Surgical and Orthodontic Management of Impacted Mandibular Premolars with a Severely Dilacerated Root

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Introduction

Impaction with a severely dilacerated root of the mandibular premolar is seldom reported, especially when it is combined with odontoma. This case showed impacted mandibular premolars due to a compound odontoma. Extraction of the primary teeth, excision of the odontoma, and an orthodontic forced eruption were performed to erupt the lower premolars. This article illustrates step by step treatment to achieve a predictable outcome.[1-3]

Case Study

A 19-year and 2 month old male came for consultation. The panoramic film showed that there were two impacted lower premolars associated with one odontoma (*Fig. 1*). The frontal and lateral view of the CT scan indicated that the impacted premolars were just near and beneath the odontoma. It should be noted that the impacted second premolar had a severely

Fig. 1: Pre-treatment pano radiograph and intraoral photographs.

Fig. 2:
Pre-treatment CT image of frontal and lateral view shows the severely dilacerated root.

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curved root tip (*Fig. 2*). The slice view of the dental CT revealed that the odontoma was very close to the lingual plate and the second premolar was deeply impacted to the level of the mandible border (*Fig. 3*). All of this information was used for selecting appropriate surgical and orthodontic techniques.

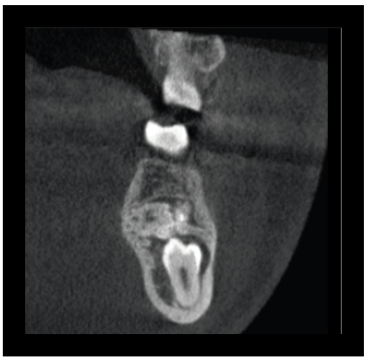

Fig. 3: Pre-treatment CT image of slice view.

Treatment Objectives

1. Redistribute the space of the mandibular left region.
2. Restore the normal appearance of the mandibular left region.
3. Establish an acceptable occlusion of the mandibular left region.

Treatment Options

1. As the angle between the root and the crown of the impacted #35 was found to be dilacerated more than 90°, some dentists thought it might be a great obstacle to forcefully erupt #35. Oral surgeons suggested to extract 7D, 7E, the Odontoma, impacted #34 & #35 and restore with a removable partial denture or dental implants (*Fig. 4*).
2. Extraction of 7D, 7E, and the Odontoma. Let #34 & #35 to erupt as spontaneously as possible. Followed by orthodontic space opening, surgical exposure and traction of #34 and dilacerated #35 into the proper position (*Fig. 5*).

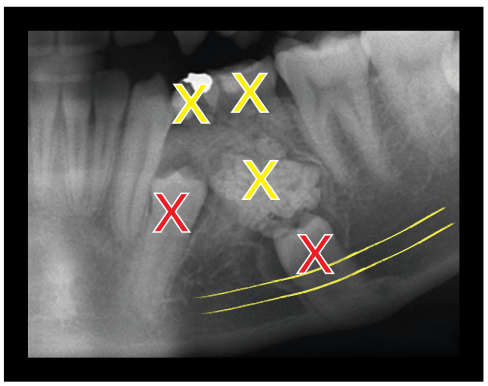

Fig. 4: Treatment option 1:
Extraction of 7D, 7E, the odontoma, and impacted #34 & #35.

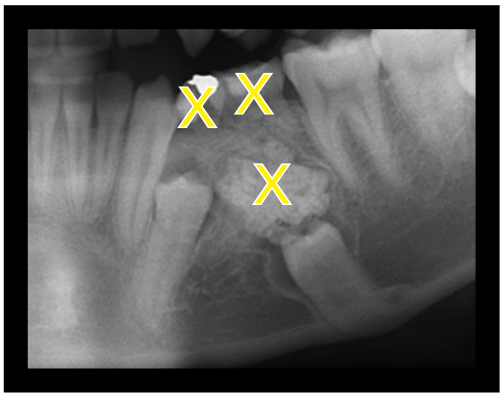

Fig. 5:
Treatment option 2: Extraction of 7D, 7E, and the odontoma.

Treatment Process

After considering the possible treatment options, the parents chose to try to save the impacted premolars and bring them into the proper position.

The first stage was to extract 7D, 7E, and the Odontoma (*Fig. 6*). The biopsy report confirmed the diagnosis of a compound odontoma (*Fig. 7*).

5 months after the first stage surgery had been completed, spontaneous eruption of #34 was visible in the oral cavity (*Fig. 8*). Then the initial leveling was performed with an open coil spring over the impacted #35 area (*Fig. 9*). The radiographic information revealed that #35 had erupted 5 mm (*Fig. 10*). During the 20 months after the first stage surgery, #35 kept erupting.

From the 13th to 20th month, #35 erupted more slowly and gradually stopped 7-7.5 mm below the alveolar ridge (*Figs. 11-13*). The reason for slowed down eruption might be attributed to the new bone formation covering #35. In total, #35 erupted 9mm in the 20 months after the first surgery had been performed (*Fig. 14*).

At the same time, an adequate space for the impacted #35 was achieved in the oral cavity (*Fig. 15*). The second stage was surgical exposure of the impacted #35. The following are step-by-step illustrations of this surgery:

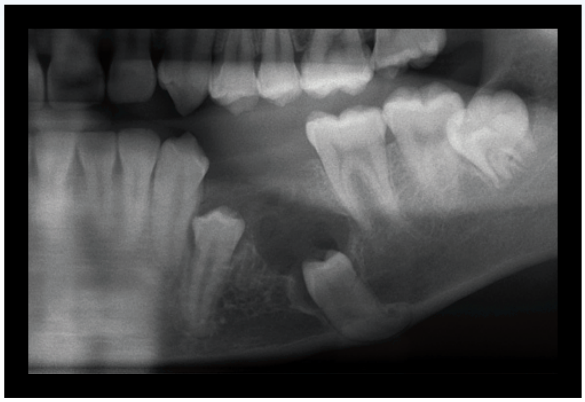

Fig. 6:
The day of the first stage surgery: the root tip of #35 was at the mandibular border.

Fig. 7: Compound odontoma.

Fig. 8: Spontaneous eruption of #34.

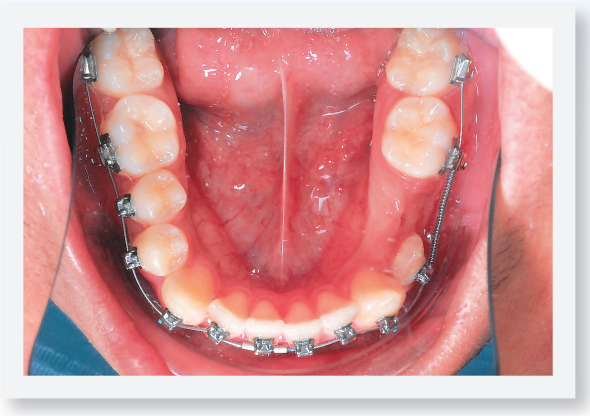

Fig. 9:

Initial leveling was performed with an open coil spring over the impacted #35 area.

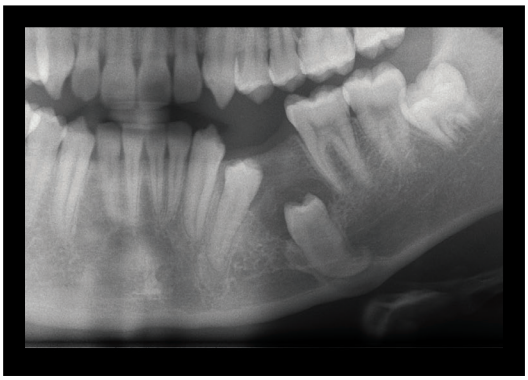

Fig. 10:

5 months after the first stage surgery: the root tip of #35 was 5 mm above the mandibular border.

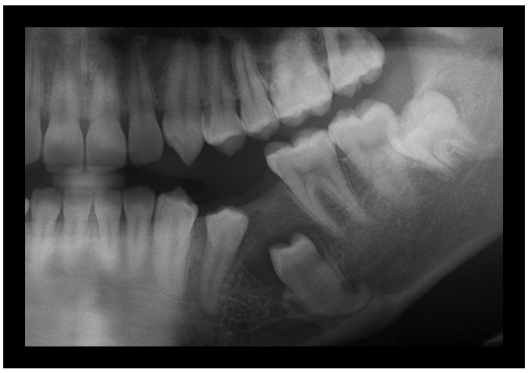

Fig. 11:

8 months after the first stage surgery: the root tip of #35 was 6 mm above the mandibular border.

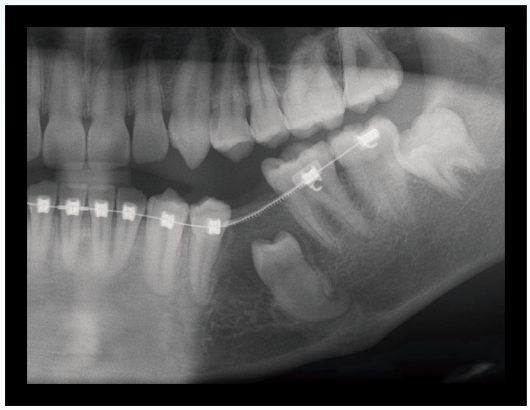

Fig. 12:

13 months after the first stage surgery: the root tip of #35 was 9 mm above the mandibular border.

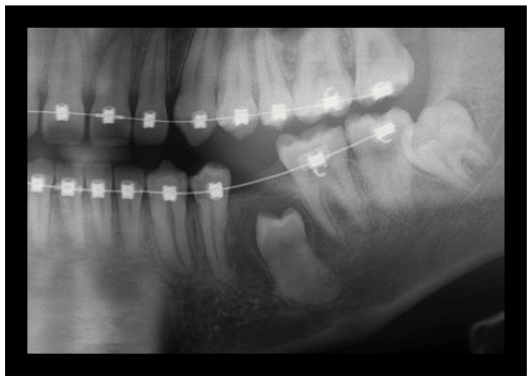

Fig. 13:

20 months after the first stage surgery: the root tip of #35 was 9 mm above the mandibular border.

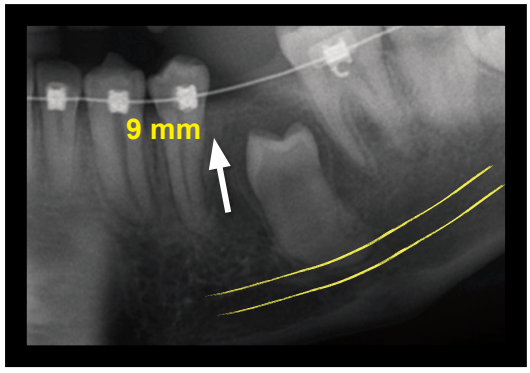

Fig. 14:

#35 erupted 9 mm in the 20 months after the first stage surgery.

1. Incision

Central linear incision on the crest and intra-sulcular incisions of #34 & #36 were performed under local anesthesia (*Figs. 16-17*).

Notice! When designing the incision lines of a surgical exposure, preparing adequate keratinized gingiva for the impacted tooth is important. If the keratinized gingiva on the buccal site is less than 2mm, the incision line should be performed more lingually instead of in the central of the crest. Then the buccal full-partial thickness flap can be sutured apically to make sure the impacted tooth erupt in adequate keratinized gingiva.

Fig. 16: Local anesthesia over the surgical field.

Fig. 17: Incision of the surgical field.

2. Flap elevation

A full thickness flap was elevated to expose the surgical field (*Fig. 18*).

Notice! According to the radiographic information, the mental foramen was located below the crown of #35. Although the buccal flap may not be elevated to the level of mental foramen, the mental nerve branches could be damaged if we pressed or retracted the flap too much.

Fig. 18: Flap elevation of the surgical field.

3. Ostectomy

A high-speed hand-piece with a carbide round bur

was used to remove the covering bone of #35 (*Fig. 19*).

Tips! According to the radiographic information, the covering bone height was 7-7.5 mm. When #35 was detected, it was important to make sure all the bone surrounding #35 occlusal table was removed in order to allow #35 to erupt easily. A dental explorer is a good tool to check the margin between the tooth and bone (*Fig. 20*). When an explorer touches a tooth, it feels like touching a smooth surface, whereas when it touches bone, it feels like touching a rough surface.

4. Bonding

Bond a button on #35 occlusal surface (*Fig. 21*).

Tips! It is very important to control the bleeding in this step. Therefore, some lidocaine was added to the surgical area and pressure with gauzes for 5 minutes. To improve the bonding efficiency, it is advisable to use a button fixed with a ligature wire, which has already been prepared extraorally.

5. 3D lever arm mechanics[2,4-6]

An extra-radicular miniscrew was inserted in the left buccal shelf area. A ligature wire was attached between a 3D lever arm and the button to extrude #35 (*Figs. 21-24*).

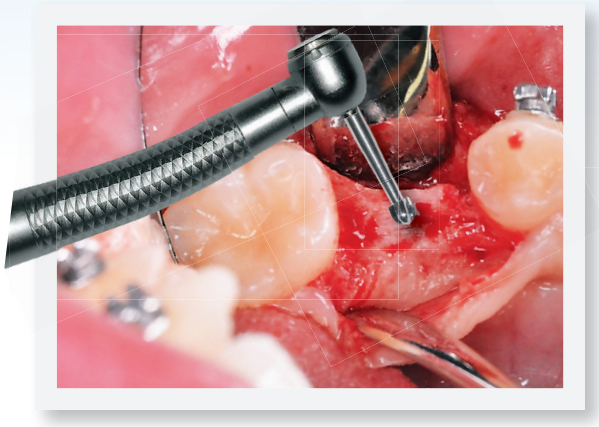

Fig. 19: Remove the covering bone of #35.

Fig. 20: Remove the covering bone of #35.

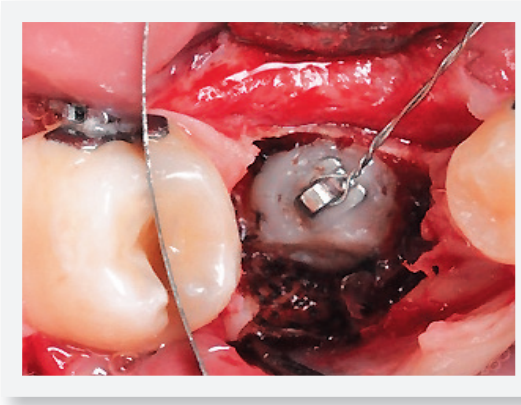

Fig. 21:
Bond a button with a ligature wire on #35 occlusal surface.

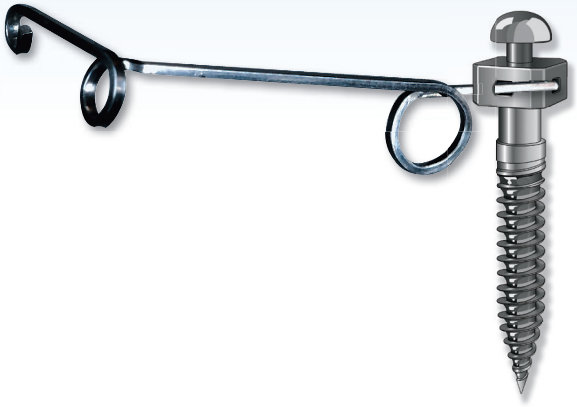

Fig. 22: The 3D lever arm consists three helixes.

Fig. 23: The 3D lever arm in unactive position.

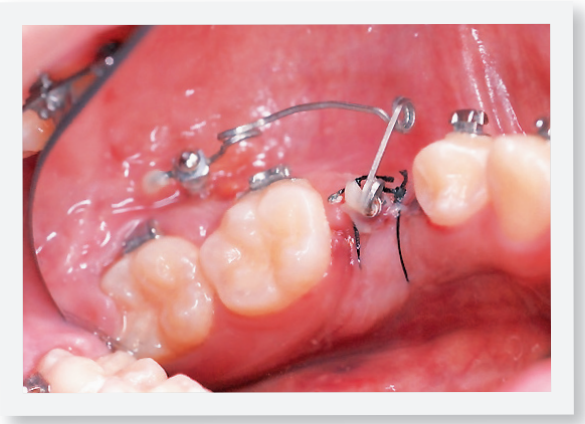

Fig. 24: The 3D lever arm in active position.

Tips! The orthodontic devices must be checked to ensure that they do not interfere with the occlusion. The .019x.025 stainless steel lever arm used consisted of 3 helical coils: one in the middle, and two on both ends. When this lever arm was inserted into the square hole of the extra-radicular miniscrew and activated, it provided more than 4 ounces of direct force to extrude #35 without lateral moment.

6. Suture

In order to irrigate and clean the surgical area, the flaps were primarily closed with simple 2 stitch interrupted sutures using 4-0 silk (*Fig. 24*) [7]

Results

Radiographically, the impacted #35 was successfully extruded to the level above gingiva 5 months after the second stage surgical exposure, and the newly positioned #35 revealed an intact root with no apparent root resorption (*Figs. 25-26*).

Discussion

Impacted mandibular premolar with a severely dilacerated root is seldom reported, especially when it is combined with odontoma.[8-11] It is probably because of the high clinical difficulty of bringing the dilacerated tooth into position, that some patients would probably instead choose to extract and replace with a prosthesis.

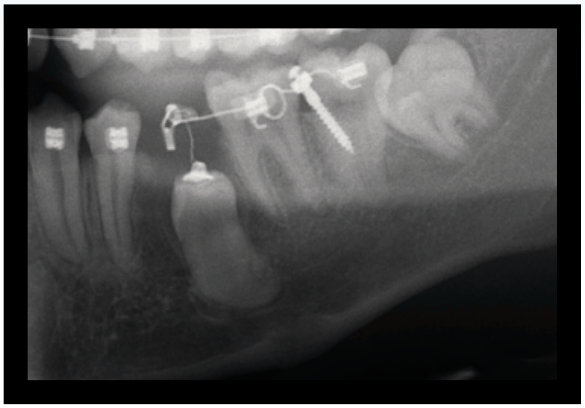

Fig. 25:

The day of the second stage surgery: the root tip of #35 was 9 mm above the mandibular border.

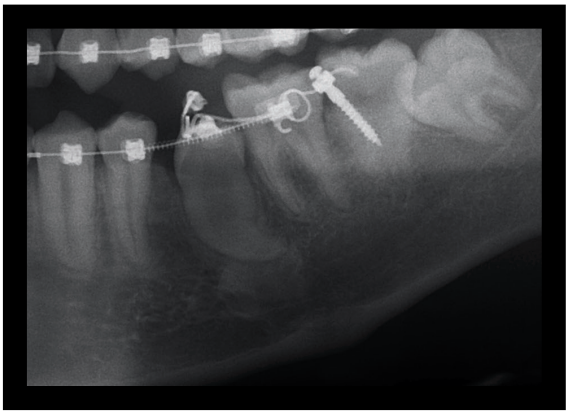

Fig. 26:

5 months after the second stage surgery: the root tip of #35 was 17 mm above the mandibular border.

In study by Malcic et al,[12] the prevalence of dilaceration of mandibular first premolar was 2.1%, and that of mandibular second premolar was 1.5%. Trauma and developmental disturbance such as odontoma are the main causes of dilacerated root formation. Odontomas are the most common types of odontogenic tumors, and may disturb the normal eruption of teeth. In studies by Regezi[13] and Kaugars,[14] the most common location of odontoma was the incisor and canine region of the maxilla followed by the incisor and canine region of the of the mandible. In this case, the physical presence of odontoma, causing the mechanical interference to the eruption of #35, might have influenced the direction of root development, leading to the dilaceration in the apical region.

Spontaneous eruption of the impacted tooth after removal of the odontoma has been reported by many authors.[15-17] Morning et al[18] examined 42 impacted teeth in relation to odontomas and reported that 45% (*19/42*) of the impacted teeth erupted, 77% (*13/17*) of the remaining teeth erupted after a second surgery, which indicated that three out of four impacted teeth would erupt after removal of the odontoma. Ohman[19] hypothesized that the forces within surrounding tissues act upon the surgically exposed crown in such a way as to direct it toward the area where the tissues were removed.

The success rate of treating the impacted dilacerated tooth depends on the degree of dilaceration, position of the tooth, and root formation of the tooth. A dilacerated root with an obtuse angle, normal erupting position, and incomplete root formation of the tooth would have a better prognosis for orthodontic traction. Studies have shown that the more bone removed during surgical exposure, the greater the bone loss after orthodontic treatment and the greater the chance of injury to the tooth during traction. This presented case

used two stages of surgery in order to reduce bone destruction. Besides, #35 was too deep to bond during the first stage surgery.[9,20,21]

With respect to the uncovering flap design, this case used the closed-eruption surgical technique, which returns the flap to its original location after placement and attachment on the impacted tooth. The technique induced a natural tooth eruption of the impacted tooth rather than the conventional design of the apically positioned flap. Vermette et al[22] compared these two surgical techniques and found that the apically positioned flap technique had more negative esthetic effects such as increased crown length and gingival scars than the closed-eruption technique.

Conclusion

Treatment of the impacted dilacerated premolars with odontoma is a clinical challenge. Combining two stages of surgery with 3D lever arm orthodontic traction provides an effective approach for treating a severely dilacerated root. Pre-surgical case study is very important in each different cases. By understanding the location of the impacted teeth and the mental foramen, incisions and flaps can be designed well, and osteotomy can be performed effectively. If the procedures illustrated in this article are followed, successful treatment of impacted dilacerated premolars with odontoma can be achieved. However, long-term monitoring of the stability and periodontal health of the dilacerated premolar is also very important after orthodontic traction.

References

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