Comparasion Of The Position Mental Foramen And Permanent Maxillary Canine Width In Gender Determination

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Abstract;AIM:To evaluate and compare the position of mental foramen and permanent maxillary canine width in gender determination.OBJECTIVE:To evaluate the permanent maxillary canine width and mental foramen for sexual dimorphism and their level of accuracy in gender determination.MATERIALS AND METHODS:The study includes 20 males and 20 females who were subjected to panoramic radiograph after obtaining their informed consent. The mental foramen of the individual was evaluated using panoramic radiograph. The average measurements from the superior and inferior borders of
mental foramen to the lower border of the mandible were measured using the tools provided within the software. Mesio-distal width of the permanent maxillary canines were measured from the anatomic contact points on both right and left sides using digital vernier calipers. The data obtained from both the measurements were analysed by student T pair test and comparatively evaluated.RESULTS: Our study showed that, both the mesio-distal width of maxillary canine and mental foramen exhibited sexual dimorphism. They both were greater in males when compared to that of females. On comparing both, the mesio distal width of maxillary canines were more accurate in sex determination than that of mental foramen.CONCLUSION:Though the mental foramen and permanent maxillary canines exhibited sexual dimorphism, In our study when compared, maxillary canine width was found to be more accurate in gender determination.

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I.   Introduction

Forensics is derived from the latin word 'forensis' which means 'the study of public'. Together with age estimtion, gender determination isimportant in forensic investigations.[1] Sexual dimorphism refers to the systemicdifference in the form (either in shape or size) between theindividuals of different sexes in the same species.[1] Gender determination using dental features is based primarily on Comparison of toothdimensions and Anatomical landmarks in skull.[1] Canines are likely to survive better during severe trauma or disasters. Hence canines ar considered to be key teeth for personal identification.[2] Mental foramen is a stable anatomical landmark in human skull[3] which exhibits sexual dimorphism[4] and can be more accurately visualised on panoramic radiograpboth vertically and horizontally. Panoramic radiograph is considered efficient in making measurements of the foramen and is an additional radiographic tool in gender determination.[5]

II.   Materials And Methods:

The present study includes 40 Patients (20 males and 20 females)who visited the outpatient department in our institution. All the patients who were advised for panoramic radiograph were briefed about the study.The panoramic radiograph and maxillary impressions were taken after their consent. The patients with fully erupted teeth,Patients with healthy state of gingivae and periodontium, [1] high quality radiographs with correct positioning and mental   foramen of separate type[5] were included in the study. The exclusion criteria are of, Ectopically and partially erupted teeth, Teeth with rotation, crowding, Teeth showing physiologic and pathological wear and tear (attrition, abrasion, abfraction, erosion), Carious teeth, Patients with parafunctional habits such as bruxism,[1] distorted radiographic   images, non-visualisation of the mental foramen, Any Surgical interventions or pathologies in the mandible, Presence of any artifacts in the panoramic radiograph**.**

Maxillary canine measurement:

The materials required for maxillary canine measurement are maxillary impression trays, alginate impression material, type III dental stone, digital vernier callipers (fig.1). Maxillary impressions were taken using alginate impression material (fig. 2) and immediately casts were made using type III dental stone (fig 3). The mesio distal widths of maxillary canines were measured between the contact points on both right and left sides using digital verniercalipers with a resolution of <0.01mm (fig.4) and the measurements were recorded.[6]

Mental foramen measurement:

Panoramic radiographs were taken using Planmeca Romexis machine (fig.5). All the images are viewed on the monitor with optimal resolutions. Only 'Separate' type radiographic image of mental foramen were included in the study.

The linear measurements were done using the tools provided within the Planmeca Romexis software. The measurements were taken from superior border of the mental foramen to the lower border of the mandibleS-L length) (fig.6) and from the inferior border of the mental foramen to the lower border of the mandible[5] (I-L length). (fig.7)

III. Results:

1) The mental foramen and mesio-distal width of maxillary canine were comparatively evaluated for their accuracy in sex determination.
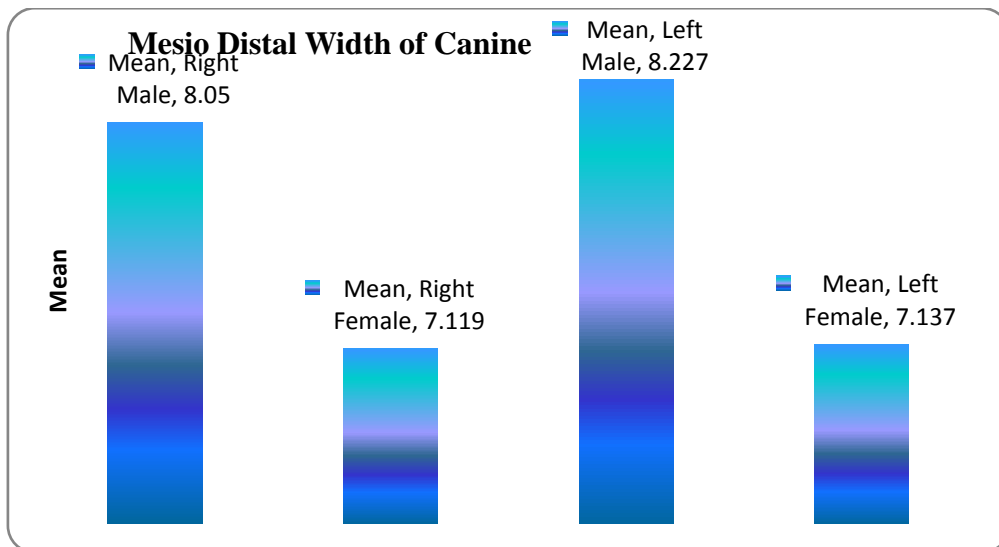
2)In our study, Males have a mean value of 8.050 while females have a mean value of 7.119 on right side and mean value for left side is 8.227 for males and 7.137 for female (Table 1) (Graph 1). There is statistically non-significant difference between right and left sides. (Table 5). In case of mesio-distal width of canine, highly significant difference between males and females is present on both right and left sides. (Table 2) Mesio-distal width of canine is larger in males when compared to the females (graph 1).

3)In case of mental foramen, on the right side, mean value of S-L length in males is 13.995 and I-L length of 11.435 while Females had an S-L length of 12.450 and   I-L length of 10.010 (table 3) (graph 2). On the left side, mean value of S-L length in males is 13.31 and I-L length of 11.165 while females had an S-L of 12.65 and I-L length of 10.310 (table 4) (graph 3). S-L and I-L length is greater in males when compared to that of females. (Graph 2, graph 4). There is non-statistical significant difference between right and left sides in both males and females. (Table 5).
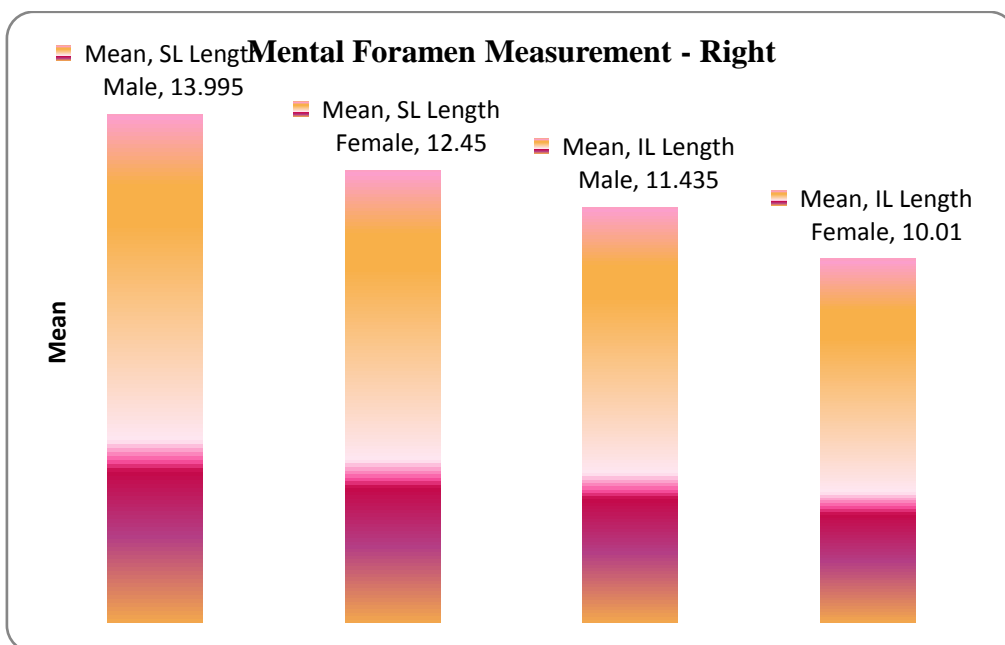
On the whole, Mesiodistal width of permanent maxillary canine has 92.5% accuracy and mental foramen is 72.5% accurate (graph 4). Mesiodistal width of permanent maxillary canine is more accurate in determining the sex of the individual when compared to that of the mental foramen.

IV. Discussion:

➢ B R Chandrasekar and C V K Reddy in their review in 2008 mentioned that according to Elphenstine, M. Raja Jayachandra Rathore of Canouj, who died in the battle field was identified by his false anterior teeth, which was first person identification done in India.[7]

➢ Khangura R K, et al in 2011 studied on 100 males and females showed that, significant sexual dimorphism were exhibited in permanent maxillary canines and can be used for sex determination.[1] And Hashim H A, Murshid Z A in 1993 studied that, canines were the only tooth to exhibit sexual dimorphism and showed that, there is no statistically significant difference between right and left sides. Sonal pamecha, H.R. Dayakara in 2012 studied on 250 males and 250 females and established that, Mesiodistal width of maxillary canine exhibits sexual dimorphism when compared to other maxillary anteriors.[8] Mohammed nahidh et al in 2013 studied on 200 patients and said that maxillary canines can be used in gender identification.[9]On the contrary Mohammed Q.Al Rifaiy et al 1997 studied on 251 males and 252 females and showed that, the mesiodistal width of maxillary and mandibular canines exhibit sexual dimorphism but not statistically significant but the intercanine distance was statistically significant.[10] WhileKaren Boaz and chavvi gupta in 2009 studied on age group 14-25 years on 100 dental casts and showed that females have greater mesiodistal width of mandibular left canines than the maxillary canines.[2]

➢ Akilesh chandra et al in 2013 studied on 150 radiographs and established that, the distance from the mental foramen to the lower border of the mandible exhibit sexual dimorphism in individual and S-L length and I-L length are greater in males than the females[5]. Wandee Apnehesmit et al in 2006 studied on 106 Thai adult skulls and showed that, the mental foramen, supraorbital notch, infraorbital foramen exhibits sexual dimorphism in different populations[4].

➢ Amorim et al in 2009 studied on 300 radiographs and established that the distance of mental foramen to the lower border of the mandible remains constant throughout the life[3].contrary to our study, Anushuman suresh jamdade et al in 2012 studied on 500 radiographs and stated that location of mental foramen is not gender dependent and it is greatly influenced by the genes.[11]

➢ In our study both mesiodistal width of maxillary canine and mental foramen exhibited sexual dimorphism reinforcing the studies of Khangura R K, Mohammed nahidh and Akilesh Chandra et al. Right and left sides were non-significant similar to the study done by Hashim H A.

Mesio Distal Width of Canine

Mean, Right Male, 8.05
Mean, Left Male, 8.227
Mean, Right Female, 7.119
Mean, Left Female, 7.137

Graph 1

Mental Foramen Measurement - Right

Mean, SL Length Male, 13.995
Mean, SL Length Female, 12.45
Mean, IL Length Male, 11.435
Mean, IL Length Female, 10.01

Graph 2

			Gender	Mean
Mesio Distal Width of Canine	Right		Male	8.05
			Female	7.119
	Left		Male	8.227
			Female	7.137
Mental Foramen Measurement	Right	SL Length	Male	13.995
			Female	12.45
		IL Length	Male	11.435
			Female	10.01
	Left	SL Length	Male	13.31
			Female	12.655
		IL Length	Male	11.165
			Female	10.31

Mean value of maxillary canine and mental foramen

Table 1

		Mean
Right	Male	8.05
	Female	7.119
Left	Male	8.227
	Female	7.137

Table 2

Maxillarycanine
mean value

		Mean
SL Length	Male	13.995
	Female	12.45
IL Length	Male	11.435
	Female	10.01

Table 3
Mental foramen mean values-right

		Mean
SL Length	Male	13.31
	Female	12.655
IL Length	Male	11.165
	Female	10.31

Table 4
Mental foramen mean values-left

		N	Mean	SD	Std. Error Mean	t	p
Mesio Distal Width of Canine	**Right**	40	7.585	0.635	0.100	-2.354	0.024*
	Left	40	7.682	0.685	0.108		
Mental Foramen Measurement	**SL Length** Right	40	13.223	1.472	0.233	-1.104	0.076*
	SL Length Left	40	12.983	1.346	0.213		
	IL Length Right	40	10.723	1.596	0.252	-1.072	0.043*
	IL Length Left	40	10.738	1.502	0.222		

P<o.o1 not highly significant.
Table 5.Comparison of maxillary canine and mental foramen -right and left sides.
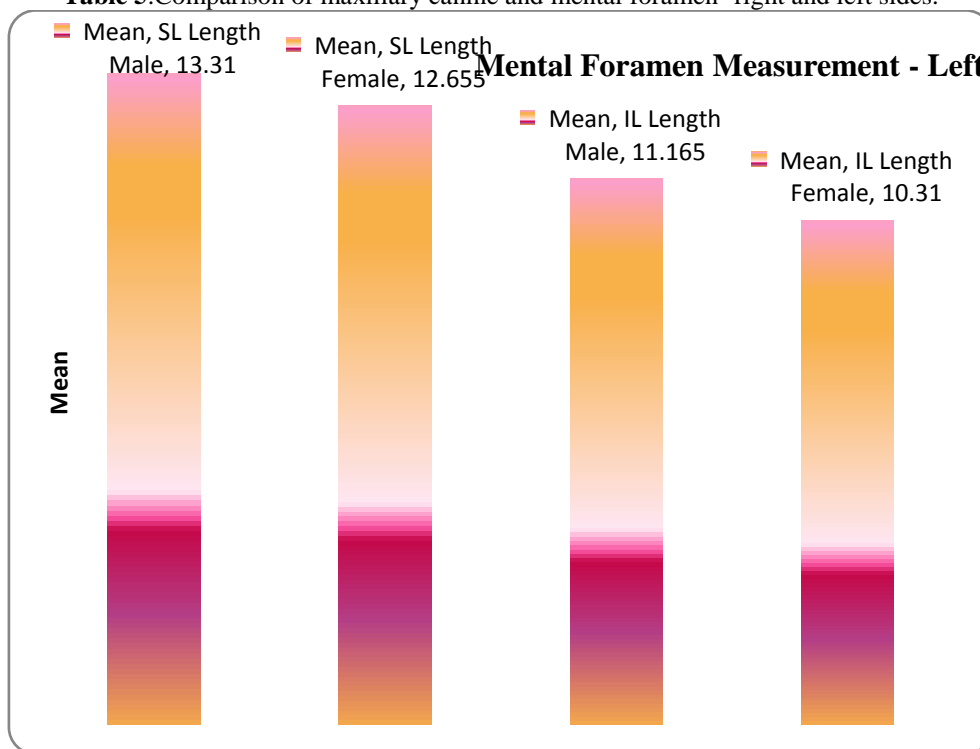
Graph 3
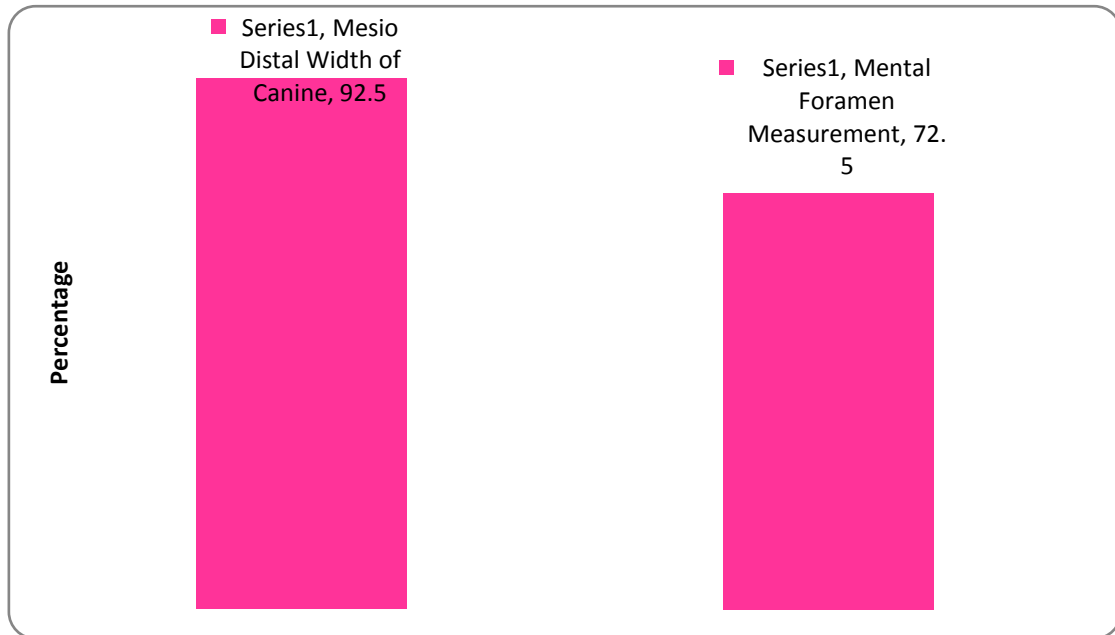
Accuracy of mesiodistal width of maxillary canine and mental foramen
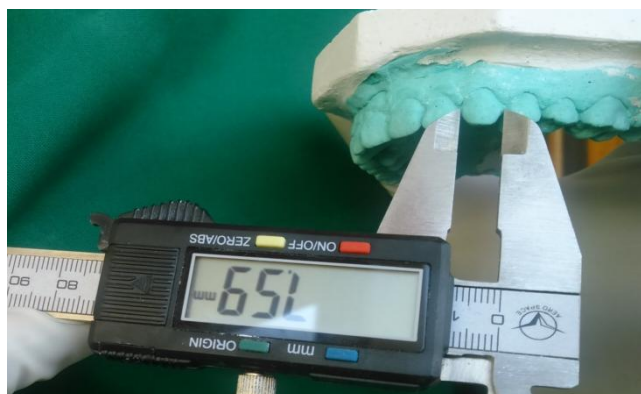Graph 4

Figures:

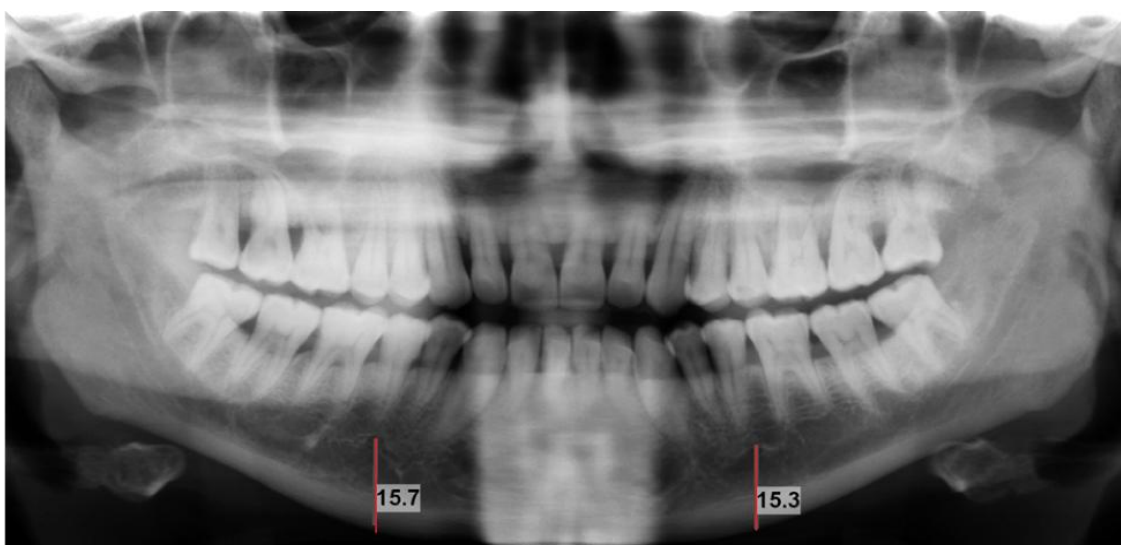**Fig 1** Armamentarium for maxillary canine meamesurement.
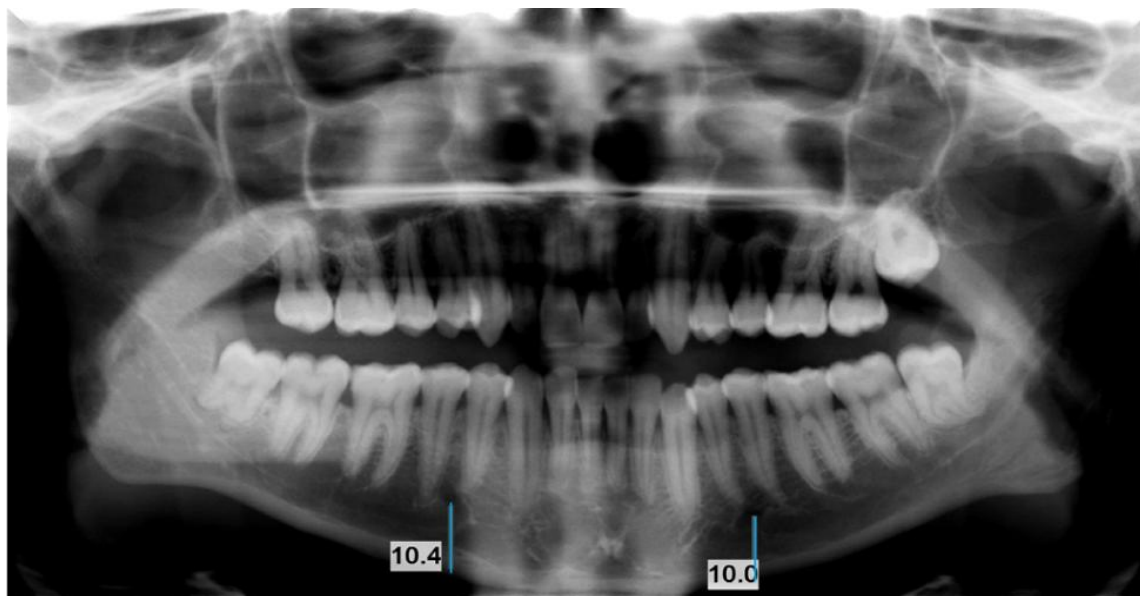

Maxillary impression
Fig 2

Maxillary cast
Fig 3

Measurement of maxillary canine using digital vernier calipers
Fig 4

Measurement of superior border of mental foramen to the lower border of themandible.(S-L length)
Fig 5

Measurement from inferior border of the mental foramen to the lower border of the mandible. (I-L length)
Fig 6

V. Conclusion:

Identification of the gender from the unknown fragmental remains of the human skeleton is difficult and challenging in forensics. Even though, mesio-distal width of maxillary canine and mental foramen exhibit sexual dimorphism. Mesio-distal width of maxillary canine is found be more accurate than the mental foramen in determining the sex of the individual in forensic dentistry. This method for is more simple, reliable and inexpensive and can be used as an adjunct tool for gender determination and can be even performed at the site of disasters. It is extremely useful in case of mass disasters when soft tissue is completely destroyed and only bone and tooth fragments remains.

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