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Original article

Reliability of cone beam computed tomography in locating and measuring the mandibular canal for planning of surgical techniques in the mandibular body☆

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ABSTRACT

Aim: The aim of this study was to determine the reliability of cone beam computed tomography to locate and take measurements of the mandibular canal, as well as the vestibular bone wall, in the planning of the bone graft surgery in the mandibular body.
Material and methods: A total of 11 mandibles from fresh cadavers were studied (22 hemimandibles, half of them with teeth). A CBTC and a surgical procedure for the lateralization of the lower dental nerve were performed with the aim of measuring the thickness of the vestibular table and the mandibular canal (MC) or lower dental nerve at 5, 15, and 25 mm from the most posterior position of the mentonian hole.
Results: The results obtained in the study indicate that CBTC, being the best diagnostic tool currently available, still appears to be unreliable when compared to actual results. This discrepancy is a mean of 1.15 mm as regards the thickness of the vestibular bone wall that covers the MC, and a mean of 0.3 mm in relation to the thickness of the lower dental nerve.
Discussion: It is important to know and assess these discrepancies in view of the multitude of surgical procedures that can be performed in this area, and in the vicinity of the lower dental nerve.

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Fiabilidad del uso de la tomografía computarizada de haz cónico en la localización y medida del conducto mandibular en la planificación de técnicas quirúrgicas en el cuerpo mandibular

Palabras clave:
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RESUMEN

Objetivo: El objetivo de nuestro estudio fue determinar la fiabilidad del estudio tomográficopara localizar el conducto mandibular y tomar mediciones exactas del diámetro de dichoconducto y de la pared ósea vestibular, como mediciones principales en la planificación dela toma de injerto óseo de cuerpo mandibular.

Material y método: Se estudiaron 11 mandíbulas (22 hemimandíbulas) de cadáver fresco, lamitad de ellas dentadas, a las cuales se les realizaron una CBTC y un procedimiento quirúrgico de lateralización del nervio dentario inferior con el objetivo de medir el grosor de latabla vestibular y el grosor del conducto mandibular o dentario inferior (CDI) a los 5, 15 y 25 mm de la parte más posterior del agujero mentoniano.

Resultados: Los resultados obtenidos por nuestro estudio indican que el CBTC, siendo elmejor método diagnóstico disponible en la actualidad, aún presenta diferencias respecto ala realidad. Esta discrepancia es de 1,15 mm de media con relación al grosor de la tabla óseavestibular que lo recubre y de 0,3 m de media con relación al grosor del CDI.

Discusión: Conocer y valorar estas discrepancias es importante dada la multitud de procedimientos quirúrgicos que se pueden realizar en esta zona, y la vecindad con el nervio dentarioinferior.

Introduction

Currently, the advances in implantology and its recognition as one of the most important therapeutic weapons in the field of Odontology have led to the need to use bone graft techniques for the provision of this tissue in certain areas for adequate implant rehabilitation.[1–3]

There is a wide range of techniques, some of which are performed in the anatomical area of the mandible. For the latter, the mandibular ramus and body grafts have been frequently mentioned in publications in recent years.[4,5]

The main noble structure in this area that must be carefully handled at all times is the intraosseous trajectory of the inferior dental nerve (IDN), located in the inferior dental canal (IDC).[4]

Thus, determining the location of this structure before surgery to avoid damage is essential for the planning of a mandibular body bone graft. Therefore, it is important to understand the reliability of the techniques that surgeons may implement.[6]

In some patients, the IDC cannot be identified using a panoramic X-ray.[7,8] Besides, this technique does not allow for a three-dimensional assessment of the mandible. Towards the end of the last century, the development of IT software together with computed tomographies (CT scans) introduced a major breakthrough for clinicians. Currently, the CT scan technique provides the largest amount of data compared to other diagnostic techniques in relation to the planning of bone tissue surgery.[6]

Previous studies on the reliability of CT scans and cone beam computed tomographies (CBCT) for the planning and selection of mandibular dental implants of adequate diameter and length, specifically about their reliability for the correct measurement of the distance between the upper rim of the mandibular canal and the upper rim of the mandible, have indicated that some anatomical points and accidents (such as the mental foramen) are essential and may not be seen clearly.[9–11]

Based on this approach, the studies conducted present contradictory results.[12,13] Our study was centred on the same area. However, instead of focusing on the coronal area of the IDC, we focused on the vestibular area. In this area, measurements must be based on a lower number and smaller anatomical accidents than those in the alveolar area. However, the potential consequences of an incorrect measurement are more serious in bone grafting surgery than in implant insertion surgery.[4]

The objective of our study was to determine the reliability of the tomography study (CBCT) to locate the IDC and take precise measurements of its diameter and of the vestibular bone wall, which are the main measurements for the planning of a mandibular body bone grafting surgery or any other kind of surgery in this area.

Material and method

The study involved 11 mandibles (8 male subjects and 3 female subjects), 22 mandibular hemiarches, half of which had teeth, obtained from fresh corpses. The mandibles were requested, under due authorisation, by the Lavante Centre, which had been authorised by the Board of Andalucía. Before conducting the clinical study for the obtaining of actual measurements, these underwent a CBCT (GE Locus Ultra, GE Healthcare, United Kingdom). The images obtained were based on the