

MANDIBULAR RAMUS HEIGHT IN SEX DETERMINATION IN RIGHT SIDE USING OPG - A RETROSPECTIVE STUDY.

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ABSTRACT

INTRODUCTION: Gender estimation is a very important field in anthropology and forensic sciences. The sex of an individual can be determined based on morphology and metric features of the skull and other bones. The skull or mandible is the most reliable part for forensic studies and in the estimation of age and sex with the help of tissue typing and DNA profiling as cadavers show a very high degree of decomposition. Various studies have related mandibles as the most preferable part of the skull which is helpful in determining age and gender and are used preferably by most of the forensic odontologists.

AIM: To calculate the mandibular ramus height with help of OPG and estimate the gender.

MATERIALS AND METHODS: The present study was conducted in the department of Forensic Odontology. OPG samples were collected from the department of oral medicine and radiology, Saveetha Dental College and Hospitals, Chennai and were measured by PLANMECA. The number of samples collected were 30 males and 30 females of age group 30-35 years. The data was transferred to SPSS software for further results.

RESULTS: The mean and standard deviation for the ramus height for Males and Females were 77.15 ± 7.42 mm and 67.17 ± 4.73 mm respectively. The p value was found to be 0.000 which denotes that there's a significant difference between the ramus height of males and females.

DISCUSSION: Highest sexual dimorphism was seen with projective height of ramus and least with minimum ramus breadth with an accuracy of 80.2%. Mandibular ramus height found to be the best parameter statistically significant with $P = 0.005$.

CONCLUSION: The mandibular ramus can be considered as a valuable tool in gender estimation since it possesses resistance to damage and disintegration processes.

Key Words: Mandible, Mandibular ramus height, Gender estimation, OPG, Temporomandibular joint

INTRODUCTION

Gender estimation is a very important field in anthropology and forensic sciences. The sex of an individual can be determined based on morphology and metric features of the skull and other bones. Soft tissues, dental records, and even the DNA extracted from the tooth can be used to identify the sex of the individual. There's 100 percent accuracy if skeleton is used for sex determination followed by 95 percent accuracy with pelvis. One skull alone can be used to estimate the sex with 90 percent accuracy according to KROGMAN but when an intact skull is not available for the dimorphism, mandible plays a very important role in the estimation as it is the most dimorphic, largest and the strongest bone of the human body. Males have a generally bigger mandible than the females (1). The mandible is the second bone to ossify and the parts of the mandible include body and the ramus.

The skull or mandible is the most reliable part for forensic studies and in the estimation of age and sex with the help of tissue typing and DNA profiling as cadavers show a very high degree of decomposition (2). Panoramic radiographs such as OPGs provide maximum details of hard tissues of maxilla and mandible and can be arranged in the electronic devices and are more accurate than the other metric methods. Various studies have related mandibles as the most preferable part of the skull which is helpful in determining age and gender and are used preferably by most of the forensic odontologists.

The ramus is the second largest part of the mandible which are vertical processes located on either side of the body. The ramus develops from the rapid spread of ossification backwards into the mesenchyme of the first branchial arch. The point of divergence is marked by mandibular foramen. The coronoid process and the condylar process are present on the superior side of the ramus which articulate with temporal bone thereby forming temporomandibular joint (3). The ramus is bound by two surfaces and four borders.

The aim of the study is to calculate the ramus height of the right side with the help of OPG and its correlation with gender.

MATERIALS AND METHODS

The current study was conducted in the Department of Forensic Odontology, Saveetha Dental College and Hospitals Chennai. The OPG samples were collected from the Department of Oral Medicine and Radiology. Total 60 samples were collected which included 30 males and 30 females in the age group of 30-35 years. The mandibular ramus height distance was calculated with the help of PLANMECA software and the values were recorded. The statistical analysis and t-test of the recorded values was done with the help of SPSS software v2.0. The inclusion criteria was selected for the study and OPGs with proper mandibular ossification without any demineralisation were selected and measurements were taken. The dislocated mandible were excluded keeping in mind the osteoclastic activity of the condylar and coronoid process. The results were evaluated.



Image 1: Image representing OPG of an individual the height of the ramus is depicted by black bar in the image.

RESULTS

The study included 60 samples out of which there were 30 Females and 30 Males aged between 30-35 years. Independent t-test was conducted with the help of SPSS software. The mean and standard deviation for the entire sample size was found to be 77.15 ± 7.42 mm. The p value was found to be 0.000 which means there was a significant difference between the ramus height of males and females ($p < 0.05$). The mean and standard deviation values for ramus height for males was 77.15 ± 7.42 mm and that for females was 66.74 ± 4.19 mm [Table 1]. The standard error mean for males was 1.35 and that for females was 0.77 [Table 2]. Paired t-test was also conducted and the paired differences between the males and females were 9.98 ± 9.06 mm with p value 0.000 which shows a highly significant difference between the ramus height of males and females [Table 3].

TABLE 1:

	N	MINIMUM	MAXIMUM	MEAN	STD. DEVIATION
MALE	30	64.20mm	89.20mm	77.1500mm	7.42
FEMALE	30	60.70mm	79.50mm	67.1700mm	4.73

Mean and Standard deviation values of males and females with maximum and minimum values

TABLE 2:

	MEAN	N	STD. DEVIATION	STD. ERROR MEAN
MALE	77.1500mm	30	7.42711	1.35600
FEMALE	66.7488mm	30	4.19316	0.77865

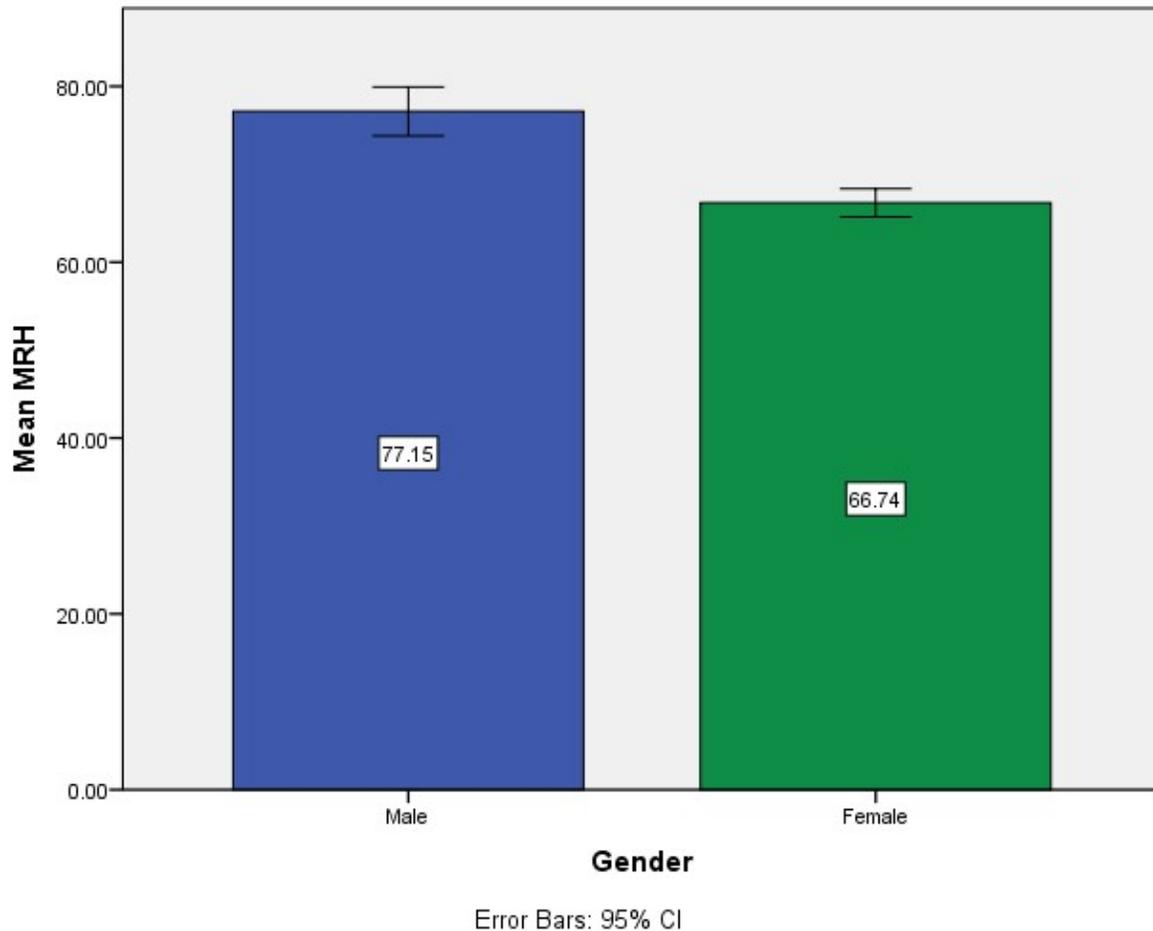
Standard error mean

TABLE 3:

	Paired Differences					t	df	Sig.
	Mean	Std. Deviation	Std. Error Mean	Confidence interval				
				Upper	Lower			
MALE-FEMALE	9.980	9.06	1.654	6.595	13.364	6.031	29	0.000

Paired sample t-test showing p value 0.000 which denotes significant ($p < 0.05$)

GRAPH 1:



Mean Mandibular ramus height bar graph for males and females. The mean value for males was 77.15mm (blue) and that for females was 66.74mm (green).

DISCUSSION

One of the most important aspect of Forensic is to estimate age and sex with the help of fragmented jaws and dentition (4)(5). Mandible is the bone which is usually intact and often recovered. OPGs are being used widely by clinicians as an appropriate screening tool for the diagnosis of oral diseases (5,6). In a study, five different parameters of the mandible were analysed and it was found that the accuracy of the gender identification was best characterised by ramus height following ramus width . Another study stated that, OPGs used for the measurement are magnified and showed geometric distortion and hence cannot be used as a reliable tool. Although CBCT was promoted for less errors (7)(8). Projective ramus height cannot be used as a reliable method for the estimation as there were no as such significant difference found whereas maximum/condylar ramus height was considered as an excellent tool for sexual dimorphism (9)(10). In another study, the mean age of the participants was 44.1 ± 14.41 , with males being shown to have a statistically significant larger ramus height and bigonial width than females ($P < 0.0001$ for both) whereas in this study the p value = 0.000 which shows high significance (11). Out of all the aspects of ramus,

ramus height is the only reliable tool for gender estimation as in a different study, condylar, coronoid and projection height of ramus was higher in males ($p < 0.001$) whereas in gonial method, gonial angle was higher in females ($p < 0.007$). Ramus' breadth and bigonial width were not different. Gonial angle also did not show a significant value (9).

CONCLUSION

The mandibular ramus can be considered as a valuable tool in gender estimation since it possesses resistance to damage and disintegration processes. OPG can be used as a reliable tool as there was very minimal error. However, projection height of ramus cannot be used as a reliable tool for the same.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest.

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