



3D EVALUATION OF NUTRIENT CANALS IN MANDIBLE USING CONE BEAM COMPUTED TOMOGRAPHY

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ARTICLE INFO

Article History:

Received 15th May, 2017

Received in revised form 12th

June, 2017 Accepted 6th July, 2017

Published online 28th August, 2017

Key words:

Canals in Mandible, Cone Beam
Computed Tomography

ABSTRACT

Introduction - The present study is focused on nutrient canals as little is published on the number and presence of nutrient canals in the body of mandible. It may be helpful in explaining why some patients still experience pain even after successful local anesthesia during minor surgical procedures.

Aim- The aim of the present study is to assess the presence, number and location of nutrient canals in mandibular arch using CBCT.

Objective- To compare the presence of nutrient canals gender wise, age wise and site wise.

Material And Methods - CBCT scans (Both genders) will be assessed retrospectively for the presence of Nutrient Canals. The canals will be assessed in the entire mandibular arch and necessary analysis will be done.

Results - Our study shows the presence of nutrient canals in general population and accuracy of CBCT in detecting its location and also the prevalence of location. Maximum number of nutrient canals were seen in the anterior region and in the lingual cortical plate.

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INTRODUCTION

Background

Nortjé *et al.* in 1977, has described IAN using panoramic radiographs that have helped physicians in many ways [1, 2] Anatomical Location of inferior alveolar nerve and mental nerve is very significant in obtaining local anesthesia in mandible. Accessory canal contains nerve fiber and they are not anesthetised then pain during and after surgical procedure in mandible is unwelcome sequel.

So to diagnose the location of accessory canal only by IOPA or Panoramic X-Ray is a blind and directionless protocol. So newer diagnostic methods of cone beam computed tomography or magnetic resonance imaging or computed tomography made the detection of accessory canal easy and precise [15-23].

There are many literature on the mandibular nerve canal and the mental foramen available [3-14]. Nutrient canal have similar anatomical and radiological appearance as of accessory canals, that is canal through either buccal or lingual plate.

Due to the availability of CBCT these canal and surrounding structures can be mineralized more properly [24-25]. A thorough understanding of the prevalence and distribution of these accessory canals is clinically important. Several reports have documented sensory disturbances caused by direct trauma to the mandibular incisive canal bundle in the interforaminal region as a result of surgical implant placement.[26-27]

As the demand for the placement of osseointegrated dental implants and grafting procedures in the rehabilitation of edentulous areas of the jaws increases, the pre-operative evaluation of anatomical variations, with respect to both the distribution and morphology of these canals, will be of even greater importance.

Aim- Use of cone Beam computed tomography for assessing the number of nutrient canal emerging from body of mandible in buccal and lingual cortical plates.

MATERIALS & METHODS

A retrospective analysis of 120 successive CBCT scans, exposed at mgv's kbh dental college and hospital, nashik, was performed. Patients were both male and female, with ages ranging from 20 to 80 years.

After applying the exclusion criteria (immune compromised

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patients, the presence of severe ridge resorption, existing implants, prosthesis, a previous history of trauma or surgery, poor image quality and subsequent scans of the same individuals), 120 scans were included in this study. 60 Number of male and 60 number of female patients scans were selected by the machine. Patients database was made by obtaining birthday and gender. The CBCT scan selected were taken for detecting 3rd molar impaction purpose or implant planning. The physical and mental health of all patient was normal and they were not taking any medicine for curative and palliative purpose and were not immunocompromised.

CBCT images having field of vision 8 x 8.5 were taken. Location of accessory or nutrient canal localized in buccal or lingual cortical plates were seen in normal light of SIRONA company CBCT machine. Viewing was done by same investigator. Scans were examined for the presence, morphology and anatomical course of accessory canals in the mandible and was viewed from posterior to anterior region and images were seen in sagittal planes for proper assessment of accessory canal.

The mandible was viewed from posterior to anterior for assesment of nutrient canals. Any observed radiolucent line meeting the following criteria was considered to represent an accessory canal: not previously reported as a known anatomical landmark in the oral radiology literature, was not present in all patients scanned and was not related to any kind of pathology. All the results were entered in excel digital database for further analysis.



A



B



C



D



E

RESULTS

Table 1 shows prevalence of nutrient canals in the buccal and lingual cortical plate which showed higher prevalence in buccal plate

COMPARISON OF TOTAL NO OF NUTRIENT CANALS IN BUCCAL AND LINGUAL CORTICAL PLATE VALUE IS SIGNIFICANT		
	Mean + SD	P - value
<u>Buccal</u> total	2.39+1.46	
Lingual total	2.775+1.405	0.0395

Table 2 shows prevalence of nutrient canals in the anterior and posterior region which showed higher prevalence in anterior region.

COMPARISON OF TOTAL NO OF NUTRIENT CANALS IN ANTERIOR AND POSTERIOR REGION VALUE IS SIGNIFICANT		
	Mean + SD	P - value
Anterior total	3.775+1.803	
Posterior total	1.37+1.046	0.001

Table 3 and 4 show the number of nutrient canals in male and female patients. Statistical difference was seen in comparing presence of nutrient canals in anterior and posterior region and buccal and lingual plates but no statistical difference was seen in comparing in gender.

Table 3 Number of Canals In Female

No of canals	Frequency	Percent
0	1	1.7
2	4	6.7
3	4	6.7
4	15	25.0
5	11	18.3
6	11	18.3
7	7	11.7
8	3	5.0
9	3	5.0
10	1	1.7
Total	60	100.0

Table 4 Number of Canals in Male

No. of canals	Frequency	Percent
0	5	8.3
2	3	5.0
3	6	10.0
4	9	15.0
5	6	10.0
6	16	26.7
7	7	11.7
8	5	8.3
9	2	3.3
10	1	1.7
Total	60	100.0

DISCUSSION

There are few literature present on the presence of nutrient canal. Our study adds to the importance of the presence of the nutrient canal in the whole of mandible and not just the symphysis area. In our study we have obtained significant difference between nutrient canals in buccal and lingual cortical plates and also between anterior and posterior region. Also we have obtained maximum and minimum no. of nutrient canals amongst the no. of male and female patients. Hirschfeld’ first described nutrient channels and foramina on radiographs which he called “interdental channels.” Since then there have been a number of reports on these structures. Ennis and associates⁶ described the anatomy of nutrient canals by stating that they are derived from the incisive branch of the mandibular artery supplying the region anterior to the mental foramen and that the terminal points of these canals are seen as small nutrient foramina on the superior labial surface of the anterior mandibular area. [28,29,30]

Several dental procedures need anesthesia. It is observed that several times the anesthetic block does not act, or the patient suffering pain ever after giving sufficient block or during excavation of carious lesion. Patient suffers pain of an particular spot due to tactile stimulus.

Patient may experience pain during implant placement. The cause can be nutrient canals presence. Also nutrient canals are held responsible for post operative bleeding after surgical procedure like extraction of tooth. [31] The nutrient canal hold a nerve and a blood vessel that causes complications. Only few individual in our study had no accessory nutrient canal. So patients with no nutrient canals can be said to be exceptions. Studies have shown pressure of nutrients canal in mandibular region mostly and in edentulous patients

frequently and in patients with high bone density. 32 It is possible to detect lingual canals using CBCT which is not possible using OPG or IOPA Wang *et al.* [33] reported an unusual case where anastomoses and foramina were detected at the end of NC by means of a periapical radiograph. Based on anatomical studies, they are reported to terminate in the foramina located interdental on the labial or lingual surfaces of the anterior region of the mandible. Although anatomic landmarks on reformatted mandibular and maxillary dental CT images and their relation to neurovascular and muscular structures, including NC, have been described by Abrahams [34], this is the first study to our knowledge that describes the incidence and anatomical location of NCs in the anterior mandible using CBCT. Atushi ogawa *et al* in a study concluded than nutrient canals are almost permanent finding on CBCT scans.[35] Yeildirim *et al* reported 37% patients with lingual foramina located in lateral incision to first premolar.[36]

Some times patients may also experience pain during implant placement for which nutrient canals can be held responsible. The same holds for post-operative bleeding of pain after surgical procedures, such as implant placement and impacted tooth extraction.

Nutrient canals or accessory canals can hold a nerve and a blood vessel, which can explain the complications. The presence of accessory canals is often overlooked by implantologists and they should be pointed out to them by dental and maxillofacial radiologists when reading the images.

The results of our study show clearly that patients without accessory or nutrient canals are exceptional. Only few patients had no accessory canals whatsoever. Hence it is more correct to speak of exceptions if patients have no accessory or nutrient canals in their mandible. Assessing the presence of accessory canals in the mandible is important and should not be ignored

CONCLUSION

Assesment of nutrient canals using Cbct is not reported in sufficient literature. The identification of nutrient canals pre-operatively may prone useful during pre surgical planning. Our study shows the presence of nutrient canals in general population and accuracy of CBCT in detecting its location and also the prevalence of location.

This is necessary for pre planning and performing procedures such as bone harvesting, implant placements etc. Patients without so-called accessory canals in the mandible are to be called exceptional. In other words, with regard to the results of this study, accessory canals can be considered as “normal”

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How to cite this article:

Apurva Patil *et al* (2017) '3d Evaluation of Nutrient Canals in Mandible Using Cone Beam Computed Tomography', *International Journal of Current Advanced Research*, 06(08), pp. 5276-5280.
DOI: <http://dx.doi.org/10.24327/ijcar.2017.5280.0689>
