Research Article

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CBCT as a Diagnostic Tool in Visualizing Lingual Foramen: A Case Study

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ABSTRACT

Aim: This was conducted to visualize lingual foramen using CBCT.

Material & Method: A cross-sectional retrospective study was conducted using cone beam computed tomography (CBCT) images of 100 patients who attended the department for various imaging purposes. The examinations were taken using the carestream 9300 machine CBCT unit, applying a standardized exposure protocol. Image reconstruction from the raw data was performed using the CS 3D imaging software.

Result: We studies 100 scans out of which in 92 lingual foramen was visible.

Conclusion: Lingual foramen transmits neurovascular bundles to surrounding structures, hence any damage to the lingual foramen during surgical procedures can result in haemorrhage and/or neurosensory disturbances. It is therefore beneficial for the dentist to be aware of the structures present in the anterior mandible when considering any surgical procedures or implant planning. Hence, CBCT plays an important role during implant planning and surgical procedures in dentistry.

Keywords: Lingual foramen, CBCT, neurovascular bundle.

INTRODUCTION

The knowledge of anatomical and morphological characteristics of mandible helps clinicians in each and every step of practicing dentistry. 2D imaging had been the backbone of dentistry since ages and now it is the era of advanced imaging which is not only helpful to clinician but also beneficial to patients in getting best of treatment. The foramens cannot be palpated so specific landmarks are used to determine their location.[1] Incorrect estimation of location of anatomical landmarks might lead to failure of anesthesia as well as may cause injury to vital structures during various osseous surgeries[2].

3D imaging provide maximum detail, minimum distortion and superimposition thus eliminating all the pitfalls of 2D imaging. It is proved to be an ideal imaging modality providing the desired diagnostic information while minimizing the cost and exposure risk to the pateints.[3] CBCT has been reported as a well-suited imaging modality for the craniofacial area. It provides clear and accurate images of structures, and therefore is extremely useful for assessing the bone component. CBCT scanners are easy to use and produce 3D image volume that can be reformatted using software for customized visualization of the anatomy. It provide an effective tool for measuring and locating various anatomical structures thereby reducing the risk of damage to these vital stuctures.

The lingual foramen, though an opening usually present in the midline on the lingual aspect of the

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anterior part of the mandible, could have variations in number and position. In order to prevent haemorrhage during surgical exploration in the mandibular anterior region, a thorough radiological evaluation of the frequency and distribution of the foramens in the mandible using cone beam computed tomography (CBCT) is needed. This study is carried out to visualize the lingual foramen in 100 cases.

MATERIALS & METHOD

A total 100 good quality CBCT scans were selected following all inclusion criteria (dentate, devoid of any osseous pathology , age ranging from 18 to 55 years) irrespective of gender were included in the study. The CBCT scans were done using carestream 9300 machine with exposure parameters 83 KVp, 8mA and 8 second. The acquired images were processed with CS 3D imaging software. The measurements were done using the measuring tools of the CS 3D software. Lingual foramen is visualized in vertical and horizontal planes using (CS3D) software. According to the scan and according to the visibility of the foramen zoom, contrast and brightness were adjusted as needed. Orthogonal slicing is used and using mouse setting, sagittal section image is moved through slices until the opening of lingual foramen is visible on sagittal section. Visibility of foramen is assessed as visible or non visible which is solely on judgement of the examiner after moving through the slices. This study is conducted to evaluate the visibility of lingual foramen.

RESULT

Lingual formen was visible in 92 patients out of 100. There were 52 males and 48 females age ranging from 18 to 55 years all dentulous in the symphysis region.

Table 1: Visibility of lingual foramen

	Total (100)	Males (52)	Females (48)
Visible	92	50	42
Non visible	8	2	6

In 92% of patients lingual foramen was visible . In 96.2% of males while 87.5% of females it was visible.

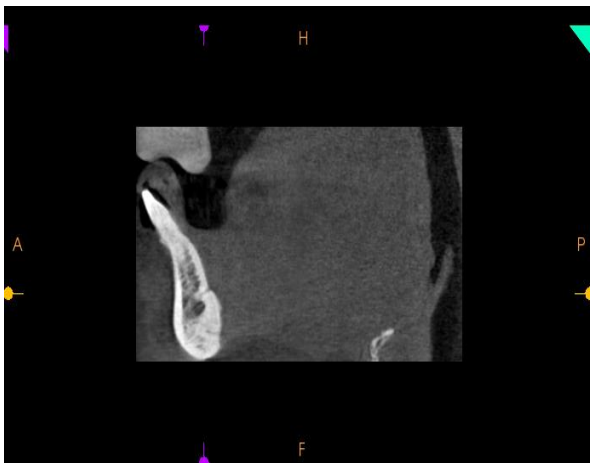

Fig 1: Visibility of mental foramen

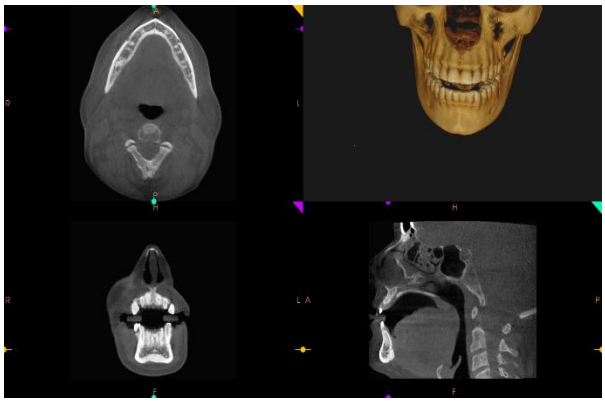

Fig 2: Axial Coronal & Saggital section

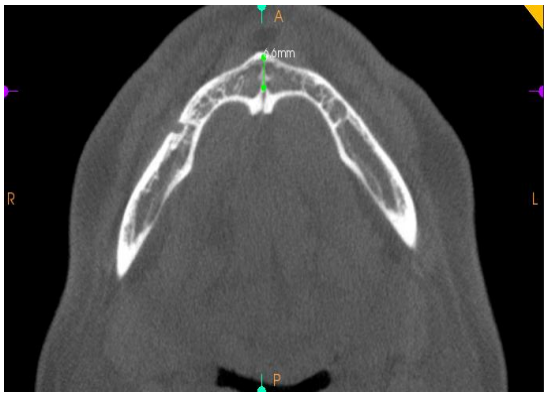

Fig 3: Axial view

DISCUSSION

Dental anatomy textbooks[4,5] equally fail to report on the existence of the lingual foramen. However, the

lingual foramen is well identified on oral radiographs and thus clearly described in textbooks related to radiographic anatomy[6].Knowledge of lingual foramen could be important for presurgical considerations of implant installation in the midline of the mandible. The content of this foramen has been a matter of debate. Some studies[7,8] assume a vascular content, its being an anastomosis of the sublingual branch of the right and left lingual arteries. The artery could be of sufficient size to provoke a hemorrhage intraosseously or in the connective soft tissue, which might be difficult to control. Some studies described the structures associated with foramen as a neurovascular bundle[9]. Some authors consider the superior foramen containing neurovascular bundle from lingual arteries and nerves and inferior foramen is supplied from sublingual or submental arteries and from mylohyoid nerve[6]. The anterior aspect of the mandible, which was generally considered a safe surgical area, must receive more attention in view of the vital structures passing through the lingual foramen. In view of the difference of opinon and lack of consistency associated with lingual foramen, this study was designed to determine its visibility.

In our study 92% visibility of lingual foramen was seen which is consistent with Mahnaz Sheikhi[10] et al using CBCT and with Tepper *et al.*,[11] Gahleitner *et al.* and Mc Donnell studies[12] showing 100% visibility using CT. Yet, our results provide no evidence for those of Jacobs *et al.*[13] study, in which lingual foramen was seen in 82% of the spiral CT images. One possible explanation for this discrepancy is that the reformatting procedure with some CT scans lacking a reformatted cross-sectional slice exactly at the mandibular midline. Furthermore, it is possible that the 1-mm slice thickness may have masked smaller diameter structure on the mandibular midline. Sutton's survey of 300 mandibles, the foramen was present in 85 % of mandibles examined. Cone-beam computed tomography (CBCT) has been shown to be superior to panoramic radiographs in displaying the mandibular lingual foramen and their bony canals variations. Image quality of CBCT systems and their relatively lower dose and cost when compared to conventional computed tomography have allowed more accessible three-dimensional assessment of craniofacial structures in dental practice.[14]

CONCLUSION

This study was aimed at visualizing the lingual foramen , the knowledge of which helps clinicians at each and every step of practicing dentistry ranging from application in local anesthetic ,implant placement or during any osseous surgeries. CBCT was used for visualizing the lingual foramen, which being a 3D imaging provides measurements accurate within 1mm with exposure comparable to OPG and less as compared to CT.

A further study with microdissection will provide insight on the neurovascularisation of the anterior mandible during surgical interventions.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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