

# CASE REPORT

## Treatment of a Deeply Impacted Mandibular First Permanent Molar

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**A**ccidental trauma to permanent teeth in children can result in the cessation of eruption due to ankylosis.<sup>1-6</sup> Although this situation almost always occurs in the anterior segments, histological analysis of permanent molars with arrested eruption has shown areas of ankylosis of unknown etiology.<sup>4,7</sup> The present article describes treatment of a patient with a deeply impacted and ankylosed mandibular first permanent molar with significant root dilaceration.

### Diagnosis

An 11-year-old male in the mixed dentition was referred for orthodontic treatment by his general dentist because of an unerupted mandibular left first perma-

nent molar. His medical history revealed early childhood asthma and glucose-6-phosphate dehydrogenase (G6PD) sensitivity, but no previous medical or dental trauma. Initial examination showed a symmetrical and well-balanced face with slight mandibular retrusion and a mild Class II malocclusion (Fig. 1).

The patient's dental age lagged somewhat behind his chronological age. A panoramic radiograph revealed the presence of all developing permanent teeth except the third molars. The mandibular left first permanent molar was deeply impacted, with a thin layer of bone over its occlusal surface. The roots were not fully formed; their apices were at the lower border of the mandible, and

the distal root was severely dilacerated in a distal direction. The roots lacked an intact, continuous lamina dura, which is a typical sign of ankylosis.

Because carious lesions were noted on several deciduous teeth, the patient was referred for restoration, which included the placement of a stainless steel crown on the mandibular right second deciduous molar. Follow-up radiography six months later showed no intrabony eruptive movement of the presumably ankylosed molar. The cause of the mandibular molar impaction could not be determined; no pathologic lesion or local impediment to eruption was found, and the adjacent teeth appeared normal.

### Treatment Plan

The treatment goals were to bring the impacted mandibular first molar into proper occlusal and functional position in the arch, correct the mild Class II malocclusion, and achieve normal overbite and overjet. Several different treatment options were presented to the patient and parents: 1. Surgical exposure and luxation, bonding of an attachment,

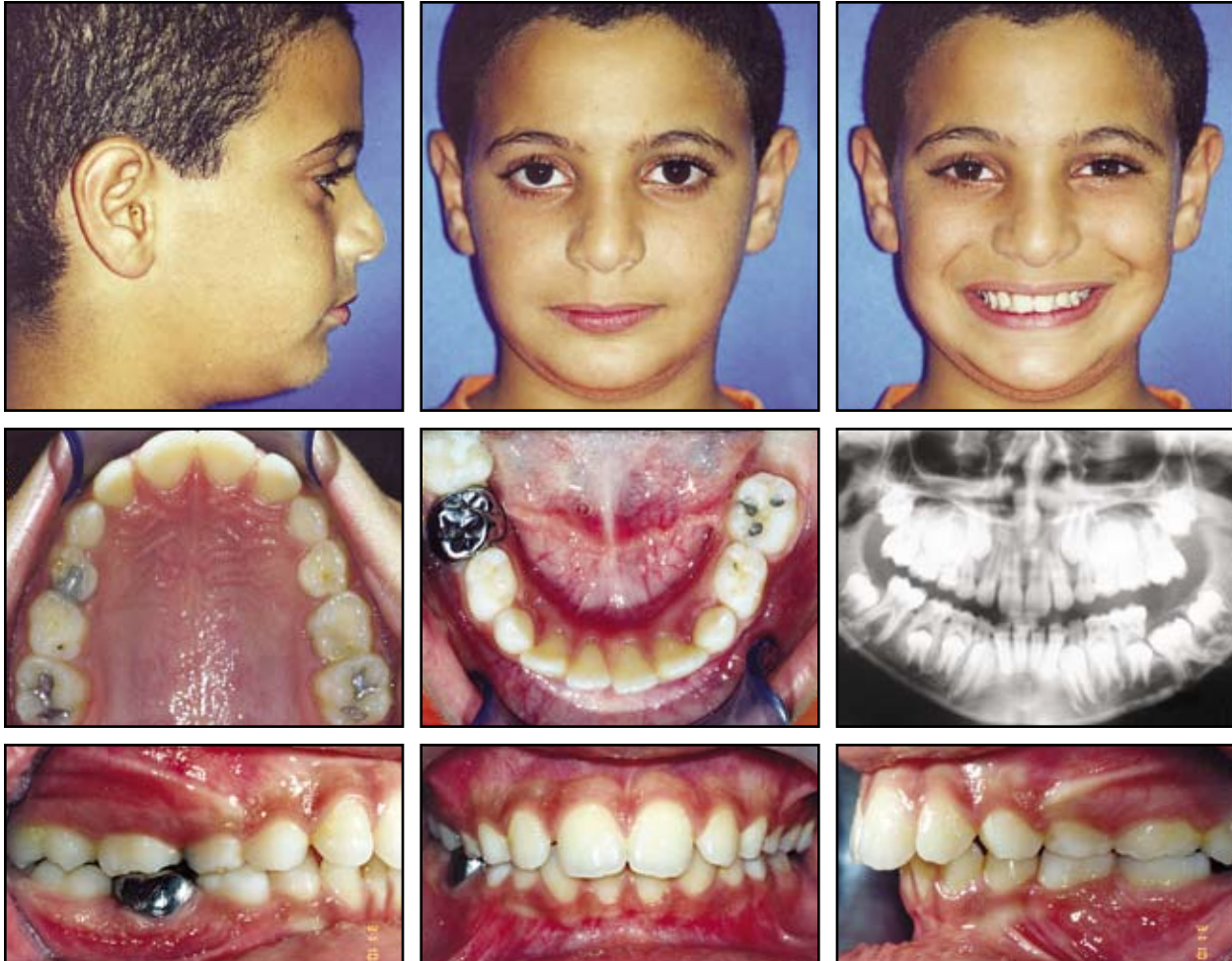
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**Fig. 1** 11-year-old male patient in mixed dentition with deeply impacted mandibular left first permanent molar and mild Class II malocclusion (photographs were taken after restoration of carious teeth).

and vertical orthodontic movement of the impacted molar to the occlusal level. This would require prolonged treatment with no guarantee of success. If the tooth did not respond to the orthodontic forces, it would need to be extracted to allow the developing second molar to drift mesially into the position of the first molar.

2. Surgical extraction of the impacted molar, with no attempt

to rescue it. Because of the tooth's proximity to the mandibular canal and the lower border of the mandible, this approach could have increased the risk of injury to the inferior alveolar nerve or even of a fractured mandible.

3. Surgical exposure and luxation, with no orthodontic intervention, in an attempt to prompt spontaneous eruption. The chances

of success were limited.

4. Waiting for spontaneous eruption, with clinical and radiographic observation every three to six months. Given the deep impaction and ankylosis of the tooth, as well as its dilacerated root, the chances of natural eruption were considered low.

The patient and parents agreed to try the first option, with the understanding that a lack of

response would require extraction of the tooth.

### Treatment Progress

Orthodontic treatment was begun six months after the initial appointment. The maxillary first permanent molars were banded, and cervical headgear was used to correct the mild Class II relationship. After the first molars had been moved distally, a transpalatal arch was inserted. These appliances were later used as anchorage for the vertical forces on the impacted molar. A periapical radiograph taken just before surgery showed incomplete root formation, with the root apices at the lower border of the mandible (Fig. 2).

The impacted molar was surgically exposed and luxated, and a surgical pack was placed to promote tissue healing. The pack was removed a week later, and an eyelet was bonded to the occlusal surface of the tooth. Metal brackets were bonded to the mandibular incisors and to the second deciduous molars.

An .014" round stainless steel archwire was inserted, and a small helix was bent at its free end, distal to the second deciduous molar, and attached to the bonded molar eyelet with elastic thread. Six months later a lingual arch was added connecting the mandibular right first permanent molar with the mandibular left second deciduous molar. An uprighting spring, embedded in an acrylic extension of the lingual arch, was tied to the eyelet with elastic thread (Fig. 3). This spring exerted a light, continuous verti-

cal force on the impacted molar, and the tooth slowly erupted. The lingual arch was removed after four months, a tube was bonded to the molar's buccal surface, and a vertical elastic was attached between the mandibular and maxillary molar tubes.

A periapical radiograph taken one year later showed further eruption of the molar, as well as root development and elongation, with the root apices moving away from the lower border of the mandible (Fig. 4). Meanwhile, all the patient's maxillary and mandibular permanent teeth had erupted and were bonded and aligned. Treatment was continued until the mandibular first molar was in full occlusal alignment. The final radiographs revealed complete formation of both the mesial and dilacerated distal roots, with their apices well removed from the lower border of the mandible and the mandibular canal (Fig. 5).

Unfortunately, the patient's compliance and oral hygiene were poor. He failed to wear the vertical elastic as instructed, missed numerous appointments, and experienced frequent bracket breakage. These factors unnecessarily prolonged the treatment time to a total of 40 months. After treatment, a mandibular bonded canine-to-canine fixed retainer and a maxillary Hawley retainer were delivered. Routine follow-up appointments showed stable results.

### Discussion

Although any permanent tooth may become impacted, the



**Fig. 2** Radiograph taken immediately before surgical exposure of impacted molar.



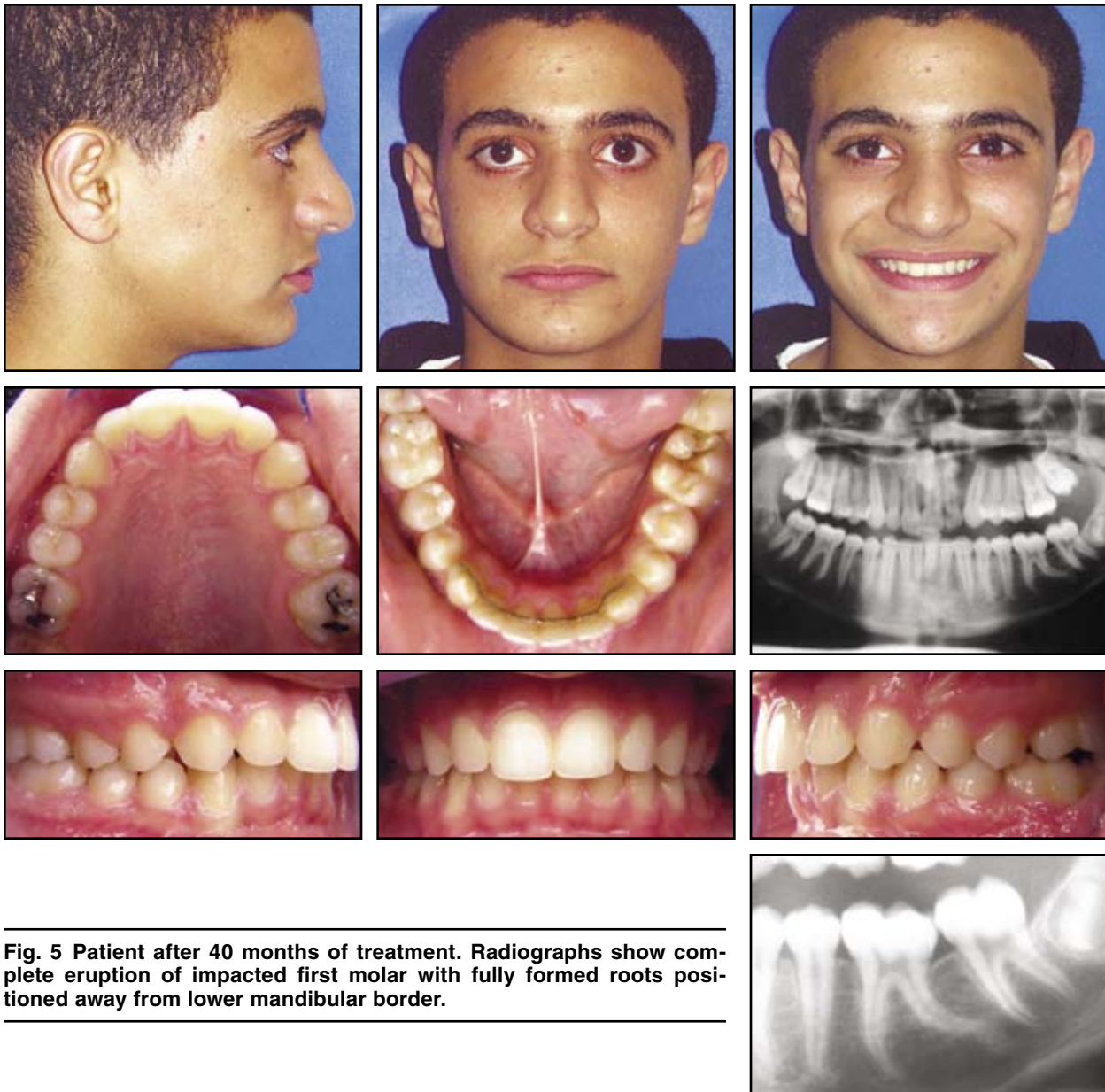
**Fig. 3** Radiograph showing attachment of spring to eyelet on molar.



**Fig. 4** Radiograph taken one year later, showing molar eruption and continued root development.

third molars are most commonly affected.<sup>8-11</sup> Only a few cases of impaction of the mandibular first permanent molar have been reported.<sup>12-18</sup> Hook-shaped roots

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**Fig. 5 Patient after 40 months of treatment. Radiographs show complete eruption of impacted first molar with fully formed roots positioned away from lower mandibular border.**

and ankylosis have been described, but deep impaction and ankylosis combined with prominent distal root dilaceration is extremely rare. When a molar is deeply impacted close to the inferior border of the mandible, the developing root may be resisted and deflected by the compact cortical bone, resulting in dilaceration.<sup>7</sup>

Root dilaceration is usually

found in the maxillary anterior region,<sup>19</sup> where the impact of trauma to a deciduous incisor may be transmitted to the developing permanent incisors, causing dilaceration in a labiolingual direction. Because the axis of the root is inclined in a different direction from the crown, the tooth does not erupt. Moving such a tooth is difficult and may require amputation of the apically dilacerated

portion of the root, followed by root-canal treatment.<sup>20-22</sup>

In the present case, the likelihood of failure in attempting to rescue the tooth with a combined surgical-orthodontic approach, the risk of fracture of the dilacerated root during luxation, and the risk of re-ankylosis during treatment were all taken into consideration. There was adequate space for the first molar to be brought

into the arch, and the maxillary first molar did not overerupt during mandibular molar traction. After proper vertical positioning of the impacted molar, however, the dilacerated part of the root was at an angle of nearly 90°, and thus could have delayed or even arrested the extrusive force.

Movement of a tooth with a dilacerated root is complicated: while most of the root moves upward, the distal segment of the dilacerated root becomes occlusally oriented and undergoes translation, effectively acting as the pressure side in a normal tooth movement. Therefore, it takes longer to achieve the desired tooth movement, and resorption of the dilacerated portion becomes more likely. A case-specific biomechanical design is required—for instance, in the case of a distally dilacerated root, an occlusal and mesial force can be applied so that the tooth is more likely to move in an arc, conforming to the curvature of the pulp chamber and the dilacerated root canal.

In this case, several light, continuous extrusive force vectors were applied, beginning immediately after exposure and luxation of the tooth and continuing until its full occlusal alignment. During eruption, both the mesial and dilacerated distal roots continued to develop and elongate. At the same time, the supporting alveolar bone followed the eruption. At the end of active treatment, the root apices and the alveolar bone were at the same levels as those of the adjacent teeth.

## Conclusion

An impacted tooth with confirmed ankylosis and root dilaceration is often regarded as hopeless, with surgical extraction the only possibility. The present case shows that combined surgical-orthodontic treatment can be successful if carefully planned and executed. Preservation of a tooth as important as the mandibular first molar is clearly preferable to extraction. To ensure the best possible prognosis, treatment should be initiated as soon as the anomaly is discovered. The importance of early radiographic screening in children cannot be overstated.<sup>23,24</sup>

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