ORIGINAL ARTICLE

Spontaneous third-molar eruption after second-molar extraction in orthodontic patients

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Introduction: This retrospective study was conducted to assess the eruption of third molars by using panoramic radiographs and to identify the variables associated with unsuccessful eruption. **Methods:** The subjects were 48 patients who had 128 permanent second molars extracted during or before orthodontic treatment. Their ages at extraction were 11 to 23 years. The position of the third molars was assessed from panoramic radiographs taken before second-molar extraction and after third-molar eruption. The median time of eruption was 3 to 4 years (interquartile range, 2 years). A successful final position was defined as eruption with proximal contact with the adjacent first molar and an angle between these 2 teeth of no more than 35°. **Results:** A total of 96.2% of the maxillary and 66.2% of the mandibular third molars erupted in good positions. The maxillary third molars uprighted and successfully replaced the second molars. In the case of Nolla developmental stage > 8, the proximal contact could remain open. Most mandibular third molars uprighted and successfully replaced the second molars. Most unsuccessful eruptions of mandibular third molars were due to excessive mesial tilting or lack of proximal contact. Unsuccessful third-molar eruptions occurred in older patients who had higher Nolla developmental stages. **Conclusions:** Maxillary third molars upright and acceptably replace maxillary second molars after extraction for orthodontic purposes. However, if the Nolla developmental stage is > 8, proximal contact could remain open. Most mandibular third molars also upright and acceptably replace the second molars after extraction. Unsuccessful third-molar eruption is most common in older patients with higher Nolla developmental stages. Most unsuccessful eruptions are due to excessive mesial tilting or lack of proximal contact. (Am J Orthod Dentofacial Orthop 2006;129:337-44)

The extraction of second molars is an alternative to premolar extraction that causes less retraction of the mandibular incisors[1,2] and less augmentation of the interincisal angle.[3] Neither the vertical dimension nor the soft tissue convexity (G-Sn-Pg') seems to be affected by extraction modality, and treatment times appear to be similar.[1]

Nevertheless, an important concern of second-molar extraction is the prognosis of third-molar eruption. Some authors have recommended not extracting the second molar if the third molar has a buccolingual orientation[4] or the angle with the first molar is over 30°.[5] However, severely tilted third molars have successfully replaced second molars.[6] Maxillary third molars have also been found to replace second molars quite successfully.[7,8] There are some concerns about the prognosis of replacement of mandibular second molars by third molars. The ideal moment for extraction of the permanent second molars to optimize the possibilities of third-molar eruption remains unclear.

The purposes of this study were to assess the proportion of correctly erupted third molars, the degree of uprighting with respect to the adjacent permanent first molar, and the time elapsed to complete third-molar eruption in a sample of patients who had undergone permanent second-molar extraction for orthodontic reasons. Additional aims were to compare correctly erupted with incorrectly positioned third molars in these patients and to identify the variables associated with third-molar eruption failure.

MATERIAL AND METHODS

A sample of 48 patients (19 male, 29 female) who had completed orthodontic treatment with fixed appliances in both arches was selected. All patients were treated with the Ricketts or the straight-wire technique by the same orthodontist in a private practice in central Catalonia, Spain.

The inclusion criteria were extraction of healthy maxillary or mandibular second molars previously or during orthodontic treatment and presence of the third

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Table I. Nolla developmental stages

Development of the tooth
1. Presence of follicle
2. Initial calcification
3. Third of crown formed
4. Two thirds of crown formed
5. Crown almost fully formed
6. Crown fully formed
7. Third of root formed
8. Two thirds of root formed
9. Root almost formed
10. Closed apex

molar next to the extracted second molar. The exclusion criteria were absence of other posterior permanent teeth in the quadrant in which extractions were made and lack of compliance with clinical recall visits after orthodontic treatment.

The patients had been seen annually after orthodontic treatment for 1 to 10 years. All third molars were monitored until occlusion was considered stable or root development was complete and the molar did not move for more than 1 year. Sex, age at extraction of the second molars, and time at which the third molars erupted were retrieved from the clinical records. Panoramic radiographs before second-molar extraction and after third-molar eruption were also retrieved, and the following variables were identified: Nolla developmental stage[9] of the third molar at extraction of the adjacent second molar (Table I), and the angle between the third molar and the neighboring first molar at extraction of the second molar and after third-molar eruption (or, in the case of noneruption, after the third molar was considered to be impacted and with totally formed roots). All panoramic radiographs had been obtained with the same equipment (Toshiba Panoura 1-C; Yoshida Dental; Tokyo; Japan). To draw a third molar, the first panoramic radiograph showing that the third molar was level with the occlusal plane and contacted the neighboring first molar was selected; eg, if the mandibular third molars took 1 year more to erupt than the maxillary third molars, the latter were drawn on the old radiograph and the former on the new one. The angles were calculated by drawing 2 lines on the panoramic radiograph: 1 line perpendicular to the occlusal line joining the cusps of the third molar, and the other joining the midpoint of the occlusal surface of the first molar with the midpoint between the 2 roots in the mandibular first molars or the buccal roots in the maxillary first molars. The angle was negative when these lines converged (mesial tilt) and positive when they diverged (distal tilt). One third molar had a major axis in the buccolingual direction; this made drawing the line as described impossible, and the angle in this case was considered to be –90°. Figures 1 and 2 represent drawings of constructed angles for the right maxillary and mandibular third molars.

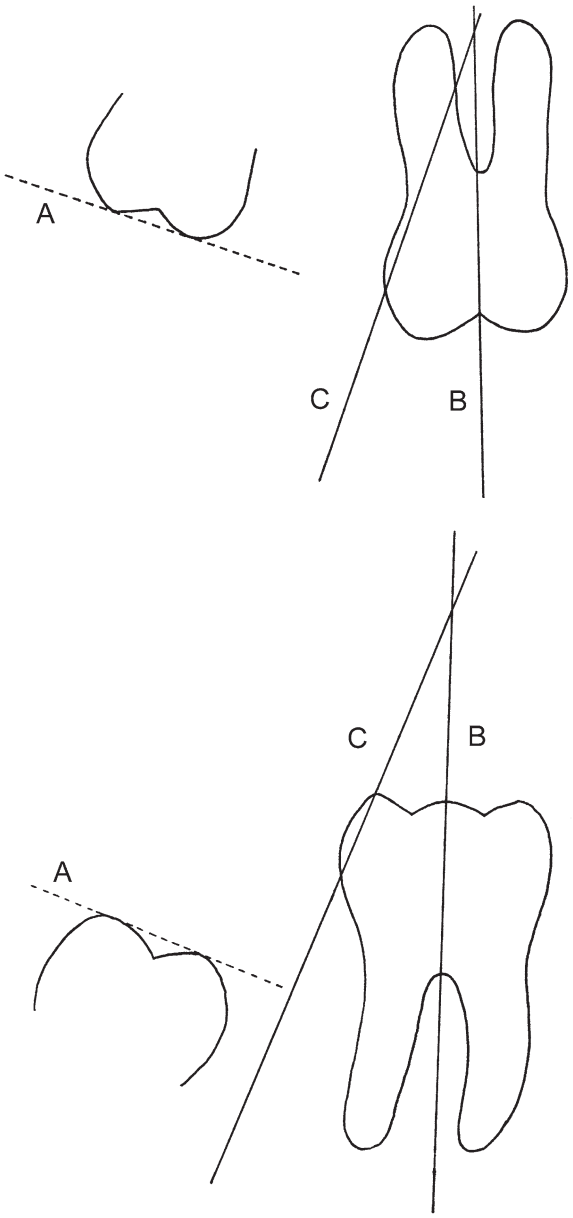

Fig 1. Construction of angle between third molar and adjacent permanent first molar before extraction of second molar (angle between lines B and C). *Line A* joins the cusps of the third molar. *Line B* is perpendicular to *Line A*. *Line C* joins the midpoint between the roots of the first molar (buccal roots in upper molars) and the midpoint of its occlusal surface.