

MANDIBULAR MAXIMUM RAMUS BREADTH IN SEX DETERMINATION IN LEFT SIDE USING OPG - A RETROSPECTIVE STUDY.

Running title: Sex Identification from Mandibular maximum ramus breadth.

Mithil Vora

Undergraduate, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences (SIMATS), Saveetha University, Chennai – 600077, India

Dr. Abirami Arthanari*

Department of Forensic Odontology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical sciences (SIMATS), Saveetha University, Chennai – 600077, India

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 maximum ramus breadth 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, maximum ramus breadth , 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. Among other things, the ramus of the mandible can be used to separate males and females due to its univariate sexual dimorphism. When it comes to skeletal sex determination, metric analysis of x-ray images is often worth considering because of its objectivity, accuracy, and reproducibility (Samatha).

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 maximum ramus breadth of the left 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 maximum ramus breadth 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 p value was found to be 0.000 which means there was a significant difference between the maximum ramus breadth of males and females ($p < 0.05$). The mean and standard deviation values for maximum ramus breadth for males was 76.33 ± 5.34 mm and that for females was 69.32 ± 4.83 mm [Table 1]. The standard error mean for males was 0.98 and that for females was 0.88 [Table 2]. Paired t-test was also conducted and the paired differences between the males and females were 7.01 ± 6.769 mm with p value 0.000 which shows a highly significant difference between the maximum ramus breadth of males and females [Table 3].

TABLE 1:

	N	MINIMUM	MAXIMUM	MEAN	STD. DEVIATION
MALE	30	60.90mm	84.60mm	76.3300mm	5.34
FEMALE	30	62.00mm	80.70mm	69.3200mm	4.83

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

TABLE 2:

	MEAN	N	STD. DEVIATION	STD. ERROR MEAN
MALE	76.3300mm	30	5.34	0.98
FEMALE	69.3200mm	30	4.83	0.88

Standard error mean

TABLE 3:

	Paired Differences					t	df	Sig.
	Mean	Std. Deviation	Std. Error Mean	Confidence interval				
				Upper	Lower			
MALE-FEMALE	7.010	6.77	1.235	9.537	4.482	5.672	29	0.000

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

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 mandibular ramus breadth cannot be used as a reliable method for the estimation as there were no as such significant difference found whereas maximum ramus breadth 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 breadth 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 of maximum breadth 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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