Letters to the editor*

Substitution of maxillary first premolars for canines

In the January 2013 issue, Dr Davide Mirabella et al reported the successful treatment of impacted canines by extracting them, substituting first premolars, and then achieving a good occlusion and facial profile (Mirabella D, Giunta G, Lombardo L. Substitution of impacted canines by maxillary first premolars: a valid alternative to traditional orthodontic treatment. Am J Orthod Dentofacial Orthop 2013;143:125-33).

This approach simplified the conventional orthodontic-surgical therapy and avoided many unpredictable risks during orthodontic extrusion of impacted maxillary canines, including inadequate alveolar bone and gingiva of the impacted teeth, and root resorption of adjacent teeth.

This replacement approach seems to be especially suitable for horizontally impacted canines, since those are the most difficult to treat. So far, a conventional 2-dimensional panoramic radiograph is still considered the primary diagnostic basis for the location of impacted canines. However, with the emergence and development of 3-dimensional cone-beam computed tomography, the diagnostic inaccuracy for the localization of impacted canines from a panoramic radiograph is evident and could result from distortions or projection errors of complex 3-dimensional structures projected to a 2-dimensional plane, thus increasing the risk of misinterpretation.

Alqerban et al1 reported a highly significant difference between the panoramic radiograph and the cone-beam computed tomographic image in impacted canine angulation. Recently, I found that our 3 patients showed high horizontal impaction on the panoramic radiographs, whereas, in fact, they were all obliquely impacted. Two of the 3 patients had mesial to distal oblique impactions, and the other had buccal to lingual oblique. Such a big diagnostic difference might result in a completely different treatment method. Inaccurate 3-dimensional diagnosis of the location and orientation of impacted teeth might be an important reason for failure in the treatment of impacted canines.

We have 2 questions. First, in Figure 3 of the case report, the right canine was high and horizontally impacted, but in Figure 4, it appeared to be labial and oblique. Could the tooth have been obliquely impacted?

Our second question deals with occlusion. How did you adjust the occlusion for the first premolars to function as canines? Did you use a canine bracket on the first premolar? Did you change the torque of first premolar?

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Authors’ response


Drs Feng and Zhao commented positively about the clinical outcome that was achieved but raised some questions regarding the severity of the impaction and the accuracy of the panoramic radiograph used as the diagnostic tool in our patient. Their point is that a panoramic radiograph is not a valid diagnostic tool to accurately determine the position of an impacted canine. They also questioned whether the right canine was really high and horizontally impacted because “in Figure 4, it appeared to be labial and oblique”; this suggested that the tooth might be obliquely impacted.

We all agree that a cone-beam computed tomography image is currently the recommended diagnostic tool to evaluate the position of an impacted canine, and we suggest its routinely use when impacted canines are suspected. However, we still believe that the right canine was located very high with respect the occlusal plane and horizontally oriented. In Figure 4, it can be noted that the crown of the right canine is partially above the palatal plane and horizontally oriented.

*The viewpoints expressed are solely those of the author(s) and do not reflect those of the editor(s), publisher(s), or Association.
In the treatment plan, extracting the impacted canines that would be replaced by the first premolars was selected not only because of the severity of the position of the impacted canines, but also to eliminate the potential adverse effects associated with an orthodontic-surgical approach. Our case report was intended to be somewhat provocative, because a good-looking smile and a well-functioning occlusion (at least in the middle term) were obtained with an unusual extraction pattern.

The second question of Drs Feng and Zhao regards the clinical management of the maxillary first premolars. When preadjusted appliances are used, it is advisable to use the corresponding bracket for each tooth to maintain the correct values of in and out and torque. Accordingly, we used a $-7\degree$ Tq/0 tip preadjusted maxillary premolar bracket (Victory series; 3M Unitek, Monrovia, Calif); as mentioned in the article, some slight negative torque was added in the finishing stage. The maxillary premolar crowns were long, and canine guidance was easy to achieve. Reduction of the maxillary premolar palatal cusps was not performed because a careful evaluation of the static and dynamic occlusion did not show a need for equilibration.

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REFERENCES

Rate of orthodontically induced tooth movement

With interest, we read the recent study reported by Dudic et al in the May 2013 issue of the AJO-DO (Dudic A, Giannopoulou C, Kiliaridis S. Factors related to the rate of orthodontically induced tooth movement. Am J Orthod Dentofacial Orthop 2013;143:616–21). Above all, we sincerely congratulate the authors for their efforts and contribution. Nevertheless, we have concerns about the amount of tooth crowding of the patients involved in this study.

First, why were the patients required to have severe crowding in both jaws? Other malocclusions—eg, bimaxillary protrusion—might also need premolar extractions, but with no or mild crowding. What’s more, the crowding situation shown in Figure 1 was mild, but the inclusion criterion was for severe crowding.

Second, according to the study, the intra-arch obstacle, which is mainly from the adjacent teeth, significantly decreased the displacement of the teeth. That is, the crowding situations in the experimental and the control teeth influenced the movement velocity and the amount of displacement. However, the authors did not clearly interpret the region of crowding in these patients. Severe crowding in the anterior segment should have less of an obstacle effect on premolar displacement.

In addition, the authors evaluated the tooth displacements when intra-arch or interarch obstacles were present. However, both intra-arch and interarch obstacles could have been present; these would greatly impair the movement velocity and the displacement of teeth. Evaluation of this situation was absent in the study. It might be advisable to extract the premolars early in patients with severe crowding and interarch obstacles to tooth movement if they are scheduled for premolar extractions.

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Authors’ response

We would like to thank Dr Yongwen Guo for his questions about our article, since this allows us to clarify certain points and prevents misunderstandings and wrong interpretations of the purpose and findings of the study.

Concerning the first point, we agree that the indications for premolar extractions are more than severe crowding. Therefore, situations with moderate crowding in patients with dental protrusion were considered to be severe crowding, since no option other than premolar extractions could be the treatment of choice. This was the case for the patient shown in Figure 1 for whom tooth crowding in the maxillary and mandibular arches demanded 4 premolar extractions.

Regarding the second point, an intra-arch obstacle to the movement of the experimental teeth was independent of the amount of the crowding in the arch. For example, patients with the same degree of crowding could have (1) nicely aligned premolars without an intra-arch