

Study on dried skulls for sex determination by mastoid process length.

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Abstract: Mastoid process is a conical prominence projecting from the undersurface of mastoid portion of temporal bone located just behind the external acoustic meatus and lateral to the styloid process. Its size vary, it is larger in males than in females. The important role of this bone is that, it is a point for attachment of several muscle the splenius capitis, longissimus capitis, posterior belly of digastrics and sternocleidomastoid, because of these muscle attachments mastoid tend to be larger in males and smaller in females. Determination of sex through skeletal remains is an age old and time tested method. In human understanding of sex determination from skeletal remains has began ever since Hippocrates time, but in depth knowledge was gained in post renaissance period. Such knowledge is applied in time of war, crimes, genocides, or mass disaster.

Keyword: Mastoid Length, Sex Determination, mastoid process, temporal bone.

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I. Introduction

Determination of sex through skeletal remains is an age old and time tested method. In human understanding of sex determination from skeletal remains has began ever since Hippocrates time, but in depth knowledge was gained in post renaissance period. Such knowledge is applied in time of war, crimes, genocides, or mass disaster. Visual examination of entire skeletal segment may produce challenge. Various skeletal components give different degrees of accuracy in gender differentiation. Skull is considered next only to the pelvis in determining the sex (Bass et al-1971). Since it is composed of hard tissue usually preserved after death. In modern societies identification of human remains is necessary for both legal and social reasons (Buchner et al 1985). The sex is best assessed by pelvis, but it is very often damaged (Helmer et al 1993). The skull is the second best area for determination of sex but the skull is not reliable, until well after puberty (Patil et al 2005).

The mastoid bone is a part of skull that had good part in sex identification. Generally sex can be identified by using the mastoid process based on inspecting its size i.e. larger or small. The size of male mastoid is larger than that of female but the problem is that, there are no standard criteria for identification purpose. A simply calling the mastoid smaller or larger is subjective and may vary depending on inspection. Therefore error may occur when inspection is done by inexperienced person. For these reasons this study is designed tried to find a criteria for identifying sex by measuring the size of the mastoid. Sex determination from the mastoid process is done metrically and non-metrically. Various authors examined the skull and determined the sex by observing the mastoid process non metrically. The tip of mastoid process is sexually diamorphic. It tend to be vertical in male and pointed inwards in females.

Broca's (1875) and Hoshi (1912) have already suggested that when the skull were placed on flat surface the male skull rest on mastoid process while female skull rest on occipital condyles or other portions of skull. Determination of skull depends on the large size and robustness of male skull relative to those of female for example male cranial have better developed supraorbital ridges, broader palates, thicker zygomatic and lager mastoid process than those of females. Mastoid process is examined metrically by various authors. According to Suazo et al (2008) sex is determined by taking a triangular area formed by the points porion, mastoidale and asterion with the help of statistical analysis and discriminant functional analysis. He studied on Brazlian skulls. Some author's used some variable like mastoid length, breadth and width of mastoid process to determine the sex. Studies on determination of sex by mastoid process in India are few, so the present study is, to determine the sex from the morphometry of mastoid process in cadaveric skull of western U.P.

II. Material & Method

The present study is conducted in the Department of Anatomy, Saraswathi Institute of medical sciences hapur , on 50 dried skulls of cadaveric origin .The skulls are studied to determine the accuracy of mastoid process in sex determination. The skulls of known sex in which spheno-occipital junction was synostosed and the mastoid part of temporal bone was intact were included for study. The skulls with physical damage, apparent deformity, defect and disease or on which sphenooccipital junction was not synostosed or in which spheno-occipital ectocranial sutures have completely disappeared were excluded from study. The mastoid measurements will be obtained with sliding caliper to the nearest milimetre as per standard anthropological convention. The mastoid measurement were taken on both side, that is right and left side and then the average of both were considered for statistical analysis. The parameter measured is Mastoid length With the skull lying on its right side and facing the observer ,the fixed arm of the vernier calipers was kept tangent to the upper border of the auditory meatus (Frankfurt plane) and the mastoid length was measured from this line to the tip of the mastoid process.



Results

On comparing the mastoid length in between males and female we observed that, mean of mastoid length in males is $28.624 \pm 8.993E-02$ and females is $23.922 \pm .3603$ The measurement when compared was statistically significant with p- value $<.000$.

Table-1
Comparison of mastoid length among males and females

GENDER	N	MEAN	SD	SEM	P	MIN	MAX
MALES	50	28.624	.6354	0.0910	.000	27.68	30.36
FEMALES	50	23.922	1.5475	0.3603	.000	18.62	27.60

Table-1 shows the comparison of mastoid length between males and females.

On comparing the mastoid length in between males and female we observed that, mean of mastoid length in males is $28.624 \pm 8.993E-02$ and females is $23.922 \pm .3603$ The measurement when compared was statistically significant with p- value $<.000$. Table-1 also shows the minimum and maximum range of mastoid length among males and females In males it ranges between 27.68 – 30.36 In females it ranges between 18.62 -27.

III. Discussion

The analysis of mastoid process is important in the determination of sex for forensic purposes. Many authors agree that qualitative aspects, such as their size, ruggedness for muscular attachment inclination, or mastoid process inclination are very good indicators of sexual diamorphis, however from the quantitative point of view their utility is discussed because on the one hand ,there does not exist consent about the parameters to determine the height, width or thickness of the mastoid process. The present study has provided base line data for sex determination of skulls in western U.P. population. The sexual diamorphism of the mastoid process have been studied both by metric and non metric techniques.

Keen's et al (1950) observed that mean mastoid length was more in skulls of male individuals as compared to skulls of female individuals irrespective of race or region Giles et al (1963) also observed that in male skulls mastoid length was more as compared to females. Klaatsch et al (1966) observed that female skulls generally preserve infantile type of small mastoid process while the male present larger mastoid.

Lanarch et al (1966) calculated size of mastoid process and divided it into five grades (small, very small, medium, large, very large). They concluded from their consecutive studies that females have predominantly very small to small type in comparison to males who have predominantly medium to large sized mastoid. Patil et al (2005) described determination of sex and estimation of stature from the skeleton is vital to medicolegal investigation. This study made to determine the sex and estimate the stature of an individual using data derived from lateral cephalogram is ideal for the skull examination as it gives details of various anatomical points in a single radiograph. A discriminant function derived from 10 cephalometric variables provide 99% reliability in sex determination. The formula obtained from regression analysis using the maximum length for estimation of stature in males as well as females.

Sumati patnaik et al (2010) determined the sex by taking three variables, mastoid length, mastoid breadth and A-P diameter and calculated the size. Discriminate functional analysis revealed correctly determination of sex in 76.7%. Mastoid length was found to be best determinant for sex. Kristen et al (2009) examine the two qualitative observation supramastoid crest size, and mastoid process size. He found that supramastoid crest is more consistent than scoring the size of mastoid process. Three paired quantitative classification were also calculated for the three mastoid measurements by him (mastoid radius, mastoid breadth and height) among males and females. Among these variables mastoid radius is the most consistent, measurement for determining the sex. Anjai et al measures various parameters in the cranium and mandible of Thais for determining the sex by modified Krogman's craniology and found that males had a wider base and a higher mastoid process in comparison to female according to his study. Mastoid height (LENGTH) in males was-17.59 and in females was-13.59. Various authors measured the triangular area over the mastoid process to determine the sex.

IV. Conclusion

The parameters like mastoid process length can be used as predictors to determine gender and could be of immense use in forensic medicine and anthropology and will also serve as a future framework for estimating the craniofacial dimensions of other Indian population.

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