



Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

ScienceDirect

journal homepage: [www.e-jds.com](http://www.e-jds.com)



Short Communication

# Orthodontic treatment for substitution of impacted mandibular second molars with their adjacent wisdom teeth

Daniel De-Shing Chen <sup>a,b</sup>, Johnson Hsin-Chung Cheng <sup>a,b\*</sup>,  
Jamie Liang-Chieh Chen <sup>b</sup>, Han-Wei Huang <sup>c</sup>



<sup>a</sup> School of Dentistry, College of Oral Medicine, Taipei Medical University, Taipei, Taiwan

<sup>b</sup> Orthodontic Division, Department of Dentistry, Taipei Medical University Hospital, Taipei, Taiwan

<sup>c</sup> Division of Oral and Maxillofacial Surgery, Department of Dentistry, Taipei Medical University Hospital, Taipei, Taiwan

Received 17 May 2024; Final revision received 22 May 2024

Available online 4 June 2024

## KEYWORDS

Impacted mandibular second molars (MM2s);  
Rapid acceleration phenomenon;  
Interdisciplinary

**Abstract** A distinctive method for extraction of the bilateral impacted mandibular second molars (MM2s) and moving the bilateral mesioangularly impacted mandibular third molars (MM3s) to the MM2 positions with appropriate occlusion by orthodontic uprighting and protraction was demonstrated in a 24-year-old woman and a 20-year-old woman, respectively. Although the surgical procedures should be performed under general anesthesia, rapid orthodontic treatment after tooth extraction aided in the initial teeth movement of the bilateral MM3s. The proposed treatment could be implemented and completed in 2 years or less. After undergoing the orthodontic treatment, the patient achieved robust bone support no matter with or without bone grafting. With this less technique-sensitive method, the patient still achieved improved posterior occlusion and masticatory function. Oral and maxillofacial surgeons should be consulted before this treatment option was adopted.

© 2024 Association for Dental Sciences of the Republic of China. Publishing services by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

\* Corresponding author. School of Dentistry, College of Oral Medicine, Taipei Medical University, 250 Wu-Hsing Street, Taipei 110, Taiwan.  
E-mail address: [g4808@tmu.edu.tw](mailto:g4808@tmu.edu.tw) (J.H.-C. Cheng).

## Introduction

The simultaneous impaction of the mandibular second molar (MM2) and the mandibular third molar (MM3) is a complex challenge for orthodontists, requiring cautious diagnosis and treatment planning. It is also regarded as a sign of posterior space deficiency.<sup>1,2</sup> Specifically, the etiology of MM2 impaction is demonstrated to be moderately influenced by genetic factors; this finding has been inferred after panoramic radiographs of individuals from Israeli and Chinese-American populations are compared and an autosomal trait is identified.<sup>3</sup> In a subsequent study, the primary causes of MM2 impaction were attributed to a larger angle of the mandibular second molar inclination with a smaller distance between the mandibular first molar and mandibular ramus<sup>4</sup> and differential root development with a deficient mesial root length of the MM2.<sup>5</sup> For this condition, one of the most common treatment of choice is extraction of the third molars and uprighting the impacted second molars. Cheng's uprighting spring was reported to be effective to achieve this goal.<sup>6</sup> In this article, a similar case of a 20-year-old woman with 4 fully bony-impacted mandibular second molars was reported; the discussion in this case involved the extraction or non-extraction of these two impacted MM2s. Lee et al.<sup>7</sup> opted to upright the second molars and reported favorable results and their treatment took 4 years and 3 months. In the present study, another alternative was proposed, namely the extraction of the two impacted MM2s in combination with the uprighting and protraction of the two MM3s.

## Materials and methods

A 24-year-old woman (the patient A) and a 20-year-old woman (the patient B) complained of their bilateral impacted MM2s and poor chewing function. For the patient A, extra-oral photographs revealed a favorable facial profile (Fig. 1A). The intra-oral photographs presented mild anterior crowding, and the panoramic film showed the bilateral impacted maxillary third molars and bilateral horizontally-impacted MM2s and the bilateral mesial-tilting MM3s. The clinical findings revealed a 2-mm overbite and a 2-mm overjet. Both canine and molar relationships were classified as Class I bilaterally (Fig. 1B and D). Cephalometric analysis revealed a skeletal Class II relationship with an ANB angle of 6.3° (Fig. 1C). Accordingly, the main goal was relieving the posterior crowding and improving the occlusal function of posterior molars. The patient understood that she had to sacrifice either her bilateral MM2s or MM3s to create sufficient space for further leveling and alignment of the associated molars. After a detailed discussion, a treatment plan for extracting her bilateral MM2s and protracting her bilateral MM3s was selected.

The treatment began with the extraction of the patient's maxillary wisdom teeth and the impacted MM2s under general anesthesia. To extract her deep impacted MM2s, an intrasulcular incision with one distal vertical release was made using a micro-blade. An envelope flap

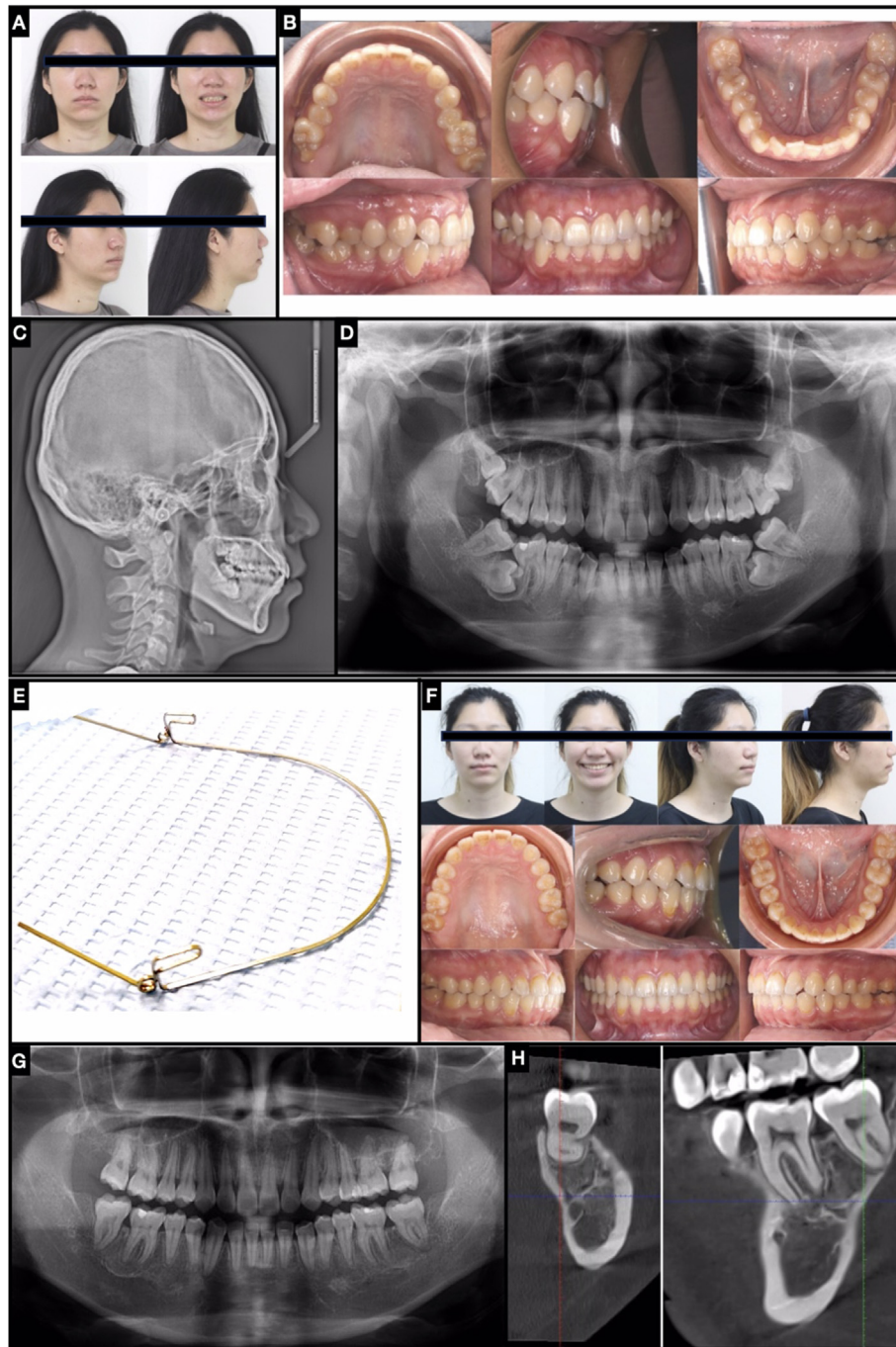
was raised in the full thickness flap approach in the coronal-apical direction. Buccal bone windows were created using a high-speed bur until the crown portions of the MM2s were exposed. Coronectomy was subsequently performed, and the roots were removed using the Winter technique. A collagen wound dressing (SurgiAid) was placed, and simple interrupted Vicryl 4.0 sutures were used to close the extraction wound. For orthodontic treatment, we used a passive preadjusted self-ligating bracket system. Initially, 0.014-CuNiTi and 0.016 × 0.025-CuNiTi were used sequentially in both dental arches for leveling and alignment. Subsequently, a 0.016 × 0.025-SS wire was used in the upper arch, and a 0.017 × 0.025-SS wire with L-loops was used as the primary tool for uprighting and protracting the MM3s (Fig. 1E). Finally, a 0.018-SS wire was used in both arches for finishing and detailing. After debonding was performed, wraparound retainers were delivered. Similarly, we extracted two impacted MM2s and uprighted the two MM3s for the patient B.

## Results

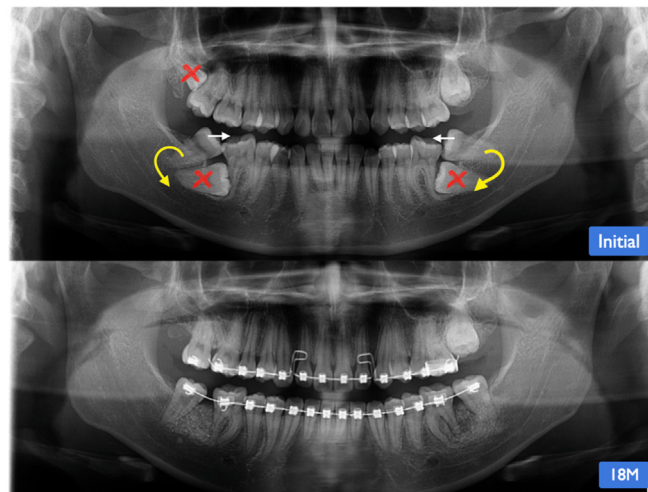
For the patient A, satisfactory outcomes were achieved within 2 years for this complex case (Fig. 1F). The panoramic film and cone-beam computed tomography revealed surprisingly robust bone support without the necessity for bone grafting procedures for the patient's MM3s, which finally replaced her MM2s (Fig. 1G and H). For the patient B, the MM3s were uprighted and protracted (Fig. 2) with active treatment of 18 months so far. Debonding was arranged after further finishing and detailing. Please note that her left maxillary second molar didn't erupt even with the soft tissue exposure, which was suspected as primary failure of eruption.<sup>8</sup> Bone grafting procedures were performed for the patient B. It seems that there are no significant differences with or without bone grafting procedures regarding treatment efficiency and final bone quality. However, further prospective clinical trials are needed to prove this.

## Discussion

The treatment options for our two patients are less technique sensitive and more straightforward compared with the conventional methods. An orthodontist is only required to bend simple L-loops in the main wire. The treatment duration for this option is also more predictable and shorter. In these cases, the surgical wound showed a rapid healing, resulting in a faster initial tooth movement. Although the oral and maxillofacial surgeon decided not to perform bone grafting, the patient A was inferred to have achieved satisfactory bone generation on the basis of her healthy systemic conditions and periodontal ligament. The treatment yielded considerable improvements in the posterior occlusion and masticatory function. However, the orthodontists who opt for this treatment should consult the oral and maxillofacial surgeons first before administering it.



**Figure 1** Records of the patient A: (A) initial extra-oral photographs, (B) initial intra-oral photographs, (C) initial lateral cephalometric film, (D) initial panoramic film, (E) a  $0.017 \times 0.025$ -SS wire with L-loops used for uprighting and protraction of MM3s, (F) final intra- and extra-oral photographs, (G) final panoramic film, (H) final cone-beam computed tomography showed robust bone support.



**Figure 2** Initial and progressive panoramic films of the patient B. Initial panoramic film showed bilateral horizontally-impacted MM2s and the bilateral mesial-tilting MM3s. Progressive panoramic film revealed that MM3s were mostly uprighted and protracted. Her left maxillary second molar was suspected as primary failure of eruption.

A comprehensive discussion is essential in interdisciplinary cases.

### Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

### Acknowledgments

The authors received no financial support for the research, authorship, and/or publication of this article.

### References

1. Raghoobar GM, Boering G, Vissink A, Stegenga B. Eruption disturbances of permanent molars: a review. *J Oral Pathol Med* 1991;20:159–66.
2. Andreasen Jens O, Petersen Jens Kølsen, Laskin Daniel M, eds. *Textbook and color atlas of tooth impactions: diagnosis, treatment, prevention*. Copenhagen: Munksgaard, 1997.
3. Shapira Y, Finkelstein T, Shpack N, Lai YH, Kuftinec MM, Vardimon A. Mandibular molar impaction. Part I: genetic traits and characteristics. *Am J Orthod Dentofacial Orthop* 2011;140:32–7.
4. Cassetta M, Altieri F, Di Mambro A, Galluccio G, Barbato E. Impaction of permanent mandibular second molar: a retrospective study. *Med Oral Patol Oral Cir Bucal* 2013;18:e564–8.
5. Shapira Y, Lai Y, Schonberger S, Shpack N, Finkelstein T. Mandibular Second Molar Impaction-Part II: etiology and role of the third molar. *Appl Sci* 2022;12:11520–30.
6. Cheng JHC, Lee YH, Fang CY, Chen DS. Orthodontic uprighting of horizontally impacted second mandibular molar through innovative use of springs. *J Dent Sci* 2023;18:939–41.
7. Lee YH, Cheng JHC, Fang CY, Chen DS. Extraction or non-extraction: orthodontic treatment for the complete impaction of second permanent molars. *J Dent Sci* 2023;18:458–60.
8. Hanisch M, Hanisch L, Kleinheinz J, Jung S. Primary failure of eruption (PFE): a systematic review. *Head Face Med* 2018;14:5.