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Case Report

Multiple lingual foramen: A case series

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ABSTRACT

The lingual foramina is a structure located at the lingual side of anterior mandible which houses the sublingual artery which in turn anastomoses with the Inferior alveolar vessels. This is a structure that has little information in terms of anatomy and its variations but it has a lot of significance when it comes to any invasive procedure in the anterior region of mandible. With the advent of Implantology, dentists have to be careful while placing implants in the region of or in proximity to the lingual foramen in order to avoid any unprecedented outcomes like haemorrhage. Cone Beam Computed Tomography is an indispensable tool at our disposal that is extensively used for treatment planning and to determine the prognosis of the disease. The anatomy and radiographic appearance should be known to the clinician for an impeccable diagnosis and treatment planning. In this paper, different appearances, variations in position and number are depicted through different sagittal and coronal section views of CBCT.

1. Introduction

Important vascular and neural systems that originate from the floor of the mouth and pass through the cortical bone of the jaw on the lingual side to feed the mental region with blood and nerves are housed in the lingual foramina.[1] The submental artery, a branch of the facial artery, travels along the inferior face of the mylohyoid muscle and then penetrates the mental region to anastomose with branches of the anterior alveolar artery.[1] The sublingual artery, a branch of the lingual artery, passes through the LF and forms an anastomosis with the central inferior alveolar arteries after travelling along the superior face of the mylohyoid muscle. The number and geographic distribution of LF, as well as the kind and number of anastomoses between these two arteries, have all been found to vary greatly. The mandibular region located between the mental foramina is widely believed to be the safest for surgical procedures, despite the complex vascularization of the floor of the mouth and the mental region. The fact that there have been a significant number of massive bleeding accidents reported following implant interventions in this region, unfortunately, serves as evidence of this misconception.[2] Even though they are uncommon compared to the overall number of implants implanted, such situations could pose a serious risk to human life. For such reason, a precise anatomic knowledge of the vascularization of the interforaminal area as well as a thorough pre-operative imaging evaluation of the variability of LF are crucial to prevent life-threatening complications during surgical procedures.[3] In fact, when dealing with mandibular surgery, individual anatomical heterogeneity of mandibular neuro-vascular bundles must be taken into account.[3] This point has been studied in previous cadaveric and imaging investigations, which were primarily based on computed tomography (CT) scans. These studies highlighted the tremendous anatomic

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heterogeneity between various groups.

The foramina are important in terms of the superior alveolar nerve block's efficacy.[3] Since these foramina are known to transport blood vessels, dental operations may become complicated. It has also been proven that these neurovascular foramina have a role in the metastasis of tumours in this area. These supplementary foramina are described by Sutton[4] as having a neurovascular bundle, which denotes an artery, vein, and nerve. These foramina's nerve fibres are seen to give auxiliary innervation for the anterior mandibular teeth. The foramina are important in terms of the superior alveolar nerve block's efficacy. Since these foramina are known to transport blood vessels, dental operations may become complicated. It has also been proven that these neurovascular foramina have a role in the metastasis of tumours in this area. It was stated that it is crucial to take into account and properly locate the presence of neurovascular bundles before performing a surgical treatment at the anterior portion of the lower jaw.[5] For the various branches of dentistry and medicine, understanding the anatomies of neurovascular foramina is crucial. However, the detailed studies about this subject are scarce. In this paper, we aim to depict the radiographic appearances and the CBCT sections they are best seen in along with a few normal anatomical variation.

2. Anatomical Variations

The Lingual Foramen were classified into two groups by their location in the mandible namely:

1. The Medial Lingual Foramen
2. The Lateral Lingual Foramen

The Number of Lingual foramen: Up to four lingual foramens have been detected in a study. The data indicated that when there was only a single midline lingual foramen (24.5%), it was normally above the genial spine.[5]

In another study, two lingual foramens were more frequent (52.9%), this has also been shown in the previous studies.[6]

2.1. Anatomical variations observed in CBCT scans

3. Discussion

The number of postoperative complaints has been increasing as implants and grafting techniques for the anterior jaw bone have been used more frequently. Oral radiographs vividly show the lingual foramen, which is why radiographic anatomy textbooks explicitly explain it. Understanding the lingual foramen may be crucial for presurgical planning for installing implants in the midline of the mandible. Debate has surrounded the foramen's contents. According to certain research, there is a vascular component, with the sublingual branch of the right and left lingual arteries anastomosing. The artery might be large enough to cause an intraosseous or connective soft tissue haemorrhage that would be challenging to manage.[7] Previous studies have been performed about frequency, diameter, and other anatomical features of lingual foramen and its canals. The present paper illustrated the radiographic presentation and a few anatomical variations encountered while viewing the anterior mandible on Cone Beam Computed Tomography scan.

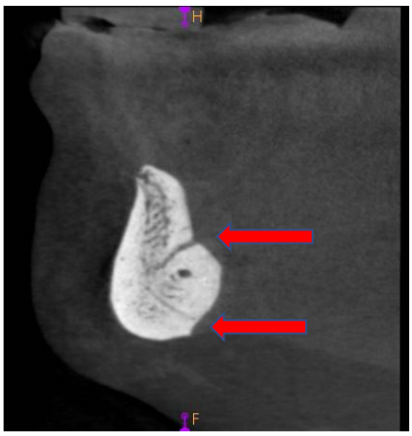

Fig. 1: Sagittal section shows Lingual Foramina seen superior and inferior to the Genial tubercle

Fig. 2: Sagittal section shows Lingual Foramina seen superior to the Genial tubercle as a linear hypodensity opening at the lingual surface of mandible

About the frequency of detection of the lingual foramen, McDonnel et al.[8] found the foramen to be present in 99.04% of specimens.

Rosano et al.[9] found lingual foramen in 100% of cases in their cadaveric study, while Tagaya et al.[10] published a double study on five cadavers and 200 patients using CBCT reporting the occurrence of lingual foramen in all cadavers and in 95% of patients.

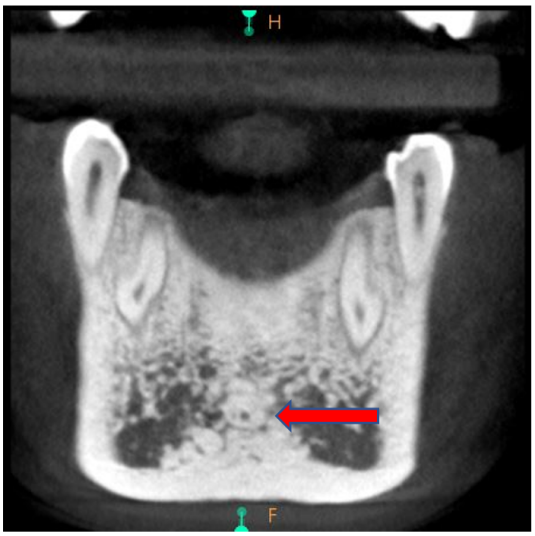

Fig. 3: Coronal section shows Lingual Foramina as a circular hypodensity in the midline in proximity to the inferior border of mandible

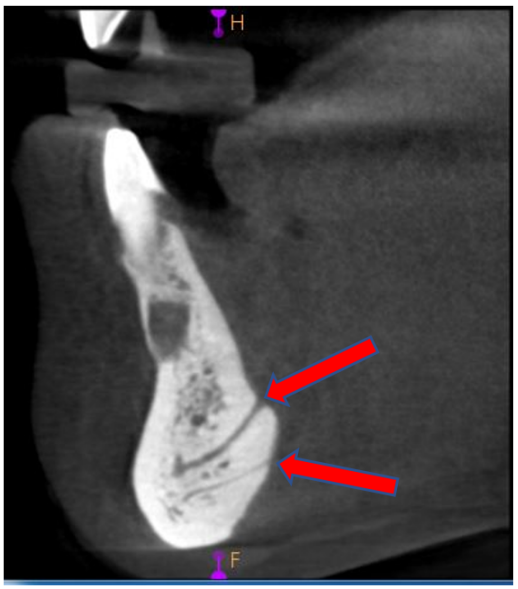

Fig. 4: Sagittal section shows Lingual Foramina superior and inferior to the genial tubercle

In a study conducted by Sheikhi et al.,[11] two lingual foramina were more frequent (52.9%), and the studies conducted by Liang et al.[12] and Tepper et al.[13] studies, in that, they found single foramen was most frequent.

Katakami et al. showed that upto 4 lingual foramen that were seen.[14]

According to Scaravilli et al,[15] Out of 114 patients, 103 (90.35%) had at least one lingual vascular canal and 52 (45.61%) had multiple (two or three) canals.

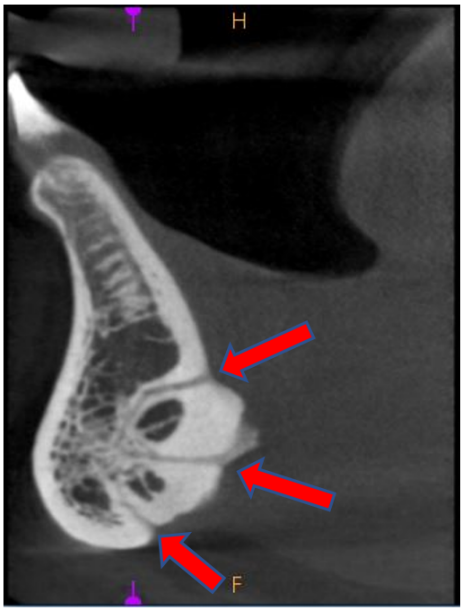

Fig. 5: Sagittal section shows multiple (3) Lingual Foramina superior and inferior to the genial tubercle with multiple openings at the lingual surface of mandible

The total number of LF has been also investigated by Xie et al.[16] one lateral lingual foramen was seen in 37.3%, two in 19.7%, three or more in 5.4%.

A single lingul foramen was the most common (75%) as observed in the findings of Babiuc et al,[17] Aoun et al.,[18] but Choi et al,[19] Kim et al,[20] and Sheikhi et al,[11] reported that double foramina were the most frequent. He et al.[21] reported that most patients had three or four foramina.

The limited, albeit high, spatial resolution of CT probably might be responsible for a lower detection rate of the LF, although according to several authors CBCT provides highly accurate data concerning mandible anatomy and state that the different frequencies reported in literature is mostly related to the anatomical variability related to different geographical regions.[22]

Here, we have shown a few images on coronal and sagittal sections of Cone Beam Computed Tomography, depicting the variations seen on a scan facilitating identification, and proper treatment planning keeping in mind, the implications of the major and minor surgical procedures. Alongside, it showcases the superiority of CBCT in portraying the anatomy immaculately.

4. Conclusion

Precise assessment of the location of anatomical structures is imperative prior to surgical procedures. There may be one or more lingual foramina in an individual. Advanced as well as age old treatments in the dentistry involve invasive surgical procedures like implant placement and

minor surgical procedures like extractions; which are often accompanied by undesirable outcomes. In some cases, damage to or near the lingual foramen also causes trigeminal neuralgia, haemorrhage and subsequent hematoma formation which are serious complications. Hence, the anatomy, its variations and how it looks on a scan should be perceived by the radiologist.

CBCT enhances the treatment planning and helps determine the prognosis of treatment and therefore the radiographic appearance and normal anatomic variations are imperative for any radiologist.

5. Source of Funding

None.

6. Conflict of Interest

None.

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