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Periodontal healing after 'orthodontic extraction' of mandibular third molars: A retrospective cohort study

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Abstract. In this study we investigated periodontal healing of mandibular second molars following 'orthodontic extraction' of adjacent impacted third molars, under the null hypothesis that there would be no difference in probing pocket depths (PPD) and clinical attachment levels (CAL) at the distal aspect of second molars before and after treatment. A retrospective survey was conducted of 64 patients who consecutively underwent 'orthodontic extraction' of mandibular third molars in close anatomical relationship with the mandibular canal from January 1997 to January 2011. Age, smoking habit, and PPD and CAL at the distal aspect of second molars before and after treatment were recorded. A statistically significant difference was found in PPD and CAL before and after treatment for the overall sample and for the sample classified by age (>25 or ≤25 years), smoking habit (smoker or non-smoker), and type of third molar impaction (horizontal, mesioangular, or vertical). Median PPD and CAL reductions amounted to 6 mm and 5 mm, respectively. The null hypothesis was rejected and orthodontic extraction proved to be indicated for those impacted mandibular third molars at high risk of a postoperative periodontal defect at the distal aspect of the adjacent second molar.

Keywords: molar; third; tooth; impacted; periodontal pocket; tooth extraction; orthodontic extrusion..

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Introduction

The risk of periodontal defects at the distal aspect of the mandibular second molar (M2) following extraction of an impacted third molar (M3) continues to challenge clinicians. A retrospective survey by Kugelberg et al. demonstrated that 43.3% of patients had probing pocket depths ≥7 mm and 32.1% exhibited an intrabony defect ≥4 mm at 2 years after surgery.[1–3]

An increase in loss of interproximal bone distal to M2 is found in over 40% of cases with a preoperative intrabony defect ≤3 mm.[1] Bone remodelling initiated by tooth extraction physiologically leads to a reduction in thickness and height of the alveolar ridge; surgical removal of impacted M3 can further predispose the adjacent M2 to bone loss due to their close anatomical proximity, the instrumentation needed during surgery, and the great difficulty in optimal oral hygiene maintenance at the distal aspect of M2.[1,2,4–6]

Although some authors have reported that M3 removal can result in unchanged or improved alveolar bone height,[7–9] it is generally accepted that patient age >25

years, mesioangular or horizontal inclination of the impacted M3, high plaque score, and pre-existing periodontal impairment at the distal aspect of M2 are risk markers for a postoperative intrabony defect.[1–3,6]

The use of bone substitutes and guided-tissue regeneration therapy has been proposed in order to eliminate or prevent these periodontal defects, but there is still no consensus on their predictability or clinical benefit.[3,10–13] Higher costs and the risk of postoperative inflammatory complications should also be taken into proper account, as with any surgical procedure.

The 'orthodontic extraction' technique was introduced in 1996 for the management of impacted M3 in close anatomical relationship with the mandibular canal.[14] As the roots of M3 are pulled away from the mandibular canal by means of orthodontic movement, the risk of neurological damage is greatly reduced, making subsequent extraction easier, quicker, and safer.[15–17] The orthodontic extrusive movement produces tensional forces on the periodontal fibres of M3, thereby resulting in new bone apposition along the path of tooth eruption.[17] So far, the hypothesis that this can limit postoperative periodontal involvement at the distal aspect of the adjacent M2 has been supported only by case reports and series.[17–20]

The aim of this retrospective cohort study was to evaluate periodontal healing of M2 using data from consecutive subjects treated with orthodontic extraction, under the null hypothesis that there would be no difference between probing pocket depths (PPD) and clinical attachment levels (CAL) at the distal aspect of M2 before and after treatment.

Materials and methods

We performed a retrospective cohort study that identified patients treated consecutively with orthodontic extraction of impacted M3 from January 1997 to January 2011. Data collection was carried out from 1 to 30 September 2013. Ethics committee approval was obtained and the study was carried out in accordance with the current standards recommended for the reporting of observational studies in epidemiology (STROBE statement). Subjects gave informed consent to the work.

All data were obtained from manual medical record review by one operator (BP), with a second operator (SIP) auditing data capture for accuracy and completeness. Demographic data, smoking habit, history of treatment with orthodontic extraction, and data from periodontal examination at the distal aspect of M2 adjacent to impacted M3 were collected.

We included all patients who had undergone orthodontic extraction of impacted M3 during the period of recruitment ($n = 92$). We excluded patients if they discontinued treatment ($n = 5$), presented cysts associated with M3 ($n = 7$), if there was tooth ankylosis ($n = 2$), post-extractive alveolar osteitis (dry socket) ($n = 1$), or if data required for analysis were missing ($n = 13$). Based on panoramic radiographs available in the medical records, the type of M3 impaction was categorised using the angle between the occlusal plane or a line parallel to it and the longitudinal axis of the M3, in accordance with Winter's classification[21]: M3 with an angle between 0° and 30° was considered to be horizontal; M3 with an angle between 31° and 60° was considered to be mesioangular; M3 with an angle between 61° and 90° was considered to be vertical. This classification was chosen because it shows the highest level of intra-examiner and inter-examiner agreement when attempting to classify M3 according to their inclination.[22]

All patients had undergone orthodontic extraction of the impacted M3 by the same experienced orthodontist (GAB) using a previously described standardised protocol.[14,16,17] When there was radiographic evidence that the molar roots were away from the mandibular canal, the orthodontic appliance was passivated and left in place for a retention phase. Extraction was then performed by one of two attending surgeons (VC, LC) without the use of any bone substitutes or membranes; a minimally invasive procedure was carried out because neither osteotomy nor coronal or root section were needed during surgery. Example radiographs taken prior to treatment, at the end of the extrusion phase, after the retention phase, and at follow-up are given in Figs. 1–4. All patients were clinically assessed by one attending periodontist (MM) for periodontal status at the distal aspect of M2 before orthodontic extraction treatment (T0) and at follow-up (T1), which varied from patient to patient but averaged 24 ± 11 months for all subjects following M3 removal.

The routine periodontal examination consisted of clinical records of PPD, recession (REC), and CAL at the disto-buccal, mid-distal, and disto-lingual site of M2 adjacent to impacted M3 using a calibrated periodontal probe (PCP-11; Hu-Friedy, Chicago, IL, USA). When the periodontal probe met the surface of M3, resulting in underestimation of the

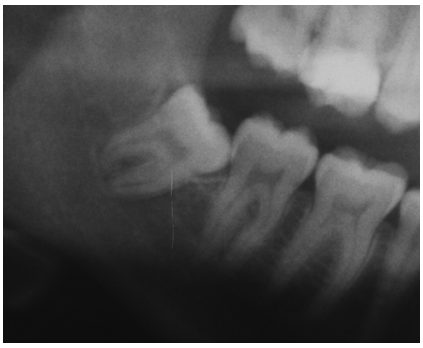

Fig. 1. Initial radiograph taken prior to orthodontic extraction of the impacted mandibular right third molar.

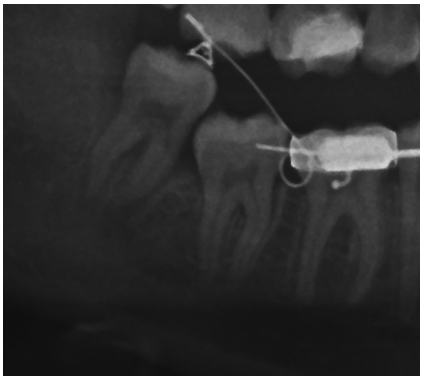

Fig. 2. Radiograph taken at the end of the orthodontic extrusion.

Fig. 3. Radiograph taken after the 3-month orthodontic retention phase (before third molar extraction).

Fig. 4. Radiograph taken at the 1-year follow-up after third molar extraction.