

Case Report

Management of unilaterally deep impacted first, second, and third mandibular molars

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ABSTRACT

Simultaneous impactions of first, second, and third permanent molars comprises a very rare clinical situation with diverse therapeutic approaches and is a difficult challenge for dentists. Early diagnosis and treatment of eruption disturbances contributes to optimal outcomes. This article reports the treatment of a teenager with severe impaction of right mandibular first, second, and third molars, which hinders the masticatory function and dental arch integrity. A decision-making process and a simple orthodontic technique are described. To shorten the treatment time and simplify the procedures, the impacted right mandibular third and second molars were orthodontically uprighted with an innovative tip-back cantilever. Subsequently, the deeply impacted right mandibular first molar was extracted with minimal obstacles. The combined surgical-orthodontic approach resolved a challenging clinical problem and eliminated the need for prosthetic or dental implant replacement of the impacted molars. Good occlusion, normal function, and a healthy periodontium of the patient were also achieved. (*Angle Orthod.* 2012;82:565–571.)

KEY WORDS: Impacted molar; Orthodontic; Uprighting; Tip-back cantilever; Dental implant

INTRODUCTION

Impaction of a second permanent molar is uncommon and usually occurs in the mandibular arch with an incidence of 0.03% to 0.21%.^{1,2} Moreover, first permanent molar impaction is rare, with prevalence rates of 0.02% for the maxillary first molar and of less than 0.01% for the mandibular first molar.^{3,4} Treatment

options for an impacted molar include extraction, surgical uprighting, transplantation, surgical-orthodontic approach, and dental implant replacement.^{5–9} In choosing a treatment plan for multiple impacted molars the decision-making process must be handled very cautiously as a result of the uncertain etiology, the lack of standard therapy, and the paucity of cases reported.

The aim of this article was to report and discuss a case in which the combined surgical-orthodontic therapy of the multiple, deeply impacted molars solved a free-end edentulism and avoided a prolonged orthodontic treatment aimed at bringing the deeply impacted first molar to the dental arch. This treatment modality had simultaneously been used to treat a concomitant malocclusion, in which case it had improved the infrabony defect at the impacted molars and satisfied the patient.

CASE REPORT

A 16-year-old boy with simultaneous impactions of three permanent molars in the right mandible sought treatment for delayed eruption of the right mandibular first and second permanent molars. Review of the patient's medical, dental, and family histories revealed no significant findings. The patient presented a Class II, division 1 malocclusion and a protrusive profile. All of the permanent teeth had erupted except

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Figure 1. Pretreatment facial (A) and intraoral (B) photographs.

for the third molars and the right mandibular first and second molars (Figure 1). Pretreatment panoramic and cephalometric radiographs revealed the presence of all permanent teeth and severely mesial inclination of the right mandibular first, second, and third molars, with the right mandibular first and second molars deeply impacted under the distal surface of the adjacent second premolar (Figure 2). Excessive distal inclination of the right mandibular second premolar and a dental follicle remaining on the right mandibular first molar were also observed. The root formation of the impacted right mandibular first and second molars had almost reached completion, while the impacted mandibular third molars had immature roots. Cephalometric analysis indicated a Class II skeletal pattern with a low mandibular plane

angle. The U1 to SN angle of 120° reflected proclination of the maxillary incisors (Table 1). Patient consent was requested and received for the purposes of this article.

With regard to the impacted right mandibular molars, the authors considered three treatment options: (1) orthodontically uprighting the right mandibular third and second molars, surgically removing the deeply impacted right mandibular first molar, and then orthodontically finishing the occlusion; (2) removing the impacted right mandibular third molar and uprighting the right mandibular second and first molars; and (3) removing all of the impacted right mandibular molars and practicing ridge preservation procedures before installation of dental implants.

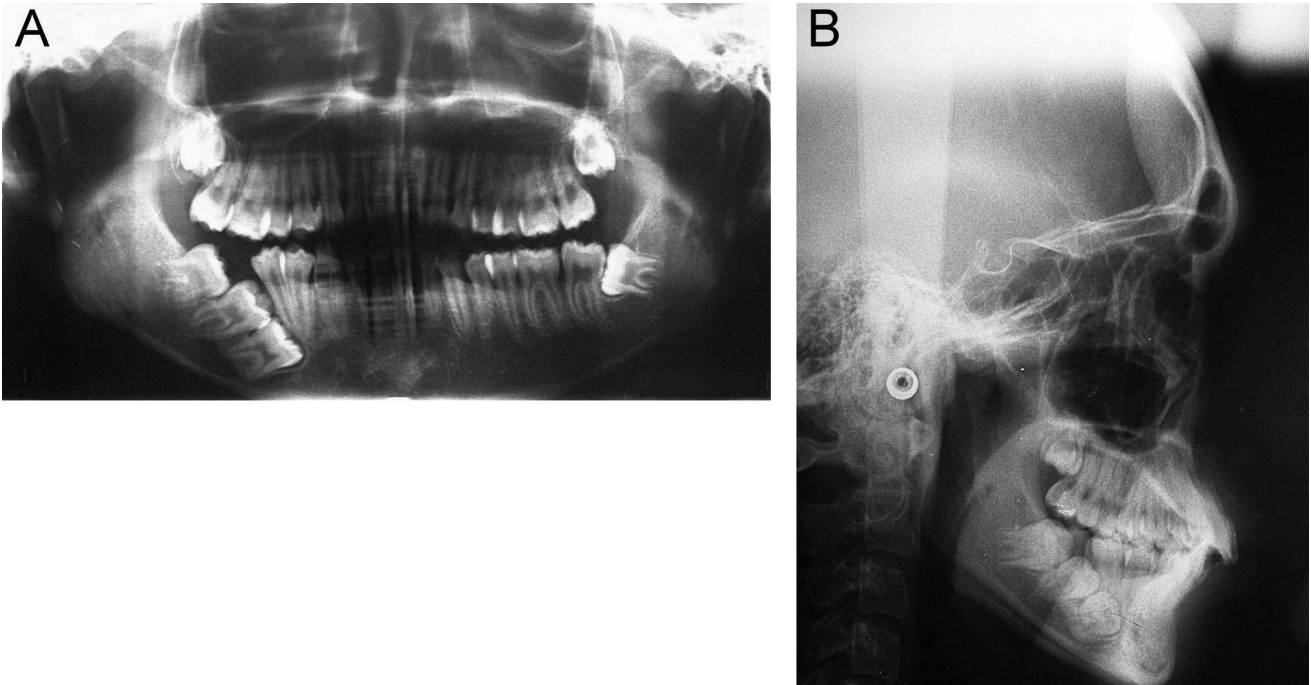


Figure 2. Pretreatment panoramic (A) and cephalometric (B) radiographs. Note the severely mesial impactions of the right mandibular permanent first, second, and third molars as well as the horizontal impaction of the left mandibular third molar.

The authors explained the various treatment plans to the patient as well as his parents and obtained informed consent. The selected treatment plan included extraction of the right mandibular first molar after orthodontic uprighting of the right mandibular third and second molars. We also expected to extract the maxillary first premolars, the left mandibular second premolar, and the third molar in order to relieve mild crowding, correct the deviation of the lower midline, and improve protrusion.

After 6 months of orthodontic treatment, we distally uprighted the right mandibular third molar and reevaluated the patient’s clinical status. The right mandibular second molar passively erupted after the right mandibular third molar had been moved. This eruption

created space, but the right mandibular first molar stayed in its original position (Figure 3). The bracket on the right mandibular second premolar was repositioned, which prevented the root of the right second premolar from approaching the crown of the impacted first molar. Within the next 3 months, the right mandibular second molar was orthodontically uprighted with an 0.016 × 0.025–inch superelastic Copper Ni-Ti® sectional wire (Damon™; Ormco, Orange, Calif) (Figure 4), which was modified from the “pole arm” tip-back cantilever.⁸ When the impacted second molar had been uprighted to some degree, a bracket was bonded to it for further alignment. Two months later, the right mandibular first molar was extracted without injury of the inferior alveolar nerve. In

Table 1. Cephalometric Measurements

Measurements	Norm ^a (Male)		Pretreatment	Posttreatment
	Mean	SD ^b		
SNA, °	83.4	3.7	87	85
SNB, °	80.6	3.5	82	81
ANB, °	2.8	2.1	5	4
Wits appraisal, mm	0	3.5	2	−0.5
N perpendicular to A, mm	0	2	5	4.5
N perpendicular to Pog, mm	−5	8	3.5	2
SN-GoGn, °	33	1.8	29.5	28.5
U1-SN, °	108.2	5.4	120	106
IMPA, °	96	6.9	97	103
Interincisal angle, °	126.7	10.2	119	123

^a For Taiwanese normative mean.

^b SD indicates standard deviation.



Figure 3. The panoramic radiograph taken at 6 months of orthodontic treatment. The right mandibular third molar had been distally uprighted and space was being created. Passive eruption of the right mandibular second molar was also observed.

the subsequent 16 months, space closure, root parallelism, and occlusion detailing were attained. The orthodontic treatment required 27 months to complete, and good occlusion was achieved. Post-treatment intraoral photographs (Figure 5) and panoramic and cephalometric radiographs (Figure 6) showed the corrected inclination of the impacted right mandibular second and third molars, with proper interdigitation and root parallelism.

Cephalometric evaluation revealed that the SNA angle was decreased by 2° , the SNB angle was decreased by 1° , and the ANB angle was decreased by 1° . The U1 to SN angle was decreased from 120° to 106° (Table 1). The movement of the maxillary incisors improved the soft tissue profile and mentalis strain. A Hawley retainer and a lingual fixed retainer were used as retentive devices for the maxilla and mandible, respectively.

DISCUSSION

According to Andreasen et al.,¹⁰ three main causes have been distinguished with regard to eruption disturbances: ectopic position, obstacles in the eruption path, and failures in the eruption mechanism.

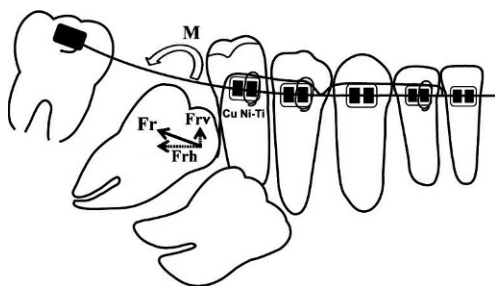


Figure 4. Force and moment acting on the impacted second molar. Cu Ni-Ti indicates the 0.016 $\times$ 0.025-inch Copper Ni-Ti[®] sectional wire; Fr, reciprocal force acting on the impacted molar; Frv, vertical (extrusive) component of Fr; Frh, horizontal (distal) component of Fr; and M, moment acting on the impacted molar.

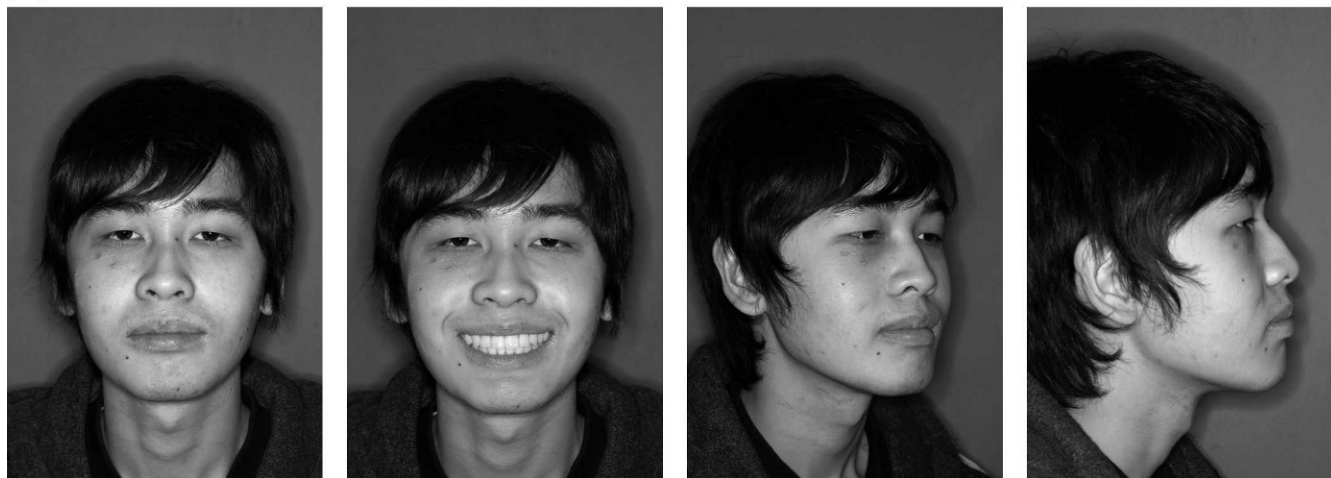
Failure of tooth eruption is associated with various systemic and local factors.¹¹ Heredity is also mentioned as an etiologic factor. Recently mutations in parathyroid hormone receptor 1 have been identified^{12,13} in several familial cases of primary failure of eruption. Local factors related to the failure of eruption include malocclusion disturbances of the deciduous dentition, the position of the adjacent teeth, space deficiency in the dental arch, idiopathic factors, supernumerary teeth, odontomas, or cysts.^{1,6,9} Unfortunately, a definitive differential diagnosis for these abnormal eruption patterns was not easy to obtain either clinically or radiographically before treatment began.

In this case, we regarded surgical removal of the deeply impacted right mandibular first molar after orthodontic uprighting of the right mandibular third and second molars as the most suitable solution. Impactions of the right mandibular third and second molars were probably attributed to obstacles in the eruption path or ectopic position.^{4,9,11} If the right mandibular second molar had ceased to erupt simply because of space deficiency or detectable obstructions in the eruption path, this approach was viable. After the right mandibular third molar was distalized and uprighted, the right mandibular second molar had erupted spontaneously. As the right mandibular third and second molars were pushed away from the right mandibular first molar, the difficulties and complications associated with the right mandibular first molar extraction could be minimized. On the other hand, if the orthodontic extrusion did not succeed, we could extract the right mandibular second molar and orthodontically move the right mandibular third molar mesially and finish the occlusion.

Primary retention is most likely caused by a disturbance in the dental follicle, which may be the main etiological factor of the right mandibular first molar in this case presented. An alteration of the dental follicle may cause failure to initiate the metabolic events responsible for bone resorption in the eruption path. When eruption of a permanent tooth is at least 2 years behind schedule, primary retention should be suspected.^{10,11}

Extracting the right mandibular third molar and orthodontically repositioning the right mandibular second and first molars, however, could not be successfully predicted. Moreover, such therapy might require considerable treatment time, which risks the periodontal health and tooth structures (eg, dental caries, root resorption). Once this approach fails, the deeply impacted right mandibular second and first molars only have to be transplanted, surgically repositioned, or extracted. In this clinical situation, transplantation or surgical repositioning of the right mandibular second and first molars was almost impractical because of the

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Figure 5. Posttreatment facial (A) and intraoral (B) photographs.

deeply impacted positions and the high risk of damage to the neurovascular bundle as well as the risk of mandibular fracture. In addition, the adjacent second premolar might present a deep infrabony defect on the distal surface after the invasive extraction. The right mandibular second and/or first molar extraction would leave the young patient with only one molar or with no molar on the right mandible.

The most aggressive method for treating the impacted right mandibular molars was to extract all of them. In this case, the extraction requires delicate technique as well as careful management to minimize risks of injury to the adjacent teeth and the neurovascular bundle as well as the risk of mandibular fracture. Based on the patient's young age and the potential growth of the facial skeleton, the patient

would have presented with a free-end edentulism in his right mandible until the appropriate timing of dental implant placement.^{14,15} Guided bone regeneration might be needed before or simultaneous to implant installation as a result of edentulous ridge resorption. Such extensive therapy would cost considerable money and time. On the contrary, dentists should advise patients to retain their teeth unless it is impracticable or unless they refuse the recommended treatment. According to a review by Lindhe¹⁶ there was no support for extracting teeth in favor of placing implants. A healthy tooth has a life-long survival rate, which has yet to be shown for the dental implant. Hence, orthodontic uprighting of the impacted molars, rather than risky tooth extractions, is recommended.

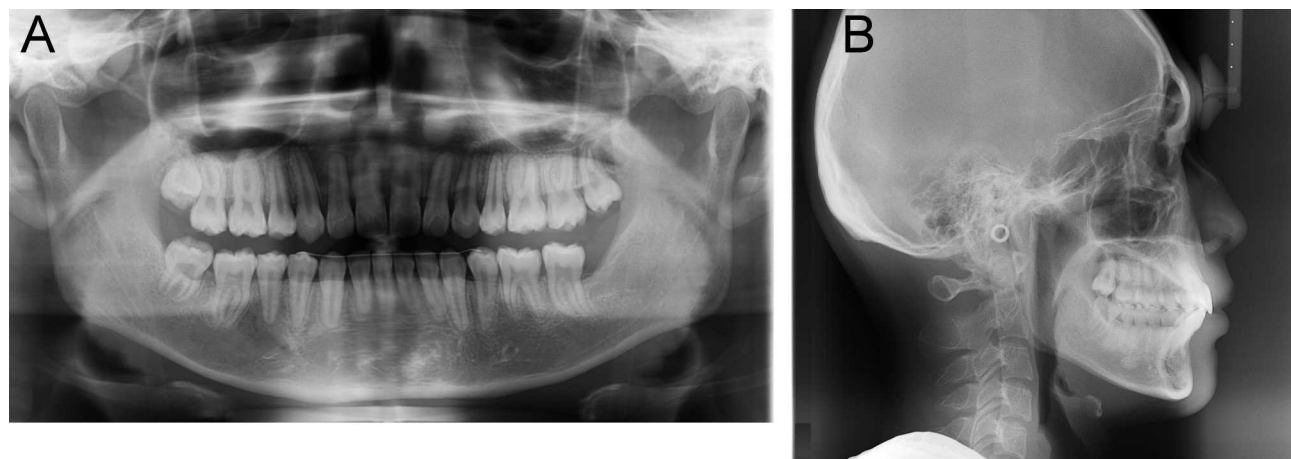


Figure 6. Posttreatment panoramic (A) and cephalometric (B) radiographs revealing corrected inclination of the right mandibular second and third molars with proper root parallelism.

Numerous orthodontic appliances and techniques have been suggested for uprighting impacted molars. A bonded attachment with a spring fixed in a vertical lingual sheath, push coil springs, interarch vertical elastics, and a removable appliance with an uprighting spring and miniscrews/miniplates have all been used for the uprighting of impacted molars.^{17–21} All of the aforementioned methods, however, have limitations in the approach of deeply impacted teeth or in the site of installation. In this case, the innovation of the 0.016×0.025 -inch superelastic Copper Ni-Ti[®] uprighting spring eliminated the need for application of an early bonding or banding apparatus to the impacted molars. The uprighting spring was inserted from the occlusal side, passing beneath the contact area between the adjacent second premolar and the deeply impacted second molar. After localized heat treatment for a toe-in bending and a v-notch bending, the sectional wire was ligatured to the anchor teeth, over the main archwire to avoid it sliding out of position. As the contact worked toward restoring its original form, it produced a distal uprighting force against the mesial surface of the impacted second molar. The tip-back cantilever produced effects on the impacted molar in three dimensions, principally in the mesiodistal (distal crown tipping) and vertical directions (molar extrusion). In this case, the impacted second molar was infra-occluded and required an eruptive force to bring it into occlusion with its antagonist. Once the impacted second molar has been uprighted to some degree, it should be banded/bracketed to accomplish space closure, buccolingual correction, and occlusion detailing. The innovative uprighting technique is simple, effective, and inexpensive with regard to the treatment of deeply impacted molars.

In the present case, distal movement of the patient's right mandibular second molar after uprighting of the

third molar also rebuilt the alveolar bone. The passive uprighting and extrusion of the right mandibular second molar raised the alveolar bone coronally and improved the infrabony defect on the distal surface of the adjacent second premolar.

It is essential to diagnose and treat eruption disturbances as early as possible (ideally during the early mixed-dentition period) because treatment at a later stage is usually more complicated.^{1,2,6} Most importantly, clinicians must inform the patient of the potential risks and possible benefits of treatment alternatives before making the final decision, which should be evaluated on an individual case basis.

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