Case Report

Correction of Class II Div 1 Malocclusion with Anterior Open Bite Using Mini Implants and Fixed Functional Appliance- A Case Report.

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ABSTRACT

The treatment of Class II malocclusions in adult patients can be either through orthodontic camouflage or through surgery. As far as camouflage is concerned, upper arch extractions or advancement of the mandibular dentition are done to reduce the overjet. When such malocclusions are combined with problems in other planes of space such as open bite, midline shifts etc, accurate diagnosis and treatment planning are paramount to ensure a stable treatment result.

This case report is of a 20 year old male patient who presented with a Class II div 1 malocclusion coupled with an anterior open bite. He had an orthognathic maxilla, retrognathic mandible, recessive chin, mm overjet, mm open bite extending from 15 to 23, missing 31. Open bite correction was done by intrusion of the maxillary posteriors using miniscrews, followed by space creation for prosthetic replacement of 31, and using a fixed functional appliance to achieve a Class I occlusion.

Key words: Class II malocclusion, posterior intrusion, mini screws, forsus FRD.

INTRODUCTION

Class II div 1 malocclusions due to a retrognathic mandible in adult patients are treated using either orthodontic camouflage or surgery [(1)]. Although surgery does provide actual skeletal change, it does come with its own set of disadvantages such as nerve damage, post-operative infections, complications of general anesthesia, cost, time taken to resume normal everyday functions etc. Due to these reasons, clinicians often face patients who ask them if any non-surgical methods are available to address their concerns.

Orthodontic literature is abundant with case reports where a Class II div 1 malocclusion due to a retrognathic mandible has been treated by camouflage using upper arch extractions. While this modality is acceptable in those cases with orthognathic or slightly deficient mandibles, it often leads to a poor facial outcome in cases with significant mandibular retrognathia and a near normal nasolabial angle. [(2)] Fixed functional appliances provide a better alternative by advancing the mandibular dentition to achieve an acceptable overjet. The method of Class II correction using such appliances is predominantly dentoalveolar with very less or no skeletal change. [(3)]

Methods of open bite correction can broadly be divided into intrusion of the posterior teeth, extrusion of the anterior teeth or a combination of both. In adult patients, it has been shown that intrusion of the posterior teeth provides a relatively more stable outcome when compared to anterior extrusion.[(4)]

This case report describes the treatment of a young adult male with a Class II div 1 malocclusion, retrognathic mandible and a posterior open bite.

Figure 1- Pre-treatment intra oral findings.

CASE REPORT

A 20 year old male patient reported to the department with the

chief complaint of 'difficulty in chewing'. There was no significant medical history. On examination, he presented with a Class II div 1 malocclusion, convex profile, retrognathic mandible, recessive chin, 8mm overjet, 2mm open bite from 14 to 23, missing 31 (extracted 5 years ago), mild upper anterior crowding, and 16, 45 and 35 in crossbite. (Figure 1, Figure 2). The pre-treatment cephalometric findings are shown in table 1 (T0).

Figure 2- Pre-treatment extra oral findings.

Figure 3- Pre-treatment lateral cephalogram tracing.

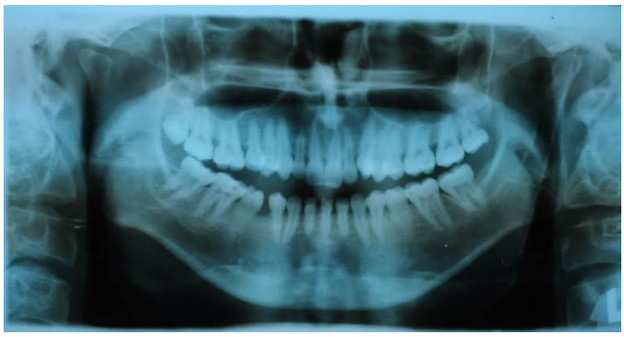

Figure 4- Pre-treatment orthopantomogram.

Based on these findings, the problem list was summarised as follows:

1. Facial profile and esthetics- convex profile, retrognathic mandible, recessive chin.

2. Anteroposterior plane- Class II div 1 incisor relation, Class II canine relation, Class II molar relation, 8 mm overjet.

3. Vertical plane - 3mm Open bite extending from 14 to 23.

Variable	T0	T1
SNA	80^0	**80^0**
SNB	73^0	**74^0**
ANB	7^0	**6^0**
MMPA	34^0	**33^0**
Face height ratio	58%	**57%**
SN to maxillary plane	6^0	**6^0**
Upper incisor to maxillary plane	109^0	**120^0**
Lower incisor to mandibular plane	96^0	**99^0**
Interincisal angle	122^0	**112^0**
Wits appraisal	4mm	**3mm**
Lower incisor to APo line	**4.5mm**	**4mm**

4. Transverse plane- Upper dental midline shifted 2mm to right of mid sagittal plane, lower midline shifted 3mm to the left, 16, 45 and 35 in crossbite with displacement.

5. Alignment- Mild upper arch crowding and spacing in the lower arch (missing 31).

Provisional treatment plan:

1. Non extraction treatment plan.

2. Maxillary posterior intrusion using buccal miniscrews and modified TPA.

3. Space redistribution in the region of 31 for eventual prosthetic replacement.

4. Forsus FRD fixed functional appliance to correct the class II div 1 relationship.

5. Settling elastics to detail the occlusion.

TREATMENT PROGRESS

1. Upper and lower PEA brackets (MBT 0.022") were bonded. Sectional levelling and alignment was initiated in the upper arch using a series of round and rectangular Nickel Titanium (NiTi) wires until sectional 0.019" x 0.025" stainless steel (SS) wires could be placed.
2. At this stage, buccal miniscrews (1.3 x 8mm) were placed between the upper 5 and 6 on both quadrants. A modified TPA (placed 3mm away from the palate) was soldered to the molar bands and bonded to the premolars using composite. (Figure 5)
3. Initial lower alignment was performed using round NiTi wires before a force couple was utilised to derotate 35 and

45 on a 0.016” S.S wire. (Figure 5)

4. After 11 months of intrusion, an acceptable amount of overbite was achieved. A NiTi open coil spring was utilised on a 0.018” S.S wire to create space for the prosthetic replacement of 31. (Figure 6).
5. Alignment on both arches was continued until continuous 0.019” x 0.025” S.S wires could be placed in both arches. A U loop was incorporated distal to the canines into the lower arch wire which allowed for adding additional lingual crown torque for the anterior segment as well as serve as a point of attachment for the Forsus FRD. (Figure 7)
6. 17 months into treatment, Forsus FRD (32mm) was inserted. (Figure 8).
7. The fixed functional appliance was removed after 6 months. Upper and lower 0.018” S.S wires were placed with an archwire sleeve in the 31 region to maintain the created space. ¼” 3.5 oz class II elastics were given to settle the occlusion. (Figure 9)
8. The treatment was completed in 24 months with a Class I occlusion and acceptable functional and esthetic outcome. (Figures 10, 11)
9. Retention- For the upper arch, bonded lingual retainers from 13-23 and a Begg’s retainer were given. For the lower arch Begg’s retainer was given with prosthetic tooth in place of 31. This was done as patient was scheduled to get a fixed prosthesis for 31 after 2 weeks. Patient was scheduled to get a bonded retainer on the lower anteriors after getting the fixed prosthesis. (Figure 12)

Figure 5- Segmental posterior intrusion using miniscrews and modified transpalatal arch.

Figure 6- Situation after maxillary posterior intrusion. Space creation in the region of 31 using NiTi open coil spring on 0.018” S.S wire.

Figure 7- Final working archwire inserted 6 weeks before placement of the fixed functional appliance.

Figure 8- Forsus FRD appliance inserted.

Figure 9- Post forsus situation.

Figure 10- Post treatment intra oral findings.

Figure 11- Post treatment extra oral findings.

Figure 12- Retention.

Critical Appraisal of the case:

- Facial esthetics improved with treatment and reduced the convexity of the profile
- Alignment of the anterior teeth improved the smile esthetics.
- Mild counterclockwise rotation of the mandible improved the mandibular prominence to a small degree (Figure 13). Further correction of the same would have required surgical intervention, to which the patient denied consent.
- Bone loss was noted around the mandibular pre molars (Figure 14). Patient was scheduled to get appropriate periodontal therapy to address the same.
- Good interdigitation was achieved and this would help in long term stability of the treatment results. Both the maxillary second premolars required mild amount of occlusal settling, which was allowed to occur post treatment.

Figure 13- Post treatment lateral cephalogram tracing.

Figure 14- Post treatment orthopantomogram.

DISCUSSION

Correction of open bite in adult patients can either be achieved by posterior intrusion, anterior extrusion, or a combination of both [5]. Some of the factors that influence this decision include incisal display, growth pattern, patient compliance etc. In this patient, the slightly increased lower anterior facial height and recessive mandible influenced the treatment modality to be chosen as posterior intrusion. Intrusion of the maxillary posterior teeth has been shown to cause forward rotation of the mandible [6,7] which would be favourable in a patient with a retrognathic mandible.

Stability of open bite correction via maxillary posterior intrusion has been studied by many researchers [8,9]. On an average, it has been shown that at four years after treatment, upto 1.2mm overbite relapse is seen, and upto 0.5mm of molar intrusion relapse has been recorded [10]. The quality of evidence, however, is not very high, and further well designed RCTs are required to accurately quantify the amount of relapse and the possible risk factors for relapse of open bite correction. It would seem then that overcorrection of the overbite by taking into consideration the possibility of relapse is a safe way to treat patients till better high quality evidence is obtained.

Majority of the relapse after open bite correction is seen in the first year after debond [8,9]. Taking this into consideration, some authors have suggested maintaining the intrusive force either via elastics to the miniscrews from the retainers, or via posterior bite planes [9, 10]. High quality evidence is lacking with regard to the best method to retain an open bite corrected by posterior intrusion. This patient did not consent to keeping the miniscrews in the mouth post treatment. Unfortunately, this particular patient could not be followed up for a long enough period to ascertain the stability of the open bite correction.

Correction of a retrognathic mandible in adult patients is usually achieved using surgery or camouflage. The advent of fixed functional appliances has stretched the envelope of camouflage treatment in such patients. While most systematic reviews suggest that fixed functional appliances work mostly through dentoalveolar correction, there are a few case reports and case studies in the literature suggesting remodelling of the glenoid fossa and condyle even in adult patients [11]. Until further high quality evidence tells us otherwise, it is safer to assume that fixed functional appliances work by dentoalveolar correction, especially in the adult patient.

Derotation of severely rotated teeth (in this case teeth numbers 35, 45) is sometimes associated with lateral root resportion, gingival recession and varying degrees of bone loss. However, these side effects are seen to a greater extent in those patients in whom severe derotation is being performed, but with poor plaque control and gingival inflammation [12]. Also, movement of teeth into edentulous areas or areas of thinner alveolar bone has been shown to increase the width of the alveolar bone in the area around the new position of the tooth [12]. At the same time, literature does mention that keeping the roots within the alveolar housing as far as possible helps to reduce the periodontal complications [13]. In hindsight, taking a CBCT

before treatment could have shown us the exact buccolingual bone thickness in that region and treatment could have been modified, but exposing the patient to a CBCT exclusively for this reason does not satisfy the ALARP principle of radiation safety[14]. In this case, the patient's self-maintenance of oral hygiene deteriorated towards the latter half of the treatment, leading to the gingival recession and bone loss seen around the premolars.

CONCLUSION

This case report highlights the successful treatment of an adult patient with an anterior open bite and class II div 1 malocclusion. However, further well designed RCTs are the need of the hour to bring more clarity to burning issues such as long term stability of open bite correction, exact mode of action of fixed functional appliances, retention regimen after posterior intrusion that is practicable etc.

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