

Surgery combined with orthodontic treatment for bilateral horizontally impacted mandibular second molars: A case report

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Surgery combined with orthodontic uprighting of impacted mandibular second molars requires sequential treatment procedures. This article presents a rare case of horizontally impacted bilateral mandibular second molars accompanied by dental crowding. The patient's mandibular second molars were fully embedded in bone with overlying mesially-impacted mandibular third molars and the mandibular first molars were inclined distally. The treatment involved staged bilateral extraction of the second premolars and mandibular third molars, followed by the surgical implantation of micro-implants for anchorage in the mandibular ramus. At a subsequent stage, the mandibular second molars were successfully orthodontically uprighted, leading to a favourable treatment outcome.

(Aust Orthod J 2024; 40: 67 - 72. DOI: 10.2478/aoj-2024-0007)

Received for publication: December, 2023

accepted: February, 2024.

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Introduction

The prevalence of impacted mandibular second molars (Mdm2s) in an orthodontic population is increasing, with reported rates of approximately 1.8% to 3%.¹ If not addressed promptly, affected patients may experience associated issues such as decay, root or crown absorption of the mandibular first molar (Mdm1), inflammation, and cyst formation around the impacted Mdm2.^{2,3} However, there is currently no consensus on a comprehensive treatment plan for mesially-impacted Mdm2s.

Due to insufficient supporting bone to facilitate orthodontic movement, Paolo et al. extracted deeply impacted second and third molars in the left mandible of a 19-year-old female.⁴ Alessandri et al. extracted an impacted Mdm2 and mesially moved the mandibular third molar (Mdm3) to its correct position.⁵ Both treatment approaches required a large incision which carried the risk of surgical complications.

Recent advancements have led to alternative treatment options for uprighting mesially-impacted Mdm2s. Orthodontic uprighting is commonly used for less severe impactions,⁶ while surgical uprighting or orthodontically-assisted uprighting after surgical uncovering are employed for deeply horizontally impacted Mdm2s.⁷⁻⁹ Kim et al. suggested that surgical uprighting is faster and easier, but orthodontically assisted uprighting is safer and associated with fewer complications.⁸

In the present article, a case of bilateral horizontally impacted Mdm2s is presented in a patient with severe dental crowding and lingual inclination of the second premolars. Extractions of the Mdm3s and second premolars were performed and the Mdm2s were surgically exposed and uprighted using micro-implants placed in the mandibular ramus. After approximately two years, a favourable treatment outcome was achieved.



Figure 1. (A) Pretreatment intraoral photographs. (B) Intraoral photographs 3 months after orthodontic treatment commencement. (C) Intraoral photographs 5 months after the left MM2 uprighting. (D) Intraoral photographs after treatment.

Case report

Case presentation

A 13-year-old female was referred to the Department of Stomatology Center of Peking University Shenzhen Hospital for the treatment of tooth impaction and dental displacement. At the initial examination, intraoral photographs revealed a molar Class II malocclusion with severe crowding of both the upper and lower arches. The second premolars were inclined

lingually, and the first molars were inclined distally. The second molars had not yet erupted (Figure 1A).

Radiographs taken before treatment showed that the MdM2s were bilaterally horizontally impacted and the overlying MdM3s were also meso-angularly impacted. In addition, the MdM1s had a distal inclination (Figure 2A). A CBCT revealed that the root of the right MdM2 was close to the mandibular canal but the root of the left MdM2 was clear (Figure 3A, B). The left MdM2 was moderately

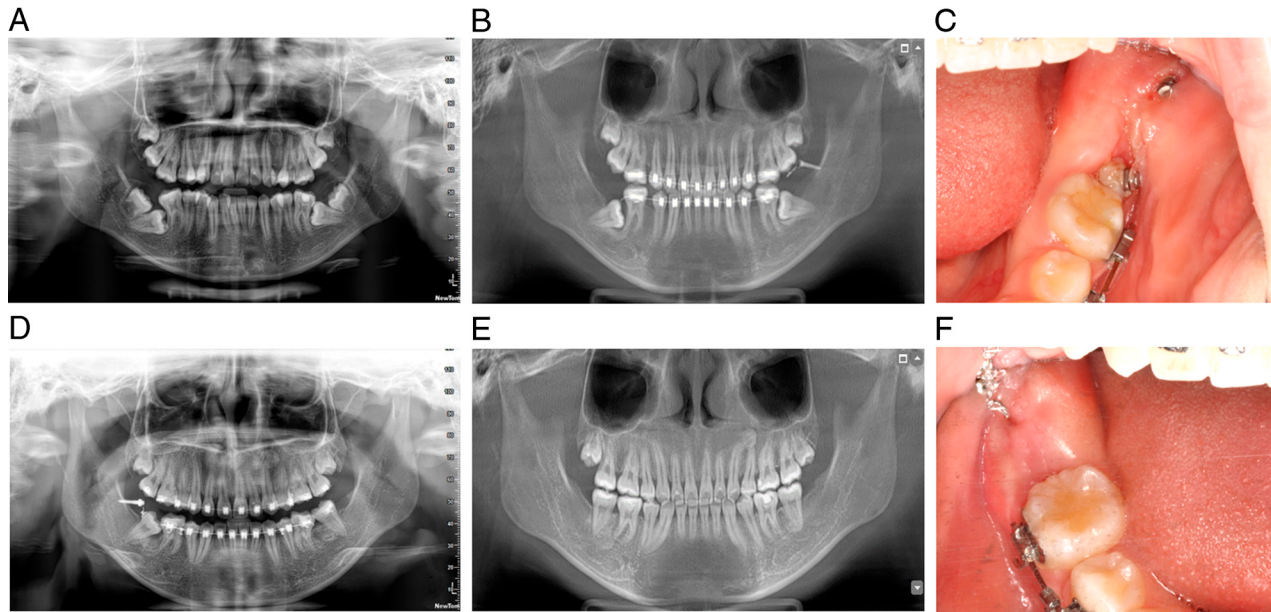


Figure 2. (A) Radiograph before treatment. (B) Radiograph after 3 months of orthodontic treatment. (C) Micro-implant anchorage implanted in the left mandibular ramus. (D) Radiograph after micro-implant anchorage implanted in the right mandibular ramus for 7 months. (E) Radiograph after treatment. (F) Micro-implant anchorage implanted in the right mandibular ramus.

horizontally impacted (Figure 3C), while the right MdM2 was deeply impacted, with its mesial cusp positioned below the root of the right MdM1 (Figure 3D). Accordingly, the eruption of the MdM2s was obstructed by the mesially-impacted MdM3s and the crowns of the MdM1s (Figure 2A).

Treatment plan

The objective of treatment was to address the dental crowding and the impaction of the MdM2s. The patient and her parents expressed a desire for a safe and painless solution. Therefore, a comprehensive orthodontic treatment plan was recommended that involved bilaterally uprighting the MdM2s using micro-implant anchorage placed in the mandibular ramus after surgically uncovering the impacted teeth. This treatment plan aimed to minimise the trauma and subsequent complications, although it would require a relatively long treatment process. The right MdM2 was deeply impacted, with its mesial cusp positioned below the root apex of the MdM1, similar to a case reported by Paolo et al.⁴ Consequently, no guarantee of successful uprighting of the right MdM2 could be provided. It was emphasised that if uprighting was not possible, extraction would be the final option. The patient and her parents were

fully informed regarding the potential risks and complications associated with this treatment plan and willingly consented to proceed with treatment.

Treatment

The patient underwent the bilateral extraction of the second premolars and MdM3s under local anaesthesia, followed by the placement of Damon MX brackets and the insertion of 0.014inch Cu–Ni–Ti round arch wires to align the dentition. Over a period of 3 months, the tooth extraction spaces gradually closed due to bilateral mesial traction of the first molars with the assistance of mandibular growth, and so the arch wire was changed to 0.017 x 0.025inch Ni–Ti rectangular wire. The crowns of the maxillary second molars (MxM2) became visible in the mouth (Figure 1B), and the crowns of the two MdM2s moved vertically as observed in the panoramic radiograph (Figure 2B).

A 12mm micro-implant was then inserted for anchorage in the left mandibular ramus, and a lingual button was bonded to the exposed surface of the left MdM2 crown. A 0.25 mm ligature wire was attached to the button (Figure 2C) and the left MdM2 was gradually uprighted using an elastic between the

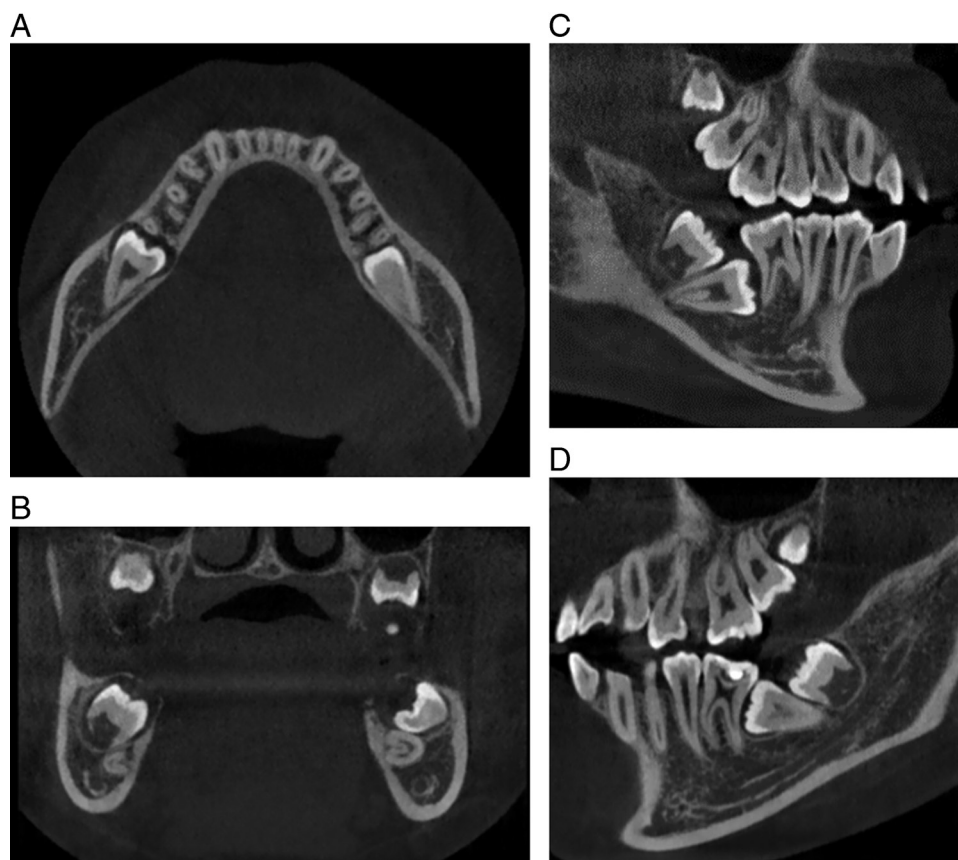


Figure 3. (A) Horizontal CT image of the bilateral Mdm2s before treatment. (B) Coronal CT image of the bilateral Mdm2s before treatment. (C) Sagittal CT images of the right Mdm2 before treatment. (D) Sagittal CT images of the left Mdm2 before treatment.

micro-implant and the ligature wire, which required re-adjustment every 4 weeks. After 5 months, the crown of the left Mdm2 was fully exposed and visible in the oral cavity, although it remained slightly tilted mesially (Figure 1C). A 0.016×0.025 inch stainless steel rectangular wire was used to support and close the spaces in the mandibular arch. Subsequently, the micro-implant in the left mandibular ramus was removed and another placed in the right mandibular ramus. Since the crown of the right Mdm2 was not exposed, an incision was made on the distal side of Mdm1 and a mucoperiosteal flap was elevated to expose the tooth (Figure 2F). Cortical bone was removed using a surgical handpiece to fully reveal the distal surface of the right Mdm2. A lingual button was bonded and the right Mdm2 was uprighted using a ligature wire attached to the button. After 7 months, the crown of the right Mdm2 was almost completely visible (Figure 2D), and the mandibular arch wire was replaced by a 0.014×0.025 inch Cu–Ni–Ti rectangular wire.

The dentition was aligned during the following 10 months and the mandibular Ni–Ti wire was changed to a 0.017×0.025 inch rectangular stainless steel wire to complete space closure (Figure 1D, Figure 2E). The 3D images showed the positions of the Mdm2s at three time points: before treatment (Figures 4A), 3 months after extracting the Mdm3s (Figure 4B), after treatment (Figure 4C). The patient and her parents expressed satisfaction with the 25-month treatment.

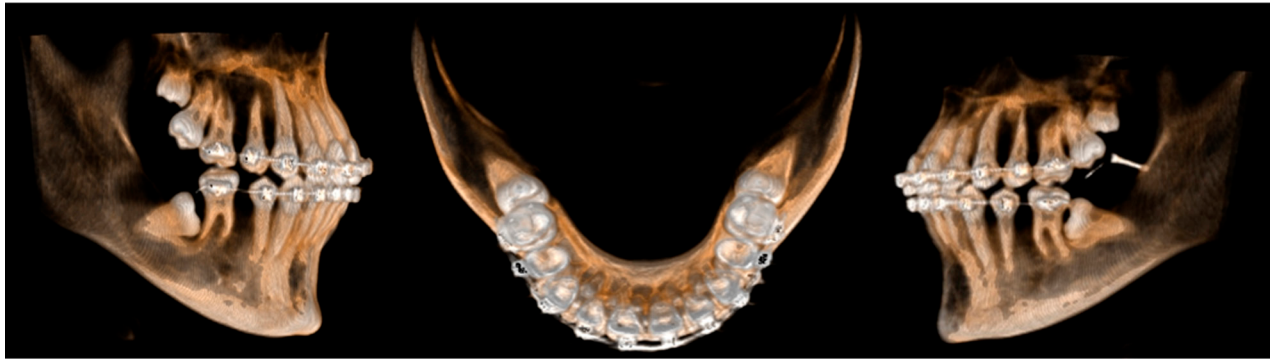
Discussion

Horizontally impacted mandibular second molars are rare, resulting in limited treatment experience. Han et al. suggested that surgical uprighting of the impacted Mdm2s can be a successful treatment option, although may produce complications such as pulpal obliteration or calcification, infection, root resorption, and root fracture.¹⁰ Alternatively, orthodontically-assisted uprighting following

A



B



C

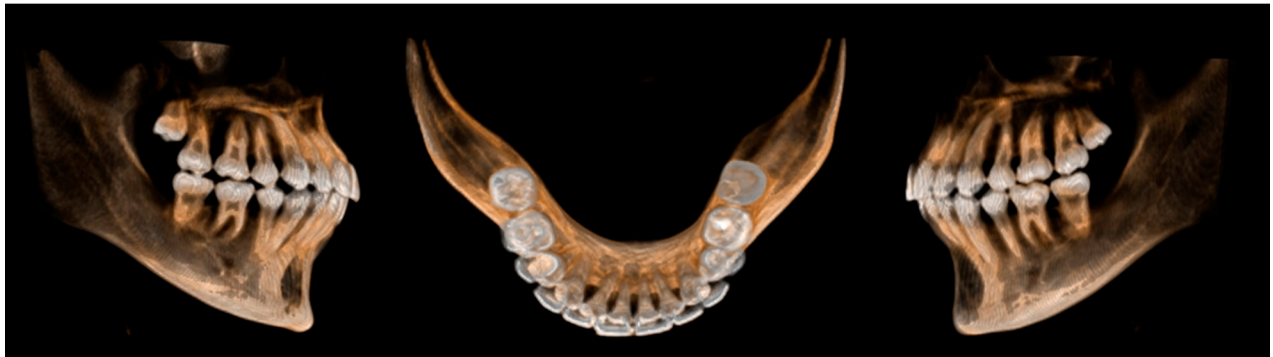


Figure 4. (A) Pretreatment 3D images. (B) After 3 months of orthodontic treatment and extraction of the bilateral MdM3s. (C) 3D images after treatment.

surgical uncovering of the impacted MdM2s may be a better choice to minimise patient discomfort.⁸ This approach involves making a small incision at the distal of the MdM1 as well as a second small incision in the mandibular ramus to expose the distal surface of the MdM2. A surgical handpiece is then used to create a hole in the cortical bone of the mandibular ramus for the placement of a micro-implant. Additionally, part of the cortical bone above the distal surface of the MdM2 is removed to create sufficient space to bond attachments.

There is an increasing consensus among scholars that the presence of the MdM3 does not hinder the eruption of the MdM2.^{11–13} However, some researchers argue that the position of the MdM3 above the MdM2 can obstruct the eruption pathway of the MdM2, and indicate the extraction of the MdM3.^{14,15} Three months after extracting the MdM3s in the present case (Figure 2B, Figure 4B), an unexpected effect was observed. The crowns of the bilateral MdM2s drifted upwards, indicating that the MdM2s could erupt. However, the directions

of the eruption were wayward as the pathways were obstructed by the MxM3s. In cases in which the impacted MdM3s are located above the MdM2s, those teeth are typically deeply embedded and close to the mandibular canal. Based on the present study, it is recommended that the MdM3s are extracted and treatment deferred for approximately 3 to 6 months. If the crowns of the MdM2s drift vertically during this period, follow-up treatment will be made easier and safer.

Conclusion

Surgery combined with orthodontic uprighting of horizontally impacted MdM2s is considered a favourable option as it significantly reduces the risk of trauma and complications for affected patients. The extractions of the MdM3s may be necessary before the uprighting of the MdM2s in those patients presenting with impacted MdM3s located above the MdM2s.

Conflict of interest

The authors declare that there is no conflict of interest.

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References

1. Turley PK. The management of mesially inclined/impacted mandibular permanent second molars. *J World Federation Orthod* 2020;9:S45–S53.
2. Valmaseda-Castellón E, De-la-Rosa-Gay C, Gay-Escoda C. Eruption disturbances of the first and second permanent molars: results of treatment in 43 cases. *Am J Orthod Dentofacial Orthop* 1999;116:651–8.
3. Mah S-J, Won P-J, Nam J-H, Kim E-C, Kang Y-G. Uprighting mesially impacted mandibular molars with 2 miniscrews. *Am J Orthod Dentofac Orthop* 2015;148:849–61.
4. Boffano P, Galesio C, Bianchi F, Rocca F. Surgical extraction of deeply horizontally impacted mandibular second and third molars. *J Craniofac Surg* 2010;21:403–6.
5. Alessandri Bonetti G, Pelliccioni GA, Checchi L. Management of bilaterally impacted mandibular second and third molars. *J Am Dent Assoc* 1999;130:1190–4.
6. Hsin-Chung Cheng J, Yi-Hsuan Lee T, Fang C-Y, De-Shing Chen D. Orthodontic uprighting of horizontally impacted second mandibular molar through innovative use of springs. *J Dental Sci* 2023;18:939–41.
7. McAbay CP, Grumet JT, Siegel EB, Iacopino AM. Surgical uprighting and repositioning of severely impacted mandibular second molars. *J Am Dental Assoc* 2003;134:1459–62.
8. Kim KJ, Park JH, Kim MJ, Jang HI, Chae JM. Posterior available space for uprighting horizontally impacted mandibular second molars using orthodontic microimplant anchorage. *J Clin Pediatr Dent* 2019;43:56–63.
9. Caminiti MF, El-Rabbany M, Lou T, Reinisch EI. Surgical uprighting of mandibular second molars: a single-group retrospective cohort study. *Am J Orthod Dentofac Orthop* 2020;158:849–55.
10. Han T, Christensen BJ. Surgical treatment of impacted mandibular second molars: a systematic review. *J Oral Maxillofac Surg* 2022;80:29–36.
11. la Monaca G, Cristalli MP, Pranno N, Galluccio G, Annibali S, Pippi R. First and second permanent molars with failed or delayed eruption: clinical and statistical analyses. *Am J Orthod Dentofacial Orthop* 2019;156:355–64.
12. Mezomo MB, Guerino P, Matje PRB, De Lima EMS. Uprighting severely impacted lower second molars prior to class II correction with upper second-molar extractions. *J Clin Orthod* 2019;53:539–49.
13. Lorente C, Lorente P, Perez-Vela M, Esquinas C, Lorente T. Management of deeply impacted molars with the miniscrew-supported pole technique. *J Clin Orthod* 2018;52:589–97.
14. Zhen J, Liu CH, Zhang WX, Zhou LS, He HX, Qin X, et al. Uprighting deeply impacted mandibular second molars with miniscrew anchorage. *J Clin Orthod* 2019;53:405–13.
15. Okihara H, Ono T. Correction of bilateral heavily impacted second molar with improved super-elastic nickel-titanium alloy wires. *Am J Orthod Dentofacial Orthop* 2020;158:114–25.