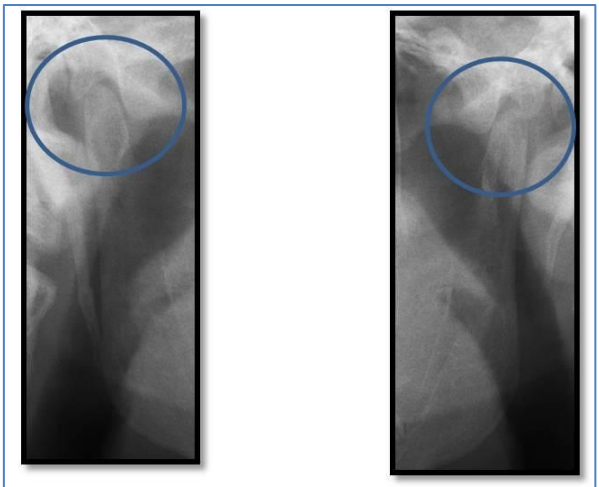

Figure 6 : Showing Post treatment condylar position

DISCUSSION

As an untoward effect, the patient presented with a Class III molar relation, with buccal rolling of lower molars creating a posterior crossbite. There was a mesial movement of the entire lower arch creating space between lower first and second molars. The lower extraction space opened bilaterally by 3mm, extrusion as well as lingual rolling of right lower first bicuspid occurred due to debonding of the bracket (Fig: 3). Radiographic examination revealed anterior shift of the mandible showing change in the condylar position anteriorly. Leucke and Johnston *et al*. [4] found that 70% of their sample had anterior condylar repositioning, whereas 30% experienced posterior condylar repositioning during orthodontic treatment.

Though the patient's condyle was displaced anteriorly he did not complain of pain or any discomfort related to the temporomandibular joint. Shen *et al*. [9] in their study found that alteration in mechanical forces such as use of Class II elastics for space closure can explain how condylar resorption can occur by orthodontic mechanical force. O'reily *et al*. [5] had reported that usage of class II elastics have little or no effects on TMD signs and symptoms. In view of the above-mentioned studies that showed class II elastics with forces that are much reduced in intensity appliance could bring about iatrogenic changes in TMJ which can lead to TMD it would be highly probable that fixed functional appliance could cause more deleterious effects on the TMJ.

Since this was a transient malocclusion which was iatrogenically created, rectifying such problems was possible since it was detected early. Greene and Laskin[3] did a questionnaire survey on TMD in growing children and concluded that symptoms of TMD are generally benign and do not progress to more serious clinical dysfunction or disease, even in subjects who previously had symptoms. Previous study stated that TMJ problems gets worsened and but in few instances it improved mainly because of the glenoid fossa remodelling that happened during growth period which tend to resolve the TMJ problems devoid of intervention, followed by correction of condylar position to its primary site (i.e.) centric relation. The adaptability of TMJ to mechanical effects varies according to age.

To overcome these deleterious effects, the FORSUS was subsequently removed and then alignment was completed with 0.019x0.025 Niti and upgraded to stainless steel wire with mild constriction in the lower arch and expansion in upper arch with crossbite elastics (through the bite elastics) to correct bilateral posterior crossbite. Class III elastics were advised for distal movement of the lower segment thereby pushing the anteriorly placed condyle relatively to its original position. Extraction space was closed followed by correction of crossbite. The iatrogenically created malocclusion was corrected in 4 months and final settling of occlusion to ideal Class I molar and canine relation was achieved using inter-maxillary elastics (Fig: 5). The condylar position was eventually restored to its ideal position before the signs and symptoms of TMD were initiated (Fig: 6).

CONCLUSION

Though treatment with fixed functional appliances yield good results in correcting skeletal class II patients, care should always be taken to prevent any adverse effects or untoward effects. When such untoward effects happen, as orthodontists we should visualize it early enough to treat the situation before it gets deteriorated. Most importantly TMJ should be considered as an important factor while dealing with orthopaedic appliances as of condylar displacement that happens during treatment can iatrogenically lead to TMDs.

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