Case Report

Unilateral en-masse distalization of maxillary posterior teeth using miniplate

ABSTRACT

Traditional methods of distalization in maxillary arch require patient cooperation with headgear or elastics, which are awkward for the patient. Hence, numerous intraoral procedures have been offered to reduce patient discomfort. In continuance with such efforts, our aim is to present a successful method of unilateral en-masse distalization using miniplate. Treatment results were evaluated using lateral cephalogram and dental models. Findings suggested that miniplate is effective method of correcting unilateral Class II relationship.

Keywords: Angle's Class II malocclusion, en-masse distalization, miniplates

INTRODUCTION

The prevalence of Angle's Class II malocclusion varies among population groups. In Indian population, the prevalence is 14.6% in age group of 10–13 years as per a study conducted by Kharbanda *et al*. in 1995. Worldwide it is highest among Caucasians and lowest among the primitive races. This malocclusion is likely to produce significant negative esthetic, psychological, and social effects. The treatment of Class II malocclusion depends on patient age, patient facial appearance, likely stability of overjet reduction, and whether it is skeletal or dental. It can be treated by growth modifications, orthodontic camouflage, or surgical correction. Class II relationship without extraction is treated by distal movement of maxillary dentition, mesial movement of the mandibular dentition, or an amalgamation of both. Distal movement of maxillary molars is frequently required in treating of Class II malocclusions without extractions. Various methods and devices are used to distalize maxillary posterior teeth.

The traditional methods of distalization in maxillary arch require patient cooperation with headgear or elastics, which are awkward for the patient and require patient compliance. As a result, numerous intraoral appliances have been tried to distalize the maxillary dentition in Class II patients with fair amount of success. Few of these intraoral Class II correctors are intraoral magnets, pendulum appliance with modifications, distal jet, Jones jig, K-loop, Ni-Ti springs, and Keles Slider appliance.[1] However, in all these above-mentioned methods of distalization, anchorage loss is unavoidable and is characterized by the proclination of maxillary incisors, an increase in overjet, and decrease in overbite.[2]

In 1985, miniplate was first used as an anchorage system in orthodontics.[3] In 1999, a skeletal anchorage system, with the anchor plates and screws, was used as an absolute anchorage system.[4,5]

Miniscrew implants have several disadvantages, such as difficulty in finding a suitable site, and increased chance of

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failure. While miniplates are more consistent and long-lasting skeletal anchorage system, it has some disadvantages, such as they are expensive as compared to miniscrews and is to be placed by an oral and maxillofacial surgeon.[6]

The aim of this report was to introduce a method of unilateral distalization of the maxillary posterior segment.

CASE REPORT

A 13-year-old boy reported to the Mahatma Gandhi Dental College, Department of Orthodontics and Dentofacial Orthopedics, with the chief complaint of irregularly placed upper front teeth. The patient was in the mixed dentition stage. On extraoral examination, the patient had a convex facial profile, straight facial divergence, acute nasolabial angle, deep mentolabial sulcus, and horizontal growth pattern [Figure 1a-d]. Intraorally, the patient presented with a Class II subdivision (left side) malocclusion. He presented with all teeth except 22 and over-retained 52, 53, 62, 63, and peg lateral in 12. Rotations and crowding were seen in lower anteriors. The patient had an overjet of 1 mm and an overbite of 4 mm [Figure 2a-e].

Diagnosis

Angle's Class II subdivision (left side) malocclusion on Class I skeletal bases with tooth size arch length discrepancy of 5 mm in maxillary and 2 mm mandibular arch, horizontal growth pattern, peg lateral 12, and missing 22.

Treatment objectives

The treatment objectives for this patient were to:

1. To achieve normal inclination of upper and lower anteriors
2. To achieve normal overbite and overjet
3. To achieve Class I molar on the left side, Class I canine, and Class I incisor relationship
4. To level the curve of spee
5. To achieve good facial profile
6. To achieve space for crown buildup in relation to 12 and for prosthesis in relation to 22.

Treatment plan

The treatment plan for this patient was to extract over-retained deciduous teeth. After extraction of deciduous teeth, bonding was to be done. At alignment and leveling stage of upper and lower arch, surgical placement of Y-shaped miniplate in left maxillary buttress area was planned for unilateral en-masse distalization of maxillary left posterior teeth. After distalization, nance palatal button was given to maintain Class I molar relationship on the left side. Space generated in anterior segment was to be redistributed for crown buildup in relation to upper right lateral incisor, and implant with prosthesis was planned for missing left lateral incisor.

Treatment progress

Before the orthodontic treatment, the patient was referred for extraction of deciduous teeth. An upper first molar was banded and second molar bonded. 022 MBT brackets were bonded on all maxillary and mandibular teeth. After leveling and aligning teeth up to 0.019 × 0.025" stainless steel, Y-shaped miniplate was placed in left maxillary buttress area for unilateral en-masse distalization of maxillary left posterior teeth [Figure 3]. Extraction of underdeveloped left upper third molar was deferred as it had risk of sinus displacement and rolling tooth. Extraction of left upper third molar was planned after two-third of root is formed.

Figure 1: (a-d) Extraoral photographs

Figure 2: (a-e) Intraoral photographs

For distalization of maxillary left posterior teeth, open coil spring was given between left canine and first premolar. To counteract the mesial force vector on left upper canine, E chain was attached from hook of miniplate to left canine bracket and an open coil spring was given between left central incisor and canine [Figure 4]. After distalization of upper left premolars and molars, E chain was attached from the hook of miniplate to the left canine bracket along with an open coil spring between upper left central incisor and canine [Figure 5]. These aided in distal movement of left upper canine, and thus, Class I canine relation on the left side was achieved.

The patient was evaluated every 4 weeks, and the force level of the activated appliance was checked and activated when necessary. The patient was instructed to brush with mild pressure so that oral hygiene around the miniplate was maintained. When upper left posterior segment moved into an overcorrected Class I relationship, the distalization ended. Unilateral en-masse distalization was completed in 6 months.

Space generated in anterior segment was redistributed for porcelain-fused metal crown in relation to upper right lateral incisor, and implant with prosthesis was planned for missing left lateral incisor after completion of vertical growth of maxilla. After vertical growth was achieved, implant was placed in upper left lateral incisor region. Bone width for implant in relation to left upper lateral incisor region was not sufficient and the patient was not willing for grafting, so single-piece osstem implant (2.5 mm × 11 mm) was planned.

Treatment assessment

All the treatment objectives were achieved by the end of 20 months. Angle's Class II subdivision malocclusion on left side was changed to Class I relation [Figures 6a-d ,7a-e,8,9, and 10 a-e]. Implant (2.5 mm × 11 mm) was placed after

Figure 3: Shows Y-shaped miniplate places in the left maxillary buttress area

Figure 5: Shows distalization of left upper canine

Figure 4: Shows distalization of maxillary left posterior teeth

Figure 6: Posttreatment photographs. (a-d) Extraoral photographs

vertical growth of maxilla [Figure 11]. The pretreatment and post treatment lateral cephalometric comparison was done [Table 1].

DISCUSSION

For the treatment of dental Class II malocclusions, large numbers of appliances have been used for molar distalization such as First Class Appliance, Jones jig, pendulum appliance, and frog appliance.[7-10] Higlers in 1992 introduced the use of distal force application on palatal aspect of maxillary molars with a spring designed in titanium molybdenum alloy (TMA) wire that anchored in palatal acrylic button. He called it pendulum appliance.[9] During the same time, Jones and White introduced a buccal sectional assembly, which is popularly called Jones Jig.[11] Varun Kalra introduced a TMA loop, known as the K loop (1993).[12] In a study conducted Ngantung *et al*., it was found that apart from molar distalization, the loss of anchorage and proclination of the maxillary incisors was also reported.[13] Investigators have researched clinical efficacy and anchorage loss following molar distalization and postdistalization.[14,15]

Miniscrews are used frequently to distalize molars. Miniscrew (Temporary Anchorage Device [TAD]) supported molar distalization is the most recent adventure in this field.

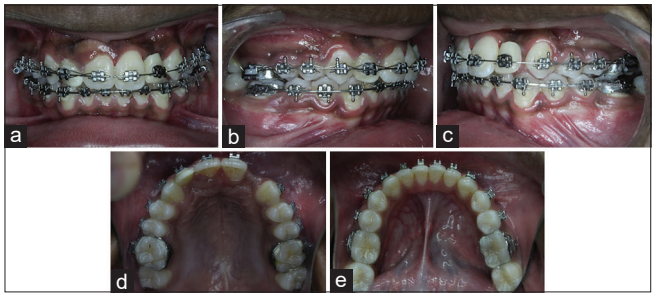

Figure 7: Posttreatment photographs. (a-e) Intraoral photographs

Figure 9: Posttreatment photographs. Extraoral photographs

In studies conducted by Liou *et al*. and Kinzinger *et al*.,[16,17] it was concluded that they did not entirely preserve their locations under constant loading, difficulty in finding a suitable site, and increased chance of failure. To overpower this, miniplates can be used to distalize entire maxillary arch unilaterally or bilaterally with minimal need of patient compliance.

The disadvantage of miniplate is that it requires surgical intervention for the placement and is more invasive than miniscrews. The additional problem with miniplate is that oral surgeon must exactly know where to place it. For distalization, it is placed at the zygomatic buttress area for which a mucoperiosteal flap is to be raised. After the required surgery, patients generally have facial swelling for about a week. These disadvantages are part of miniplates usage. Hence, a risk-benefit study must be carried out wisely to know whether the patient will benefit from the use of miniplates considerably or not.

In cases requiring distalization, recent advance is use of infrazygomatic crest (IZC) and buccal self (BS) orthodontic bone screws. As these have to be placed in extraradicular position so we do not have to change their position as was the case with TADs. Due to this and no extensive patient compliance, they are now used extensively.[18-20]

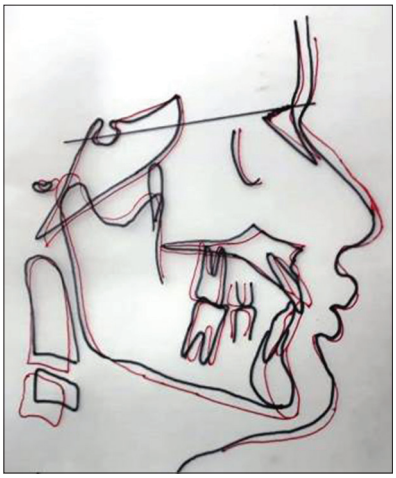

Figure 8: Pre (black line) and post (red line) distal driving lateral cephalometry superimpositions on S-Na

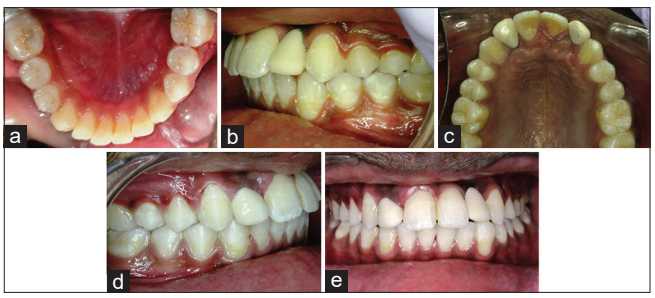

Figure 10: Posttreatment photographs. (a-e) Intraoral photographs

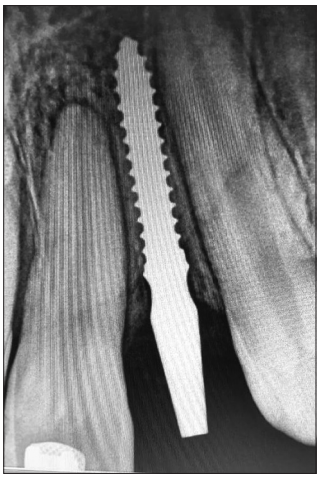

Figure 11: Implant placed in the left upper lateral incisor region

Table 1: Pre and posttreatment of cephalometric variables

Variables	Norms	Pretreatment	Posttreatment
SNA angle	82	82°	83°
SNB angle	80	80°	81°
ANB angle	+2	2°	2°
U1-SN (upper incisor to N-A) angle	102±8	104°	107°
IMPA	90	97°	98°
Interincisal angle	131	128°	125°
FMA	25	15°	20°
GoGn-SN (Mandibular plane angle)	32	21°	24°
Gonial angle	125	118°	126°
LAFH/TAFH (%)	55	55.23	56.33
Jarabak index (%)	62-65	69	69.5

IMPA: Incisor mandibular plane angle, FMA: Frankfort mandibular plane angle, LAFH/TAFH: Lower anterior facial height/total anterior facial height

Hence, in the above case, distalization using miniplate can be considered novel as miniplates are more consistent and long-lasting skeletal anchorage system as compared to miniscrew implants because it has certain disadvantages, such as difficulty in finding a suitable site, and increased chance of failure.

Limitations of the study

The limitation of this case study was that right upper lateral incisor was a peg lateral with dilacerated root. As a result tooth movement was limited and as root canal treatment was not possible so minimum crown preparation could be done to place porcelain-fused metal crown. Another limitation was patient denied for bone grafting, so the implant was placed palatal resulting in unfavorable crown placement.

CONCLUSION

Various appliances that require minimum compliance from the patient are being used to change the occlusion and posterior relationship of the jaws. The newer additions can be miniplates, miniscrews, IZC, and BS orthodontic bone screws which are transforming the procedure of en-masse distalization of maxillary posterior teeth unilaterally or bilaterally. Hence, distalization using miniplate can be considered novel as miniplates provide consistent and long-lasting skeletal anchorage system as compared to miniscrew implants because it has certain disadvantages, such as difficulty in finding a suitable site, and increased chance of failure. Thus miniplates can be used frequently with today's scenario of preferring nonextraction therapies.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the legal guardian has given his consent for images and other clinical information to be reported in the journal. The guardian understands that names and initials will not be published and due efforts will be made to conceal patient identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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