

An Uprighting Appliance for Impacted Mandibular Second and Third Molars

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For patients who have missing first molars or whose first molars need to be extracted, the ideal orthodontic treatment is to move the other molars mesially into the first molar spaces. Unfortunately, the mandibular third molars are the most likely teeth to be impacted,¹ and it requires skill and patience to upright severely impacted molars.

A number of techniques have been described for this purpose.²⁻⁴ Several of these use removable devices requiring patient cooperation,⁵ however, and most require surgical exposure of the impacted molar, sometimes involving a portion of the alveolar bone.⁶ Treatment time may be extended because it takes more time to move impacted molars distally and then occlusally than to accomplish the two movements at the same time.⁵

Since 1999, we have effectively uprighted

mandibular second and third molars with a fixed appliance. This orthodontic technique allows simultaneous distal tipping and uprighting of the impacted teeth, usually without the need for surgical exposure, bone removal, or splinting.²

Appliance Construction and Activation

A mini-hook is fabricated from .014" stainless steel wire as follows (Fig. 1): Bend the wire into a circle with a 1.5mm diameter, extending in a perpendicular arm 1.5mm in length. At the top of the arm, bend a hook parallel to the circle.

Bond the mini-hook conventionally to the distal surface of a horizontally impacted molar or the occlusal surface of a mesially impacted molar, so that the hook opens mesially. Make sure the hook does not contact the opposing maxillary molar during closure. Surgical exposure is



Fig. 1 Fabrication and bonding of mini-hook (arrow).



Fig. 2 Fabrication and placement of push-spring (arrow) to move crown of impacted molar distally and occlusally.

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needed only if a horizontal impaction is so severe that the molar has not erupted at all. In such a case, the distal surface of the impacted molar should be exposed just enough to bond the mini-hook.

Solder an .018" stainless steel wire, about 60mm in length, to the middle of the lingual surface of the mesially adjacent molar band (Fig. 2). Be sure not to compromise the flexibility of the wire in soldering. Bend the wire at the distolingual corner of the band, extend it 2-3mm buccally, and then turn it distally, making a double- or triple-bend push-spring.

Cement the band with the push-spring to the mesially adjacent molar. Stretch the spring 4-5mm distally, and attach it to the open mesial end of the mini-hook (Fig. 3). The push-spring will then exert a distalizing and uprighting force. It should be reactivated monthly until the impacted molar is upright.

Case 1

A 17-year-old male presented for treatment of impacted molars in the mandibular right second molar region. Periapical radiographs showed that a horizontally impacted second molar was

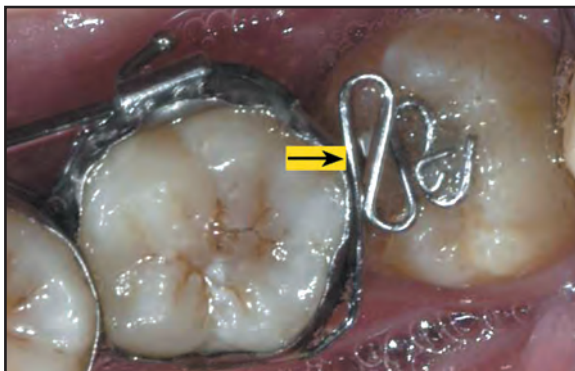


Fig. 3 Activation of push-spring (arrow).

buried beneath the mesially inclined third molar, and that the mandibular left third molar was also horizontally impacted (Fig. 4).

After extraction of the two impacted third molars, the patient was referred to the orthodon-

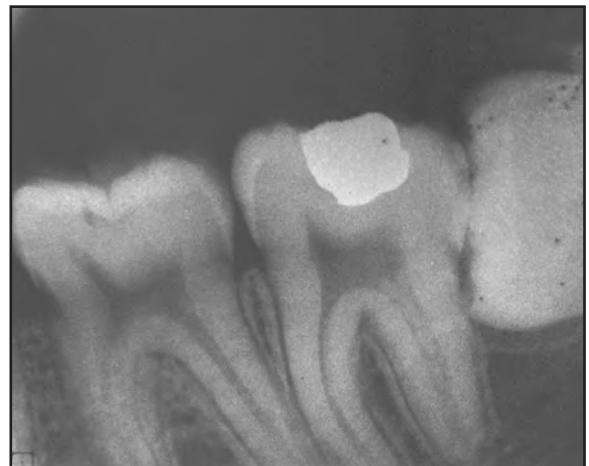


Fig. 4 Case 1. 17-year-old male patient with horizontally impacted mandibular right second molar, mesially inclined mandibular right third molar, and horizontally impacted mandibular left third molar.



Fig. 5 Case 1. A. Patient before treatment. B. After two months of uprighting. C. After three months of uprighting. D. After five months of uprighting. E. After six months of uprighting (continued on next page).

tist. Clinical examination indicated a Class I canine and molar relationship with mild crowding in both arches (Fig. 5). The panoramic radiograph revealed that the mandibular right second molar was horizontally impacted, its mesial margin contacting the distal surface of the first molar root (Fig. 6).

A mini-hook was bonded to the distal surface of the mandibular right second molar. A push-spring soldered to the adjacent first molar band was activated to distalize and upright the

impacted second molar. After six months of treatment, the horizontally impacted molar was nearly upright, and MBT* brackets were bonded in both arches. Seven months later, the second molar had reached its proper occlusal position.

After 15 months of orthodontic treatment, the fixed appliances were removed and a Hawley retainer was delivered.

*Trademark of 3M Unitek, Monrovia, CA; www.3MUnitek.com.



Fig. 5 Case 1 (cont.) F. After 15 months of orthodontic treatment.

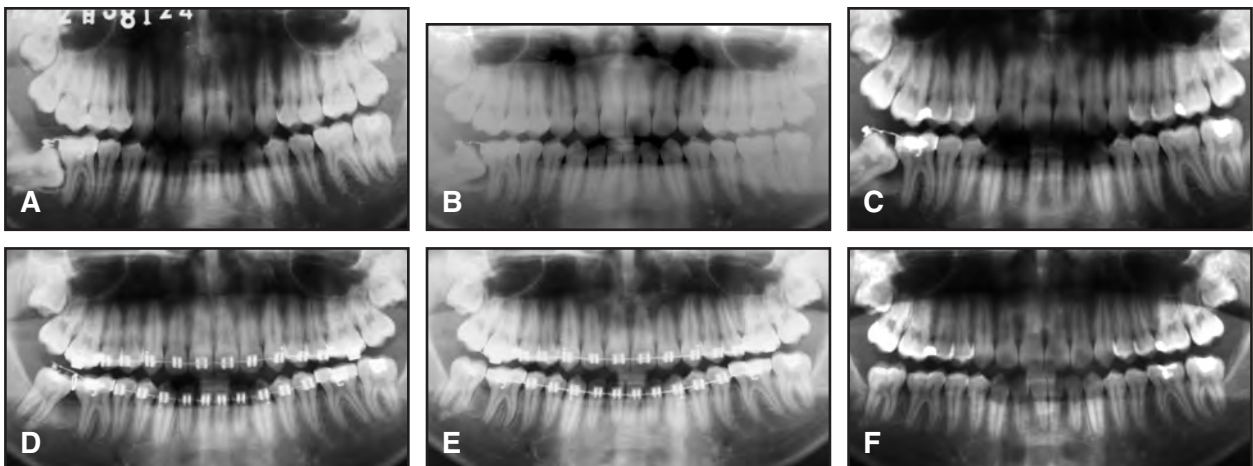


Fig. 6 Case 1. A. Patient before treatment. B. After two months of uprighting. C. After four months of uprighting. D. After seven months of uprighting (mini-hook relocated to occlusal surface of molar). E. After 12 months of uprighting. F. After 15 months of orthodontic treatment.



Fig. 7 Case 2. 17-year-old male patient with missing maxillary central incisors and mandibular left first molar, periodontally compromised mandibular right first molar, and horizontally impacted mandibular third molars at beginning of orthodontic treatment.

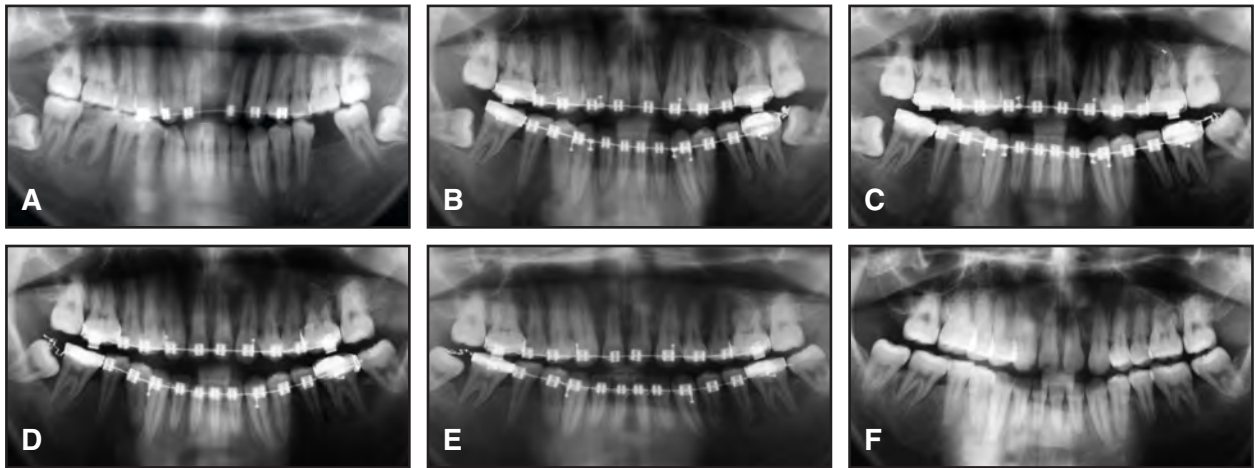


Fig. 8 Case 2. A. Patient at beginning of treatment. B. After 19 months of space closure. C. After six months of uprighting mandibular left third molar. D. After four months of uprighting mandibular right third molar. E. After 10 months of uprighting mandibular right third molar. F. After 39 months of total active treatment.

Case 2

A 17-year-old male presented for tooth alignment and space closure. Intraoral examination showed that the maxillary central incisors

and mandibular left first molar were missing and that the mandibular right first molar had severe caries (Fig. 7). The panoramic radiograph revealed a horizontal impaction of both mandibular third molars (Fig. 8).



Fig. 9 Case 2. A. Patient after 39 months of orthodontic treatment. B. Two years later, after restoration of maxillary central incisors.

The treatment plan was to extract the mandibular right first molar, close the space, and upright both mandibular third molars. After 19 months of treatment with fixed appliances, the molar space had been closed. At this point, the parents declined to have the two mandibular third molars uprighted at the same time. A mini-hook and push-spring were used to upright the man-

dibular left third molar in six months, and the parents then agreed to have the same procedure performed on the right side. After another 12 months, the mandibular right third molar was uprighted. Both mandibular third molars were then bonded, and the remaining space was closed.

The entire treatment took 39 months (Fig. 9).

Discussion

The basic biomechanics of uprighting impacted molars involves a rotational couple, so that the roots of the impacted molar move mesially while the crown moves distally. In clinical practice, however, the movement cannot be a simple rotation because the molar is impacted in the bone or soft tissue, and it is difficult to apply the force in an ideal position. Therefore, the force becomes a combination of rotation and translation.⁷

With the uprighting appliance described above, when the push-spring is compressed, it produces not only a distal force, but also a light occlusal force. The point of the alveolar bone, opposite or beneath the distal neck of the impacted molar (depending on the degree of impaction and the force of the spring) serves as a fulcrum for the force couple. The result is a combination of rotation, translation, and occlusal movement.

Proper timing of the uprighting procedure can shorten treatment.⁸ The impacted molars should be uprighted before any other tooth alignment in patients with impacted mandibular second molars (Case 1), or with impacted mandibular third molars if there is little crowding or if several years have passed since orthodontic extraction treatment, with the antagonists in normal positions. The teeth should be aligned first and the mandibular second molar moved mesially if the mandibular first molar is not present (Case 2), or if it is too difficult to bond a mini-hook to the crown of an impacted third molar because of crowding.

We have used this system to upright 14 impacted mandibular molars in 11 patients, three male and eight female, ranging in age from 14 to 26, with an average age of 19.4. The impacted teeth have included 12 mandibular third molars and two mandibular second molars; nine were horizontally impacted, and five mesially impacted at an average angle of 78.1°. Six of the patients had missing first molars, four required first molar extractions because of severe caries, and four had sufficient space for third molar eruption due to previous extraction treatment, with the opposing maxillary third molars in normal posi-

tions. In these 11 cases, the impacted molars were all uprighted and erupted into normal occlusal relationships. Panoramic radiographs showed that the spaces originally occupied by the crowns of the impacted molars were replaced by alveolar bone. The uprighting procedures took six to 12 months, with an average of 7.4 months.

Conclusion

The orthodontic uprighting appliance described above is simple to construct and activate. The low profile of the mini-hook eliminates the need for a removable appliance to raise the vertical dimension and avoid occlusal contact with the opposing molars. Because the mini-hook is bent at a 90° angle, it locks securely to the push-spring, usually without ligation. As long as the mini-hook can be bonded to the occlusal surface of the impacted molar, no surgical exposure is necessary, reducing the likelihood of infection or trauma. The regeneration of normal alveolar bone makes this technique especially suitable for patients with impacted mandibular third molars and missing first molars.

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