



Evaluation of dimensions of the distal alveolar bone of the second molar by cone beam after extraction of third molars

Evaluación de las dimensiones del hueso alveolar distal del segundo molar a través de cone-beam post-extracción del tercer molar

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ABSTRACT

Several studies have assessed the quality of periodontal tissues adjacent to the second molar after extraction of third molars using clinical assessment and radiographs. In clinical practice, the space occupied by these molars is used to perform distalizing movements and tissue integrity is a condition to do it, so it is necessary to evaluate with suitable methods such as digital volume tomography alveolar bone quality, before and after the removal of third molars. The aim of the study was to evaluate through cone beam dimensions the distal alveolar bone of the second molar after third molar extractions in patients undergoing orthodontic treatment. A quasi-experimental study was implemented with a six months follow up in patients with orthodontic treatment that attended the post-graduate clinic of the University of Cartagena. The sample consisted of 128 molars of 32 individuals treated with fixed appliances. Bone dimensions behaved as follows: height was 3.44 mm T0, T1 of 3.96 mm and 3.44 mm in T2; the thickness was 2.90 mm T0, T1 was 2.79 mm and 3.37 mm T2; T0 width was 15.58 mm, 15.50 mm in T1 and T2 of 15.19 mm. The alveolar process can recover its dimensions after extraction thanks to dental movements generated by orthodontics thus maintaining a stability which results in periodontal health.

RESUMEN

Diversos estudios evalúan la calidad de los tejidos periodontales adyacentes al segundo molar después de la extracción de los terceros molares utilizando como método la valoración clínica y las radiografías. En la práctica clínica, el espacio ocupado por estos molares se usa para realizar movimientos de distalización y la integridad de los tejidos, es una condición para poder realizarlo, por lo que es necesario evaluar con métodos idóneos, como la tomografía volumétrica digital, la calidad del hueso alveolar, antes y después de la extracción de los terceros molares. El objetivo de la investigación fue evaluar a través de *cone-beam* las dimensiones de hueso alveolar distal del segundo molar después de la extracción de los terceros molares en sujetos sometidos a tratamiento de ortodoncia. Se implementó un estudio cuasiexperimental con seguimiento a seis meses, en pacientes con ortodoncia fija; que acuden a la Clínica de Postgrado de la Universidad de Cartagena. La muestra fue constituida por 128 molares de 32 individuos tratados con ortodoncia fija. Las dimensiones óseas se comportaron de la siguiente manera, la altura en T0 fue de 3.44 mm, en T1 de 3.96 mm y en T2 de 3.44 mm; el grosor en T0 fue de 2.90 mm, en T1 fue de 2.79 mm y en T2 de 3.37 mm; la anchura en T0 fue de 15.58 mm, en T1 de 15.50 mm y en T2 de 15.19 mm. El proceso alveolar puede recuperar sus dimensiones después de una extracción gracias a los movimientos dentales generados por ortodoncia, manteniendo una estabilidad que se traduce en salud periodontal.

Key words: Alveolar bone, third molar, orthodontics, tooth movement, tooth extraction, computed tomography cone-beam.

Palabras clave: Proceso alveolar, tercer molar, ortodoncia, movimiento dentario, extracción dental, tomografía computarizada de haz cónico.

INTRODUCTION

The third molars are the teeth that frequently present congenital absence and impaction. They are present in 90% of the population and at least 33% of them presents an impacted third molar, and moreover, they represent 98% of all impacted teeth. The mandibular third molar presents a greater frequency of impaction and the incidence varies from 9.5 to 68 per cent in different populations.¹ The difficulty in third molar eruption, in particular of the lower, is due to their late formation and to the phylogenetic evolution of the mandible, which gives as a result a lack of available space for the molars to erupt normally. So far there

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is no model that allows us to reliably predict whether eruption or retention of the third molar will occur.²

In a study by Chaparro Avendaño et al., that analyzed the morbidity of the third molars, they reported that the main reason for extraction was the indication by the orthodontist (40.5%), followed by prophylactic indication (39.5%). The presence of clinical manifestations was an indication for extraction in 20% of cases.³

One of the problems that the orthodontist faces is the compensation of malocclusions of skeletal or dental origin, which until a few years ago, was one of the indicators of premolar extractions. In recent times orthodontists have increasingly resorted to distalization as an alternative solution to this anomaly, so that old techniques have been revitalized and also, new techniques arise proving to be very effective in responding to the scientific and technical development.^{4,5} Given that these new techniques prevent bicuspid extractions, the space occupied by the third molars is required by the distalization of the upper or the lower arch depending of the malocclusion.⁶

On the other hand most of scholars such as Metteset al. (2005), Richardson (1989), Mr Lindqvist & Thilander (1982), Carbonell (1999), Harradine et al (1998) and many others, have come to the conclusion that «the removal of the third molars to reduce the degree of overcrowding, cannot be justified». However, authors such as Sato, Riccketts and Zachrisson are supporters of the preventive removal of the third molars due to their importance as a factor in relapse of orthodontic treatments, especially of incisor crowding; and particularly in the orientation of Sato, due to their importance in the development of posterior discrepancy, which has been observed to be a very important etiopathogenic factor in the development of skeletal malocclusions such as class III and open bites.⁷ Some authors report that periodontal tissues in general do not present significant changes with third molar extractions and that in many cases there is evidence of an improvement of the periodontal health status of the tissues adjacent to the second molar,^{8,9} but that the procedure represents a risk in patients with healthy periodontium.¹⁰

MATERIAL AND METHODS

This was a quasi-experimental study with a follow-up cohort of six months. The population was composed of all patients that attended the Postgraduate Clinic of Orthodontics at the University of Cartagena with fixed appliances during the period between February 2013

and December 2013. The sample was composed of 128 molars of 32 individuals treated with fixed appliances. The patients had voluntarily agreed to take part in the project by signing an informed consent. The size of the sample was selected using the STATA 12.0 Software, with a type 1 error of 5% and a power of 80%; average bone height in T0 was 3.1 with a standard deviation of 0.8; average height in T1 was 2.8 and diversion of 0.8, preventing a 10% loss of the sample.

Individuals were selected in a non-probabilistic manner considering the following criteria: individuals treated with fixed appliances at the Faculty of Dentistry of the University of Cartagena, subjects with upper or lower impacted third molars, subjects in whom distalization movements would be performed during the orthodontic treatment; participants with a range of age between 15 to 45 years. In order to restrict the entry of sample units that could confuse the results interpretation it was decided to exclude patients who presented: periodontal disease in the area of the second molars before starting orthodontic treatment, patients who suffered from any systemic disease, patients who smoked; patients with incomplete root formation of the second molar and women in state of pregnancy.

The sample was selected in a non-probabilistic manner taking into consideration that all patients fulfilled the inclusion criteria and signed the informed consent. Finally the patients were given an order to perform a CBCT scan in the Coides Radiological Center (Cartagena, Colombia). After the CT scans were obtained, they were coded as well as the measurement instrument and the envelope in which all documents of the patient were saved.

A properly standardized examiner, using a Toshiba Satellite MC45 computer and a Genius DM03003 mouse, performed the measurement. The variables width, height and thickness were measured as follows:

- **Bone width:** labio-lingual distance of the alveolar ridge distal to the second molar. The reference point in which the measurement was obtained was half the distance from most coronal point in the bone crest to the apex of the distal root of the second molar. The measurements were performed in the bone distal to the second molar before (T0), eight days (T1) and six months (T2) after the extraction of the third molar.
- **Bone height measurement:** it was measured from the amelocementary line to the most coronal edge of the ridge of the alveolar bone distal to the second molar. To this end, we conducted a sagittal slice

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