

Uprighting mesially impacted mandibular permanent second molars

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Impaction of permanent teeth is a common clinical occurrence that may involve any tooth in the dental arch. The teeth most often impacted, in order of frequency, are the maxillary and mandibular third molars, the maxillary canines and the mandibular second premolars.¹⁻³ Dachi and Howell¹ reported that 16.7% of 3,874 routine full mouth radiographs showed impacted teeth and that most were maxillary and mandibular third molars. Mandibular second molar impactions were not reported.

Kramer and Williams² in their study of 3,745 full-mouth radiographs found impacted teeth in 18.2% of the cases, with third molars accounting for 95% of the impactions. No impacted mandibular second molars were mentioned.

Aitasalo and coworkers³ looked at 4,063 panoramic radiographs and found impacted teeth in 14.1%, with third molars accounting for 76.1% of the impactions. They did not report any second molar impactions.

Mead,⁴ in a study of incidence of impacted teeth found in 1,462 office cases, reported 89.7% third molar impactions and only 0.4% second molar impactions. Grover and Norton,⁵ studying panoramic radiographs of 5,000 Army recruits, reported that 98% of unerupted or impacted teeth were third molars and only 0.03% were mandibular second molars.

While impacted third molars are a very common occurrence in dental practice, mandibular second molar impaction is a relatively rare dental anomaly. The real incidence of mandibular second molar impaction is unknown but is reported to be in the range of about 3 in 1000 (0.03%).^{6,7} When found, second molar impaction often presents a challenging problem to both the orthodontist and oral surgeon. Unilateral impaction of the mandibular second molar is more common than bilateral impaction and occurs much more frequently in the mandible than in the maxilla. It has been found more often in

Abstract

Impaction of permanent teeth is a relatively common occurrence and can involve any tooth in the dental arch. Impacted mandibular second molars are relatively rare, but when they occur they may present a clinical problem for the orthodontist and oral surgeon. A typical case of bilaterally impacted mandibular second molars is illustrated, with orthodontic and surgical treatment options presented. Emphasis is placed on early diagnosis and initiation of corrective orthodontic therapy.

Key Words

Impaction • Mandibular second molar • Molar uprighting

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Figure 1

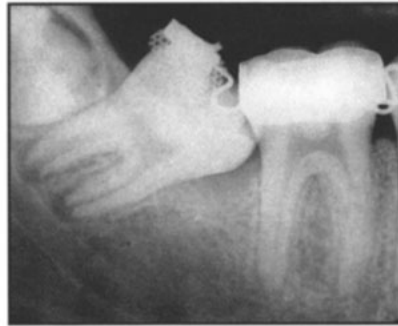


Figure 2A

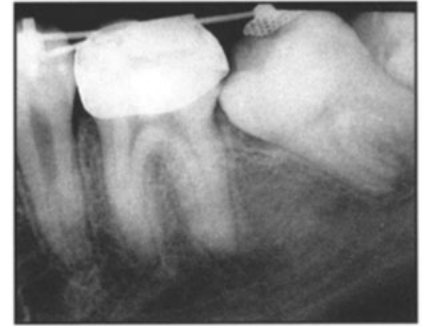


Figure 2B

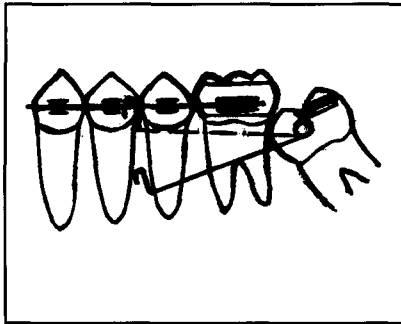


Figure 3



Figure 4



Figure 5

Figure 1
Panoramic radiograph at 11 years showing the mandibular right and left second molars mesially tipped and impacted.

Figure 2A-B
Periapical radiographs showing tubes bonded on the distobuccal cusps of the impacted second molars with uprighting springs attached.

Figure 3
Diagram of an uprighting spring hooked onto the main archwire.

Figure 4
Panoramic radiograph showing the uprighted second molars just before debanding.

Figure 5
Mirror view of mandibular arch showing uprighted second molars.

males than in females and more frequently on the right side than on the left. Impacted second molars are most commonly mesially inclined.⁸

The low frequency of mesially impacted second molars has kept the clinical significance of this anomaly quite low. Consequently, little information is available in the dental literature. Surgical repositioning is often recommended. However, orthodontic uprighting may be a better alternative, with a lower risk to the tooth. This paper discusses both surgical and orthodontic options and presents successful orthodontic treatment correcting bilaterally impacted mandibular second molars.

Case report

An 11-year-old girl was referred for orthodontic consultation and treatment. Clinical examination revealed a mild Class II interarch relationship with an arch length deficiency in the maxilla, resulting in a blocked out maxillary left canine. The maxillary right and left and the mandibular right deciduous second molars were present, but they were quite loose and about to exfoliate. Permanent second molars had not erupted.

Examination of the panoramic radiograph (Figure 1) revealed the presence of all permanent teeth, including developing third molars. The maxillary right and left second premolars appeared to be inclined palatally. The mandibular right second premolar had a mesial angulation. The mandibular right and left permanent second

molars were tipped mesially and were obliquely impacted under the distal bulge of the permanent first molars. The developing mandibular third molar buds were lying on top of the distal roots of the second molars.

Treatment was initiated with cervical headgear traction in an attempt to gain space in the maxillary arch. Following the eruption of the maxillary and mandibular second premolars, full edgewise mechanotherapy was used to level and align the erupted teeth. A compressed coil spring was used to open space for the blocked-out maxillary left canine.

Under local anesthesia, the impacted mandibular left second molar was surgically exposed and the mucoperiosteum reflected just enough to expose the distobuccal cusp of the tooth. The gingiva was then sutured, leaving access to the exposed tooth. Following suture removal 1 week later, the tooth was carefully etched, with due consideration for prevention of soft tissue injury. In spite of the difficulty in controlling moisture, a tube was bonded and a light uprighting spring inserted. The same procedure was repeated 2 weeks later on the right side (Figure 2A-B). The buccal tubes were replaced twice and their bonded positions changed to eliminate occlusal interference and potential breakage. A few months later, rectangular .016 x .022 uprighting springs, hooked onto the main archwire, were used for continuous uprighting and distal movement of the second molars (Figure 3). Anticipating the potential for some relapse, the mesial



Figure 6

marginal ridges of the second molars were elevated above the distal marginal ridges of the first molars (Figure 4).

The time required for uprighting and erupting the second molars into occlusion was 7 months. Total treatment time was 2 years. The corrections were not hindered by the presence of the third molars, which were not removed, although they were being followed radiographically.

Discussion

Almost all impacted second molars are associated with arch length deficiencies, more so in the mandible than in the maxilla.^{6,8} Moving the first molar posteriorly to gain arch length in the mixed dentition and to correct buccal or anterior crowding may result in impaction of the mandibular second molars.

Sometimes a normally developing mandibular second molar may, for reasons unknown, suddenly change its inclination and become obliquely or horizontally impacted.^{9,10} This may occur on one side while on the contralateral side the tooth erupts normally, as clearly demonstrated in the panoramic radiograph of an 8-year-old boy (Figure 6). Excess space is evident on the mandibular left side, between the fully erupted first molar and the developing crown of the second molar, compared with the contralateral side. In fact, the two teeth appear to be in normal developmental positions, which does not raise a suspicion of any future pathology.

A panoramic radiograph of the same patient at the age of 11 years 6 months (Figure 7) revealed a normally erupted mandibular right second molar. The position of the left second molar, however, changed during the 3.5 year interval. For unknown reasons, the tooth became almost horizontally impacted. No discomfort was associated with this condition, and the patient was unaware of the problem.

This case suggests that arch length deficiency in the mandibular posterior region is not always the main reason for second molar impaction. On occasion, the mandibular posterior segment will



Figure 7

show more than adequate arch length for the second molar, yet the tooth may become impacted. Moreover, careful examination of the panoramic radiographs of the cases reported by Freeman⁹ and Ferrazzini¹⁰ revealed situations very similar to the one presented in this article. The second molar becomes impacted on the side where the available space is greater. This is contrary to the reports that the majority of mandibular impacted second molars are associated with arch length deficiency.⁶ It could well be that excess space between the developing second molar crown and the first molar roots may allow the developing second molar to incline more mesially during the course of its eruption and thus become impacted under the distal bulge of the first molar. It is possible that the developing second molar needs the close guidance of the distal root of the first molar for its normal vertical eruption, a situation analogous to the eruption pattern of the maxillary canine, which according to some, requires the guidance provided by the root of the lateral incisor.¹¹

Incorrect band fitting on the mandibular first molar may hinder the erupting second molar, catching it under the distogingival edge of the band, resulting in mesial inclination and eventual impaction.¹²

There may also be an associated problem with the more common third molar impaction, when the developing third molar bud competes for space above the second molar, causing its impaction. Occasionally, the erupting mandibular second premolar and second molar may compete for space in the arch resulting in the impaction of the second molar.⁸

Mesial inclination of the impacted mandibular second molar is much more common than distal inclination. In fact, most of the cases reported in the literature show the unerupted mandibular second molar mesially inclined in an oblique or horizontal position. This is probably due to the initial mesial angulation of the developing tooth bud. This is contrary to the unerupted mandibu-

Figure 6
Panoramic radiograph of an 8-year-old boy. Note excess space on the mandibular left side between the erupted first molar and the developing crown of the second molar compared with that on the right side.

Figure 7
Panoramic radiograph of the same boy at age 11 years 6 months. Note the almost horizontally impacted mandibular left second molar compared with the normally erupted right second molar.

lar second premolar that has been reported to be inclined distally in an oblique or horizontal position.^{13,14} The mandibular second molar was reported inverted in only one case,¹⁵ with the crown directed toward the lower border of the mandible.

The proper time to treat these impactions is when the patient is 11 to 14 years old, during early adolescence when second molar root formation is still incomplete and before the third molars complete their development on top of the second molars. Treatment options for an impacted mandibular second molar include:

1. If the second molar is tipped slightly to the mesial, a separator can be placed between the teeth. This may relieve the tight contact under the distal bulge of the first molar, enabling self correction and eruption of the second molar.

2. When the tooth is tipped severely, surgical repositioning may provide a quick and easy solution (particularly when orthodontic treatment is not an option), with or without extraction of the adjacent third molar.^{10,16-18} Others have suggested splinting the repositioned tooth with autogenous bone grafts¹⁹ or using Gelfoam.¹⁶ Disadvantages include the risk placed on tooth vitality, root resorption, and ankylosis as well as potential problems for the adjacent teeth.

3. Extraction of an impacted second molar that

appears to have no chance of uprighting, to allow for the eruption of the third molar, is another option. This requires not only challenging manipulations by the oral surgeon so as not to injure the adjacent teeth, but depends also upon the positional development of the third molar and its eruption path, which is unpredictable. Due to the long time interval between extraction of the impacted second molar and eruption of the third molar, often 3 to 4 years, the third molar often tips mesially and becomes impacted. If the third molar is then extracted at a later age it will result in a short occlusal table of only one molar. In addition, the antagonist may overerupt if not extracted at the same time.

4. Extraction of the impacted second molar and its immediate transplantation into the correct position or transplantation of the third molar to the second molar socket have also been suggested.^{20,21} However, the transplanted tooth is then subject to root resorption and ankylosis, or may be lost due to infection.

5. A better alternative to extraction or surgical repositioning of an impacted mandibular second molar is its surgical uncovering followed by orthodontic uprighting and erupting. This may be done with or without extraction of the adjacent third molar. This option can be highly successful although orthodontic treatment can some-

times be difficult.⁹ A variety of orthodontic appliances and techniques have been suggested for uprighting and erupting impacted second molars following their exposure. A bonded attachment to the distobuccal surface with a spring fixed in a vertical lingual sheath,¹⁰ push coil spring,⁹ interarch vertical elastics,²² and a removable appliance with an uprighting spring²³ have all been used for the initial uprighting of the impacted second molar. Other approaches include a pin placed in the crown of the impacted second molar,²⁴ a bonded attachment on the occlusal surface of the second molar and auxiliary springs,^{25,26} or a bonded tube on the buccal surface and uprighting springs²⁷ or superelastic NiTi wire to upright and drive the tooth distally.²⁸ Similar techniques have been used to upright and align impacted third molars.²⁷⁻²⁹

The significant advantage of orthodontic uprighting techniques is the distal tipping and uprighting of the impacted tooth without the necessity of surgical assistance, bone removal, or splinting.

Conclusions

For the best clinical results, uprighting of mesially impacted mandibular second molars should begin in early adolescence to take advan-

tage of the incomplete root formation. With early diagnosis and recognition of the potentially developing impaction, practitioners are alerted to initiate adequate corrective measures. Although surgical uprighting of impacted mandibular second molars appears to be a quick and easy procedure, orthodontic uprighting techniques are more advantageous and offer a better long-term prognosis with no adverse pulpal or periodontal risks to the tooth or supporting structures.

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