

UPPER MOLAR INTRUSION, LOWER MOLAR MESIALIZATION AND UPRIGHTING ALL IN ONE – A CASE REPORT

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Abstract

Skeletal anchorage devices are one of the greatest tool available to orthodontists till date that enables the clinician to achieve great clinical success in complex cases like upper molar intrusion and lower molar protraction as described in this case report where a young female patient aged 14 year had missing lower molars leading to supraeruption of opposing tooth that disturbed the stomatognathic system. This case report also focuses on the careful inspection and maintenance of proper oral hygiene during the course of treatment by the patient and her treating resident as well. As here patient demanded orthodontic treatment primarily for her esthetic concern not due to her functional needs that clearly indicated her attitude towards her general oral health. Orthodontic treatment had enhanced her facial profile dramatically and restored her functional occlusion very well that is generally achieved by the surgical procedures and not merely by the orthodontic treatment. These facial changes improved her self-esteem that led to better social –life and esthetics, as demanded by patient.

Key words: Molar Intrusion, Molar Protraction, Bimaxillary Protrusion, Missing First Molar, Supraeruption, TAD, Skeletal Class II malocclusion, Single Arch Extraction, Ortho-Endo Interrelationship, Molar Extraction.

Introduction

Molar intrusion has always been a complex and difficult treatment modality, throughout the 20th century. Posterior teeth intrusion is done to correct open bite or supra erupted teeth. The mechanics used for this, greatly rely on patient compliance, but introduction of temporary anchorage devices (TADs) over recent years, has allowed the intrusion of posterior teeth with minimal need of patient compliance and less of side –effects on adjacent teeth.¹

Early loss of permanent lower first molar leads to supraeruption of antagonist tooth that leads to premature contact in centric relation, occlusal interferences in the lateral protrusive movements and lack of prosthetic space, making it difficult to rehabilitate the stomatognathic system.^{2,3}

The fundamental aim of any dental treatment is to avoid dental plaque retention, but this cannot always be achieved especially in cases of orthodontic treatment due to bands, archwires and ligatures, this has detrimental effect on the teeth and their supporting tissues^(4-6,7). So in some cases, the gains achieved by orthodontic treatment may be limited due to uncontrolled dental plaque accumulation resulting in the possible development of caries or gingivitis or periodontitis leading to loss of teeth and their supporting structure.⁸

This case report discusses one of such clinical scenario where a good orthodontic treatment outcome had been less advantageous for patient in term of general oral health, reasons for this could be lack of patient education, socio-economic status, and patient's willingness to follow proper protocol during the course of treatment.

Case report

A fourteen year old female patient reported with a chief complaint of forwardly placed upper front teeth (Figure-1).

History

Patient didn't give any relevant medical history. Her lower first molars were extracted due to dental decay and her past dental experience was uneventful.

Extra oral examination

On extra oral examination patient presented with mesocephalic head shape, mesoprosopic facial form with a convex facial profile and posterior facial divergence along with incompetent lips.

Intraoral examination

She had Class II canine and premolar relation bilaterally, molar relation could not be established as lower first molars were missing, that subsequently led to supraeruption of 16 and 26. An overjet of 6mm, overbite of 3 mm, and scissor bite with respect to 35 were observed clinically. Initial decalcification irt 11, 21, 31, 41 and dental decay irt 16, 26,

Functional examination

Functional examination reveals an oro-nasal respiration.

Smile assessment

On smile analysis, full incisor display with 2mm of gingival show was observed.

Radiographic analysis

Panoramic radiograph shows all permanent teeth were present except for 36 and 46 with adequate bone support for fixed orthodontic therapy (Figure-1).

TMJ examination revealed normal size, shape and position of the condyle.

On Cephalometric assessment, an ANB of 8° signified Skeletal Class II pattern and MPA of 42° showed vertical growth pattern (Table-1). Other cephalometric parameters such as 1/NA, 1/NB and IMPA were increased suggesting proclined upper and lower incisors.



Figure 1- pre-treatment records

Treatment objectives

1. To intrude the supraerupted maxillary molars.
2. To level and align the maxillary and mandibular arches.
3. To obtain an ideal over jet and over bite.
4. To obtain Class I canine and premolar relation bilaterally with a good intercuspation.
5. To attain Class II molar relation bilaterally subsequent to mesialization of 37, 47

Treatment alternatives

1. Upper first premolar extraction, dental decompensation followed by superior repositioning of maxilla and BSSO advancement of mandible with genioplasty after completion of growth.
2. Upper first premolar extraction and retraction, with mesialisation of 37 and 47 along with vertical reduction and augmentation genioplasty.
3. Upper first premolar extraction and retraction, follow interdisciplinary approach i.e. prosthetic replacement of lower first molars along with vertical reduction and augmentation genioplasty.

Treatment plan

Based on clinical and radiographic diagnosis, extraction of both upper first premolars was decided and edentulous spaces of lower first molars were utilized for protraction of posterior segment without any need for prosthetic replacement, considering patients poor socio-economic status and an unnecessary burden of artificial prosthesis. Patient did not prefer for any surgical intervention considering cost and risk factor.

Treatment progress

In first stage, both right and left maxillary first molars were banded with beggs bracket welded on both palatal and buccal surface. For the intrusion of molars two orthodontic mini-implants of 1.5 X 8 mm dimension (S. K surgical, Pune) were placed, one on buccal surface between second premolar and first molar and other at 5 mm distance from slope of palatal surface between first and second molar. From mini-implants two diagonally opposite elastomeric chains were applied for controlled force application. Within 6 months of time span both molars were intruded successfully without any flaring (figure 2).



Figure 2- Orthodontic mini-implants placed for correction of supraerupted upper first molars

Second stage of treatment was initiated following extraction of both maxillary first premolars, bonding of upper arch was done and 0.014" NiTi (3M Unitek Nitinol Super elastic wire) was placed (figure 3) and gradually reached to 0.019" X 0.025" SS. Upper anterior segment retraction was done using same mini-implant from the power arm of 6 mm length (figure 4). Lower arch bonding was done and initial 0.014" NiTi (3M Unitek Nitinol Super elastic wire) was placed and subsequently reached to 0.019" X 0.025" SS. In lower arch, group C anchorage was maintained. Protraction of posterior segment was done using 150- 200 gm of Class I force. After protraction of posterior segment an up-righting spring was placed in third and fourth quadrant (figure 5) to upright the tipped molars bilaterally.



Figure 3- U=0.014" NiTi (3M Unitek Nitinol Super elastic wire) placed with Transpalatal arch



Figure 4- Retraction on U=0.019x0.025" SS using mini implants

Final settling of occlusion was done using short Class II and triangular elastics of 1/4" dimension and 4 1/2 ounce force (AO EAGLE).

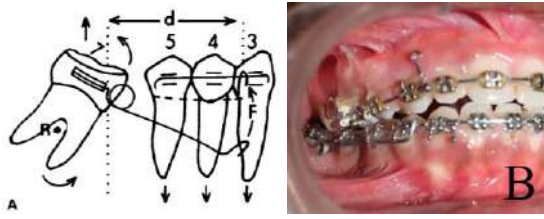


Figure 5-(A) up-righting spring for lower 2nd molar (B) up-righting spring in mouth

During the course of treatment patient developed caries irt 11,15, 17, 21,26,31and 41. She was referred to the department of Endodontics regarding opinion for the same. After proper diagnosis fracture was observed irt 16, so extraction was advised (figure 6) and restorations irt 11,15,17, 21, 26,31and 41was done.

After debonding fixed lingual retainers were applied in both arches and modified beggs appliance along with replacement of 16 was given, as patient was not willing for rehabilitation of her missing teeth (figure-7).

Treatment result

A pleasing soft tissue profile (figure-6) was achieved by upper first premolar extraction and camouflage only. All treatment objectives were achieved. Figure 8 shows superimposition of pre and post treatment lateral cepahlogram and following changes were observed.

- a) Intrusion of 16 and 26.
- b) mesialisation of 37,38 and 47,48.
- c) Retraction of upper and lower anterior segment.



Figure 6- post treatment records



Figure 7- Intra –oral Periapical radiograph of 16

Discussion

Sometimes patient's attitude toward dental treatment becomes limiting factor for an orthodontist to reach a proper diagnosis and treatment planning that could be best suited for the patient. As in this report, due to patient's negligence she lost her vital natural teeth after a successful intrusion of 16th at is considered one of the difficult procedures in orthodontic literature. So if this scenario could be known at the beginning, the diagnosis and treatment plan might have been different from present and instead of extracting the premolars, the first molar extraction would have given a better result. Good patient education for proper maintenance of oral hygiene and a careful inspection of oral cavity at every visit could have limited the loss.

Kanomi in 1997 firstly described the intrusion of mandibular anterior and buccal teeth using mini-screw implants.¹⁰ Earlier work of Creek more and Eklund, shows the use of a surgical vitallium screw placed in the region of the anterior nasal spine as a source of anchorage to elevate the maxillary incisors.¹¹ Based on earlier literature it is evident that the skeletal anchorage has been utilized for various purposes during 20th century but the advances in the field of temporary anchorage device enables us to perform many biomechanically complex procedures very efficiently with less patient compliance and their associated side effects.

Luecke states that biomechanics for mesialisation of the posterior segment is very complex and treatment time is much longer than any other extraction pattern, but success to some extent depends on adequate diagnosis and an effective biomechanical design.¹² Protraction in mandibular arch becomes more difficult due to high bone

density. Sandler and Moldez conclude that mesialization of the posterior segment should be performed with rectangular archwires that fill the slot for torque expression, rotation, anchorage as this minimizes tipping of molars.^{13,14}

Figure 5 (A&B) shows a helical spring for up-righting of distally tipped second molar after protraction. The helix is about 2 mm in diameter made of 0.017" x 0.025" TMA wire. Up-righting springs were fitted into the buccal tube of second molar in third and fourth quadrant respectively. All teeth anterior to second molar from one side to contralateral side is used as anchorage for uprighting. Hook is placed between canine and first premolar, such that it do not contact the bracket and be able to slide freely on the stabilizing segment wire of 0.019" X 0.025" SS. Activation of the spring is done by raising and engaging the hook over the stabilizing segment, this introduces a combined extrusive force and distal moment on the molar. These extrusion forces are countered by the opposing occlusal force.¹⁵

The magnitude of the moment of force, $M = d \times f$, where d is the distance from the mesial of the buccal tube to the crown of the premolars where the hook of the spring is attached and force (f) can be measured with a dontrix gauge.

Brandt and Seddon recommend performing mesialization of the posterior segment, in three months following the loss of the first permanent molar, otherwise there is an increased risk of creating an undesirable inclination, rotation of the second molars and bone loss.^{16,17}

According to Heckmann et al¹⁸ molar inclination can be measured using following landmarks i.e, tip of the molar cusps and bifurcation of mandibular second molars were marked for the molar axis, as described by a line through the midpoint of the line connecting both cusp tips and through the bifurcation reflects the tooth axis. The connecting line between the right and left gonion is used as a skeletal reference line.¹⁹ The angle between the molar axis and reference line was measured before and after second molar mesialisation. A reduction in the angle signified mesial tipping of the second molar, an increase indicates uprighting (figure-10). Here α_1 - angle between right second molar axis and skeletal reference in pre-treatment OPG, α_2 - angle between right second molar axis and skeletal reference in post-treatment OPG β_1 -angle between left second molar axis and skeletal reference in pre-treatment OPG, β_2 - angle between right second molar axis and skeletal reference in post-treatment OPG. In post treatment OPG it's evident that α_2 is greater than α_1 and β_2 is greater than β_1 that indicates up righting of second molar after mesialisation.



Figure 8- Superimposition Pre Treatment-Black, Post Treatment- Red



Figure 9- Modified Begg's retainer with replacement of 16

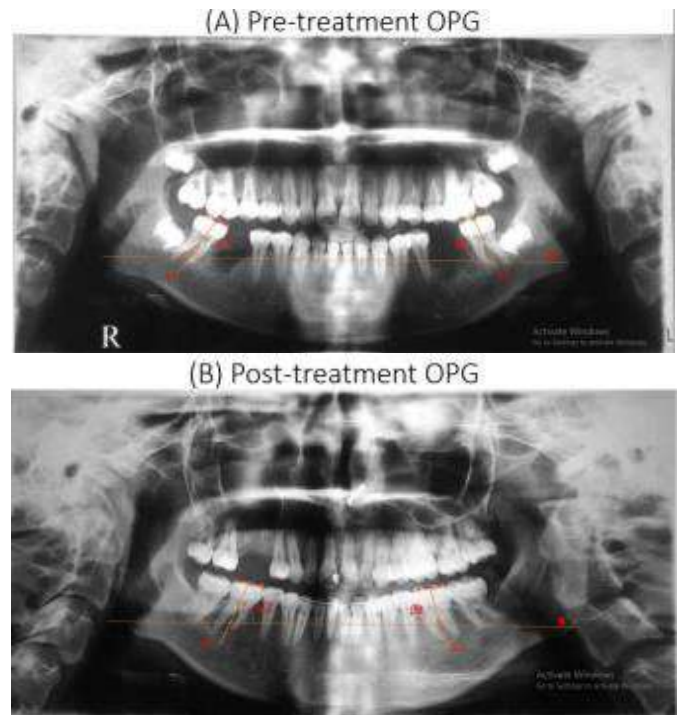


Figure 10-Tooth axis inclination of mandibular second molars before and after space closure.

Conclusion

Bilateral upper molar intrusion and lower protraction of second and third molar can be achieved successfully with the proper diagnosis & treatment planning and understanding the biomechanics involved, with minimal complications during treatment. As for now orthodontic science has evolved so much that we have various choices available that can be utilized according to clinician's preference and the clinical situations to be treated.

Declaration of patient consent

The author 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 understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity can't be guaranteed.

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