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ORIGINAL ARTICLE

Influence of premolar extraction or non-extraction orthodontic therapy on the angular changes of mandibular third molars

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KEYWORDS

Premolar extraction;
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Abstract *Aim:* To compare the angular changes of the third molars relative to the occlusal plane and to the second molar long axis in extraction group and compare these changes with a non extraction group.

Materials and methods: The study included pre and post treatment panoramic radiograph records of 90 subjects treated by first premolar extractions and 90 subjects who had been treated with non extraction orthodontic therapy ($n = 90$). Two angular variables were measured. Firstly, the angle between the long axis of the third molar and the occlusal plane (M3–OP) and secondly, the angle between the long axis of the third molar and the long axis of the second molar (M3–M2). Data were analyzed by paired and student's *t*-test.

Result: The analyzed data to assess the changes in the third molar angulation from pretreatment to post treatment did not vary significantly in both the groups ($p < 0.05$). Both the groups showed decreased angular values. The M3–OP angular difference was (-7.3 ± 2.45) in extraction group as compared to (-5.85 ± 1.77) in non extraction group. The M3–M2 angular difference of (-4.26 ± 3.11) in extraction group and (-2.98 ± 1.74) in non-extraction group was observed.

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Conclusion: Extraction of premolars did not demonstrate considerable changes on the angulation of the third molars. The factors other than premolar extractions may influence the angulation of the third molars.

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1. Introduction

The eruption of the mandibular third molar (M3) and their influence on the dental arch has long been a subject of controversy that interests various specialties of dentistry (Tarazona et al., 2010). The development of mandibular third molar starts within the mandibular ramus between the ages of 7–15 years and erupts into the oral cavity at around 18–24 years of age (Richardson and Dent, 1974; Kim et al., 2003; Artun et al., 2005). From clinical point of view, its eruption is uncertain and very difficult to predict if there will be enough space in the arch for it to take its acceptable final position (Tarazona et al., 2010). The impaction rate of the third molars (mandible > maxilla) is high compared to any other teeth and could vary from 9.5% to 39% (Else and Rock, 2000; Yavuz et al., 2006). These high impaction rates could be due to the lack of space that occurs due to biological factors such as alteration in the longitudinal growth of the mandible, distal eruption pattern of teeth, delays in the development of facial structure, limited resorption at the anterior aspect of the mandibular ramus, and greater size of mandibular third molar crown (Tarazona et al., 2010). Previous studies on mandibular third molar have concentrated about the influence that the third molars have on the rest of the dentition, rather than the control that the rest of the dentition has on the third molars (Stagers et al., 1992).

The impact that mandibular third molars have on the relapse of lower incisor crowding following the conclusion of orthodontic treatment has been a subject of many theories (Jain and Valiathan, 2009). Some authors advocate extraction of the first premolar to accommodate the third molars (Faubion, 1968; Silling, 1973) whereas others believe that the third molars may still remain impacted in spite of premolar extraction (Björk et al., 1956; Dierkes, 1975), although few studies have found very little difference between extraction and non extraction cases (Hattab, 1997). The extraction therapy is associated with mesial movement of the mandibular molars (Kim et al., 2003) and each millimeter of forward movement by the other lower molars improves the chances of eruption of a third molar by 10% (Else and Rock, 2000).

It is challenging to predict the fate of the third molars, since the second molars of an average 12-year old orthodontic subject have not yet erupted and the third molars have a limited amount of calcification at that time. This period is best considered for treating most of the malocclusions and thus it is very crucial for the orthodontist to determine the course of the third molars and draw an appropriate treatment plan (Richardson, 1980).

Previous studies have found improved angulation of developing third molar in patients treated with extraction (Else and Rock, 2000; Jain and Valiathan, 2009; Saylor et al., 2005). Richardson (1970) found an average change of

11.2° by mandibular third molar between 10 and 15 years with respect to the mandibular plane. This indicates a tendency for the tooth to become straighter and likely to decrease the M3–OP angle. If these changes fail to occur, impactions are inevitable. It has also been reiterated that anchorage conditions and type of mechanics used during treatment have a greater effect on the third molar angulation rather than the actual extraction of first premolars (Stagers et al., 1992).

Considering the above aspects, the current study aimed at determining the changes in the third molar angulation relative to the occlusal plane and to the second molar long axis in extraction group and comparing these changes with a non extraction group.

2. Materials and methods

The study included the pre-treatment (T1) and post-treatment (T2) panoramic radiograph records of 180 subjects (90 males and 90 females) who had undergone fixed orthodontic treatment at various orthodontic clinics in different cities of Saudi Arabia. A total of 360 panoramic radiographs (2 per patient, pre treatment and post treatment) were evaluated. 90 subjects (45 males and 45 females) had been treated with first premolar extraction and 90 subjects (45 males and 45 females) had been treated with non extraction therapy. The mean age at the start of the treatment was 13.67 in the extraction group and 13.41 in the non extraction group. The average duration of the treatment was 2.7 years. The ethical guidance for the study was in accordance with World Medical Association declaration of Helsinki, 1975, as revised in 2000.

The criteria used for inclusion and exclusion of the subjects are:

Inclusion:

- Class I skeletal and dental relationships;
- Bilaterally unerupted mandibular third molars that could be seen on panoramic radiographs in mesioangular positions. Root development of the third molars was no more than 2nd/3rd;
- Second premolars (P2) fully erupted into the mouth;
- High-quality pretreatment (T1) and post treatment (T2) panoramic radiographs without any distortion errors or magnifications;
- The average duration of treatment in both the groups should not be less than 2 years.

Exclusion:

- Patients with Class II malocclusion requiring extraction of the second premolars and mandibular molar protraction.
- Class I maxillomandibular protrusion cases requiring anchorage preparation.

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