

Double mental foramina

Agujero mentoniano doble

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ABSTRACT

The knowledge of the location, trajectory, and characteristics of the neurovascular bundles in the jaws is fundamental to reduce risk of injuries to this structure during surgical procedures, especially when anatomical variations are present. The presence of anatomical variations associated with the mental foramen has been reported in some cases and is frequently undervalued in clinical procedures. Sensorial disturbances, such as paresthesia in the lower lip or cheeks, may occur as result of pressure on the mental foramen. These anatomical variations can be detected in clinical practice by imaging exams. Computed tomography has been established as a valuable imaging modality capable of providing in-depth information about maxillofacial structures, allowing detailed evaluation of their topography and anatomical variations, such as additional mental foramina. The objective of this article was to describe a case with double mental foramina that only could be observed in computed tomography images. The use of cone beam computed tomography has increased in dentistry, thus anatomical variations that may have an influence on the diagnosis and treatment planning must be recognized. Have a good knowledge of additional mental foramina may contribute to adequate anesthetic techniques and to avoid misdiagnosis of bone lesions and eventual damages to the nerves and vessel during surgical procedures in that region.

Keywords: mental foramen; mental foramina; computed tomography.

RESUMEN

El conocimiento de la ubicación, trayectoria y características de los haces neurovasculares en la mandíbula es de fundamental importancia para reducir el riesgo de lesión en estas estructuras durante procedimientos quirúrgicos, especialmente cuando hay presencia de variaciones anatómicas. La presencia de estas variaciones anatómicas relacionadas con el agujero mentoniano ha sido reportada en algunos casos y no es frecuentemente valorada en los procedimientos clínicos. Alteraciones sensoriales, tales como parestesias en el labio inferior o en las mejillas, pueden ocurrir como resultado de la presión en el agujero mentoniano. Estas variaciones anatómicas pueden ser detectadas en la práctica clínica a través de los exámenes de diagnóstico por imágenes. La tomografía computarizada se ha establecido como una técnica de imagen útil capaz de proporcionar información detallada de las estructuras maxilofaciales, lo que permite una evaluación minuciosa de su topografía y de las variaciones anatómicas, tales como el agujero mentoniano accesorio. El objetivo de este artículo es describir un caso con agujeros mentonianos dobles que solo pudieron ser observados en las imágenes de tomografía computarizada. El uso de la tomografía computarizada de haz cónico se ha incrementado en la odontología, así las variaciones anatómicas que pueden tener influencia sobre el diagnóstico y planificación del tratamiento pueden ser conocidas. El conocimiento de los forámenes mentonianos adicionales puede contribuir a una adecuada técnica de anestesia y evitar errores diagnósticos de lesiones óseas y daño eventual de los nervios y vasos durante procedimientos quirúrgicos en la región.

Palabras clave: agujero mentoniano, agujero mentoniano doble, tomografía computarizada.

INTRODUCTION

Mandibular canal is an anatomical structure that extends bilaterally from the mandibular foramen to the mental foramen carrying the inferior alveolar nerves, arteries, and veins. The mental foramen is located bilaterally on the lateral aspect of the mandible, usually inferiorly to the interproximal region of the first and second premolars.¹ In the premolar region, the inferior alveolar nerve usually splits in two branches, the mental nerve and the incisive nerve. The incisive nerve runs intraosseously along with veins and innervates the anterior mandibular teeth, while the mental nerve emerges at the mental foramen and divides into four branches: angular (innervation of the angle of the mouth region), medial and lateral inferior labial (skin of the lower lip, oral mucosa and gingiva as far posterior as the second premolar), and mental branch (skin of the mental region).²

The locations and configuration of the mental foramen and mandibular canal are important considerations in surgical procedures and must be identified preoperatively to prevent confusion with bony defects. To avoid damage, the neurovascular bundle must be identified precisely before any surgical procedure involving mandible, such as in extraction of third molars, dental implant treatment, and sagittal split ramus osteotomy.^{3,4} However, the presence of anatomical

variations like additional mental foramina is often ignored. Surgical complications might be attributed to the existence of a true neurovascular supply, and it is indicated close attention to this variations to reduce the rate of paralysis and hemorrhage in surgical procedures.⁴

The presence of additional foramens and canals in the mandible is frequently undervalued in clinical procedures. It is important to highlight that these anatomical variations may only be pre-surgically detected on imaging exams, and such detection may have a direct influence on therapeutic success. Furthermore, the objective of this article was to describe a case with double mental foramina that only could be observed in computed tomography images.

CASE REPORT

A 25-year-old asymptomatic male underwent cone beam computed tomography exam and panoramic radiography for preoperative third molar assessment. Extraoral and intraoral examinations showed no significant issues. On panoramic radiography, it was observed the mental foramen with the normal position, shape and number, without any anatomical variations associated (Fig. 1).



Fig. 1. Panoramic radiography was observed the mental foramen with the normal position, shape and number, without any anatomical variations associated.

Three-dimensional images were obtained by i-CAT cone beam computed tomography_unit (Imaging Sciences International, Inc, Hatfield, PA, USA). The sagittal slice (Fig. 2) shows two bifurcations on the right mandibular canal below the right inferior premolars originating three exits. Distinct intra-osseous courses could be observed, which originated three mental foramina separated by bony septa. The additional mental foramina were located in posterosuperior and posteroinferior positions. On the left side, all images showed only one foramen without any anatomical variation.

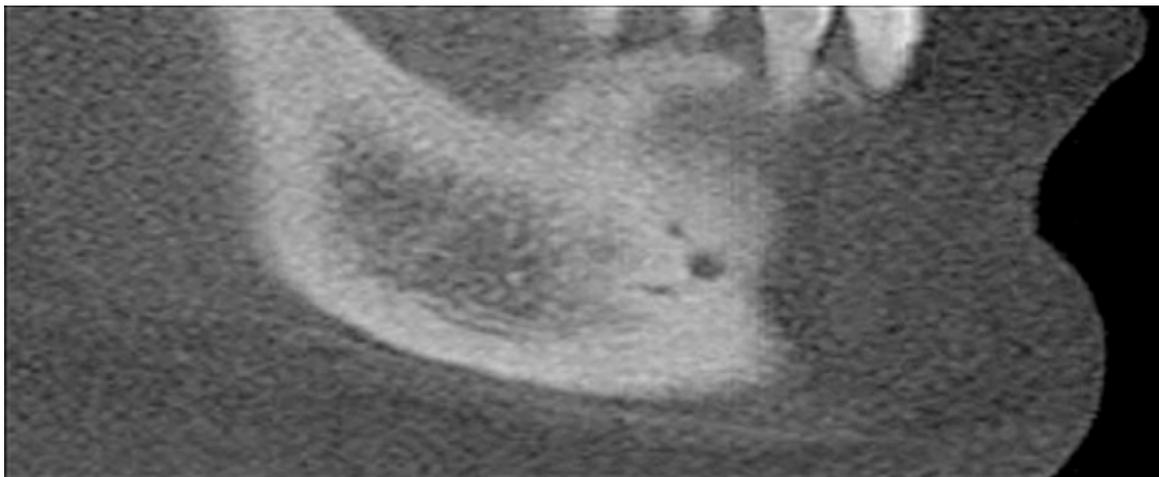


Fig. 2. Sagittal slice of the cone beam computed tomography showing the presence of two additional mental foramina in the posterior superior and posterior inferior positions.

DISCUSSION

The presence of one or more additional foramina is among the variations described in the literature, which are usually called mental foramina. It has been assumed that such variation results from the ramification of the mental nerve before it passes the mental foramen.³⁻⁷ It is important to differentiate the additional mental foramina from a nutritious foramen. The additional mental foramina is defined as a bony foramen originated from the mandibular canal. Nutritious foramina, on the other hand, are not originated from the mandibular canal, and their dimensions are significantly smaller.⁶ It was possible to observe that in the present case the anatomical variations are originated directly from the mandibular canal, being classified as additional mental foramina.

It is possible to observe in the present case that, based on the findings of Hu et al.,² the additional mental foramina probably carry the ramification that innervates the mental region and the medial half of inferior lip (mental and medial inferior labial branches, respectively). The angular and/or lateral inferior labial branches probably emerge in the posterior superior additional mental foramina, and the mental branch emerges in the posterior inferior additional mental foramina. This can be justified due to the both positions of the additional mental foramina presented in the case report.

This anatomical variation can be detected in clinical practice using conventional radiographic exams, e.g., periapical and panoramic radiographs. However, conventional radiographs have several drawbacks, such as the superimposition of anatomical structures and the distortion and magnification in panoramic radiography that can lead to errors of identification. Cone beam computed tomography has been established as a valuable imaging modality capable of providing in-depth information about maxillofacial structures, which allows detailed evaluation of their topography and anatomical variations. It provides reliable high-resolution images and superior technology compared with its predecessors, and it can generate images with a small slice thickness and good visualization of bony structures.⁸ It was possible to observe this in our case because the presence of the additional mental foramina was misdiagnosed in the panoramic radiography, being your characteristics (location, number and position) described only in the cone beam computed tomography. Besides, we believe it is possible to recognize this

anatomical variation when a smaller voxel size of the cone beam computed tomography is used.

Studies with cone beam computed tomography images show a similar incidence of additional mental foramina. *Oliveira-Santos et al.*⁷ found 27 out of 285 cases (9.4 %), being two of them bilateral additional mental foramina. *Katakami et al.*⁶ observed 16 out of 150 cases (10.7 %), with one bilateral case. *Naitoh et al.*⁴ found 11 out of 157 cases (7 %), and two had bilateral occurrence. Using multislice computed tomography, *Haktanir et al.*⁵ observed the presence of additional mental foramina in 4 out of 100 cases (4 %), with one bilateral case. Another study conducted by *Kalender et al.*³ also evaluating the presence of additional mental foramina on cone beam computed tomography images showed 27 out of 386 cases (6.5 %). In the present case, the double additional mental foramina was located only in the right side of the mandible.

The location of the additional mental foramina were also evaluated and were most commonly located inferior to the mental foramen (posteroinferior^{4,6,7} and anterior inferior positions).³ In the present case, the double additional mental foramina were both located posterior to the mental foramen (posterior superior and posterior inferior positions).

Although the most reliable diagnosis of additional foramina is through direct visualization during surgery, it is not applicable to clinical practice. Thus, the imaging exams have become extremely important in detecting such anatomical variations, being helpful for a proper treatment planning. Some cases are reported in the literature in which the presence of additional mental foramina is detected on conventional radiographs.^{9,10} *Ramadhan y otros*¹⁰ presented a case of two additional mental foramina in the computed tomography; however, in the panoramic radiography, it was only observed one foramina. In our case, the additional mental foramina were only diagnosed by the three-dimensional images. Nevertheless, it has been demonstrated that two-dimension radiographs may underestimate the presence of additional mental foramina,¹¹ particularly when their dimensions are inferior to 1mm. The small sizes of the additional mental foramina presented in this clinic case, we believe that was the reason for the misdiagnosis in the panoramic radiography.

Sensorial disturbances, such as paresthesia in the lower lip or cheeks, may occur as result of pressure on the mental foramen. Such alterations may be transient or permanent, depending on how much the nerve is damaged. Cone beam computed tomography examination is very helpful to obtain information about the maxillofacial structures, trabecular patterns, alveolar processes, skeletal measurements, and surgical planning of jaw deformities or implant insertion. It is the most accurate imaging modality for the identification and localization of the mandibular foramen, mandibular canal, and mental foramen. The localization of such structures, as well as their eventual anatomical variations, is of fundamental importance prior to any surgical and anesthetic procedures. Because the mental nerve supplies the skins of the chin and mucous membrane of the lower lip and gingiva, in the surgeries of the anterior region of the mandible, the surgeon should protect this major anatomical structure when the additional mental foramina are present.

The use of cone beam computed tomography has increased in dentistry, thus anatomical variations that may have an influence on the diagnosis and treatment planning must be recognized. Have a good knowledge of additional mental foramina may contribute to adequate anesthetic techniques and to avoid misdiagnosis of bone lesions and eventual damages to the nerves and vessel during surgical procedures in that region.

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