

Orthodontic Traction of the Impacted Mandibular Third Molars to Replace Severely Resorbed Mandibular Second Molars

Soonshin Hwang¹, Yoon Jeong Choi²

¹Department of Orthodontics, Gangnam Severance Hospital, Yonsei University College of Dentistry,

²Department of Orthodontics, Institute of Craniofacial Deformity, Yonsei University College of Dentistry, Seoul, Korea

Prophylactic removal of impacted third molars is a common procedure in dentistry, but the necessity of routine extraction is still controversial. When impacted third molars caused severe apical root resorption of the second molars, orthodontic traction of the third molars after extraction of the damaged second molars could minimize alveolar bone defect and preserve the patient's natural teeth. By well-planned orthodontic treatment, functional occlusion was established avoiding extraction of the impacted teeth and eliminating the possibility of a large bone defect after extraction.

Key Words: Molar, third; Orthodontic space closure; Root resorption; Tooth, impacted

Introduction

Prophylactic removal of impacted third molars is a common procedure in dentistry¹. Possible problems associated with third molars are odontogenic cysts, internal resorption of the third molars, and damage to second molars, such as caries, periodontitis, and root resorption^{2,3}. However, some authors recommended against extracting asymptomatic third molars, while others supported prophylactic extraction^{1,4}.

When extensive damage of the second molar is evident, orthodontic alignment of the third molar following extraction of the second molar would be a useful treatment option. Even though successful replacement of the extracted second molar by uprighting the third molar has been reported in several studies⁵⁻⁷, this procedure is not recommended if bucco-lingual inclination of the third molar is not favorable or the angle between the first and third molars is greater than 30^{o8}.

Corresponding Author: **Yoon Jeong Choi**

Department of Orthodontics, Yonsei University College of Dentistry, 50-1 Yonsei-ro, Seodaemun-gu, Seoul 03722, Korea
TEL : +82-2-2228-3101, FAX : +82-2-363-3404, E-mail : yoonjchoi@yuhs.ac

Received for publication May 3, 2016; Returned after revision June 24, 2016; Accepted for publication June 26, 2016

Copyright © 2016 by Korean Academy of Dental Science

© This is an open access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Furthermore, this replacement option was more successful in growing patients rather than in adult patients^{6,7,9-12}.

Here, we report a case of successful replacement of the second molars by the third molars for a patient with severely damaged mandibular second molars and mesially impacted mandibular third molars. By orthodontic treatment, the axis of the impacted third molars was corrected and the space was closed between the first and third molars, resulting in a stable occlusion without additional prosthodontic treatment.

Case Report

A 28-year-old woman was referred from the Department of Oral and Maxillofacial Surgery for orthodontic treatment of the impacted mandibular third molars after extraction of the mandibular second molars. Both mandibular third molars were mesially impacted and the adjacent mandibular second molars showed external root resorption in the distal roots (Fig. 1). From panoramic radiograph, the impacted third molars seemed to overlap with the mandibular canal on both sides. The right third molar was horizontally impacted and its crown size was slightly smaller than that of the adjacent second molar. The inclination of the left third molar was

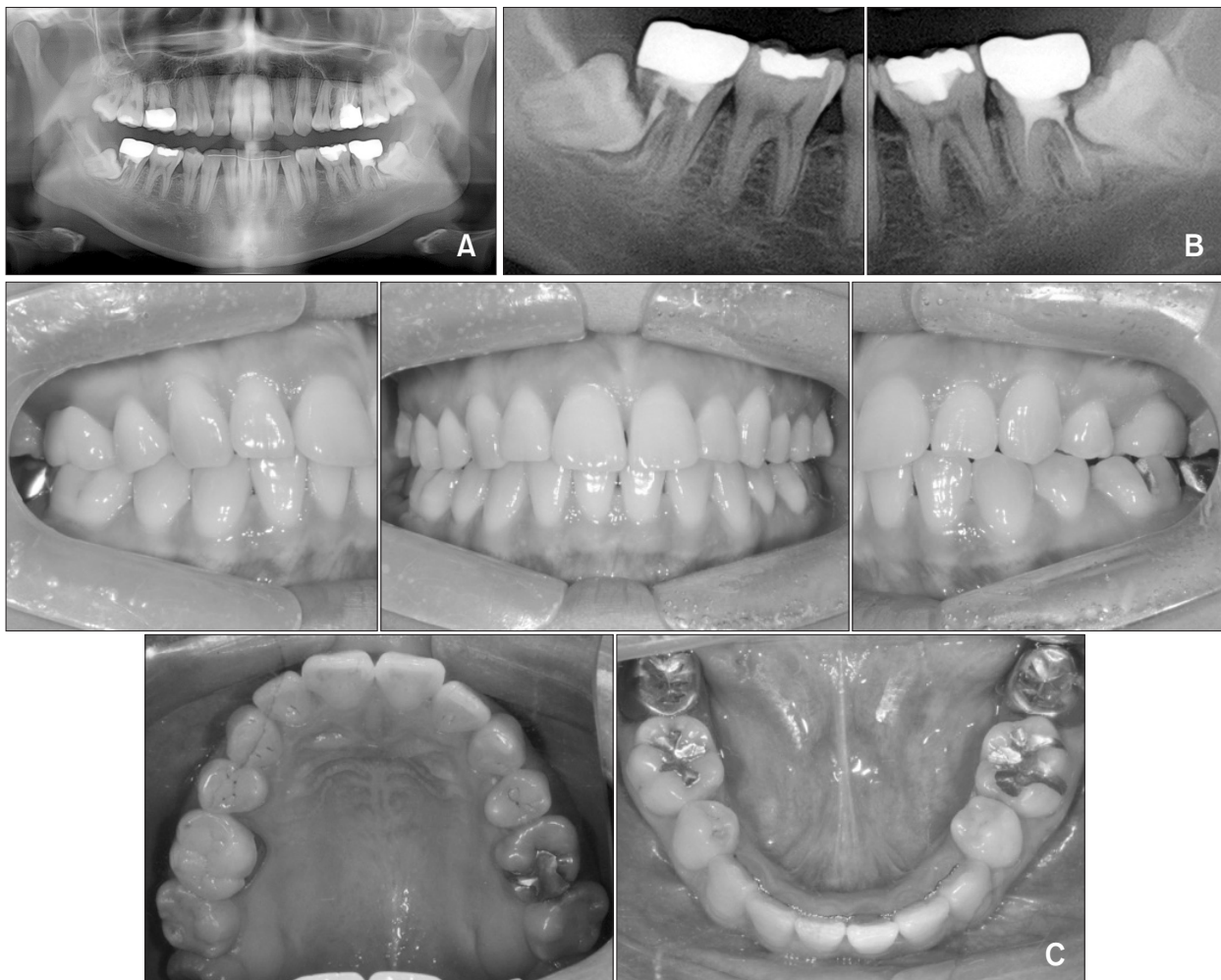


Fig. 1. Pretreatment panoramic (A) and periapical (B) radiographs, and intraoral photographs (C).

relatively favorable and the crown size was within normal limits. She reported no discomfort from the mandibular second molars.

Four first premolars were absent because of previous orthodontic treatment 15 years ago. She had good occlusion with appropriate overjet and overbite. In the anterior region, there was minor crowding with slight recession of the interdental papilla between the central incisors. On the basis of these findings, the patient was diagnosed as having severe external root resorption of the mandibular second molars with mesial-inclined impaction of the mandibular third molars. Therefore, the treatment objective for this patient was to restore functional occlusion with sound tooth structure after extraction of the hopeless mandibular second molars.

Three treatment alternatives were suggested to the patient: extraction of the mandibular second and third molars followed by implant prosthesis; autotransplantation of the maxillary third molars after extraction of the mandibular second and third molars; and extraction of the second molars with orthodontic movement of the third molars. The first option is relatively simple and provides stable and predictable result. However, a large bone defect may occur after extraction of the mandibular second and third molars and additional prosthodontic treatment with bone graft could be required. With

the second option, the patient's natural teeth can be saved without additional prosthodontic treatment. Even though survival rate of the autotransplanted teeth is reported as 93% and their success rate was 71%¹³⁾, longevity of the transplanted maxillary third molars cannot be guaranteed because the maxillary third molars have a single conical shaped, not multiple divergent, root. Furthermore, a large bone defect distal to the teeth after extraction of the mandibular third molars can affect optimal healing of the transplanted teeth. The third option is a less invasive option, but requires the longest treatment duration. Even though the right third molar showed slightly smaller crown size compared to the second molar, it was assumed to be clinically acceptable in size.

Three treatment alternatives were discussed with the patient. Because of previous extraction of four premolars, she strongly wanted to maintain as many teeth as possible. Even though the second option would provide acceptable occlusion with shorter treatment duration, the patient hesitated to select the option because of possible ankylosis or external root resorption after autotransplantation. Therefore, we selected the last option and started orthodontic treatment by extracting the mandibular second molars.

To minimize orthodontic treatment, orthodontic brackets were bonded only to the mandibular

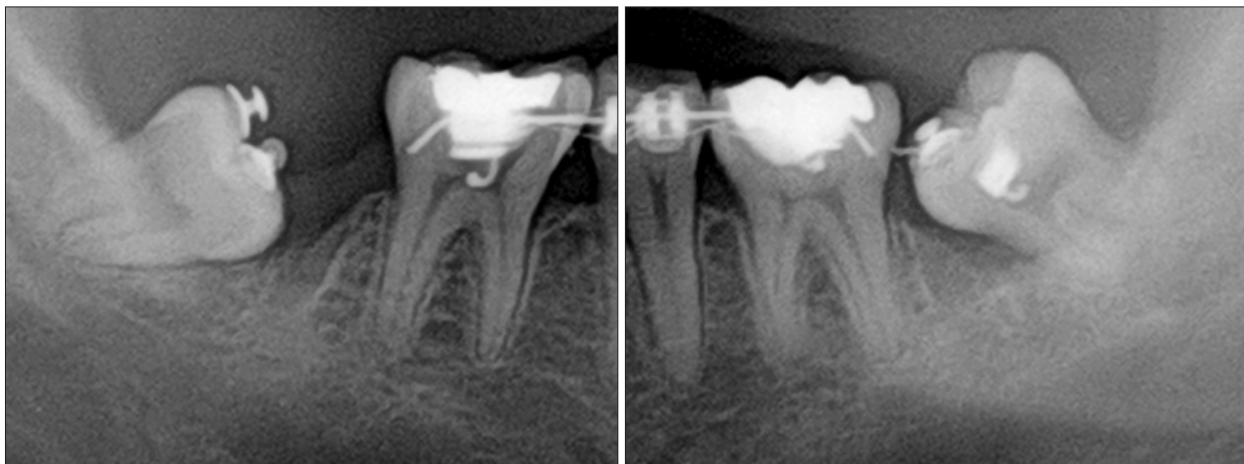


Fig. 2. Progress periapical radiographs 3 months after extraction of the mandibular second molars.

premolars and first molars. To reinforce anchorage and prevent undesirable tooth movement, the original fixed retainer from canine to canine was replaced by a more rigid wire (0.018-inch stainless steel) from premolar to premolar. When the second molars were extracted, metal buttons were

bonded on the third molars. Three months after the extraction the third molars spontaneously moved to the second molars' position (Fig. 2). Orthodontic uprighting was performed by using a 0.017×0.025-inch titanium molybdenum alloy (TMA) uprighting spring with a 0.016×0.022-inch stainless steel (SS) base wire during the subsequent 7 months (Fig. 3). Thereafter the mandibular third molars were protracted on a 0.016×0.022-inch SS wire (Fig. 4). When the space was almost closed, minor space was observed between the left canine and premolar. A bracket was bonded to the left canine, and all spaces were closed after 22 months of orthodontic treatment (Fig. 5).

The posttreatment records showed well-aligned mandibular third molars with functional occlusal contacts. Even though the right third molar had a



Fig. 3. Progress panoramic radiograph 13 months after the extraction.

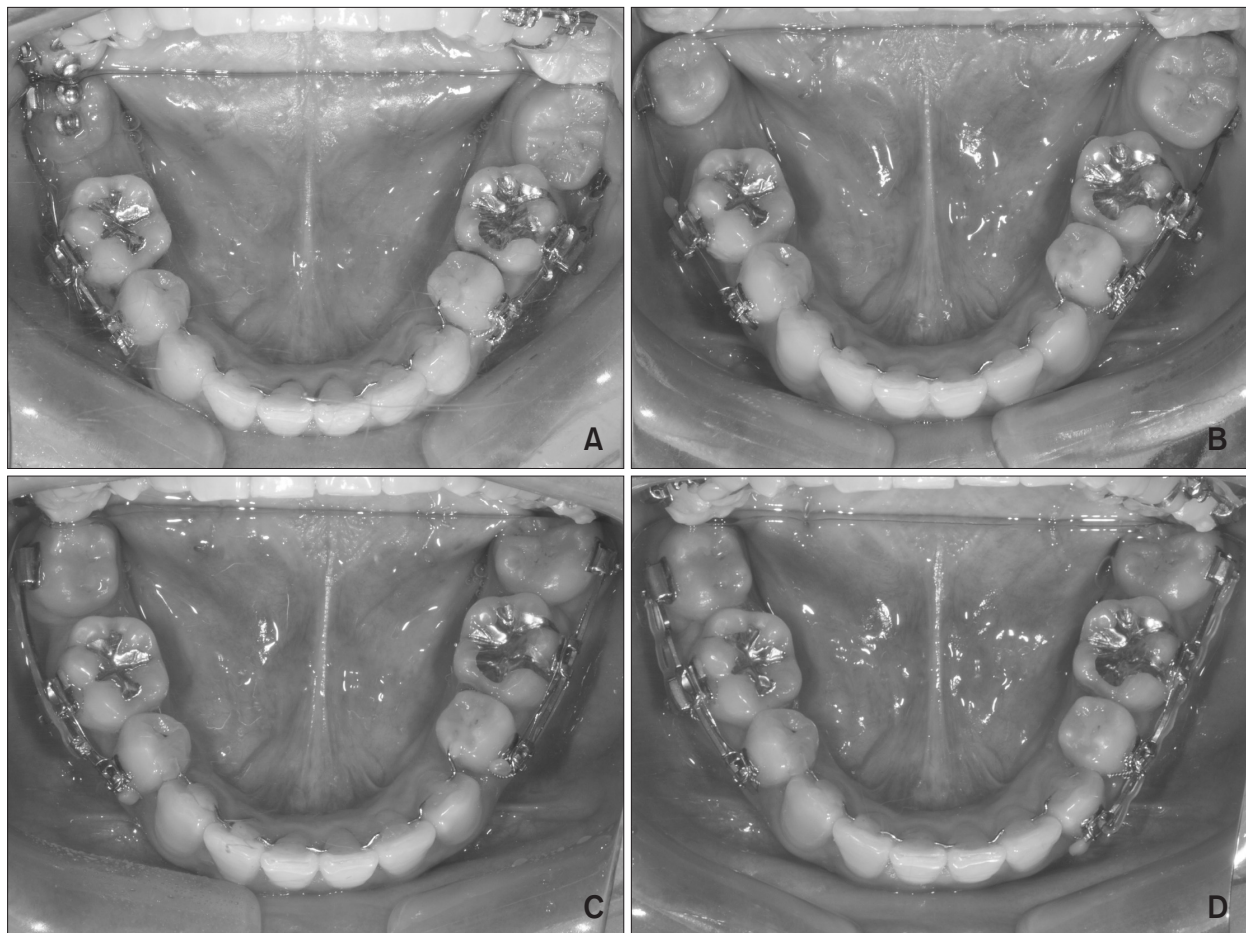


Fig. 4. Progress intraoral photographs 6 months (A), 10 months (B), 16 months (C), and 20 months (D) after treatment.

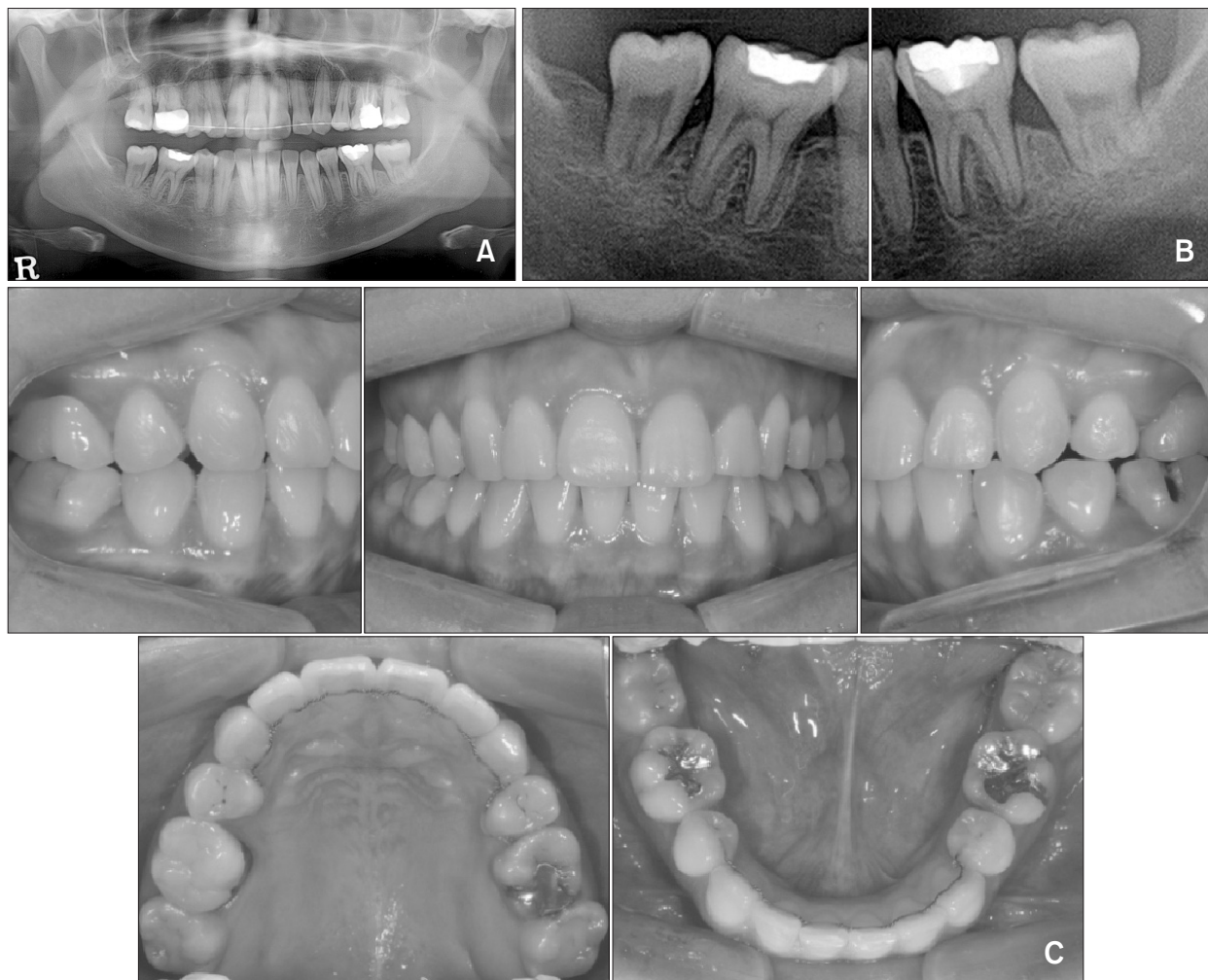


Fig. 5. Posttreatment panoramic (A) and periapical (B) radiographs, and intraoral photographs (C).

slightly small crown size, it could be considered clinically acceptable. While the alveolar bone level demonstrates healthy periodontium on the distal side, angular bone defect was observed on the mesial side. The patient reported no discomfort, and no complication was reported during the 2-year follow-up period.

Discussion

The severely resorbed mandibular second molars were extracted and successfully replaced by the impacted third molars. Even though treatment took 22 months, the impacted third molars were orthodontically uprighted and surrounded

by healthy periodontium without additional prosthodontic treatment. The mandibular second premolars and first molars provided enough anchorage to move the impacted third molars into the second molars' position.

Periodontal problems and caries of the second molars are common problems for retained asymptomatic unerupted third molars¹⁾. Therefore, prophylactic extraction of the mandibular third molars is recommended to improve the periodontal status on the distal side of the second molars and to reduce susceptibility to caries²⁾. Even though evidences to support routine prophylactic extraction are still lacking⁴⁾, it seemed evident the impacted third molars caused external root resorption of the second

molars in the present case. Therefore, regular follow-up appointments with periodic radiographic examination should be done to detect possible pathologic changes, because 'asymptomatic' does not necessarily mean 'disease free'^{1,2)}.

Extraction of the mandibular second molars that showed severe apical resorption of the distal roots was unavoidable in the present case. There has been a report of 3.5 years of successful retention for severely resorbed mandibular first molars¹⁴⁾. However, long term prognosis for maintaining the resorbed second molars, instead of replacement with an implant or third molars, could not be guaranteed. Also, teeth that have erupted earlier into the oral cavity are prone to more extensive dental decay and should be treated or extracted in cases of hopeless prognosis¹⁵⁾. In this case, extraction of the hopeless second mandibular molar combined with orthodontic treatment would provide satisfactory results⁵⁾.

Angular bony defect was observed after treatment, which seemed inevitable in the present case. The third molars moved spontaneously to the extraction site of the second molars in 3 months. However, as seen in the periapical radiographs taken 3 months after extraction (Fig. 2), the alveolar bone was remodeled along a line connecting the cemento-enamel junctions (CEJs) of the first molar and mesially tipped third molar, which led to vertical bone loss of the alveolar crest. Even though the alveolar bone level was maintained at this level during orthodontic space closure, the alveolar bone could not be regenerated to the level of CEJ after uprighting the third molars, leaving angular bony defect on the mesial side of the third molars after orthodontic treatment (Fig. 5A, B). Trauma from occlusion during orthodontic tooth movement or poor oral hygiene could also be a factor for the vertical alveolar bone loss. If adequate bone graft procedure had been performed at the time of extraction of the second molars, the bony defect could have been minimized.

Patients who have impacted third molars are given instructions for appointments to be seen every 2 years or sooner to prevent pathologic changes¹⁶⁾. In the present case, the impacted third molars not only caused apical root resorption of the second molars but also influenced the angular bony defect after the treatment. By well-planned orthodontic treatment, severely resorbed second molars were replaced by impacted mandibular third molars. Functional occlusion was established by a minimally invasive approach avoiding extraction of the impacted teeth and eliminating the possibility of a large bone defect after extraction. Long-term follow-ups with proper oral hygiene instructions for the third molars are recommended.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

References

1. Nunn ME, Fish MD, Garcia RI, Kaye EK, Figueroa R, Gohel A, Ito M, Lee HJ, Williams DE, Miyamoto T. Retained asymptomatic third molars and risk for second molar pathology. *J Dent Res*. 2013; 92: 1095-9.
2. Marciani RD. Is there pathology associated with asymptomatic third molars? *J Oral Maxillofac Surg*. 2012; 70(9 Suppl 1): S15-9.
3. Blakey GH, Golden BA, White RP Jr, Offenbacher S, Phillips C, Haug RH. Changes over time in the periodontal status of young adults with no third molar periodontal pathology at enrollment. *J Oral Maxillofac Surg*. 2009; 67: 2425-30.
4. Mettes TG, Nienhuijs ME, van der Sanden WJ, Verdonschot EH, Plasschaert AJ. Interventions for treating asymptomatic impacted wisdom teeth in adolescents and adults. *Cochrane Database Syst Rev*. 2005; (2): CD003879.
5. Tomonari H, Yagi T, Kuninori T, Ikemori T, Miyawaki S. Replacement of a first molar and

- 3 second molars by the mesial inclination of 4 impacted third molars in an adult with a Class II Division 1 malocclusion. *Am J Orthod Dentofacial Orthop.* 2015; 147: 755-65.
6. De-la-Rosa-Gay C, Valmaseda-Castellón E, Gay-Escoda C. Spontaneous third-molar eruption after second-molar extraction in orthodontic patients. *Am J Orthod Dentofacial Orthop.* 2006; 129: 337-44.
 7. De-la-Rosa-Gay C, Valmaseda-Castellón E, Gay-Escoda C. Predictive model of third molar eruption after second molar extraction. *Am J Orthod Dentofacial Orthop.* 2010; 137: 346-53.
 8. Battagel JM, Ryan A. Spontaneous lower arch changes with and without second molar extractions. *Am J Orthod Dentofacial Orthop.* 1998; 113: 133-43.
 9. Bayram M, Ozer M, Arici S. Effects of first molar extraction on third molar angulation and eruption space. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2009; 107: e14-20.
 10. Gooris CG, Artun J, Joondeph DR. Eruption of mandibular third molars after second-molar extractions: a radiographic study. *Am J Orthod Dentofacial Orthop.* 1990; 98: 161-7.
 11. Livas C, Halazonetis DJ, Booij JW, Katsaros C. Extraction of maxillary first molars improves second and third molar inclinations in Class II Division 1 malocclusion. *Am J Orthod Dentofacial Orthop.* 2011; 140: 377-82.
 12. Orton-Gibbs S, Crow V, Orton HS. Eruption of third permanent molars after the extraction of second permanent molars. Part 1: Assessment of third molar position and size. *Am J Orthod Dentofacial Orthop.* 2001; 119: 226-38.
 13. Kokai S, Kanno Z, Koike S, Uesugi S, Takahashi Y, Ono T, Soma K. Retrospective study of 100 autotransplanted teeth with complete root formation and subsequent orthodontic treatment. *Am J Orthod Dentofacial Orthop.* 2015; 148: 982-9.
 14. Choi YJ, Huh JK, Chung CJ, Kim KH. Rescue therapy using orthodontic traction to manage severely impacted mandibular second molars and to restore an alveolar bone defect. *Am J Orthod Dentofacial Orthop.* 2016. [in press]
 15. Ay S, Agar U, Biçakçi AA, Köşger HH. Changes in mandibular third molar angle and position after unilateral mandibular first molar extraction. *Am J Orthod Dentofacial Orthop.* 2006; 129: 36-41.
 16. Dodson TB. Surveillance as a management strategy for retained third molars: is it desirable? *J Oral Maxillofac Surg.* 2012; 70(9 Suppl 1): S20-4.