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PRESENTACIÓN DE CASO

Trifid nasopalatine canal: case report of a rare anatomical variation and its surgical implications

Conducto nasopalatino Trifid: presentación de caso de una variación anatómica rara y sus implicaciones quirúrgicas

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ABSTRACT
The nasopalatine canal is a long slender structure present in the midline of the anterior maxilla that connects the palate to the floor of the nasal cavity. The nasopalatine canal contains the nasopalatine nerve, the terminal branch of the nasopalatine artery, fibrous connective tissue, adipose tissue, and minor salivary glands. The purpose of this article was to report a case of a trifid nasopalatine canal detected by cone beam computed tomography prior to dental implant placement. A 47-year-old female patient was submitted to cone beam computed tomography. Axial and sagittal sections revealed a trifurcation of the nasopalatine canal. Each canal was separated from the other by bony septa and extended independently from the floor of the nasal cavity to the incisive foramen in the remnant of the alveolar process in the anterior region of the maxilla. Cone beam computed tomography has permitted better visualization of the details and anatomical variations of the nasopalatine canal. Detailed knowledge of variations in the shape, number and size of the nasopalatine canal is fundamental for surgical procedures, such as local anesthesia in the anterior maxillary region and placement of dental implants, in order to prevent damage to important arteries and nerves.

Key words: Nasopalatine canal; anatomical variation; computed tomography; dental implant.

RESUMEN
El canal nasopalatino es una larga estructura delgada presente en la línea media del maxilar anterior que conecta el palato al suelo de la cavidad nasal. El canal nasopalatino contiene el nervio nasopalatino, la rama terminal de la arteria nasopalatina, el tejido conectivo fibroso, el tejido adiposo y las glándulas salivales menores. El propósito de este artículo es presentar el caso de un canal nasopalatino trifid detectado a través de tomografía computarizada de haz cónico anterior a la colocación de implantes dentales, en una paciente de femenino 47 años de edad. Secciones axiales y sagitales revelaron la trifurcación del canal nasopalatino. Cada canal se apartó del otro por tabiques ósea y extendida independientemente del suelo de la cavidad nasal para el agujero incisivo en el remanente del proceso alveolar en la región anterior del maxilar. La tomografía computarizada de haz cónico ha permitido una mejor visualización de los detalles y variaciones anatómicas del canal nasopalatino. El conocimiento detallado de las variaciones en su forma, el número y el tamaño del canal nasopalatino es fundamental para los procedimientos cirúrgicos, así como la anestesia local en la región anterior del maxilar superior y la colocación de los implantes dentales, con el fin de prevenir el daño a las arterias y a los nervios importantes.

Palabras clave: canal nasopalatino; variación anatómica; tomografía computarizada; implante dental.

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INTRODUCTION

The nasopalatine canal (NPC), also called the incisive canal or anterior palatine canal, is a long slender structure present in the midline of the anterior maxilla that connects the palate to the floor of the nasal cavity. The oral opening of the NPC is called the incisive foramen, which has a funnel shape and is located below the incisive papilla.1-3 At the end of its course until the nasal cavity, the NPC divides into two canaliculi that reach the floor of the nasal cavity as two openings, one on each side of the nasal septum, known as the foramen of Stenson.1,2,4-6 The NPC contains the nasopalatine nerve, the terminal branch of the nasopalatine artery, fibrous connective tissue, adipose tissue, and minor salivary glands.[1,3,7]

Radiographically, the lateral walls of the NPC appear as a pair of radiopaque lines that extend from the incisive foramen to the floor of the nasal cavity.[1,4,8,9] Tomographic imaging study, such as cone beam computed tomography (CBCT), has permitted better visualization of the details and anatomical variations of the NPC.[1,3,4,7,9-11]

Detailed knowledge of variations in the shape, number and size of the NPC is fundamental for surgical procedures, such as local anesthesia in the anterior maxillary region and placement of dental implants[1,2,7,9,10,12] in order to prevent damage to important arteries and nerves.[3,7,9]

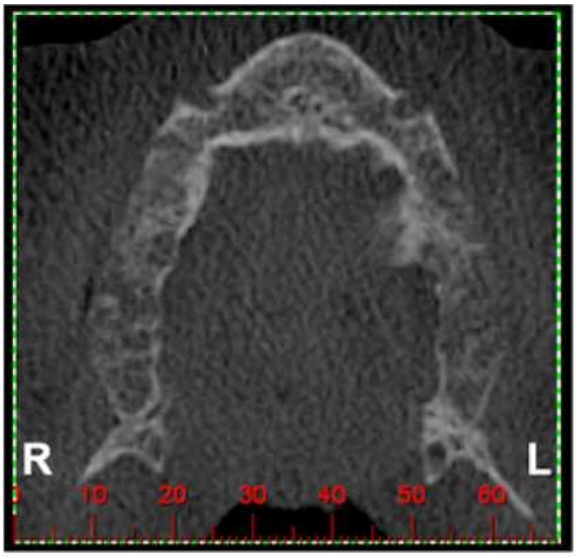

Fig. 1. Axial CBCT section showing the trifid nasopalatine canal consisting of independent canals separated by bony septa.

Studies reporting anatomical variations of the NPC are sparse in the literature.[5,7,9,11] Only few cases of an additional NPC have been reported[5,13] and none publication was found about NPC with two accessory canals. This study reports a rare case of a trifid NPC detected by CBCT prior to dental implant placement.

CASE REPORT

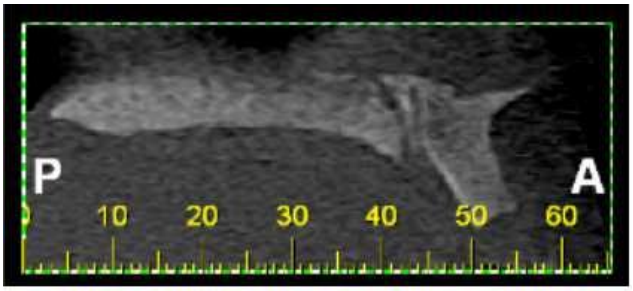

Fig. 2. Right sagittal CBCT section showing two nasopalatine canals extending from the nasal opening to the incisive foramen.

A 47-year-old female patient was submitted to CBCT (iCAT, Imaging Sciences International, Hatfield, PA) for the planning of oral rehabilitation with dental implants. Sites of recent tooth extraction were observed, but the patient was asymptomatic and the mucosa was intact.

Axial (Fig. 1) and sagittal (Figs. 2 and 3) CBCT sections revealed a trifurcation of the nasopalatine canal. Each canal was separated from the other by bony septa and extended independently from the floor of the nasal cavity to the incisive foramen in the remnant of the alveolar process in the anterior region of the maxilla.

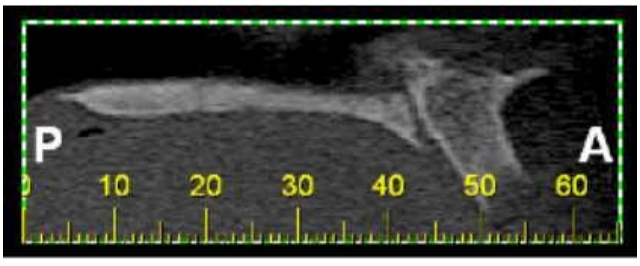

Fig. 3. Sequential section to the left showing the third canal.

A wider canal (1.9 mm in diameter) could be observed in front of the other two canals, which was slightly displaced to the right in such a way that the two canals could be seen in sagittal sections obtained from the right to the left, one in front of

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the other in a first section (Fig. 2), with the posterior canal measuring 0.8 mm in diameter. A sequential sagittal section slightly to the left (Fig. 3) revealed the third canal, which measured 0.9mm in diameter.

DISCUSSION

The anterior region of the maxilla is frequently exposed to trauma and tooth loss[7] and oral rehabilitation with osseointegrated dental implants is often the treatment of choice.[1,3,8,10,14] The oral opening of the NPC, the incisive foramen, is found in this region which maintains close proximity to the roots of the upper central incisors.[2,5] In view of this anatomical relationship, thorough radiographic analysis is necessary during dental implant planning.[1,5] More recently, surgical techniques involving the obliteration of the NPC or displacement of its neurovascular components have been described for implant placement. However, the impact of this management on the sensory function of the anterior palate is still not completely understood.[2,13,15] Damage to the large vessels, such as the nasopalatine artery, is associated with the risk of hemorrhage, and nasopalatine nerve injury can trigger pain and/or paresthesia.[7,10] Furthermore, contact of the dental implant with nerve tissue compromises osseointegration.[2,3,7,8] Therefore, knowledge of anatomical variations in the size, shape and number of the NPC is important, but studies on this topic are sparse.[2,6,8,10,12] Advances in imaging methods, in conjunction with increased access to CBCT in dentistry, have permitted to obtain a detailed and reliable three-dimensional view of the structures present in the maxilla and mandible,[1,10,12,16] favoring the identification of anatomical variations that can have a relevant impact on surgical planning.[1,3,8,10,16]

In this study, we report the case of a trifid NPC in which each canal was separated from the others by bony septa and extended independently from the nasal opening to the incisive foramen (Fig. 1, 2 and 3). Neves et al.[13] showed the presence of two independent NPC with distinct foramina in the nasal cavity and in the anterior alveolar process of the maxilla. Bornstein et al.[5] analyzed anatomical variations of the NPC in 100 patients and observed 15 cases of a bifid NPC. We found no report of a trifid NPC in the literature. The absence of this variation in the literature may point to the need for a detailed investigation of multiplanar images in CBCT for recognition of anatomical structures and their possible variations.

According to Thakur et al.6 the mean diameter of the NPC is 2.32 mm. In the present case, the canals found had different diameters, with one wider canal (1.9 mm) and two smaller canals (0.8 and 0.9 mm in diameter). In the case reported by Neves et al.13 the diameter of the additional canal ranged from 1.2 to 2.0 mm. Therefore, studies including larger samples should be performed in an attempt to determine whether the presence of accessory canals, which are narrower, represents a greater surgical risk when compared to a single NPC which is generally wider.

Liang et al.[7] evaluated the anatomical variations of the NPC and observed a wide variability in its morphology and size, with the NPC branching into four canals during its course from the palate to the floor of the nasal cavity. However, the presence of independent NPC was not demonstrated. Oliveira-Santos et al.[11] reported cases of additional foramina adjacent to the incisive foramen. However, the canals associated with the additional foramen were ramifications of the NPC and not independent canals. Thakur et al.6 studying the morphology of the NPC by CBCT in 100 subjects, observed variations in the number of foramina and in the diameter, length and height of the bifurcation. No finding of an additional NPC was described. Similarly, López Jornet et al.,[10] Acar and Kamburoglu1 and Kajan et al.[8] found that the most common shape of the NPC was the single channel shape.

Since different surgical procedures are performed in the anterior region of the maxilla, the identification of neurovascular structures that permeate this region is essential.1,3,10 In this respect, careful analysis of the entire course of the NPC permits the identification of possible anatomical variations that can interfere with surgical planning.8,10 Finally, this study reports the case of a trifid NPC identified by CBCT. This imaging method

is an excellent tool for the identification of anatomical variation since it provides the professional with a three-dimensional view, as well as the possibility of reconstructions, thus reducing surgical complications.

Conflicto de intereses

Los autores no declaran conflictos de intereses.

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