EVALUATION OF APPEARANCE, LOCATION, COURSE AND MORPHOLOGY OF THE MANDIBULAR INCISIVE CANAL USING ORTHOPANTOMOGRAM IN SOUTH INDIAN POPULATION

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ABSTRACT:

Aim:

The aim of the study is to evaluate the appearance, location, course and morphology of the mandibular incisive canal using Orthopantomogram in the South Indian population based on gender and age group.

Materials and Methods:

The study consisted of 2000 OPG's ranging from 18 yrs to 75 yrs at Saveetha Dental College & Dental Hospital, Chennai to evaluate the appearance and visibility of anatomical structure of mandible on Orthopantomogram - Mandibular canal, mental foramen, incisive canal, lingual foramen . OPG's with malinformation, trauma, muscoskeletal disorder were excluded from the study.

Results:

Out of 2000 OPG's the visibility of mandibular incisive canal in male gender is 90% visible when compared to female gender figuring to 83% (Graph 1). The visualization of presence of mandibular incisive canal between age group 18- 59 years is 90% whereas between 60-75 years it starts to reduce gradually to 85%.

Conclusion:

The study has revealed that Orthopantomogram (panoramic radiography) are used to give painless, fast and easy X-ray of the jaws without radiation left in the body . OPG can be considered for the cognizance of the position of anatomical structures during the major maxillofacial surgeries and placement of endosseous implants to provide sufficient information.

Keywords: Appearance; Location; Course; Morphology; Mandibular Incisive Canal; Orthopantomogram;

INTRODUCTION:

The mandibular incisive canal is a bony canal within the anterior mandible that runs bilaterally from the mental foramina usually to the region of the ipsilateral lateral incisor teeth(1). X-rays is a known method that uses radiation to take pictures of bones and other parts inside the body. Orthopantomogram is a panoramic scanning dental X-ray of the upper and lower jaw. It shows a flattened two-dimensional view of a half-circle from ear to ear. Panoramic x-rays allow images of multiple angles to be taken to make up the composite panoramic image, where the maxilla (upper jaw) and mandible (lower jaw) are in the viewed area. (2) It also demonstrates the number, position and growth of all the teeth including those that have not yet surfaced or erupted through the gum. It is different from the small close up x-rays dentists take of individual teeth. It shows less fine detail, but a much broader area of view. This view is useful to check the invisible like wisdom teeth, the development of a child's jaw and teeth. It is also often used to check jaw joints, the TMJ (tempero mandibular joint), on special occasions the CMA (cranio-mandibular articulation) .

The mandibular incisive canal is the medial extension of the mental nerve, which runs in the anterior region of the mandible and may open lingually close to the genial tubercle. The nerve will vary in course, with multi-morphic representation (3). The number of cases with surgical intervention in the inter-foraminal area has increased considerably as this region has good bone quality and quantity along with the perception that this is a safe zone. Failure in ascertaining the exact position of the neurovascular bundle in this region may lead to complications like transient or long term paresthesia of the associated region.

Knowledge of the anatomy in the region between the mental foramens is still poorly documented although correct identification of the anatomical structures in this region is important for the success of surgical procedures (4) . In the literature, complications can be found due to anatomical variation in the inferior alveolar nerve because this nerve can extend forming a canal of the incisive nerve, with an extension anteriorly to the mental foramen towards the middle line . The section of nerve in front of the mental foramen and just before its ramification to the incisive nerve can be defined as the anterior loop of the inferior alveolar nerve. Their presence should always be considered when planning a surgery in an interforaminal region, especially implant surgery, thus avoiding injury to the nerve and neurosensory disorders (5) .

The etiology of mandibular asymmetry is vast and might be a combination of genetic and environmental influences. Common causes include trauma, infections, developmental abnormalities, myogenic problems, and syndromes such as Treacher Collins, occlusal interferences, and joint pathologies like rheumatoid arthritis. Traditionally, mandibular

asymmetry has been diagnosed by a combination of tools. These include a thorough clinical examination followed by photographs of various frontal and side views, in addition to radiographs such as lateral and posteroanterior cephalograms, oblique radiographs of the mandible taken at 45°, and panoramic radiographs (6).

Orthopantomography is a roentgenographic technique allowing examination of the entire dentoalveolar region on a single film.(7) It is used primarily as a rapid screening examination to show the general anatomic relationships of the maxilla, mandible, and adjacent structures. Although dental films provide much finer detail, the orthopantomogram is a simple, rapid, and comfortable examination that can provide useful information on a wide variety of pathological processes with less cost and radiation exposure than the conventional full-mouth periapical series. (8)The orthopantomogram is obtained with the patient standing or sitting with the alveolar ridge parallel to the floor. Only a single exposure is required, during which the x-ray tube makes a sweep about the patient's head (9).

Orthopantomography has the ability to detect the presence of the mandibular incisive canal. The image shows the presence of the incisive canal . An accurate spatial orientation of the nerve anterior to the mental foramen is possible using cone beam computed tomography (CBCT) (10). This visualization can help us in the diagnosis and treatment planning which could prevent any unforeseen problems.The aim of the study is to evaluate the appearance, location, course and morphology of the mandibular incisive canal using Orthopantomogram in the South Indian population based on gender and age group.

Previously our team had conducted numerous clinical trials (11)(12,13)(14,15)(16)(17) and lab animal studies(18,19)(20,21)(22) and in -vitro students (23,24)(25) over the past 5 years. Now we are focussing on epidemiological surveys. The idea for this survey stemmed from the current interest in our community.

MATERIALS AND METHOD:

The study consisted of 2000 OPG's ranging from 18 yrs to 75 yrs at Saveetha Dental College & Dental Hospital, Chennai to evaluate the appearance and visibility of anatomical structure of mandible on Orthopantomogram - Mandibular canal, mental foramen, incisive canal, lingual foramen . OPG's with malinformation, trauma, muscoskeletal disorder were excluded from the study. Questionnaire was framed on the “Evaluation of Appearance, Location, Course and Morphology of the Mandibular Incisive Canal using Orthopantomogram in South Indian Population” was distributed in Google forms as an online Survey. The advantages of online setting is that more participants can be easily met with and data can be collected faster.

Questionnaire validity checking was done by consulting experts. The data was collected, analyzed and represented in a Bar Chart in SPSS software statistically.

RESULTS AND DISCUSSION:

All the calculations are processed using statistical Package for Social Science software. Descriptive statistics including tables and graphs are applied to show the outcome of the study.
Out of 2000 OPG's the visibility of mandibular incisive canal in male gender is 90% visible when compared to female gender figuring to 83% (Graph 1). The visualization of presence of mandibular incisive canal between age group 18- 59 years is 90% whereas between 60-75 years it starts to reduce gradually to 85%.

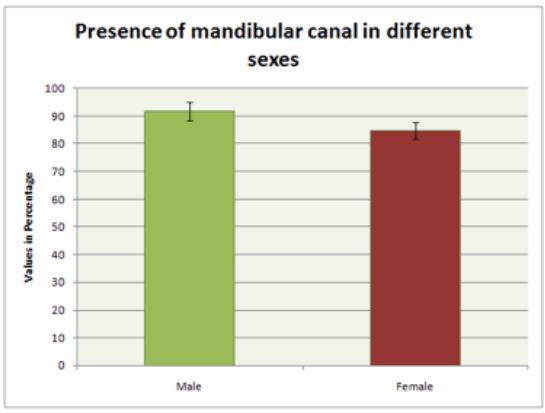

Figure 1: The bar graph represents the percentage distribution showing responses to presence of mandibular canal in different sexes. X axis represents the gender and Y axis represents the values in percentage. The presence of the mandibular canal is more in males than females.

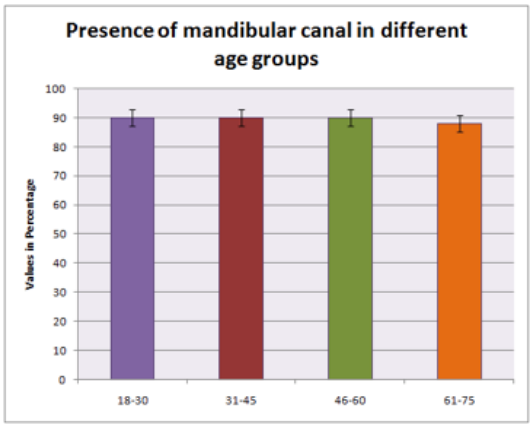

Figure 2: The bar graph represents the percentage distribution showing responses to presence of mandibular canal in different age groups. X axis represents the gender and Y axis represents the different age groups. The presence of the mandibular canal is almost the same in all age groups.

Extraoral radiography like panoramic radiography (also called pantomography) is a technique used for producing a single tomographic image of facial structures, which includes the maxillary and mandibular arches and their supporting structure(26).

OPG is a two-dimensional image, lacking sufficient data in the buccolingual region and enhancing in both vertical and horizontal regions. It serves as a valuable tool for planning surgical assessment of an implant (27). This technique also used to evaluate the topographic relationship between the mandibular canal and impacted third molars. Moreover, it serves as part of the standard of care for preoperative evaluation of an implant site. The advantages of panoramic imaging include visualization of many anatomic features, low cost, and availability. The digital panoramic images when compared with conventional images are equally efficient in the localization of mental and mandibular foramens(28).

The mandibular division of the trigeminal nerve enters the mandibular foramen, as the inferior alveolar nerve and proceeds anteriorly in the mandibular canal to traverses the mandible from the lingual to the buccal side. (29)The nerve is midway between the buccal and lingual cortical plates in the first molar vicinity and in the molar region it divides into the mental and incisive nerve.

In the mental canal, the mental nerve continues upward and emerges from the mental foramen in conjunction with blood vessels. (30)Normally, three nerve branches come out of the mental foramen
One innervates the skin of the mental area, and the other two proceed to the skin of the lower lip, mucous membranes, and the gingiva as far posteriorly as the second premolar.(31) Mandibular incisive canal is a bilateral canal that runs medially from both mental foramens, between lingual and vestibular cortical plates.(32) It contains neurovascular bundle which provides innervation to the lateral and central incisors, canine, and mandibular first premolar.The incisive canal may also appear to be ill-defined, and neurovascular bundles may run through a labyrinth of intertrabecular spaces.

In the present study, the visibility of anatomical structures of the mandibular incisive canal on the panoramic radiograph was assessed. The mandibular incisive canal was observed in 90% Male gender with good visibility. The study done by Tejavathi Nagaraj revealed that gender does not exert effect on the appearance of the anatomical structures in the interforaminal region

and also revealed, significant statistical difference existed between visibility and age of mandibular canal and mental foramen.(33)

The Study done by Kamrun has revealed that the visibility of the superior border was very poor in panoramic images and the use of cross-sectional CT images remarkably improved this poor visualization.(34) The mandibular incisive canal visibility decreases as the age increases because of osteoporotic changes in the bone by decreasing the visibility of superior and inferior border of the canal. The current study has reiterated this fact that the mandibular incisive canal is clearly visible between the age group of 18-60 years and later gradually decreases.

CONCLUSION:

The study has revealed that Orthopantomogram (panoramic radiography) are used to give painless, fast and easy X-ray of the jaws without radiation left in the body . With the increased interest in performing a thorough pre-surgical examination in the inter-foraminal region, Orthopantomogram images should be utilized to obtain information on the appearance, location, and course of the mandibular incisive canals and their relation to other anatomical structures of the jaw.

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