

Mastoidale, Asterion and Porion (MAP) Triangle – The Determinant of Sexual Dimorphism

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Abstract

Background: Sex determination is utmost important for forensic experts and Anthropological studies. **Aim:** The aim of this study is to compare cranial morphology between male and female skull using MAP Triangle. **Subjects and Methods:** A total of 100 adult dry skull (50 male and 50 female) were used for study using a digital Vernier calliper. **Results:** The male parameters were significantly higher than female parameters with no significance difference in Right and Left side of male and female. **Conclusion:** The skull is most commonly site for sexual dimorphisms in human Skeleton and MAP Triangle can be additive value gender differentiation.

Keywords: MAP, Sexual dimorphism, Skull bone.

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Received: July 2019

Accepted: August 2019

Introduction

Sex refers to set of biological characteristic of an organism, which is linked to physical and physiological features including reproduction anatomy. The morphological characteristic of human skeleton amongst gender has been the interest of researchers. The increasing demand from medicolegal investigation of skeletal remains created a surge for more precise identification of gender attributes. In forensic science the identification of the skeletal remains starts from the determination of sex. The existence of sexual dimorphism in human skeletons and its importance in medicolegal investigations have long been acknowledged. Therefore, human skull is probably the most fascinating bone in the series. In the skull, the temporal bone is highly resistant to physical damage; thus it is commonly found as remainder in skeletons and is important for sex determination.

The reliability gender differentiation is almost 100% with entire skeleton, 92% using the skull alone, and 98% when skull combined with pelvis. Krogman and Iscan¹ Even though several postcranial elements have proven to be more effective in sex prediction, the skull still demonstrated the most dimorphic parts of the skeleton.^[2] There are mainly four available methods of gender differentiation i.e. morphological, metrical, geometrical morphometries and molecular. Out of these bone morphology is the oldest. The sexual dimorphism in the human skull is grossly determined by certain factors like general size, nuchal crest, mastoid process, supraorbital ridges, mental eminence etc.

Paiva & Segre (2003) introduced an easy technique for sex determination starting from the temporal bone. The technique is based on the triangular area calculation obtained between the points Mastoidale, Asterion and Porion (MAP). They found significant differences in the area between the right and left mastoid triangle when comparing male and female skulls, but owing to the asymmetries present in the skulls, it is recommended to observe the value of the total area (adding right and left sides), which was also significant, so that when it is higher than or equal to 1447.40 mm², the skull is diagnosed as male skull, and a value near to 1260.36 mm² or less is indicative of female skull.

MAP is most studied method worldwide and the reports in this regards are available for different racial and ethnic groups.^[4-12] The racial ethnic variation in the morphological characteristics of skull is obvious. Therefore, the aim of this study was to develop a sex determination technique using Mastoidale, Asterion and Porion triangle for north Indian population

Subjects and Methods

The study was conducted at Indira Gandhi Institute of Medical Sciences, Sheikhpura, Patna, using 100 fully ossified and dry adult human skulls (males=50 and Females=50). The study was approved by institutional research committee. A digital venire caliper and micro-tip pencil was used for carrying measurement. The following landmarks were marked -

Mastoidale- The most inferior point of mastoid process.

Asterion - Meeting point of lambdoid, Occipitomastoid and Parietomastoid sutures. And

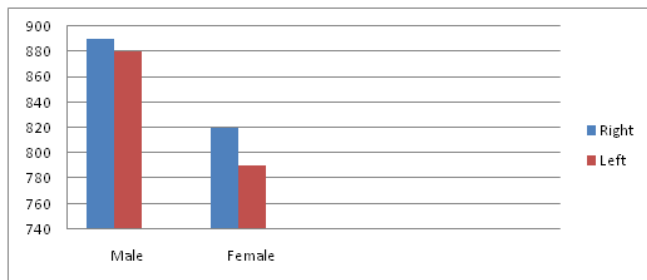
Porion - Upper most lateral point of external acoustic meatus pore.

The mastoid triangle area was calculated by means of the Heron formula. According to the method described by De Paiva and Segre, the total area was calculated by adding the area obtained on each side.

The observed data was subjected statistical analysis using SPSS software version 10.

Results

The mean observed values of MOP triangle for the male skull was found to be 890 and 880 for the right and left side respectively. The mean observed values of MOP triangle for the female skull was found to be 820 and 790 for the right and left side respectively. (Graph-1)



Graph 1: Mean measured values MOP triangle amongst gender

The MOP index amongst the gender was significantly different, but was comparable and non-significant for the right and left for the same gender.

Discussion

Determination of sex plays a key role for anatomists, anthropologists and forensic experts. Numerous techniques have been described for sex determination including clinical and radiological examination, anthropometry, growth charts, chromosomal analysis but anthropometric measurement of bone still remains supreme.^[13-18] Cranial bone analysis whether morphometric or morphological have played an important role in sex determination.

Body size, proportions and architectural differences are the three primary biological differences amongst genders.^[19] Males generally have more body mass index than females as they have more muscular and more weight of axial skeleton. Lots of studies were done for sex determination using skull for various parameters like foramen magnum, mastoid triangle, mastoid process, mandible and various lengths and landmarks.^[20-21] The present study of sex determination using MAP Index showed, a significant difference between male and female parameters, with higher values for males. This was in consonance with the

previous study of Reichal et. al.; Galdames et. al.; and Gupta et.al.. In this study area of MAP triangle of male was found to be significantly higher than that of female.

Conclusion

The present research showed high level of sexual dimorphism and will be of immense help to forensic expert.

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How to cite this article: Kumari P, Kumar A, Kumar S. Mastoidale, Asterion and Porion (MAP) Triangle - The Determinant of Sexual Dimorphism. *Asian J. Med. Res.* 2019; 8(3):FM07-FM09.
DOI: [dx.doi.org/10.21276/ajmr.2019.8.3.FM3](https://doi.org/10.21276/ajmr.2019.8.3.FM3)

Source of Support: Nil, **Conflict of Interest:** None declared.

