

CBCT STUDY ON THE ANATOMY OF THE MENTAL FORAMEN AND CANAL IN ROMANIAN POPULATION

IULIANA BABIUC¹, MIHAELA PAUNA², CLAUDIA MATEIAS³, GABRIELA TĂNASE⁴, AUGUSTIN MIHAI⁵, MĂDĂLINA MALIȚA⁶, RADU COSTEA⁷, MIHAI BOGDAN BUCUR⁸, CAMELIA IONESCU⁹, MIHAI BURLIBAȘA¹⁰

^{1,2,3,4,5,6,7,8,9,10} "Carol Davila" University of Medicine and Pharmacy Bucharest

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Abstract: The aim of cone beam computed tomography (CBCT) in this study was to analyze the anatomy of the mental foramen and canal in a Romanian group of patients. **Methods:** 50 CBCT volumes of the mandible were used to study the morphology of the mental foramen and canal. The presence and position of accessory mental foramina and canals was investigated. **Results:** The mental foramen was located under the second lower premolar in 39% of the cases, between the two premolars in 55% of the situations and distal of the second premolar in 6% of the analyzed sites. An anterior loop was found in 50% of the cases. An accessory mental foramen was detected in 6,5% of the analyzed hemimandibles. **Conclusion:** CBCT technology offers valuable information on the anatomy of the mental foramen.

INTRODUCTION

The anatomy of the mental foramen and canal play an important role in planning a surgical manoeuvre in the premolar area.(1) The mental canal contains the mental nerve and mental artery, terminal branches of the inferior alveolar nerve and artery.(2) Failure to properly locate and manage the mental nerve during surgical procedures can lead to neurological complications involving the soft tissues of the lower lip and front of the chin and of the mucosa covering the interforaminal region of the mandible.

The location and the variations of the mental foramen were first examined on cadavers and dry skulls.(3,4) Panoramic radiographs allow most of the time to locate the mental foramen, but fail to offer accurate information about the course of the mental canal and possible accessory mental foramina. Modern cone beam computed tomography (CBCT) examinations allow for a precise assessment of the surgical anatomy of the clinical cases.

Three-dimensional reconstructions of the skull, oblique and cross-sectional slices offer important information on the anatomy of the mental canal and mental foramen. Naitoh et al (5) compared the efficiency of rotational panoramic radiography to detect the accessory mental foramen to the CBCT technique. The panoramic radiographs allowed for the visualisation of the accessory mental foramen in 48,6% of the cases.

Morphometric studies indicate that the most frequent positions of the mental foramen are in the longitudinal axis of the second premolar and between the two lower premolars. Different populations show a higher prevalence of one of these locations. The position of the mental foramen underneath the second premolar was found most frequent in Indian (6), Malayan (7) and Zimbabwean (8) mandibles, whereas in Chinese (9) and Kenyan (10) populations the most often position was found between the premolars.

The presence of accessory mental foramina has also been reported. Studies in Japanese subjects reported the incidence of multiple mental foramina ranging from

6,7 to 12,5%.(5,11,12) High rates of accessory mental foramina were also found in Central Asian and Sub-Saharan populations.(12)

PURPOSE

The aim of this study was to analyze, with the help of CBCT technology, the position of the mental foramen in relation to the premolars and to determine the incidence of the accessory mental foramina in a Romanian group of patients.

MATERIALS AND METHODS

50 CBCT volumes of the mandible were analyzed. The patients underwent CBCT examination for the purpose of implant therapy. There were 27 women and 23 men, aged between 23 and 74 years. The tomographic volumes were acquired using a Picasso Trio from Vatech with a standardized exposure protocol. The analysis was made using EzImplant-Plus Software.

The premolar region was carefully examined in cross-sectional slices and 3D reconstructions in order to detect the position of the mental foramen and the course of the mental canal. The position of the foramen relative to the premolars and its' dimensions, together with the trajectory of the mental canal were recorded. The presence and position of accessory mental foramina and canals was investigated.

RESULTS

The mental foramen was located under the second lower premolar in 39% of the cases, between the two premolars with an incidence of 55% and distal of the second premolar in 6% of the analyzed sites.

The mean width of the foramen was 4mm (SD 0,23mm) and the medium height was 3,4mm (SD 0,20mm). It was located at a mean distance of 12.61mm from the tip of the alveolar crest (SD 2,4mm). The mental canal presented an anterior loop in 50% of the cases.

In 6,5% of the cases, an accessory mental foramen was detected. These were smaller diameter foramina, usually

⁴Corresponding author: Gabriela Tănase, Str. Plevnei, Nr. 19, Sector 5, București, România, E-mail: mburlibasa@gmail.com, Phone: +40723 472632
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located distal of the main mental foramen.

Figure no. 1. The distribution of the location of the mental foramen

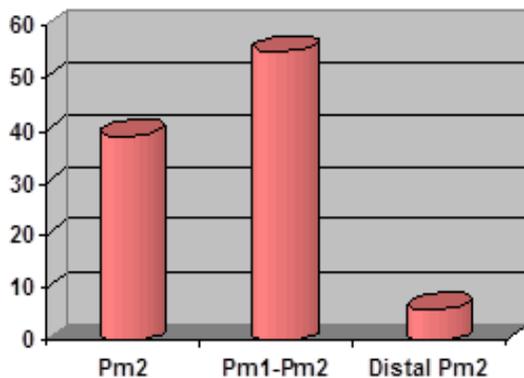


Figure no. 2. 3D reconstruction of a hemimandible with an accessory mental foramen

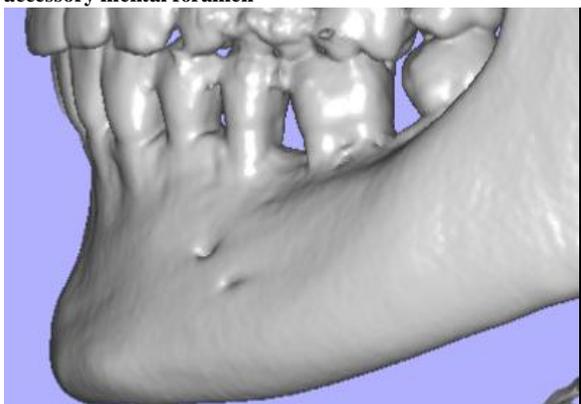
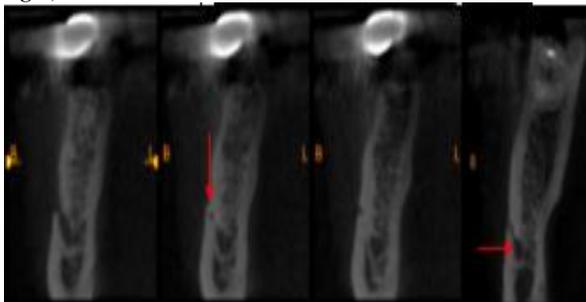


Figure no. 3. Cross-sectional CBCT slices showing the mental foramen (first slice on the left), the accessory mental canal through the buccal cortical plate (second slice from the left) and the accessory mental foramen (first slice from the right)



DISCUSSIONS

The location and the morphology of the mental foramen are of a great importance in surgical dentistry. Implant placement procedures must be carefully planned around the emergence of the mental nerve, in order to avoid neurological complications.

CBCT technology offers the possibility to explore the anatomy of the surgical site before beginning the surgical procedure, and therefore allows for an optimal description of the region.

The position of the mental foramen relative to the tip of the crest must be carefully assessed. Sometimes, there is sufficient bone volume for the placement of a dental implant even right above the canal, but this has to be ascertained tomographically. However, care must be taken when raising a flap in the buccal premolar region.

The anterior loop of the mental canal must be carefully examined on CBCT slices. Its presence is generally overrated on panoramic x-rays, due to the lack of coordination between the elliptical curvature of the mandible and the circular trajectory of the capturing device. As a result, very often the image of the premolar region on panoramic X-rays is not ortoradial, but it is projected with an angle, showing the inferior premolars overlapped and throwing the mental canal towards the distal. To ascertain a distal loop of the mental canal, correct cross-sectional and oblique slices must be examined on the CBCT. Our results concerning the anterior loop are similar to previous CBCT reports from the literature. Nascimento et al (13) reported the incidence of the anterior loop in 41,6% of the investigated cases.

The presence of the accessory mental foramen must be carefully assessed. Cadaver studies indicate that the accessory mental nerve can have a variable composition. Toh et al (14) studied an accessory mental nerve that was innervating the mucosa and skin of the corner of the mouth and of the median labial region. Communications of the accessory mental nerve with branches of the buccal and facial nerves were also observed.

The incidence of the accessory mental foramina found in this study is comparable to the data reported on other different populations.(5,11,12) This morphological variation is relatively frequent and failure to detect and avoid it during surgical procedures can lead to neurological complications. Therefore, a good analysis of the surgical site in the premolar and molar area by means of CBCT is imperative.

CONCLUSIONS

CBCT technology offers valuable information regarding the mental foramen. Clinicians should carefully investigate the anatomy of the mental foramen and canal, as well as the presence of accessory mental foramina before any surgical procedure in the mandibular premolar and molar area.

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