The Use of Temporary Anchorage Devices for Molar Intrusion: A Case Report

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Abstract:

Background: This article reviews the use of temporary anchorage devices (TADs) for maxillary molar intrusion.Types of Studies Reviewed. The authors reviewed clinical, radiographic and histologic studies and case reports. The studies provided information regarding the application, placement and biological response of orthodontic TADs.Results. TAD-supported molar intrusion is controlled and timely and may be accomplished without the need for full-arch brackets and wires.Supraerupted maxillary first molars can be intruded 3 - 4 millimetres in 6 months (approximately 0.5-1.0 mm per month), without loss of tooth vitality, adverse periodontal response or radiographically evident root resorption.Clinical Implications. True molar intrusion can be achieved successfully with orthodontic TADs, re-establishing a functional posterior occlusion and reducing the need for prosthetic crown reduction.

Key Words: Temporary anchorage device; intrusion.

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Introduction

While treating patients on a regular basis, the orthodontist very often encounters a dentition that is neglected after early loss of permanent posterior teeth. Supraeruption of maxillary molars is a common example of the same. The extruded tooth along with the elongated dentoalveolar process may induce various problems such as functional disturbances, occlusal interferences and cause great difficulty during treatment planning, be it comprehensive orthodontic therapy or a simple prosthetic rehabilitation.

In such cases Intrusion of the supraerupted maxillary molar is one of the correct way to treat the problem.

A variety of appliances and procedures have been proposed to intrude the supraerupted molars ranging from simple bite planes to complex mini-plates inserted after a brief surgical procedure.

Temporary anchorage devices (TAD's) are used most widely because they are relatively simple to insert, require minimal surgical procedure, negate all the side effects seen in conventional orthodontic therapy and the force can be applied almost immediately.

Here, we report a case with overerupted maxillary right and left first molars treated by intrusion using skeletal anchorage with the help of Temporary anchorage devices (Micro Implants). Subsequently, the occlusal clearance was sufficient to rebuild the posterior occlusion by an implant prosthesis placed in the area of the missing antagonistic tooth.

Case Report

A 24 year old female patientwas seeking restoration of her right and left posterior occlusion because of the overerupted left upper first and second molars following the loss of the lower first and second molars. She was presented with a treatment plan that consisted of crown reduction of the overerupted molars and prosthetic implant replacement of the missing teeth. In other words, to provide adequate occlusal clearance for the implant prosthesis, the overerupted upper molars would receive elective endodontic therapy, occlusal reduction, crown lengthening, and crown restoration.

Patient requested an alternative treatment to preserve her upper two vital molars. She was then referred to us for management of the overerupted left upper first and second molars.

Diagnosis

This patient presented with a Class I malocclusion characterized by bimaxillary dentoalveolar protrusion. Her dental conditions revealed mild crowding in the maxillary arch, overerupted maxillary right and left first molars. Judging by the marginal ridge discrepancy, the maxillary first molars had overerupted by three mm occlusally bilaterally, encroaching upon the antagonistic missing dental space leaving insufficient space in the mandibular arch for prosthesis.(Fig. 1)

Mandibular arch on the right side revealed missing first and second molars and an in-standing lateral incisor. Whereas the left side depicted a missing first molar and a lingually tipped second molar. A few restorations were also noticed in the maxillary and mandibular arches.(Fig. 1)

Intrusion of maxillary first molars was planned using Temporary anchorage devices (TAD's) as TAD's were demonstrated to be an efficient option for the intrusion of maxillary and mandibular teeth.

Treatment Objectives

1. To achieve bodily intrusion of the supraerupted maxillary first molars without disturbing the occlusal harmony.
2. To assess the amount of intrusion and buccal/palatal as well as mesial/distal tipping of the maxillary molar in patients with one micro-implant placed buccally and one palatally without transpalatal arch.

Figure 1. Pre-treatment intraoral photographs

Treatment Mechanics

Optimum size of the band was selected and a basic edgewise molar tube paralleling the occlusal plane of the tooth was welded. A straight piece of stainless steel wire (0.018"x0.025") was bent 90^{0}and inserted in the molar tube. This piece of wire serves as the guide wire for all the radiographs to be taken for comparative assessment (Fig. 2). Pre-treatment radiographs were recorded before the insertion of TAD's.

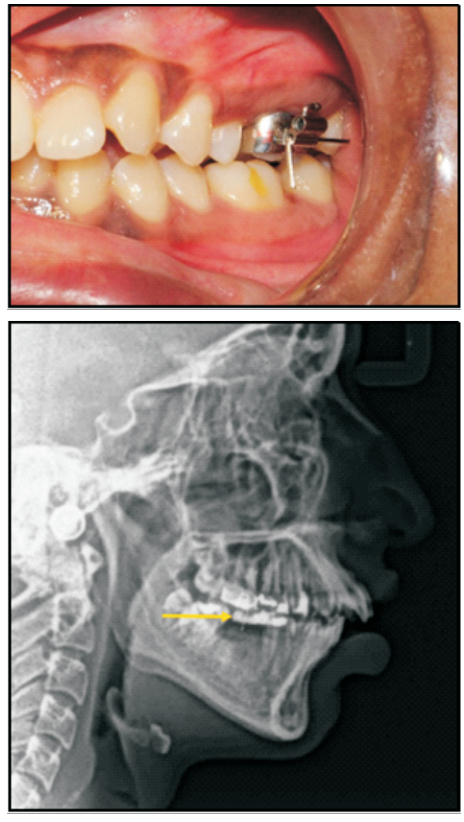


Figure 2. Placement of guide wire for all the radiographs

A Micro implant of 1.3x8 mm was placed on the palatal mucosa between the upper right first and second molar and on the buccal mucosa between the upper right second premolar and first molar as shown in (Fig. 3)

Placement of micro implants on the left side was switchedas a comparison between the two combinations was required, henceMicro implant of 1.3x8 mm was placed on the palatal mucosa between the upper left second premolar

first molar and on the buccal mucosa between the upper left first molar and second molar as shown in (Fig. 3)

After recording the pre-treatment radiographs with the guiding wire placed in the molar tube the extruded molar was subjected to an intrusive force of 150gms through use of an elastomeric chain. Force was measured with the help of dontrix gauge. The elastomeric chain is changed once every 4 weeks to allow adequate time for intrusion and to avoid any unnecessary root resorption due to frequent change in the force element. (Fig. 3)

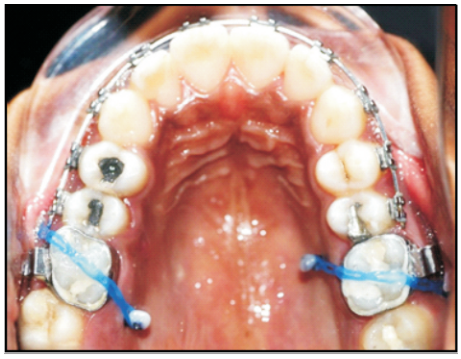


Figure 3. Position of micro implants & placement of E-chain

i) Lateral Cephalogram-

Standardised exposure system with Kodak 8000C Digital Panoramic and Cephalometric System was used.

Lateral Cephalogram:-

Lateral cephalogram was recorded to determine the intrusion that occurs during the treatment. It will also be used to determine the mesial / distal tipping of the molar during and post intrusion.

Pre-treatment and post-treatment cephalogram will be superimposed to find out the total amount of intrusion as well as the mesial / distal tipping occurring during the treatment.

Evaluation Procedure-

A line superimposing the guide wire is marked on the lateral cephalogram and distal angle (DA) between the line and palatal plane (ANS to PNS) was measured.

The change in the distal angle if any, will be recorded in the cephalogram taken for assessment every 6 weeks till the desired intrusion is achieved. (Fig. 4)

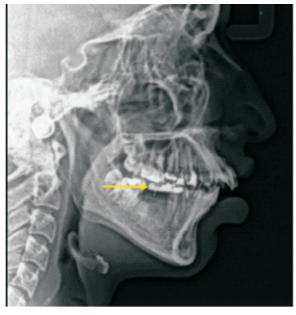


Figure 4. A (0.018"x0.025" SS) wire bent 90^0 and inserted into the molar tube of maxillary right first molarbefore shooting the radiograph can be appreciated in the lateral cephalogram above.

ii) Postero-Anterior view (PA view):-

In this type of radiography buccal / palatal tipping of the maxillary molars can be visualized. Pre and post treatment PA views were evaluated to determining the total amount of tipping that occurred during the treatment.

Evaluation Procedure-

A line superimposing the guide wire is marked on the PA cephalogram and Lateral angle (LA) between the line and zygomatic plane (AZ to ZA) is measured.

The change in the lateral angle if any, will be recorded in the cephalogram taken for assessment every 6 weeks till the desired intrusion is achieved or 24 weeks whichever is earlier. (Fig. 5)

Figure 5. A (0.018"x0.025" SS) wire bent 90^0 and inserted into the molar tube of right and left maxillary first molars before shooting the PA radiograph can be appreciated above.

iii) Study Models:

Pre-treatment and post-treatment impressions will be recorded and casts will be analysed for intrusion of molars.

Evaluation Procedure-

The perpendicular distance from the mesio-buccal cusp of the molar to be intruded is measured from the line joining the buccal cusp of the adjacent second premolar and the mesio-buccal cusp of the adjacent second molar with the help of a digital vernier calliper.

The difference between the length of pre and post records will be evaluated.

Results

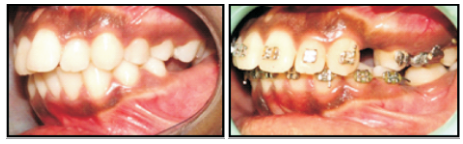
Patient wished to undergo for full orthodontic treatment and hence upper and lower arches were bonded but the maxillary first molars were excluded till the desired amount of intrusion was achieved.Thedesired amount of intrusion was achieved within 6 months after the intrusive force was applied.

It was possible to establish functional occlusion in the right and left side posterior dentition after installing the implant prostheses. The intrusion of the two molars was achieved by using a combination of placement of mini-implant and E-chain. This apparatus enabled us to complete treatment in a short period of time without any errors. (Fig. 6)

To evaluate the results of the treatment, the pre-treatment and posttreatment records were compared. Lateral Cephalometric tracings superimposed at the maxillary stable structures (Fig. 8) revealed that the right and left molars were intruded three mm on average with appreciable amount of mesio-platal tip. (Table 1, 2)

Intraoral Photographs:

Pre-Treatment Post-treatment



Pre-Treatment Post-treatment

Figure 6. Photographs depicting pre and post treatment of maxillary molar intrusion.

Study Models:

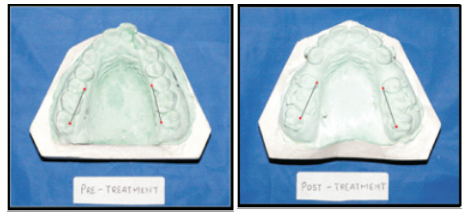


Figure 7. Study models depicting change in the first molars position in transverse plane.

Figure 8. Study models depicting change in the first molars position of the right side in vertical plane.

Figure 9. Study models depicting change in the first molars position of the left side in vertical plane.

Superimpositions of Lateral Cephalogram:

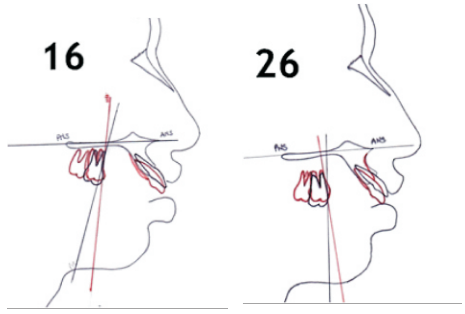


Figure 10. Superimpositions of pre and post treatment lateral cephalogram of intrusion of maxillary first molars (i.e 16, 26).

Superimposition of PA view:

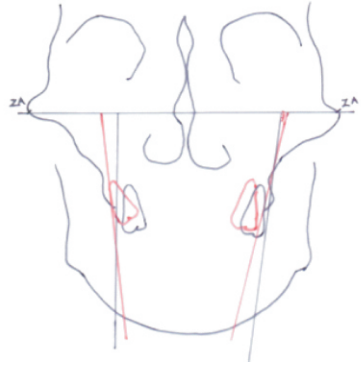


Figure 11. Superimpositions of pre and post treatment PA view of intrusion of maxillary molars.

Desired amount of intrusion was achieved within 6 months. Results have been displayed in the tables presented below.

Table 01	16	
	Pre	Post
Bucco lingual tipping	74°	82° (Mesial tip by 8°)
Mesio Distal tipping	91°	84° (Palatal tip by 7°)
Amount of intrusion	3 mm	

Table 1. Values of amount of tipping and intrusion that took place in the maxillary right first molar.

Table 02	26	
	Pre	Post
Bucco lingual tipping	86°	94° (Mesial tip by 8°)
Mesio Distal tipping	84°	76° (Palatal tip by 8°)
Amount of intrusion	2mm	

Table 2. Values of amount of tipping and intrusion that took place in the maxillary left first molar.

Discussion

Supraerupted maxillary molars were successfully intruded within the maxillary sinus cortical floor using orthodontic miniscrews. Short-term molar intrusion was achieved without clinically detectable apical root resorption.

The question remains whether intruded molars will relapse to their original position? Sugawara et al evaluated the post treatment dentoalveolar changes following intrusion of mandibular molars using skeletal miniplates in nine adult open bite patients[07].

The authors reported an average relapse rate of 30% for the lower first and second molars.

In the near future, further long-term follow up studies will be needed to determine the relapse potential of molars intruded with skeletal anchorage.

Conclusion

TAD-supported molar intrusion is controlled and timely and may be accomplished without the need for full-arch brackets and wires.With miniscrews, orthodontist can overcome anchorage limitations and perform difficult tooth movements predictably and with minimal patient compliance. In adult patients, a multidisciplinary treatment may present a more conservative approach to rehabilitate the patient's occlusion. Restorative dentists, periodontists and surgeons should have some understanding of the many applications of orthodontics when presenting patients with options for correcting occlusal problems.

Temporary anchorage devices were demonstrated to be an efficient option for the intrusion of maxillary and mandibular teeth. Nevertheless, there is still a need for longitudinal studies that evaluate the mean quantity of intrusion; treatment time; velocity of intrusion; changes in coronal inclinations of the intruded molars, and their adverse effects.

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