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Case Report

Orthodontic miniscrew supported correction of partially impacted mandibular 2nd molar- A case report

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ABSTRACT

A wide range of clinical procedures have been introduced and practiced to correct mesially inclined mandibular molars which is a common situation among young adults, occurring usually due to inadequate space in the arch for its eruption. There are two major treatment options available for the correction of impacted / partially impacted molars and this depends on several factors. The objective was to treat a 15-year-old male patient having a lower right partially impacted 2nd molar using skeletal anchorage system. The lower right 3rd molar was surgically excised, and the partially impacted 2nd molar was uprighted using an orthodontic miniscrew which was placed between lower right 1st and 2nd premolars on the mesial side. The use of skeletal anchorage system has an excellent advantage over conventional methods since there is prevention of unwanted movement of anchor teeth leading to successful correction without any delay in the treatment duration.

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1. Introduction

Tipping of mandibular molars is a common situation among young patients, which usually occurs due to premature loss of adjacent teeth leading to unwanted movement. Mandibular arch length inadequacy, tooth size discrepancy, early loss of adjacent permanent 1st molar, unusual mesial eruption pathway of the second molar or premature eruption of the mandibular 3rd molar can lead to partial or total impaction of the 2nd molar with an incidence of 0-0.3% of the general population and 2-3% of orthodontic patients.¹ Mandibular second molar impactions could be unilateral or bilateral, with or without loss of the adjacent mandibular first molar, and with or without mandibular third molar impaction.²

A wide range of clinical procedures have been introduced and practiced to correct mesially inclined molars but many have come across a most common disadvantage of conventionally uprighting molars which is the unintended displacement of anchor teeth. To overcome this, heavy orthodontic appliances had to be placed since multiple teeth were included to reduce anchorage displacement. During the last decade, the use of skeletal anchorage has been widely accepted in clinical orthodontics. Skeletal anchorage reduces the side effects that occur with dental anchorage, simplifies the orthodontic appliances and treatment biomechanics.³

2. Case Report

A 15-year-old male patient reported to the Department of Orthodontics with a chief complaint of unerupted lower 2nd molar on the right side. He was diagnosed with a Class

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I skeletal pattern with orthognathic maxilla and mandible and an average growth pattern. Patient had Class I molar relationship bilaterally. Crossbite was present with 12, followed by moderate lower anterior crowding. Midline in the lower arch was shifted to the left by 2 mm. Patient had a straight profile, average nasolabial angle with potentially competent lips. (Figures 1 and 2)

Radiographic examination showed a mesially tipped lower right 2nd molar and developing 3rd molars. (Figure 3)

The following treatment plan was established:

1. Non-extraction treatment by levelling and aligning of all teeth without placing bands on all 1st molars.
2. Evaluation of arch length discrepancy after all teeth were aligned.
3. Extraction (Germectomy) of the developing mandibular right 3rd molar.
4. Uprighting of the mandibular right 2nd molar using skeletal anchorage system.

2.1. Treatment progress

After taking an informed consent of the patient and his parent about the treatment, all the teeth were bonded and properly aligned to evaluate tooth size discrepancy and need for extractions. After all the teeth were aligned, it was decided that extraction of any teeth was not required and therefore the original treatment plan was considered.

Extraction of the lower right 3rd molar was carried out which was followed by immediate placement of a buccal tube on the 2nd molar. Sutures were placed for proper healing and the treatment continued after 2 weeks of surgery. (Figure 4)

After 2 weeks, the treatment continued where an orthodontic mini-implant (Dentos Inc. Daegu, Korea) of 6 mm length and 1.6 mm diameter was used for uprighting the partially impacted 2nd molar. The miniscrew was implanted in the attached gingiva between the lower 1st and 2nd premolars using the standard implantation method. A rectangular Stainless-Steel wire of 0.016 x 0.022-in along with a nickel-titanium open-coil spring was placed from the implant into the molar tube to aid in distalization of the molar. Within 20 days, the mandibular 2nd molar was unlocked from the 1st molar after which a 0.017x0.025-in Beta-Titanium alloy wire was placed to upright the molar.

After about 8 months, the mandibular 2nd molar was completely uprighted and was brought into occlusion by placing a 0.016 x 0.022-in Nickel-Titanium wire in the lower arch followed by 0.016 x 0.022-in Stainless Steel wire. The total treatment duration was 15 months. (Figures 6 and 7)

The patient underwent extraction of the remaining 3rd molars in both the arches before the retention phase. The panoramic view shows completely uprighted lower right 2nd molar and extraction of all 3rd molars following

complete healing. (Figure 8)



Fig. 1: Pre-treatment extra oral photographs.



Fig. 2: Pre-treatment intra oral photographs.



Fig. 3: Pre-treatment orthopantomogram.

2.2. Biomechanical considerations

Since an impacted 2nd molar is locked underneath the distal cusp of the 1st molar, a distalizing force is required to unlock the tooth before applying a single force or moment for uprighting the molar.

In mild cases, the distance from the Center of Resistance to the line of force at the bracket level is enough to produce sufficient distalizing force. In such cases, an open-coil spring can be attached to the miniscrew which would generate a single force which is needed to upright the tooth. Similarly, in moderate to severe cases, a single force creates a moment which is limited, since the distance from the line of force to the Center of Resistance is reduced.



Fig. 4: Germectomy of 48 followed by placement of buccal tube on 47.

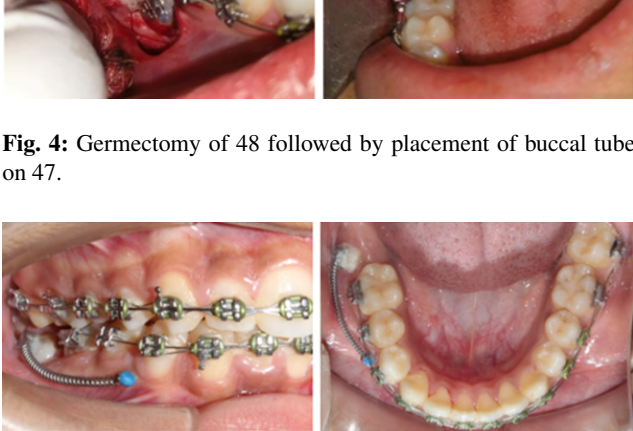


Fig. 5: Uprighting of 47 using orthodontic mini-implant.



Fig. 6: Post-treatment extra oral photographs.



Fig. 7: Post-treatment intra oral photographs.



Fig. 8: Post-treatment orthopantomogram.

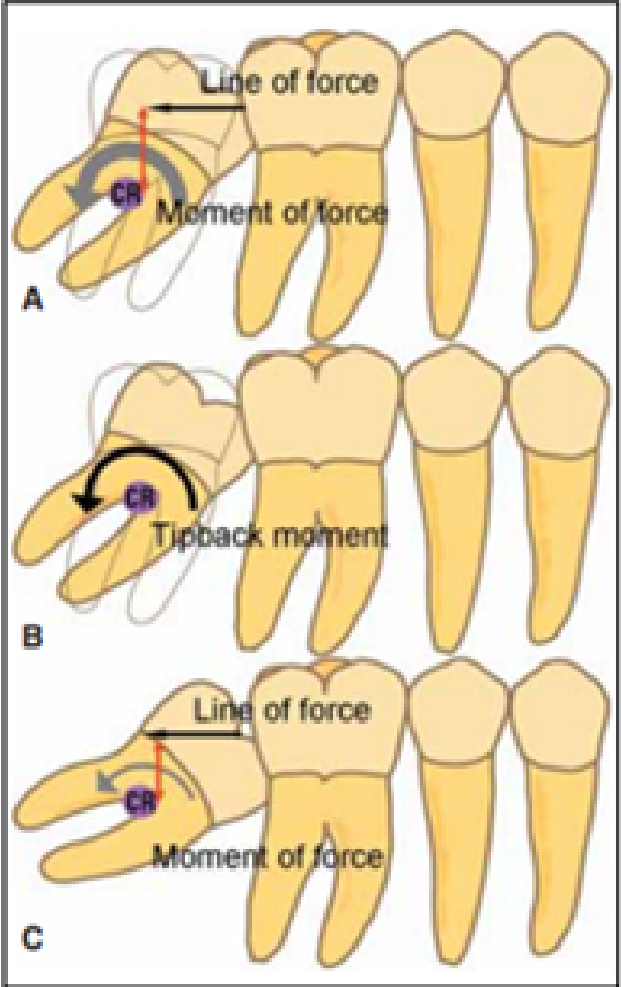


Fig. 9: Biomechanics of molar uprighting.

Therefore, in such cases an uprighting spring can be used for provision of a sufficient tip-back moment. (Figure 9)⁴

3. Discussion

The most common etiologic factor for impaction of 2nd molars is inadequacy of space due to arch length discrepancy. Apposition and resorption procedures provides the space required for their eruption and any interference during this leads to impaction of molars.

Other factors leading to second molar impactions are:

1. Presence of cysts or tumor in the path of eruption.
2. Root invaginations or deflections.
3. Syndromes related to eruption of teeth.
4. Mutations of receptor PTH1.
5. Ill-fitted bands over the 1st permanent molar in early phases of treatment.
6. Use of functional appliances (lip bumper /Arnold Expander) in order to increase mandibular length.⁵

Impacted mandibular 2nd molars are commonly diagnosed between 11-14 years of age and since being asymptomatic, they are not of much concern and are generally brought into notice as a secondary finding during an orthodontic examination. In a case with an absence of one molar and a completely erupted contralateral tooth, the orthodontist should be alerted about the chances of impaction and a proper radiographic evaluation should be carried out. In a panoramic view, if the 3rd molar follicle is seemed to be overlapping the developing 2nd molar, it is also an early sign of impaction of the adjacent 2nd molar.⁶

Advantages of early correction of impacted / partially impacted molars are:

1. Reduction in pocket depth by 0.1 mm on each tooth surface.
2. Easy placement of dental implants in case of absent 1st molars.
3. Elimination of primary contacts which would lead to TMJ problems and traumatic occlusion.
4. Establishing an overall vertical dimension.⁷

The two possible major options for treatment of impacted second molars based on many factors such as its severity, accessibility, and complexity with or without possible adverse effects are either surgically or orthodontically. Repositioning, Transplantation, or extraction of the impacted 2nd molar are the possible surgical methods. Although these methods are quick, have a lesser time duration and is a relatively easy solution, this may lead to trauma to the surrounding tissues leading to pulp necrosis or root resorption of the adjacent tooth. Even though the molar is correctly repositioned, post-surgical stability of the tooth remains unanswered.⁸

As compared to the surgical technique, the orthodontic method is shown to have a better prognosis with a relatively

lower risk level. The tip-back cantilever spring or the uprighting spring have been used most predominantly. However, there are few disadvantages of the conventional method such as unwanted movement of the anchor units, extrusion of the molar, need for bulkier appliances and longer treatment duration.⁶ Mini implants are made of pure titanium or titanium alloy with a diameter of 1-2 mm and length of 8-20 mm which remain stable during the treatment with minimum loss of anchorage.⁹

The impacted molar can be uprighted using two ways, direct anchorage or indirect anchorage. Indirect anchorage can be achieved by connecting the miniscrew to the anchor tooth or teeth using a resin-wire splinting method. Direct anchorage can be achieved by placing the miniscrews distal to the molar and by applying a distal uprighting force.¹⁰

Su-Jung Mah et al.¹¹ uprighted mesially impacted mandibular molars with two miniscrews and concluded in their study that this is a simple system having an advantage of preventing unwanted tooth movement.

The retromolar region is most frequently used for uprighting of the mesially tipped 2nd molar as proposed by Roberts et al. in 1990 giving a distalizing force using elastomeric threads.¹² However, in an adolescent patient, due to the developing 3rd molar, it is not advisable to insert the miniscrew in the retromolar area unless it has been extracted. In such situations, the miniscrew can be inserted between the roots of the 2nd premolar and 1st molar or between the roots of 1st and 2nd premolars on the mesial side generating a pushing force which would aid in uprighting of the molar.

Fujita et al.¹³ in their case study of uprighting severely impacted mandibular 2nd molar stated the benefits of confined orthodontic treatment. They also stated that early diagnosis and treatment of impacted or partially impacted mandibular 2nd molars is required to abstain complications.

4. Conclusion

Early diagnosis and treatment of impacted mandibular molars has proved to normalize periodontal problems, maintain functional occlusion, prevention of unwanted situations related to the adjacent structures. There are several treatment options available depending upon the severity of impaction or inclination of the teeth. The use of skeletal anchorage system has led to more accurate results with lesser side effects. The system is uncomplicated with provision of limited forces by using only few orthodontic appliances, shows an advantage over other non-skeletal techniques by preventing unwanted movements of anchorage teeth.

5. Conflict of Interest

None.

6. Source of Funding

None.


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