IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

"Morphologic Evaluation of Anterior Loop of Inferior Alveolar Nerve (IAN) by Using a Cone-Beam Computer Tomography: An Observational Study"

Dr. Sonali Laxmanrao Dumne[1], Dr. Subodh Pandurang Gaikwad[2], Dr. Monica jaideep mahajani[3], Dr.Surabhi Chavhan[4], Dr.Manali Patil[5]

[1]Post Graduate student , [2]Associate Professor, [3]Professor and Head of Department, [4]Post Graduate student , [5]Post Graduate student ,

[1]Department of Periodontology and Implantology,

[1]DR.HSRSM dental college, Hingoli, Maharashtra, India.

Abstract:

We all aware about the position and variation of inferior alveolar canal is mandatory to avoid iatrogenic complication. This study was conducted among 45 patients to determine variation in inferior alveolar nerve (IAN) loop through cone-beam computed tomography (CBCT) images.

Materials and Methods: CBCT images of 40 patients were involved in this study. All images were studied to see Type I, Type II, and Type III pattern of IAN. Results were subjected to statistical analysis for correct inferences.

Results: 21 males and 19 females were included in the study. The difference was statistically non-significant (P = 0.35). Type I pattern was seen in 9 patients, Type II in 12, and Type III in 19 patients. The difference was statistically significant (P < 0.05). The most prevalent pattern was Type III (males - 5 and females - 14), followed by Type I (males - 6 and females - 3) and Type II (males - 10 and females - 3). There was statistical significance difference between males and females in Type II (P < 0.05).

Conclusion: The anterior loop of IAN is quite common and show variation in structure. The most common pattern recorded was Type III. CBCT is very useful in the detection of IANC.

Keywords- Anterior loop, Cone-Beam Computer Tomography, Prevalence

INTRODUCTION

Inferior alveolar nerve (IAN) may be directed anteriorly or inferiorly from the mental foramen forming loop by curving back termed as anterior loop of IAN. IAN itself may show variation in its structures. It can be straight and angled. (Fig 1)

The placement of the dental implant in premolar region may demands precise study of the region as improper placement may lead to paresthesia and ultimately failure of treatment. To avoid iatrogenic complication, the sound awareness of its alteration is considerable.

Various studies have reported the prevalence rate that ranges from 22% to 88%. [1, 2] Computed tomography (CT), cone-beam Computed tomography (CBCT), and direct anatomical analysis are reliable diagnostic for evaluation of IAN. The thorough knowledge of anatomical structures and landmarks are of paramount importance in dentistry. A dental implant in prosthodontics, surgical extraction of an impacted tooth in oral surgery, Apicectomy and retrograde restoration in Endodontic, Gingivectomy or flap surgery in periodontics etc. adequate distance from vital anatomical structures are necessary to maintain normal function of the oral cavity.

In mandible, important landmarks such as mental foramen, inferior alveolar nerve canal (IANC), submandibular fossa, and mandibular foramen are of prime importance whereas in maxilla, floor of maxillary sinus or nasal cavity carry huge value. The variation in their structure, anatomy is a challenge for dentists as they may show the disparity in person-to-person.

IANC has superior and inferior borders which carries neurovascular bundles. CBCT is reliable tools for assessing its position and exact location. CBCT has been proved slightly better in this regards since it provides fine details and less patient exposure as compared to CT. [1] moreover, it gives image without overlapping and distortion.

In some studies, anatomical planes have been utilized as landmarks in determining the anterior loop of Inferior alveolar canal. Thus, there should be some reliable method which helps in locating anterior loop of Inferior alveolar canal. [3]

Solar et al. [4] classified anterior loop into Type I, Type II, and Type III. In Type I, Y-shaped anatomy is observed while anterior loop is missing; in Type II, anatomy is T-shaped while anterior loop is absent; and in Type III, Y-shaped anatomy is seen, and the incisive branch is thicker as compared to main branch. Incisive nerve one of the two terminal branch of IAN of posterior division of the trigeminal nerve.

Aim of this study was conducted to determine variation in IAN loop with the help of CBCT.

MATERIALS AND METHODS

This study comprised 40 good quality CBCT images of patients visiting the Department of Radiology due to any complaint. All were informed regarding the study, and written consent was obtained. Ethical clearance was taken before the study.

Patients with a history of some previous surgery in the mandible such as orthognathic surgery, operated cases of cysts and tumors in mandible, patients with developmental disorders, and trauma to mandible were excluded from the study. Poor quality images of no diagnostic value were not considered. In all patients, CBCT images were obtained using the same machine (Newton) under standardized exposure parameter (85 kVp, 12 s, and 10 mA) with the field of view 8 cm × 11 cm. (fig-2) Sagittal, axial, and coronal sections were obtained.

RESULT

Results are tabulated and subjected to statistical analysis using Chi-square test. A value of $P < 0.05$ was considered statistically significant. CBCT shows that of 40 patients, males were 21 and females were 19.The difference was statistically non-significant (P-0.35). Distribution of patients Gender Males Females Age (years), mean SD 38.6±2.4 34.2±1.6 0.12 SD: Standard deviation. The difference was statistically no significant ($P = 0.49$). (Fig-7).

DISCUSSION

The detection of IAC can be seen in various radiographs. Panoramic radiographs being two-dimensional (2D) cannot help in exact localization. (Fig-3)The anterior loop of IAN may not be seen on panoramic images. With the advent of CT and CBCT, this has been made easier. Three-dimensional (3D) nature of CBCT is very effective as all the sections such as axial, coronal, and sagittal may be utilized in detection of the IAC. Any variation in its structure or morphology is evident in CBCT sections. Any shortcoming on other radiological view other than CBCT may be overcome by it. The field of dentistry since the pre surgical assessment has made easier with the CBCT, thus minimized the risk of complication which may occur due to poor assessment of anatomical structures such as IAC. A recent study by Li et al. in 2013, utilized spiral computer tomography in determining the prevalence, position, and length of IAC in a Chinese population.[5]Another study by Kuzmanovic et al.[6] assessed the anterior loop of inferior alveolar nerve by radiological and morphological study. In this study, he involved 90 patients who were exposed to CBCT of the mandible to assess the IANC. It included 40 males and 50 females. He utilized axial, coronal, and sagittal sections and multiplanar reformation was done in detecting variation in patterns of IANC. The anterior loop of IAN showed Type III pattern in 50% of study population.

The result of this study is in agreement with the study conducted by Demir et al.[7] who conducted study on Turkish population to detect anterior loop of IAC using CBCT. Type I was seen in 29% and Type II in 21% of cases. We found that 15 males and 30 females exhibited Type III pattern (50%), whereas Type I was seen in 14 males and 12 females (28.9% subjects). Type II was seen in 19 patients (21.1%) (Males - 11, females - 8). There was a statistical significance difference between males and females in relation to Type III pattern ($P < 0.05$), whereas other patterns were statistically non-significant ($P > 0.05$).

Kaya et al. [8] conducted a study to detect the anterior loop of IAN by comparing panoramic images with spiral CT and observed the lower prevalence of panoramic images as compared to spiral CT. The lower occurrence on panoramic may be explained by the fact that 2D nature of the imaging modality might miss the finer details whereas spiral CT showed higher prevalence rate. In this study, he utilized CBCT because it is quite cheaper as compared to CT. Moreover, it is beneficial regarding lower patient exposure, easy technique, and details are more evident. However, the only limitation with CBCT is low contrast and resolution as compared to CT. Wismeijer et al. [9] have suggested 3-mm distance from mental foramen safety margin. The major complications such as paresthesia of the lower lip may be avoided by considering the safety margin. The placement of the dental implant anterior and posterior to this safety margin is beneficial for both patient and the operator. Filo et al. [10] in their study, assessed the anterior loop of IAC at mental foramen and found it in >75% of patients. The bilateral occurrence was seen in most of the patients, thus suggesting CBCT as important radiographic aid before placing dental implant in the mandibular region, especially around premolars.

The measurement of the anterior loop of IAC was also done in their study, though we did not include this parameter in the present study. The need of 3D imaging was well appreciated.

CONCLUSION

There is variation in the occurrence of IANC. The anterior loop of IAN is quite common. In this study, we found different patterns. The most common pattern recorded was Type III. Females exhibited higher prevalence than males. This may help in gender identification. However, large-scale studies are required to substantiate the results obtained in this study. CBCT proved to be useful in detection of the masked anterior loop of IAN.

IV. RESULTS AND DISCUSSION

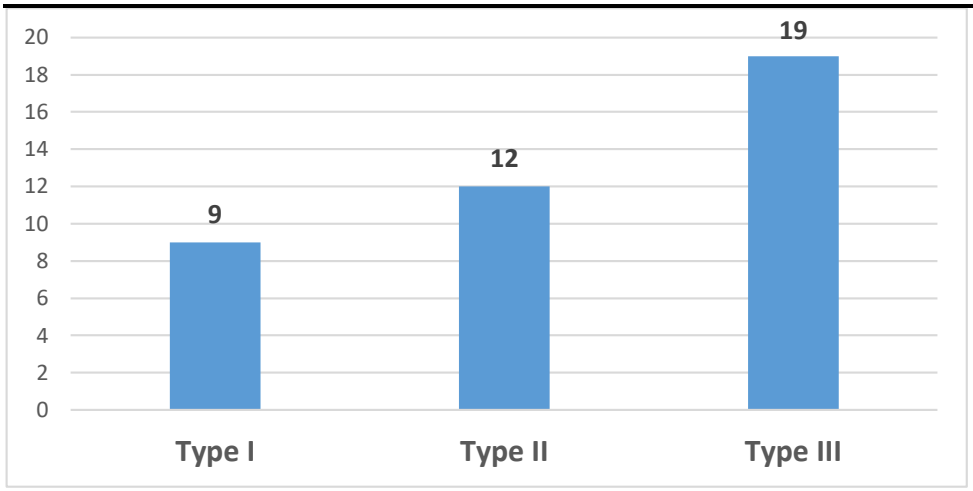
4. TABLES

1. Distribution of patients (TABLE 1)

	Male	Female	P value
N	21	19	0.80
Age (Years), mean+-SD	52.00 (9.09)	53.89 (8.17)	0.49

TABLE 1 shows that Type I pattern was seen in 9 (21%), Type II in 12 (29%), and Type III in 19 (50%) of patients. The difference was statistically.

Different Types of loops (in numbers) (TABLE 2)



3. Gender wise distributions (TABLE 3)

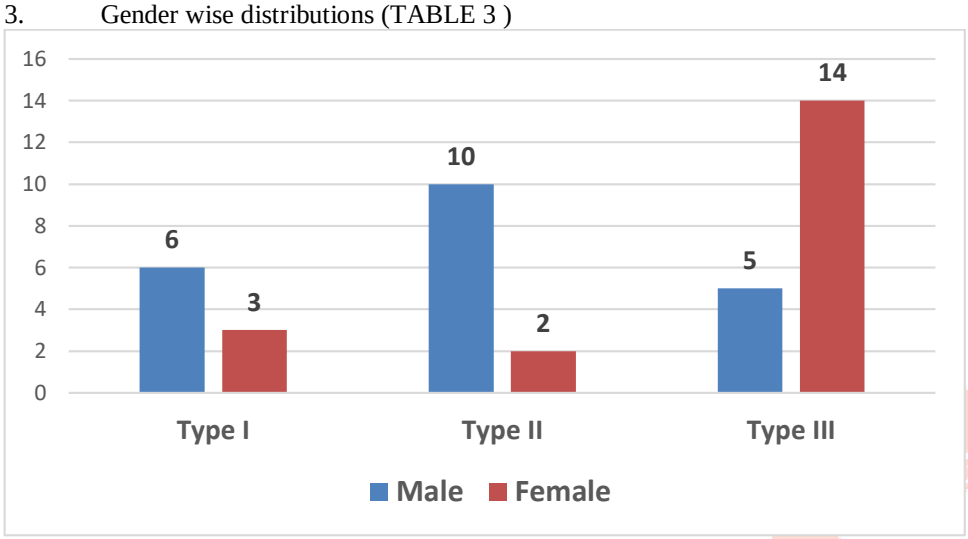


TABLE 2 AND 3 shows that Type I pattern was observed in 9 (15.5%) males and 3 (13.4%) females, Type II pattern was seen in 10 (12.2%) males and 2 females (8.8%), and Type III in 5 (16.7%) males and 14 (33.4%) females. In gender wise, for TypeI, there is no statistically sig difference (P value = 0.35), while For type II (P value= 0.01) and for Type II (0.001) there is statistically significant difference. Type II ($P < 0.05$), whereas Type I and III did not show any difference ($P > 0.05$).

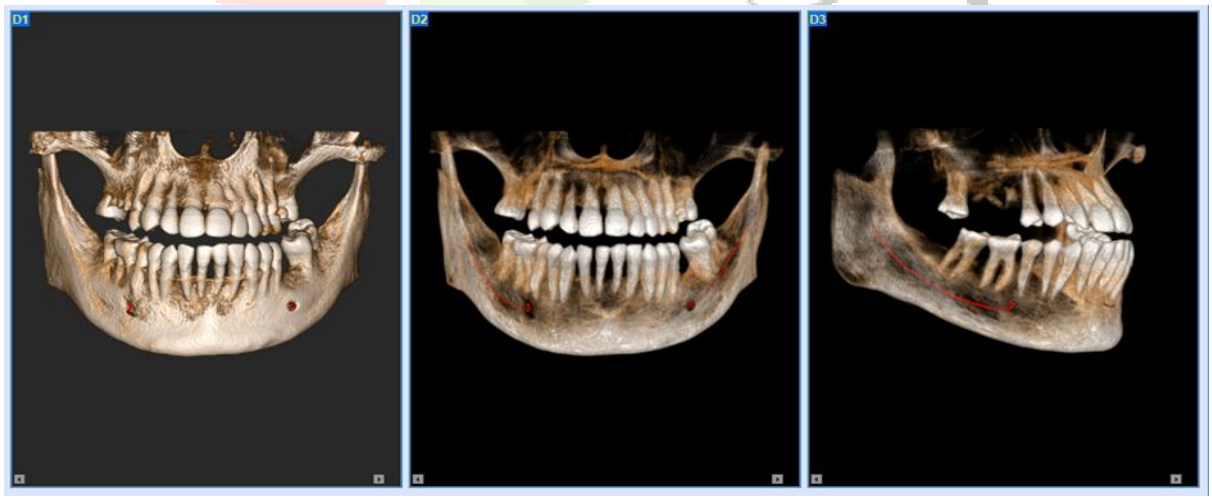


Fig 1 – position of IAN and curving back through mental foramen.

Panoramic views were utilized for generation of sections. (Fig-3)

Fig-2 (Newtom) CBCT machine.

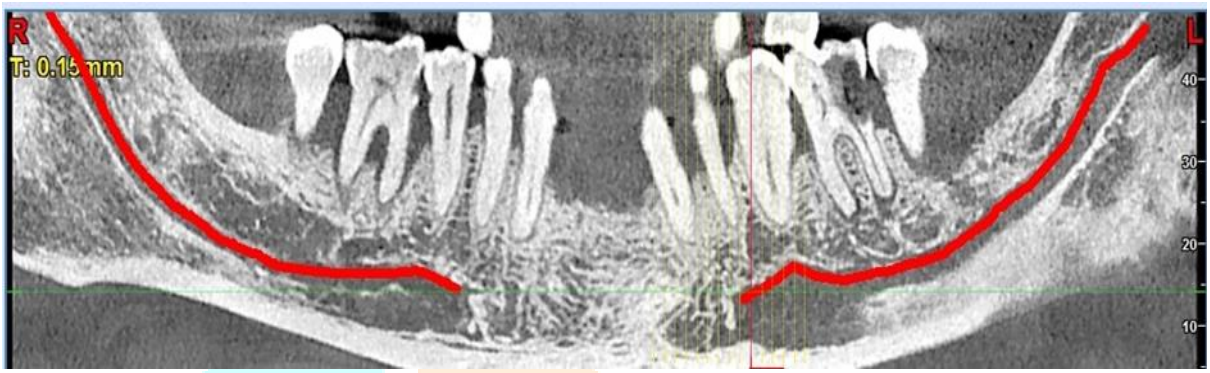


Fig-3 Panoramic section displaying inferior alveolar nerve canal

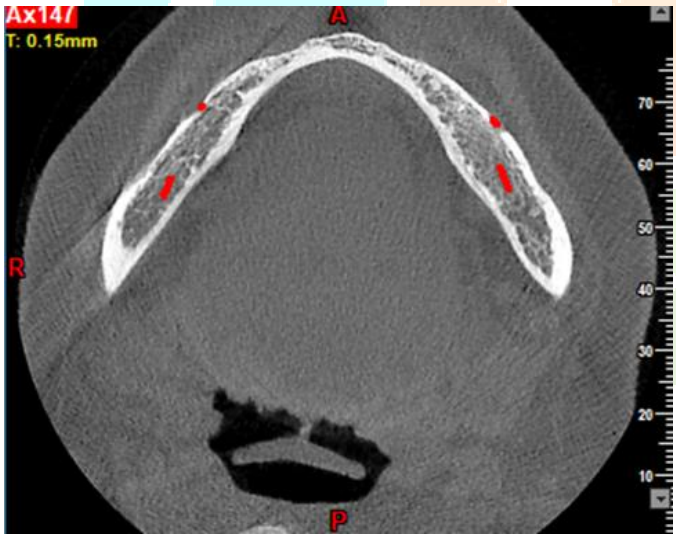


Fig-4 Axial section showing the left and right mental foramen

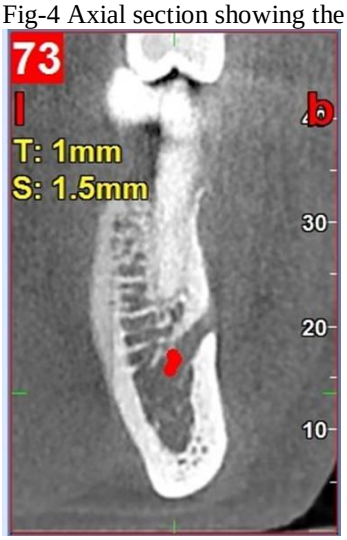


Fig -5 Coronal sections showing Type I pattern

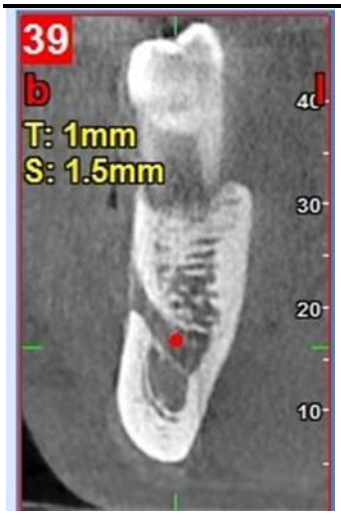


Fig- 6 Coronal sections showing Type III pattern

REFERENCES

1. Suomalainen A, Kiljunen T, Käser Y, Peltola J, Kortesniemi M. Dosimetry and image quality of four dental cone beam computed tomography scanners compared with multislice computed tomography scanners. Dentomaxillofac Radiol 2009;38:367-78.
2. Rosa MB, Sotto-Maior BS, Machado Vde C, Francischone CE. Retrospective study of the anterior loop of the inferior alveolar nerve and the incisive canal using cone beam computed tomography. Int J Oral Maxillofac Implants 2013;28:388-92.
3. Greenstein G, Tarnow D. The mental foramen and nerve: Clinical and anatomical factors related to dental implant placement: A literature review. J Periodontol 2006;77:1933-43.
4. Solar P, Ulm C, Frey G, Matejka M. A classification of the intraosseous paths of the mental nerve. Int J Oral Maxillofac Implants 1994;9:339-44.
5. Li X, Jin ZK, Zhao H, Yang K, Duan JM, Wang WJ, et al. The prevalence, length and position of the anterior loop of the inferior alveolar nerve in Chinese, assessed by spiral computed tomography. Surg Radiol Anat 2013;35:823-30.
6. Kuzmanovic DV, Payne AG, Kieser JA, Dias GJ. Anterior loop of the mental nerve: A morphological and radiographic study. Clin Oral Implants Res 2003;14:464-71.
7. Demir A, Izgi E, Pekiner FN. Anterior loop of the mental foramen in a Turkish subpopulation with dentate patients: A cone beam computed tomography study. J Marmara Univ Inst Health Sci 2015;5:231-8. 10.
8. Kaya Y, Sencimen M, Sahin S, Okcu KM, Dogan N, Bahcecitapar M, et al. Retrospective radiographic evaluation of the anterior loop of the mental nerve: Comparison between panoramic radiography and spiral computerized tomography. Int J Oral Maxillofac Implants 2008;23:919-25.
9. Wismeijer D, van Waas MA, Vermeeren JI, Kalk W. Patients' perception of sensory disturbances of the mental nerve before and after implant surgery: A prospective study of 110 patients. Br J Oral Maxillofac Surg 1997;35:254-9.
10. Filo K, Schneider T, Locher MC, Kruse AL, Lübbers HT. The inferior alveolar nerve's loop at the mental foramen and its implications for surgery. J Am Dent Assoc 2014;145:260-9.