VOLUME-7, ISSUE-11, NOVEMBER-2018 • PRINT ISSN No 2277 - 8160

Original Research Paper

Surgery

DETERMINATION OF AGE AND GENDER USING BIGONIAL WIDTH - AN ORTHOPANTOMOGRAPHIC STUDY

Nagalaxmi Velpula	Professor and Head Department of Oral Medicine and Radiology Sri Sai College of Dental Surgery,Vikarabad Telangana
Aditi Ramesh	Assistant professor Department of Oral Medicine and Radiology Sri Sai College of Dental Surgery Vikarabad Telangana
Roshni Tandon*	Post Graduate student Department of Oral Medicine and Radiology Sri Sai College of Dental Surgery Vikarabad Telangana *Corresponding Author
Faisal Taiyebali Zardi	Reader Department of Oral Medicine and Radiology Sri Sai College of Dental Surgery Vikarabad Telangana

ABSTRACT

INTRODUCTION. Mandible plays a major role in determination of age and gender which is important in forensic and medico legal cases. Skull is the most dimorphic portion of the skeleton after pelvis and mandible is dimorphic, largest and strongest bone of the skull. Hence, using digital panoramic radiographs this study was conducted in Telangana population to evaluate the usefulness of different linear measurements of ramus in determination of age and gender.

MATERIALS AND METHOD: 150 panoramic images of dentate subjects with an age ranging from 20-70yrs old were selected for the present study. The Bigonial Width measurements were performed and further subjected to statistical analysis.

RESULTS: It was seen that the mean value of the bigonial width was more in males than females. On comparing, the mean value of bigonial width among different age groups, there was a significant difference among the mean values of bigonial width.

KEYWORDS : Age determination, Gender determination, Orthopantomograph, Bigonial Width.

INTRODUCTION:

Mandible plays a major role in determination of age and gender which is important in forensic and medico legal cases. Skeleton helps in genetic, anthropological, odontological and forensic investigation and identification of indivduals.[1] Skull is the most dimorphic portion of the skeleton after pelvis and mandible is dimorphic, largest and strongest bone of the skull.[1,2] Mandibular condyle and ramus in particular have been proved to show a high sexual dimorphism. Mandibular ramus is used to differentiate between sexes as the development of mandible; growth rates and duration are different in both males and females.[1] Masticatory forces which are different in both the genders, affect the form and dimensions of mandibular ramus which thus affect the anatomical landmarks of the mandible. Inspite of this variability, a number of studies have been carried out using ramus as a standard of measurement for age and sex determination.[3]

Panoramic radiography is a popular and most frequently used diagnostic tool in routine dental practice and screening of patients and is convenient to visualize the complete maxillo-mandibular region, temporomandibular joint and bilateral vital structures in a single film.[3,4,5,6] These radiographs have been studied to be the most reliable tool for obtaining linear measurements in a horizontal plane.[2,7] some studies have also shown that vertical measurements had an acceptable accuracy and reproducibility.[8]

Hence, this study was conducted to evaluate the usefulness of bigonial width of ramus in determination of age and gender using digital panoramic radiographs in Telangana population.

MATERIALS AND METHODS:

150 digital orthopantamographs which were taken for various diagnostic procedures were assesed in the present study. Each OPG was obtained using **CARE STREAM CS 8000** instrumentation, with a standard of exposure parameters 71kVp, 6.1mA and 13.2 seconds.

The age group of the subject ranged from 20-70 years. The images were saved in .JPEG format and exported to the Care stream dental imaging software where the bigonial width was measured. The study was held at the Department of Oral Medicine and Radiology, Sri Sai College of Dental Surgery, Vikarabad.

METHOD OF MEASUREMENT OF BIGONIAL WIDTH:

Mandibular ramus linear measurements were performed after image calibration. For standardisation, a reference line was drawn along the posterior border and along the inferior border of mandible with the point of intersection at the gonion was taken. Bigonial width was measured horizontally from the left to right gonion. The sex and age of the individual was blinded to the observer. The mean values were taken and calculated. These calculated values were further subjected to stastical analysis.

INCLUSION CRITERIA:

1. OPG of dentate subjects (presence of all teeth with or without third molars).
2. Age ranging from 20-70 years were selected for the study

EXCLUSION CRITERIA:

1. OPG without any exposure or positioning errors
2. Presence of any pathological lesions, Fractures or any Deformity.

STASTICAL ANALYSIS:

The results in the present study were stastically analyzed with the help of SPSS for windows version 20, using independent t-test to compare the mean values of bigonial width among males and females. ONE-WAY ANNOVA and Tukey's post hoc analysis was used to compare the mean values of bigonial width among the 3 age groups.

RESULTS:

The Mean$\pm$SD value of BG in females is 152.76$\pm$10.09 and in males is 160.11$\pm$11.59.. It was seen that the BG values are greater in males than in females with high significance ($p<0.001$) (Table I).

The Mean$\pm$SD BG value in the age group of 20-40 years is 154.83$\pm$11.54, 41-60 years is 159.73$\pm$10.68 and 60 years above is 165.11$\pm$5.12.One -way ANNOVA was used to compare the mean values of BG amongst the 3 age groups, there was a significant difference in the mean BG values. On further Tukey's post hoc analysis the mean BG values in the 20-40 age group was significantlygreaterr than the 60+ year age group.(Table II). This demonstrates that the BG width increased with increase in age.

TABLE I: The Mean+SD value of Bigonial Width in females and males

PARAMETERS	MEAN±SD		p-value
	FEMALES	MALES	
BG	152.76±10.09	160.11±11.59	<0.001(S)

TABLE II: The Mean+SD value of Bigonial width in the age group of 20-40 years, 41-60 years and above 60 years

	MEAN±SD				
PARAMETERS	20-40yrs	41-60yrs	60 yrs above	p-value	POST-HOC
BG	154.83±11.54	159.73±10.68	165.11±5.12	0.04	20-40<60

Picture I: Measurement of Bigonial Width (Red line)

DISCUSSION:

Determination of age and sex in anonymous skeletons is complicated in cases of explosions, wars and mass disasters.[9] Identification of the remnants of skeleton is important in forensic medicine and anthropology specially in cases of crime investigations.[10] In case of availability of the entire adult skeleton, sex can be determined with an accuracy of upto 100%, depending mostly on the available parts of skeleton. However, in case of mass disasters where mostly bone fragments are found, sex determination with 100% accuracy is not possible.[11,12] A major role can be played by the forensic odontologist in identification of age and sex using facial bones especially mandible because it is a large, strong and durable bone made of dense compact bone structure, forming the movable part of the skull and depicts sexual dimorphism and hence is useful for the purpose of identification of age and gender. Mandibular condyle as well as the ramus of the mandible particularly show sexual dimorphism and are sites which are associated with the most morphological changes in size and remodelling of bone during growth.[2]

OPG is the most widely used radiograph in routine dental practice. The major advantage in taking an OPG is that both maxillary and mandibular structures, temporomandibular joint and other supporting structures can be visualised in a single image. Another advantage of OPG is that it requires less radiation exposure and uses less time for image acquisition.[13]Panoramic radiographs have been used routinely as one of the screening tool for diagnosis of oral diseases. It has also been a very good source for retrospective studies. Several studies have been reported that panoramic radiographs are reproducible and accurate for the linear and angular measurements of mandible.[14,15,16]

In the present study a total of 150 OPG of dentate subjects were included with an age range of 20-70 years for measuring bigonial width in a total of 150 rami. The bigonial width was measured using the Carestream 8000 instrumentation. It was observed that the mean Bigonial width values were significantly greater in males i.e. 160.11 than in females i.e., 152.76. This study was in agreement with a study conducted by Leversha et al[3] which was done in Far North Queensland population where in the mean bigonial width among males was 188.43 and among females was 182.12 which was statistically significant. But according to study conducted in population of Bangalore, India by Jambunath et al[1], the bigonial width was not significantly different between genders. Another study conducted in Indonesian population by Kanya et al[17], the mean bigonial width in males was 229.4 and in females was 223.2 which was significantly more in males than females similar to the findings in our study. This difference in the results in various studies may be due to the varying population selected.

Our investigations, on the other hand revealed that bigonial width significantly increased as age increased which was not in agreement with a study conducted by Leversha et al[3] in whose study the bigonial width significantly decreased with an increase in age.

Hence, the use of mandibular ramus can be used for the determination of age and sex in forensic medicine and crime investigations. However further studies using larger sample size and different imaging modalities can be recommended to provide a more representative sample that reflects the entire population.

CONCLUSION:

Orthopantomographs are proved to be a valuable tool in the determination of age and sex using different linear measurements in mandible. From the results obtained from the telangana population, we can conclude that the bigonial width is more in males than in females and increases with increase in age. While considering the smaller sample size used in the present sudy, a study with lager group of sample are required to compare the results of our study in a larger more representative population of the area which is more reliable and accurate.

REFERENCES

1. Jambunath U. Sex Determination by using Mandibular Ramus and Gonial Angle–a Preliminary Comparative Study.
2. Muskaan A, Sarkar S. Research Article Mandible-An Indicator for age and sex determination using digital Orthopantomogram.
3. Leversha J, McKeough G, Myrteza A, Skjellrup-Wakefiled H, Welsh J, Sholapurkar A. Age and gender correlation of gonial angle, ramus height and bigonial width in dentate subjects in a dental school in Far North Queensland. Journal of clinical and experimental dentistry. 2016 Feb;8(1):e49.
4. Jyothsna M, Ranjith K, Sarat G. DETERMINATION OF GENDER USING CONDYLAR HEIGHT AND CORONOID HEIGHT–AN ORTHOPANTOMOGRAPHIC STUDY.
5. Rosing FW, Graw M, Marre B, Ritz-Timme S, Rotschild MA, Rotzcher K, Geserick G. Recommendations for the forensic diagnosis of sex and age from skeletons-HOMO. Journal of Comparative Human biology. 2007;58:75-89.
6. Ruston VE, Horner K, Worthington HV. Aspects of panoramic radiography in general dental practice. Br Dent J.1999;186:342-4.
7. Schluze R, Krummenaeur F, Schalldach F, d'Hoedt B(2000). Precision and accuracy of measurements in digital panoramic radiography. Dentomaxillofac Radiol. 29: 52-56.
8. Vazquez L, Nizamaldin Y, Combescure C, Nedir R, Bischof M, Dohan Ehrenfest DM, Carrel JP, Belser UC. Accuracy of vertical height measurements on direct digital panoramic radiographs using posterior mandibular implants and metal balls as reference objects. Dentomaxillofacial Radiology. 2013 Feb;42(2):20110429.
9. Fouadet al. Sex determination from mandibular canines a new radiometric method. Forensic Med Clin Toxicol. 2012;20:89-103.
10. Williams PL, Bannister LG, Berry MM. Gray's Anatomy. 38th Ed, New York, Churchill Livingstone. 2000:409-19.
11. Scheuer L. Application of osteology to forensic medicine. Clin Anat. 2002;15:297-312.
12. Saini V, Srivastava R, Rai RK, Shamal SN, Singh TB, Tripathi SK. Mandibular ramus: An indicator for sex in fragmentary mandible. J Forensic Sci. 2011; 56(Suppl 1):s13-6.
13. Poongodi V, Kanmani R, Anandi MS, Krithika CL, Kannan A, Raghuram PH. Prediction of age and gender using digital radiographic method: A retrospective study. Journal of pharmacy & bioallied sciences. 2015 Aug;7(Suppl 2):S504.
14. Razi T, Moslemzade SH, Razi S. Comparison of linear dimensions and angular measurements on panoramic images taken with two machines. Journal of dental research, dental clinics, dental prospects. 2009;3(1):7.
15. Shahabi M, Ramazanzadeh BA, Mokhber N. Comparison between the external gonial angle in panoramic radiographs and lateral cephalograms of adult patients with Class I malocclusion. Journal of oral science. 2009;51(3):425-9.
16. Laster WS, Ludlow JB, Bailey LJ, Hershey HG. Accuracy of measurements of mandibular anatomy and prediction of asymmetry in panoramic radiographic images. Dentomaxillofacial radiology. 2005 Nov;34(6):343-9.
17. Kanya AP, Kiswanjaya B, Makes BN, Iskandar HH. Estimating sex in an Indonesian Population Using the Mean Value of Eight Mandibular Parameters in Panoramic Images. Journal of International Dental and Medical Research. 2017;10:417-22.