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RESEARCH ARTICLE

ASSESSMENT OF LOCATION AND COURSE OF INFERIOR ALVEOLAR CANAL USING CONE BEAM COMPUTED TOMOGRAPHY

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Mandibular Canal, Inferior Alveolar Canal, Forensic Radiology, CBCT, Gender Determination

Abstract

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Background and Rationale: Forensic radiology is an evolving integral branch of forensic medicine. The most challenging tasks for forensic dentists and anthropologists has been identification and determination of sex of unknown human skeletal remains. Morphological and morphometric analysis of course and relationship with adjacent structures of mandibular canal can be useful in determining gender. CBCT being very useful in forensic contexts offering several advantages for postmortem forensic imaging including good resolution for skeletal imaging, relatively low cost, portability, and simplicity.

Aim and objectives: To determine the sexual dimorphism of mandibular canal using cone beam computed tomography (CBCT) images.

Materials and Methods: Course of mandibular canal classified into types based on considerable distance between the mandibular canal and the root apexes of premolars and molars, A) Catenary, B) Progressive descending, C) Straight. Location of mandibular canal was evaluated in 4 different points. Comparison of length and width of mandibular canal, prevalence of anterior loop, bifid mandibular canal, accessory mental and mandibular canal among genders. Comparison of continuous variables such as distance, length and width of canal with gender and side was done using unpaired t-test. Comparison of categorical variables with gender and side was performed using Chi-square test. The level of significant was 5%.

Results: The prevalence of type of canal was highest in straight canals 53.9% followed by progressive descending and catenary canals 23.7% and 22.4% respectively. Measuring the length of canal showed statically significant result as mean length of IAC was 68.36 ± 5.24, 64.10 ± 3.18 in males and females respectively. Width and distance to adjacent structures had no significant result but dimensions were slightly lesser in females. Prevalence of anterior loop was found to be 57.9%.The most frequently observed type of bifid canal was retromolar42.9% followed by forward 28.6%, dental 19%and buccolingual 9.5%. There was no significant difference of assessing prevalence of anterior loop, accessory mental and mandibular foramen in relation to gender and side.

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Conclusion: Sex determination becomes one of the first priorities in the process of identification by a forensic investigator in the case of mishaps, chemical and nuclear bomb explosions, natural disasters, crime investigations, and ethnic studies.Advanced cross-sectional imaging modalities especially CBCT is a suitable tool for observing anatomic characteristics of mandibular canal in forensic odontology. In the current study we found significant result on type of course and length of canal for gender determination.

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Introduction:-

Identification and determination of sex of unknown human skeletal remains especially in mass disasters, totally mutilated, putrefied, and skeletal remains have been one of the most challenging tasks for forensic dentistry and anthropologists.[1] Application of radiology in forensic sciences was introduced in 1986, to demonstrate the presence of lead bullets inside the head of victim.Preoperative radiographic evaluation plays a key role in minimizing the damage to mandibular canal as a result sensory disturbances of the lower lip and mandibular posterior region, intraoperative and postoperative haemorrhage can be avoided. Radiographically mandibular canal appears as a dark, linear shadow with thin radiopaque superior and inferior borders which cast by the cortical bone that bounds the canal.

The purpose of the present study was to analyse the exact location and position of inferior alveolar canal to the adjacent anatomical structures and to analyse there is any gender variation of these measurements. Since the time of its introduction, CBCT has become the indispensable third eye of dentistry. The study results were undertaken to help the clinician especially surgeons for better understanding of anatomical variation and position of mandibular canal so that it can lead to safe treatment planning for those surgical procedures that involves the mandible.

Forensic radiology utilizesthe imaging methods to advance non-invasive documentation and analysis of forensic findings in both living and dead persons. It has been useful technique and that are efficient, comparatively easy, records can be obtained in both living and dead, and is economical than DNA technology. Here we suggest CBCT play a vital role in crime investigation and mass incidents with lesser radiation and low cost.

Materials and Methods:-

This cross-sectional study was approved by Institutional Ethics Committee/ Institutional Review Board, Government Dental College, Kottayam under the protocol number of IEC/M/15/2018/DCK. A total of 76 CBCT scans of hemi-mandibles were selected those patients underwent CBCT scans for various dental problems, patient age ranges from 18 to 57 of which 41 males and 35 females were taken up for the study. Inclusion criteria of this study, the patients above the age of 18 years.

Exclusion criteria:

1. CBCT exams with artefacts or pathological lesions and posterior edentulousness
2. History of fracture, trauma, orthognathic surgery
3. Any previous manipulation which could alter the position of the mandibular canal

To search the arche of data which shows completely seen from mandibular foramen to mental foramen. A multiplanar reconstruction image will be used, where axial, coronal, sagittal axes will be visualized at intervals of 0.2 mm.

1. The course of mandibular canal was determined based on the study of Worthington, who proposed three types of course A) Catenary, B) Progressive descending, C) Straight. In the catenary type (I), there is a considerable distance between the mandibular canal and the root apexes of premolars and molars. In the progressive descending type (II), there is a greater proximity of the mandibular canal with the molar root apexes, and proximity of the mandibular canal homogeneously with the roots of molars and premolars in the straight type (III).

Figure 1:- Types of course of inferior alveolar canal:

Fig. 1A:- Catenary. **Fig.1B:-** Progressive descending. **Fig. 1C:-** Straight.

2. The first section in trans-axial view after mental foramen, where the loop of mandibular canal is formed, will be selected as point 1 and interludes of 10 mm will be selected for subsequent measurements (respectively, points 2, 3, 4). On these sections, the shortest linear distances (in mm) from the most lingual aspect of the canal to the outer lingual cortical plate of the mandible and from the mandibular canal to the inferior border of mandibular body will be measured. Furthermore, the minimum distance between the buccal cortices and the mandibular canal will be evaluated.

Figure 2:- Distance to adjacent anatomical structures:

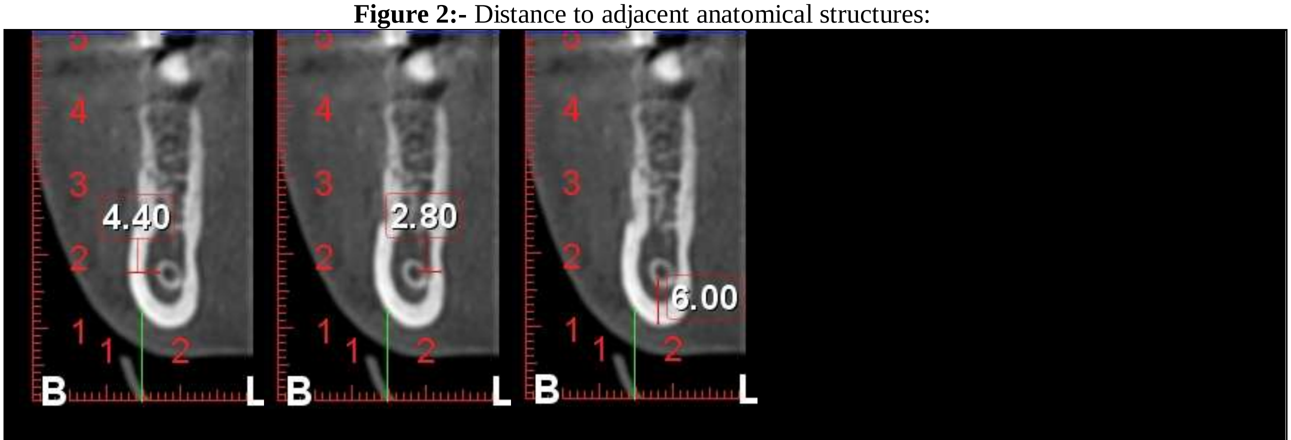


Fig. 2A: Measuring distance from buccal cortical plate

Fig. 2B: Measuring distance from lingual cortical plate

Fig. 2C: Measuring distance from inferior border of mandible

3. Measuring the length of inferior alveolar canal from mandibular foramen to mental foramen in the section of sagittal oblique reformation
4. In cross-sectional view after mental foramen, where the loop of mandibular canal is formed, will be selected as point 1 and interludes of 10 mm will be selected for subsequent measurements (respectively, points 2, 3, 4, 5). On these sections longest diameter of inferior alveolar canal will be measured.
5. Variations of mandibular canal such as accessory canal will be evaluated using coronal, sagittal, cross-sectional and panoramic reconstructed CBCT images for all semi-mandibles. Naitoh et al. classified into the following four categories:

A. Retromolar canal: the branch emerging from the main canal reaches the retromolar region.
B. Dental canal: the end of the separated canal reaches the root apex of the first, second and third molar
C. Forward canal: the branch emerging from the upper border of the main canal
a. Forward canal without confluence: It separates from the mandibular canal in the mandibular ramus and then extends to the second molar area

b. Forward canal with confluence: It separates from the mandibular canal in the mandibular ramus, extends anteriorly and then rejoins to the main mandibular canal.

D. Buccolingual canal: the branch emerging from the buccal or lingual side of the main canal

Figure 3:- Types of bifid mandibular canals:

Fig.3A:- Sagittal image showing retromolar canal type which bifurcated from the main canal to retromolar region.

Fig.3B:- Sagittal image showing dental canal type which bifurcated from the main canal to mesial root of first molar region.

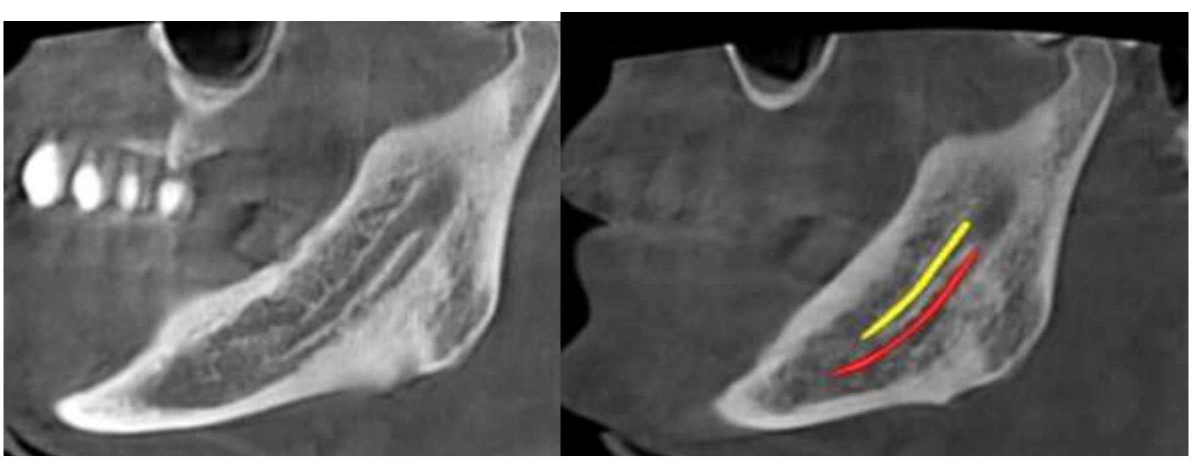


Fig. 3C:- Sagittal image showing forward type of canal without confluence which bifurcated from the main canal to mesial root of first molar region.

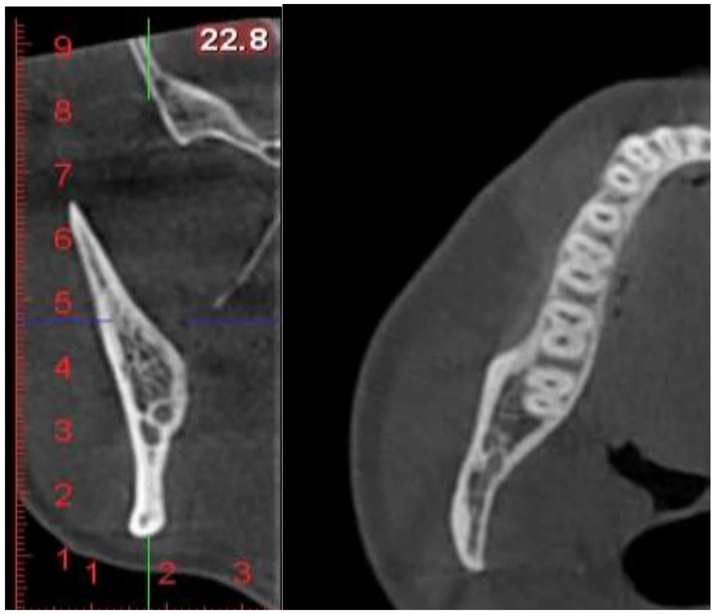


Fig. 3 D:- White arrow on cross- sectional and axial images showing buccal type of canal.

6. Accessory mental foramen will be assessed on axial and cross-sectional CBCT slices of 0.2mm thickeness
7. Accessory mandibular foramen will be assessed on cross-sectional view and 3D reconstruction.

Statistical Analysis:

The observed data were coded, tabulated and analysed using IBM SPSS Version 20. Comparison of continuous variables with gender and side was done using unpaired t-test while with age group was done using ANOVA. Comparison of categorical variables with gender, side and age group was performed using Chi-square test. A p value of less than 0.05 was considered statistically significant.

Results:-

A total of 76 CBCT scans of mandible were enrolled in the study. The demographic profile of the study participants showed that the age of the participants ranged from 18-57 years of which 53.9%(n=41) males and 46.1%(n=35) were females. The characteristics of study population is given in Table 1.

Course of Inferior Alveolar Canal:

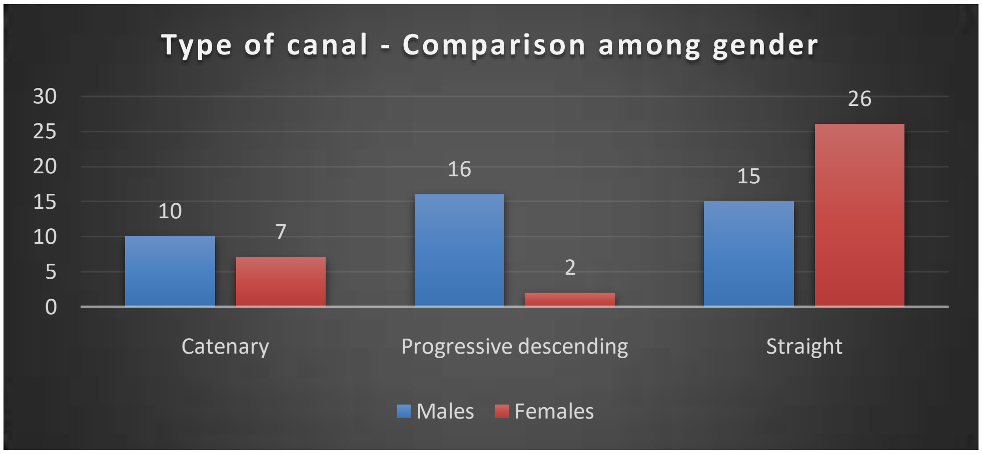
Table 1:- Showing frequency distribution of type of mandibular canal.

Type of canal	Frequency n (%)
Catenary	17 (22.4%)
Progressive descending	18 (23.7%)
Straight	41 (53.9%)

Table 2:- Females showing a higher proportion of straight course compare to males p<0.005.

Gender	Type			p value
	Catenary	Progressive descending	Straight	
Males	10 (24.4%)	16 (39.0%)	15 (36.6%)	0.001*
Females	7 (20.0%)	2 (5.7%)	26 (74.3%)	

*Statistically significant



Graph 1:-Showing distribution of type of canal among gender.

Table 3:- There was no significant difference in relation to sides of jaw(p=0.683).

Side	**Type**			**p value**
	Catenary	Progressive descending	Straight	
Right	9 (22.5%)	11 (27.5%)	20 (50.0%)	0.683
Left	8 (22.2%)	7 (19.4%)	21 (58.3%)	

Distance of Inferior Alveolar Canal with Adjacent Anatomical Structures:

Table 4:- There was a statistically significant difference among gender with respect to distance between canal and lingual plate at point 3 (W3). It was observed that the distance was significantly higher in females (2.33 ± 0.91) compared to males (1.96 ± 0.59).

Distance of inferior alveolar canal with adjacent anatomical structures	**Mean ± SD**		**p value**
	Males(n = 41)	Females(n = 35)	
Canal to inferior border point 1 (H1)	8.24 ± 1.51	7.69 ± 0.94	0.067
Canal to lingual plate point 1 (W1)	3.52 ± 1.46	3.34 ± 1.17	0.558
Canal to buccal cortical plate point 1 (B1)	3.57 ± 0.99	3.28 ± 1.10	0.231
Canal to inferior border point 2 (H2)	6.70 ± 1.55	6.38 ± 1.29	0.341
Canal to lingual plate point 2 (W2)	2.05 ± 0.84	2.28 ± 1.14	0.323
Canal to buccal cortical plate point 2 (B2)	5.29 ± 1.21	5.11 ± 1.42	0.566
Canal to inferior border point 3 (H3)	6.48 ± 1.67	6.22 ± 1.29	0.451
Canal to lingual plate point 3 (W3)	1.96 ± 0.59	2.33 ± 0.91	0.039*
Canal to buccal cortical plate point 3 (B3)	5.96 ± 1.07	5.76 ± 1.31	0.479
Canal to inferior border point 4 (H4)	8.04 ± 2.09	7.96 ± 1.90	0.854
Canal to lingual plate point 4 (W4)	2.52 ± 0.93	2.27 ± 1.22	0.310
Canal to buccal cortical plate point 4 (B4)	4.39 ± 1.20	4.39 ± 1.61	0.995

Length Inferior Alveolar Canal:

Table 5:- There was significant difference in length of inferior alveolar canal in relation to gender with males (p<0.001) showing highest length than females.

	Mean ± SD		**p value**
	Males (n = 41)	Females (n = 35)	
Length	68.36 ± 5.24	64.10 ± 3.18	< 0.001*

Table 6:- There was no significant difference in relation to age group and side.

	Mean ± SD		**p value**
	Right (n = 40)	Left (n = 36)	
Length	65.83 ± 5.03	67.03 ± 4.70	0.291

Diameter Of Inferior Alveolar Canal:

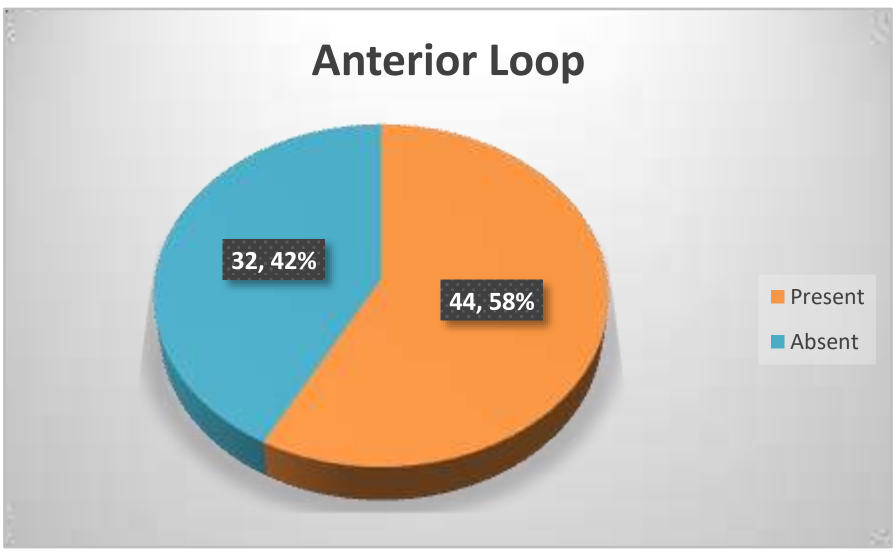
Table 7:- Highest diameter of mandibular canal was measured on cross sectional view. It was observed that highest diameter of the canal in males observed at point 2,4,5. There was a significant difference in diameter of canal in relation to gender with males showing a highest diameter at point 2, 4, 5.

Diameter of inferior alveolar canal	**Mean ± SD**		**p value**
	Males (n=41)	Females (n=35)	
Diameter of alveolar canal at 1	2.57 ± 0.51	2.33 ± 0.63	0.070
Diameter of alveolar canal at 2	2.35 ± 0.42	2.13 ± 0.45	0.035*
Diameter of alveolar canal at 3	2.19 ± 0.34	2.22 ± 0.48	0.764
Diameter of alveolar canal at 4	2.40 ± 0.45	2.10 ± 0.50	0.009*
Diameter of alveolar canal at 5	2.41 ± 0.53	2.09 ± 0.39	0.005*

Table 8:- Showing there was no statistically difference between the sides of hemimandible among diameter of the inferior alveolar canal at all 5 points.

Diameter of inferior alveolar canal	**Mean ± SD**		**p value**
	Right (n=40)	Left (n=36)	
Diameter of alveolar canal at 1	2.42 ± 0.53	2.51 ± 0.63	0.482
Diameter of alveolar canal at 2	2.30 ± 0.46	2.19 ± 0.43	0.283
Diameter of alveolar canal at 3	2.26 ± 0.46	2.15 ± 0.34	0.259
Diameter of alveolar canal at 4	2.28 ± 0.50	2.24 ± 0.49	0.705
Diameter of alveolar canal at 5	2.25 ± 0.47	2.28 ± 0.52	0.749

Prevalence Of Anterior Loop:



Graph 2:-Showing distribution of prevalence rate of anterior loop of mental nerve.

Table 9:- There was no statistical difference among prevalence of anterior loop in gender.

Anterior Loop	**Gender**		**p value**
	Male	Female	
Present	24 (54.5%)	20 (45.5%)	0.902
Absent	17 (53.1%)	15 (46.9%)	

Table 10:- Showing no statistical difference was found between the sides of prevalence anterior loop.

Anterior Loop	**Side**		**p value**
	Right	Left	
Present	26 (59.1%)	18 (40.9%)	0.186
Absent	14 (43.8%)	18 (56.2%)	

Table 11:- Showing prevalence of anterior loop among the type of inferior alveolar canal.

Anterior Loop	Type			p value
	Catenary	Progressive descending	Straight	
Present	9 (20.5%)	7 (15.9%)	28 (63.6%)	0.097
Absent	8 (25%)	11 (34.4%)	13 (40.6%)	

Location Of Mental Foramen:

Location of mental foramen	Frequency
Between 1st and 2nd premolar	20 (26.3%)
Apex of 2nd premolar	40 (52.6%)
Between 2nd premolar and 1st molar	16 (21.1%)

Table 12 and Graph 3 showing frequency distribution of location of mental foramen

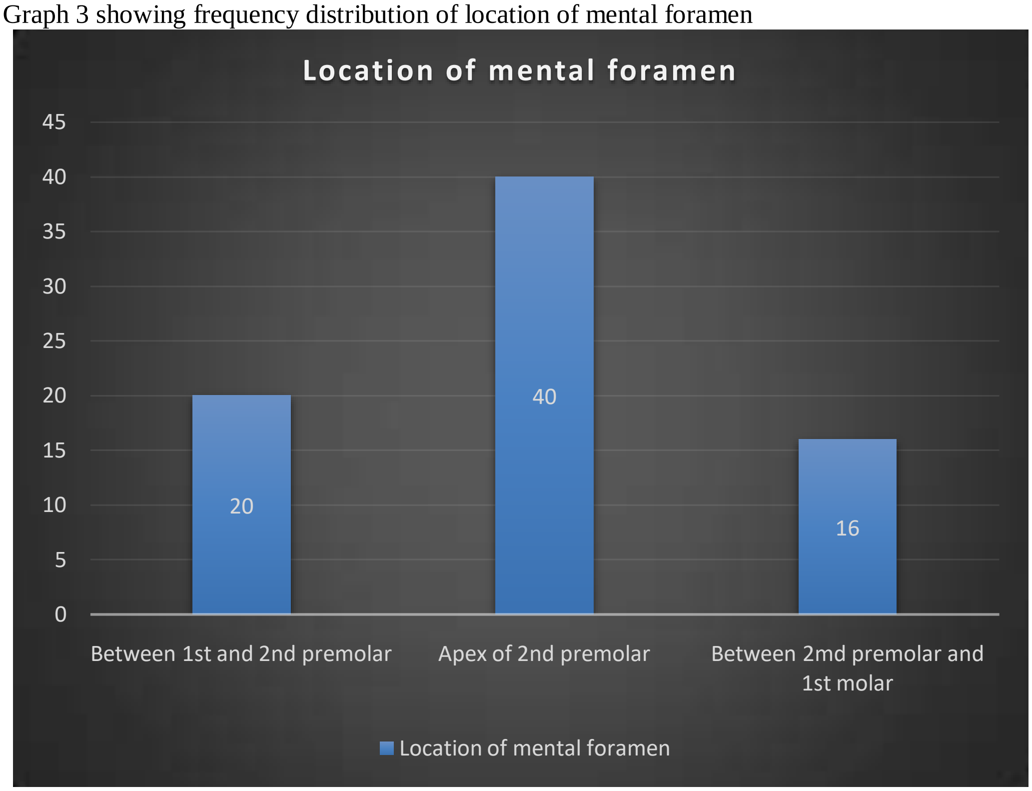


Table 13:- Showing frequency distribution location of mental foramen among gender.

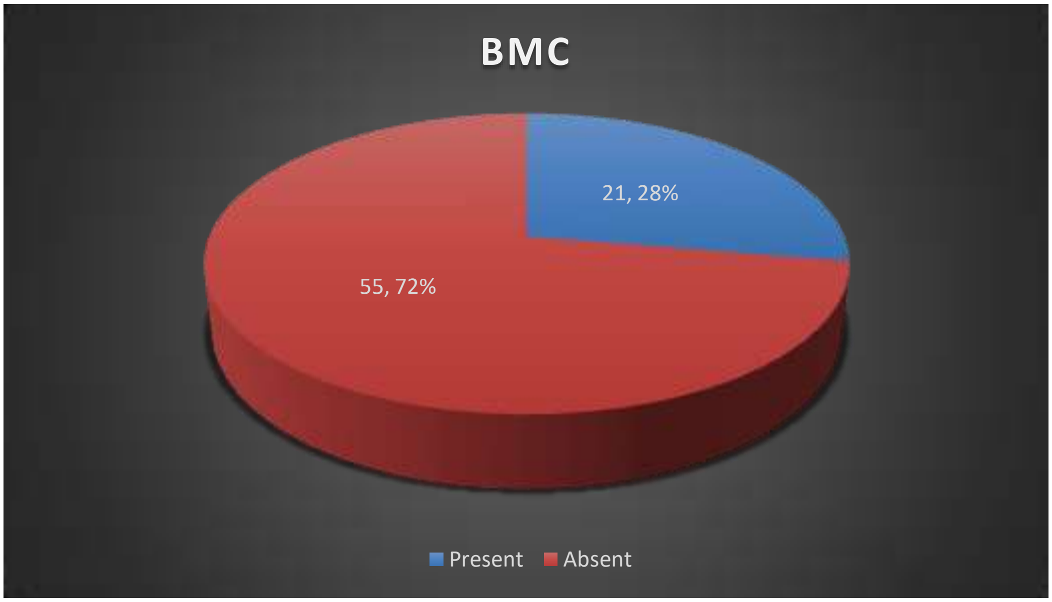
Location of mental foramen	Gender		p value
	Male	Female	
Between 1st premolar and 2nd premolar	9 (45.0%)	11 (55%)	0.643
Apex of 2nd premolar	23 (57.5%)	17 (42.5%)	
Between 2nd premolar and 1st molar	9 (56.2%)	7 (43.8%)	

Table 14:- Showing no statistical difference was found on distribution among the sides (p=0.673).

Location of mental foramen	Side		p value
	Right	Left	
Between 1st premolar and 2nd premolar	10 (50%)	10 (50%)	0.673
Apex of 2nd premolar	20 (50%)	20 (50%)	
Between 2nd premolar and 1st molar	10 (62.5%)	6 (37.5%)	

Bifid Canal:

Graph 4A &B:- Showing frequency distribution and types of bifid mandibular canals.



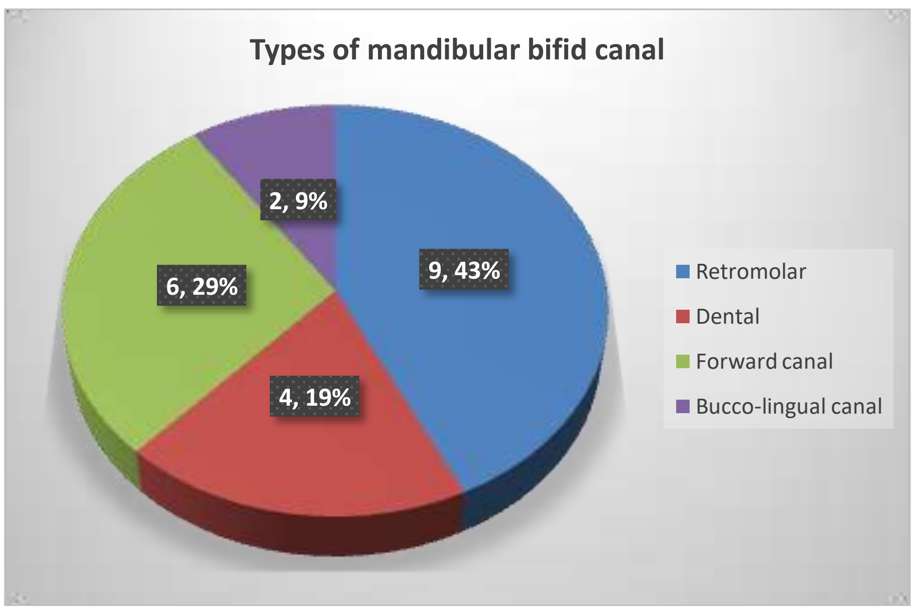


Table 15:- Showing frequency distribution of BMC among gender.

Accessory bifid canal	Gender		p value
	Male	Female	
Present	14 (66.7%)	7 (33.3%)	0.169
Absent	27 (49.1%)	28 (50.9%)	

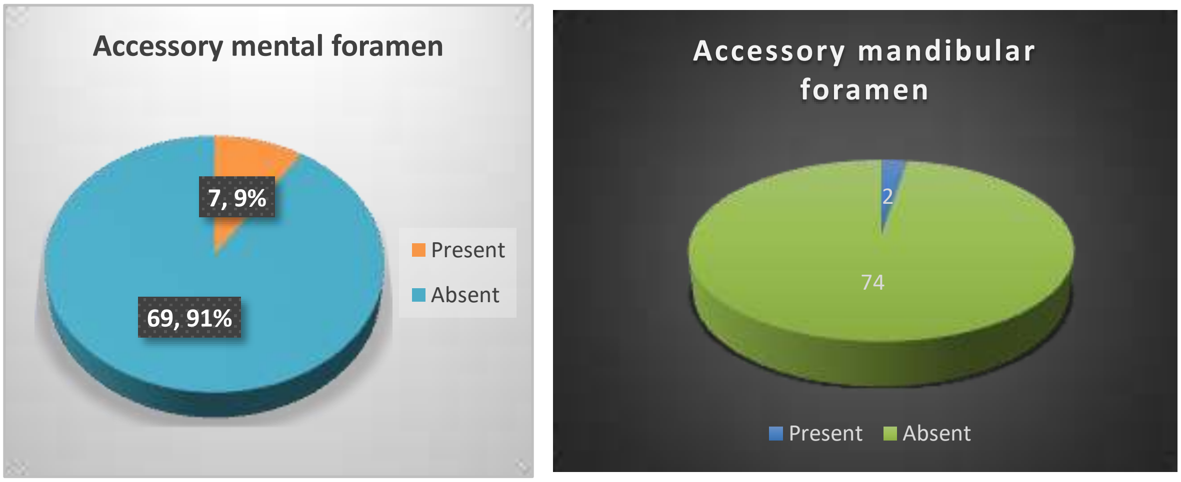
Table 16:- Showing distribution of BMC between the sides of hemimandibles.

Accessory bifid canal	Side		p value
	Right	Left	
Present	12 (57.1%)	9 (42.9%)	0.626
Absent	28 (50.9%)	27 (49.1%)	

Accessory Mental And Mandibular Foramen:

The accessory foramen was observed in 7 (9.2%) (3 males and 4 females) out of 76 hemimandibles. There was no significant gender difference. It was observed 4(57.1%) in straight types of inferior alveolar canal course and 3(42.9%) in catenary type.

Graph 5A & B:- Showing the frequency distribution of accessory mental and mandibular foramen.



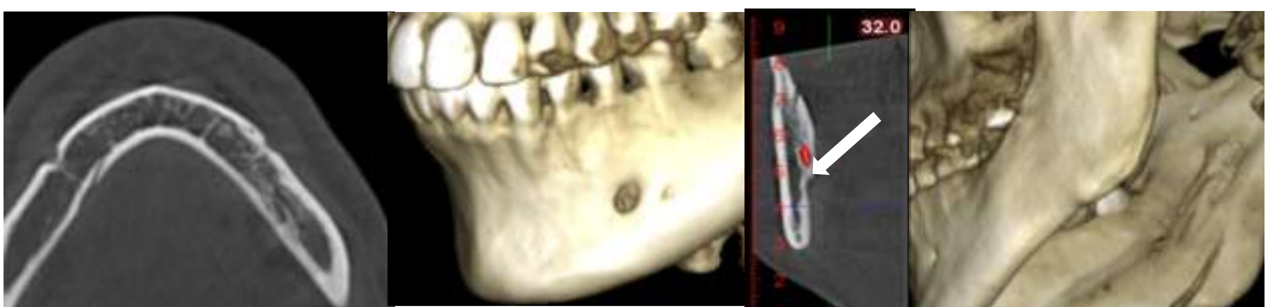


Fig.4A&B:- Accessory mental foramen and accessory mandibular foramen.

Discussion:-

Forensic science deals with the identification of the dead using numerous techniques. As radiographs are able to capture their distinct anatomical features, they become an invaluable tool in forensic sciences.In various surgical interventions such as extraction of mandibular third molars, implant surgeries, orthognathic surgeries, and those to reduce and to fix of fractures in the different regions of the jaw, are examples of the procedures that can be done close to the mandibular canal, increasing the risks of injuries to the inferior alveolar nerve. [(4–6)]CBCT has the potential to eventually emerge as a comprehensive and practical system to analyse the inferior alveolar canal, and it would become an excellent tool for understanding the importance in forensic radiology for gender determination.[(9–14, 52,56)]

Prevalence of the type of inferior alveolar canal:

A detailed anatomy and course of inferior alveolar canal were studied on sagittal section in our study we have used Worthington's classification which is based on analyzing the relationship between the position of the mandibular canal and the dental apices in the different types as catenary(type 1), progressive descending(type 2), straight(type 3).

In the present study among 76 hemimandibles of which 41 were males and 35 were females, straight canals were presented the highest prevalence of 53.9% (41 hemimandibles) followed by progressive descending and catenary canals 23.7%(18 hemimandibles) and 22.4%(17 hemimandibles) respectively. There was a significant difference in course type in relation to gender (p=0.001) with females showing a higher proportion of straight course. No difference between the sides of jaw.

Interestingly similar to our study, Clarissa Lopes Vieira et al also obtained straight canal course as most prevalent type but prevalence of other two types vary from our study. Second most prevalent was catenary and finally progressive descending. Ayla Ozturk et al, AbdallahEdrees et al found as the most common configuration was a catenary-like canal followed by the progressive descent and the remaining had a straight pattern.[21,59]

Assessing the pattern of mandibular canal is more relevant in implant placement. The most common pattern was found in our study was straight type of canal (53.9%). This group is less favorable for implant placement posterior to premolars. Catenary types was found only a small percentage (22.4%) provides more space for implant placement, especially in the first molar region compared with the premolar region.

Distance of inferior alveolar canal with adjacent anatomical structures:
The MC is located closer to the lingual surface of the mandible in the posterior part of the body of mandible, and progressively it becomes more superficial in relation to the buccal surface of the mandible where it ends at the mental foramen.[2]

In current circumstances, two-dimensional imaging techniques are still being used widely to evaluate the position of IAN, but the disadvantage was the exact position of anatomic structures cannot be perceived in a two-dimensional image and the measurement of available bone above the nerve for accurately choosing an implant is difficult. Therefore, three-dimensional imaging techniques such as CT and CBCT should be used to assess the quantity of bone present surrounding the IAN.

In our study we obtained, there was a statistically significant difference among gender with respect to distance between canal and lingual plate at point 3 (W3). It was observed that the distance was significantly higher in females (2.33 ± 0.91) compared to males (1.96 ± 0.59) other values showed, these parameters were slightly lower in females than males but such difference were not statistically significant. Vidya, et al in 2019 done a gender-wise comparison of MC position in relation to the roots of the 1st and 2nd mandibular molars showed the statistically significant as slightly lower value in females. [66]

Length of the inferior alveolar canal:
In the present study we found that there was significant difference in length of inferior alveolar canal in relation to gender with males (p<0.001) showing longer length than females but these was no difference between both the sides and between the age group. Mean length of IAC was 68.36 ± 5.24, 64.10 ± 3.18 in males and females respectively. Measuring the length of IAC using CBCT was rarely discussed in the literatures especially for gender determination. Liu et al found longer length in males compared to females but the measurements were done on panoramic radiography.[60]

Diameter of the inferior alveolar canal:
Based on the literature (Mohammad Mehdi Aghdasi) inferior alveolar canal diameter was 2.94 ± 0.58 mm[76].The diameter of MC was measured at 5 points from mental foramen with 10mm distance of each. The mean diameter of MC we obtained in males were 2.57 ± 0.51, 2.35 ± 0.42, 2.19 ± 0.34, 2.40 ± 0.45, 2.41 ± 0.53 of point 1,2,3,4 and 5 respectively where as in females it was 2.33 ± 0.63, 2.13 ± 0.45, 2.22 ± 0.48, 2.10 ± 0.50 and 2.09 ± 0.39.

In the present study showed the highest diameter of mandibular canal was measured on cross sectional view. It was observed that highest diameter of the canal in males observed at point 2,4,5. There was a significant difference in diameter of canal in relation to gender with males showing a highest diameter at point 2, 4, 5. Tie Liu et al, Judy Chia-Hui Chen et al, Mohammad H. Al-Shayyab et al. showed males has larger diameter of IAC than females.[60,74,77]Based on the significant result of our study and above mentioned literatures may help for gender determination in forensic radiology.

Prevalence of anterior loop:
Identifying anterior loop to prevent potential complications during dental surgery are important, such as tooth extraction, implant installation, and periapical surgery.

In this study out of 76 hemimandibles, 44(57.9%) had anterior loop, in this 26 (59.1%) on right side and 18(40.9%) on left side. There was no significant difference in relation to gender and side. It was observed that 63.6% (n=28) with a straight course of inferior alveolar canal. None of the literatures had discussed about the prevalence of anterior loop associated with the type of course of IAC. [89]HakanEren et al studied 141 CBCT scans, they were obtained 86% of anterior loop and it showed a high prevalence of anterior loop was detected by CBCT imaging, with predominance in female patients.[95]

Location of mental foramen:
It was observed that 52.6% (n=40) located at the apex of 2nd premolar of 23(57.5%) in males and 17(42.5%) in females. Location of MF between the 1st and 2nd premolar and between the 2nd premolar and 1st molar were observed in 26.3% (n=20) and 21.1% (n=16) of cases respectively. There was no significant difference in relation to gender and side.

The location and distance between the MF and the apex of adjacent root is an important factor for consideration while carrying out certain surgical procedures, such as apicoectomy, genioplasty and also in endodontic procedures. [110]

Bifid mandibular canal(BMC):
The term bifid has its origins in Latin and means cleft into two parts. Chavez et al. has proposed that three diverse inferior dental nerves are fused together during embryonic maturation to make a single nerve. The presence of these anatomic structures has crucial clinical implication in dentistry. So that, an awareness of the mandibular canal variations can help prevent complications that may arise due to damage of the BMC during surgery. Traumatic neuroma, paraesthesia, anaesthesia and bleeding are all possible complications. Several researchers have the pattern of BMCs based on their anatomic location and shape. Nortje et al. 1977; Naitoh et al. 2009; Kuribayashi et al. 2010 the bifid mandibular canals were classified into four types. Nortje et al. and Langlais et al. performed panoramic radiography, whereas Naitoh et al. performed cone beam computed tomography (CBCT). Here we used Naitoh et al classification on BMC.

In our study BMC were identified in 21 (27.6%) out of & 76 hemimandibles. It were observed in 14 males and 7 females. Most frequently observed type of bifid canal was retromolar42.9%(n=9), forward 28.6%(n=6), dental 19%(n=4)and buccolingual 9.5%(n=2). These canals were identified 57.1%(12) on right sides and 42.9%(9) but there was no significant difference in relation to gender and side.

Unlike our study O¨zlemOkumus et al were found in 248 of the 1000 hemimandibles (24.8%). Mandibular canal variations were observed in 71.5% of patients on the right side, 52.5% on left side. The forward canal was the most common type (48.8%), followed by the retromolar canal (26.2%), the dental canal (12.9%), buccolingual canal (9.7%). Murat et al. (2014) also found prevalence rate of the types of BMC in a same order of Okumus et al.[82,83]

Accessory mental foramen:
AMF results from the ramification of the mental nerve before emerging into the mental foramen. Knowledge of anatomical variation of mental foramen plays an important role in successful anesthesia and surgical procedures.[104]In the present study the accessory mental foramen was observed in 7 (9.2%) (3 males and 4 females) out of 76 hemimandibles(Fig4A). It was observed 4(57.1%) in straight types of inferior alveolar canal course and 3(42.9%) in catenary type. There was no significant gender difference and this finding of our study supported by many previous literatures (Naitoh et al., 2009; Oliveira-Santos et al., 2011; Cantekin and S¸ekerci, 2014; Khojastepour et al., 2015; MuineloLorenzo et al., 2015).

Accessory mandibular foramen:
In this present study we found 2 out of 76 hemimandibles(Fig4B) similar to our study Young-Yuhn Choi et al obtained 6 out 446 CBCT scans.

Here we have obtained significant result on length, width at three points which were higher in males when compared to females. Based on the type of mandibular canal, females has the higher proportion of straight canal. As a result of it directs the mandibular canal has the evidence to determine the sexual dimorphism. So further studies with large number of population are needed to conclude the mandibular canal also play a role in gender determination. Forensic radiology is a part of lifeline emerging tool to identify the gender.

Prevalence of anterior loop, bifid mandibular canals, accessory mental foramen and accessory mandibular foramen showed no statistical significant difference among gender and between the sides of jaw.

Conclusion:-

CBCT has emerged as a valuable tool to determine the precise location and course of mandibular canal. It provides an invaluable means of gender identification in mass casualty incidents. Thus we have concluded from this study that mandibular canal can be used as a tool to determine the sexual dimorphism and further studies with large sample should be carried out to authenticate the role of mandibular canal in forensic radiology.

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