Radiographic Morphometric Analysis of Mandibular Ramus for Sex Determination: A Retrospective Study

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KEYWORDS
Mandibular ramus, Trauma, sex determination, morphometric analysis.

ABSTRACT
Introduction: Mandibular ramus is quadrilateral process projecting upward and backward from the posterior part of the body of mandible and ending on other side of the temporomandibular joint Recognisable proof of age and sex assurance represents certain troubles and depends on the remaining parts of skeletal structures and teeth, as these two structures endure long after the demise of an individual.
Materials And Methods: The morphometric analysis were conducted on the ramus of mandible of 2000 digital opts using adobe photoshop CS6.Equal number of male and female opus with age groups ranging from 18-75 without any malformation, trauma, or any musculoskeletal disorder were included in the study.
Results And Discussion: The values of the above mentioned measurements in both the sexes were summed up in the following graph. The distinguishing of sex from human remains is of major significance in legal medication and human studies, particularly in criminal examinations just as in the ID of missing people.
Conclusion: The radiographic morphometric analysis for mandibular ramus for sex determination it is main tool for sex determination. It is used mainly in forensic investigations. Further studies can be done with large sample size and other imaging modalities.

1. Introduction

Mandibular ramus is a quadrilateral process projecting upward and backward from the posterior part of the body of the mandible and ending on the other side of the temporomandibular joint(1). Recognisable proof of age and sex assurance represents certain troubles and depends on the remaining parts of skeletal structures and teeth, as these two structures endure long after the demise of an individual. If the whole grown-up skeleton is accessible for examination, age and sex can be resolved up to 100% precision, yet if there should be an occurrence of mass calamities where divided bones are accessible, the assessment gets troublesome. From the skull, mandible is the most dependable bone for sexual dimorphism (2). Every individual has a unique identity and the identification of the alive or dead person with the different characteristics of teeth and jaw is used in forensic odontology (3)In the skull mandible ,mandible is used mainly in determining sex as it gives correct results(4).

Mandibular ramus can be used to distinguish between sexes and it also involves more than one variety in sexual dimorphism(5). In the skeleton, sexual orientation estimation is the initial step of the recognizable proof procedure as resulting strategies for age and height estimation are sex-subordinate(6).The mandible is viewed as appropriate for concentrate as it is the most strong bone of the facial skeleton and holds its shape superior to different bones(7).

Mandibular ramus can be distinguished with sexes, on the stages development of the mandible and duration for mandible(8).The characteristics of skeleton differs among the every population because of the osteometric standards(9). Skull is the most dimorphic structure after pelvis for sex assurance(10). It is found that mandible gave 88 % of accurate sex determination(11) .If the sex determination is done,the metric analyses are of great importance for accuracy(12).The components of the skull are made of hard tissues which can exist even in extreme conditions and also retain all the details of the skull(13).The mandibular ramus is of excellent use in forensic sciences(14).

A few investigations have been led utilizing dry grown-up mandibles for sex assurance. Be that as it may, in the wake of experiencing different databases, till date, just one investigation is directed for sex assurance through mandibular ramus utilizing computerized orthopantomogram (OPG)(2). Henceforth, the need was felt to plan the present investigation to decide sex utilizing five factors on mandibular ramus from advanced OPG, with a bigger sample size.

2. Materials and Methods:

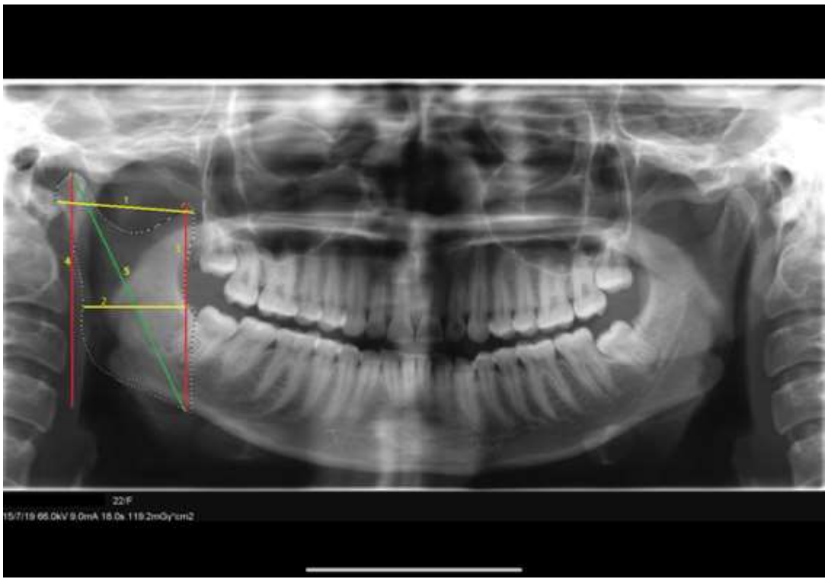


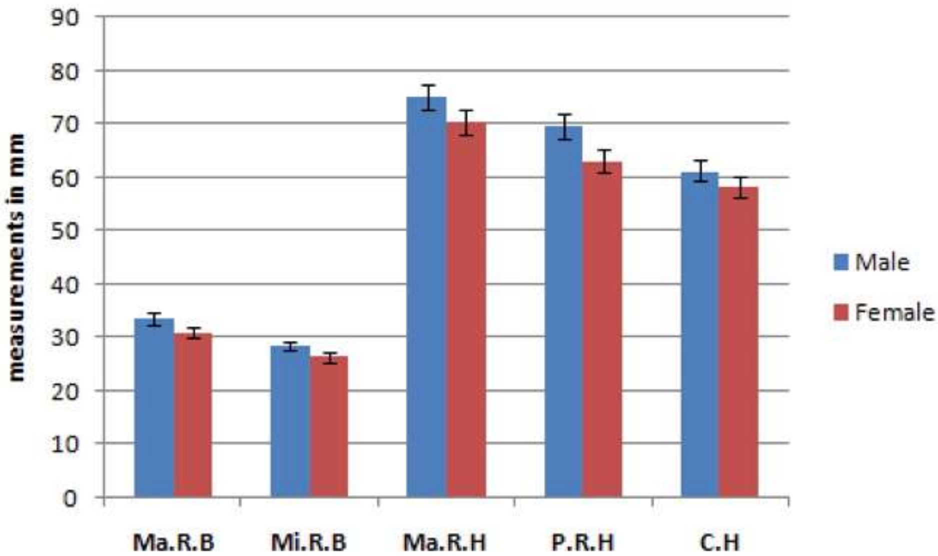
Figure 1: the orthopantomogram showing various measurements used in the study

The morphometric analysis was conducted on the ramus of mandible of 2000 digital opts using adobe photoshop CS6. Equal number of male and female opus with age groups ranging from 18-75 without any malformation, trauma, or any musculoskeletal disorder were included in the study. Ruler measurements are set to a logical 1cm scale and using an analysis function the area selected by the polygonal lasso tool was calculated and given as cm squares. The magnification factor of the opg was then divided. Student's t test was used to compare the means and linear regression model was attempted using spss version 2.

1. Maximum ramus breadth (Ma.R.B): The distance between the most anterior point on the mandibular ramus and a line connecting the most posterior point on the condyle and the angle of jaw
2. Minimum ramus breadth(Mi.R.B):Smallest anterior–posterior diameter of the ramus
3. Coronoid height(C.H):Projective distance between coronion and lower wall of the bone
4. Condylar/maximum ramus height(Ma.R.H):Height of the ramus from the most superior point on the mandibular condyle to the tubercle or most protruding portion of the inferior border of the ramus
5. Projective ramus height(P.H.R):Projective height of ramus between the highest point of the mandibular condyle and lower margin of the bone.

3. Results and Discussion

The values of the above mentioned measurements in both the sexes were summed up in the below graph.



Graph 1: Bar chart representing the various parameters for sex determination.X axis reprsents the parameters and Y axis represents the measurements.Red colour represents female and blue colour represents male. The mean values were significantly higher in males when compared to females and were statistically significant (P < 0.05).

Box's M	*F*			
	Approximate	df1	df2	*p*
156.416	10.142	15	4.001	0.05

The Box's M statistics was applied to verify the applicability of mandibular ramus in determining sex. Our study confirmed that male and female sex can be differentiated and this was highly significant (P < 0.05).

Mandible is the last skull issue that remains to be worked out development and is delicate to the youthful development spray. The phases of mandibular turn of events, development rates, and its length fluctuate in guys and females and thus valuable in separating genders. In the present study, the dimensions of different parameters on mandibular ramus were correlated with sex and it was distinctly observed that the mean values were significantly higher in males when compared to females and were statistically significant (P < 0.05). The distinguishing of sex from human remains is of major significance in legal medication and human studies, particularly in criminal examinations just as in the ID of missing people and in endeavors at remaking the lives of antiquated populaces (1).

A study conducted by Chandramani Bhagwan found Minimum ramus breadth measurement was used as the best parameter for differentiation of sex (2).termination.In our study mandibular ramus height was used as the best parameter for sex determination. In the previous study by Ajit Damera, it shows that the ramus height showed maximum sexual dimorphism(5). In the study by Maneesha Sharma minimum ramus breadth is an to identify the sex(7). In the previous study by Kotya Naik tells that panoramic radiographs was used for sex determination(8). In the study by Suazo gives moderate sex accuracy (10). A study by Vineeta Saini coronoid height is used as a determined of sex it gave 74.1% accuracy for determining sex (4). In the previous study dental panoramic radiographs are used for the dental implants (15).The author in this study concluded that gonial angle can be used for sex determination but not for forensic investigation(16).The author Rupa concluded ramus height and gonial angle on the right side pof male gave greater values than that of females(17).According to previous studies,mininmum ramus breadth was used as the means of sex determination and gave correct results(18).The author Ohm in his study noted that their is increase in size of gonial angle(19).In one study is concluded as aging occurs the height of the mandible also changes(20).In another study shows that the gonial angle size varies due to the eating habits,ecomic backgrounds(21).OPG is used to get accurate values of gonial angles than cephalogram this gives clear pictures(22) .The gonial angles of orthopantogram can be used in the accurate age estimation(23).One author concludes that radiographs are used to preserve information over longer periods of time(24).

Mandible is the most grounded structure of the skull in light of a thick layer of minimized bone(25). It has an essential job as a result of its sexual dimorphism and radiomorphometric highlights despite the fact that it experiences morphological changes in size and rebuilding during development up to specific age (26). The author Lanster concluded panoramic radiographs gave relatively correct measurements(27).Dimorphism in the mandible is because of size and shape, and male bones are typically huge and more solid than female bones . Mandible is the last skull unresolved issue development and is touchy to the immature development spray. The phases of mandibular turn of events, development rates, and its term fluctuate in guys and females and henceforth helpful in separating genders (9). Limitations of this study are the lesser sample size with advanced statistical tools can determine the area of mandibular ramus.

4. Conclusion

This study concludes that the radiographic morphometric analysis for mandibular ramus for sex determination can be used as a main tool for sex determination. It is used mainly in forensic investigations. However further studies can be done with large sample size and other imaging modalities.

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