



The Important Role of Skull and Pelvic Girdle in Forensic Anthropology: A Review

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ABSTRACT:

Each fragmented or splintered bones or exhumed from the ground is very imperative facet in forensic anthropology and a very clamant in this realm of legal scenario. Skull part is the axial skeleton and a pelvic girdle is the part of appendicular skeleton that plays an essential role in the osteological studies and also a very crucial component in the field of forensic anthropology as well as forensic sciences. Skull is an important component in forensic anthropology which helps to determine the sex and also to estimate the age of the individual and osteology part is played an essential role in forensic anthropology. Osteology is an important part in biological anthropology which how the human body parts are structured with bones; also is a great opportunity for the archaeological sites to find the skeletal remains and the sutures are very valuable to find and record the age through study and determination from the skull. In forensic anthropology, pelvic girdle shows the way how to determine the sex through intensive investigation, through visual assessment or by comparison between two pelvic bones etc., and it provides to identify whether the bone is male or female; and also a core support for our body and is a crucial part in legal scenario and also in the field of forensic anthropology. Pelvic girdle and vertebral column helps to support our body with various articulated bones and pelvic bone is made up of three bones i.e. ilium, ischium and pubis. Multifaceted tools and techniques which makes facilitate through employing hi-tech equipments. Being employed multifarious tools and techniques, taking up the best tools and equipments like craniometric measurement, Computer Tomography (CT), Magnetic Resonance Imaging (MRI), X-Ray, anthropometers, Geographic Information Systems (GIS), and Radiocarbon Dating, high-powered microscopes etc., these all have been facilitating to reveal the conundrum of complicated case through forensic anthropologists to analyse the skeletal remains, sex determination etc., and also those who have been concentrated in the field of forensic sciences. Perplexity or disconcertment with scourges and under suspected clears the ruminant about to set free in this field of forensic dimension. Sex determination is an important aspects in forensic anthropology and also makes facilitate to identify the male and female through visualisation the two skulls. It plays a key role in the field of forensic anthropology and a very helpful in the academic area too that it makes assimilated to understand how the human skull is different from male to female and a very valuable to imbibe knowledge. The important component of skull and pelvic girdle are very much needed in the legal scenario which through visual assessment also can be done the determination of sex. The difference in skull and pelvic bone of morphology from male and female are very crucial component which is an important role in forensic anthropology.

Keywords: Pelvic girdle, Skull, Forensic Anthropology, Mandible, high-tech equipment, Skull suture, Biological Anthropology

Introduction

Year after year, in the modern era of advancement of science and technology has been opened through striving to touch the committed goal in intensive investigation to acquire knowledge, scientific investigation in forensic field through analytical approaches, identifying the fragmented bones by reconstruction from the skeletal remains and exhuming from the ground in archaeological sites, DNA profiling, conflicted helps to understand through utilising the scientific tools and techniques in forensic investigation by locating the bodies etc. In osteological study can be divided the skeletons into two as the axial and the appendicular, and the skull part is from axial skeleton and the pelvic girdle is a part from the appendicular (Grisbaum and Ubelaker, 2001; Renshaw *et al.*, 2020 and Tamhane, 2021). Employing multifaceted tools and techniques and much understanding in the broad-ranging discipline of forensic anthropology that makes different the mankind's consideration so that unmask the mystery cases which helps to solve the perplexity (Black, 2009; Valsecchi *et al.*, 2019 and Wescott, 2018). Nevertheless forensic anthropology is a part of biological anthropology but plays a significant role in contributing to this field of study and gain the huge information; also providing comprehensively to bridge the gap between modern and ancient skeletal remains through multifaceted hi-tech equipments (Stewart, 1979; Klepinger, 2006). Being utilised and taking up the best tools and equipments like craniometric measurement, Computer Tomography (CT), Magnetic Resonance Imaging (MRI), X-Ray, anthropometers, Geographic Information Systems (GIS), and Radiocarbon Dating, high-powered microscopes etc., these all have been facilitating to bring light the conundrum of complicated case through forensic anthropologists to analyse the skeletal remains, sex determination etc., and also those who have been concentrated in the field of forensic sciences (Chowdhury *et al.*, 2016; El Morsi *et al.*, 2015; Lopatin, 2022 and Thomson, 2023). Biological profiling is the another important method that helps to obtain in investigation to assimilate the significant notion of encompassed of perplexity and complicated in solving the crime or any other occurred and

also makes easier to provide tremendous information which in-depth examination of medico-legal scenario (Abualhija *et al.*, 2023; Austin and King, 2016; Spradley, 2016). In forensic anthropology, it helps to ponder about and determining the age, sex, ancestry which unite how the person was lived, from where that person is belonging to etc., that through thorough investigation provides significant data to be used in the field of study and if it is a strong reason then pave the way to facilitate through assembling all the necessary information by employing multifarious tools and techniques. Skull like from mandible, supraorbital, mastoid process region etc., and from pelvic girdle like pubic arch, pelvic inlet, sacrum concavity, ilium, obturator foramen etc., these are very helpful while determining the sex through examining the human skeletal remains that makes facilitate either through visual assessment, analysing and morphologically intensive study by multifaceted tools and techniques (Afrianty, 2013; Smithsonian, 2014). Therefore, human skull and pelvic girdle plays an important role in the field of forensic anthropology and forensic sciences that through these bones help to bring the light and also determining the sex in the legal scenario. Taking up the new perspectives in the field of forensic anthropology which purvey the sources for mankind in this modern world to be ruminated broader to adhere with that attention on this has been very valuable; helps to unmask the involuted aspect of our life and also through utilising of multifarious methods and hi-tech equipments ease to investigate which can access through the perplexity of hidden cases.

Sex Determination of Skull Bone Through Visualisation in Forensic Anthropology

Sex determination is an important aspect in forensic anthropology and also makes facilitate to identify the male and female through visualisation the two skulls. It plays a key role in the field of forensic anthropology and a very helpful in the academic area too that it makes assimilated to understand how the human skull is different from male to female and a very valuable to imbibe knowledge. 22 bones comprised human skull which subsumed 8 cranial bones (frontal bone, parietal bones - paired, sphenoid bone, temporal bones - paired, occipital bone and ethmoid bone) and 14 facial bones (inferior nasal concha - two bones, lacrimal bone - two bones, mandible - one bone, maxilla - two bones, nasal bones - two bones, palatine - two bones, vomer - one bone and zygomatic bones - two bones) and reveals the differences of male and female's skull bone through visual assessment and other significant craniometric tools and techniques which facilitates to acquire knowledge (Smithsonian, 2014). If do the visual assessment from the architecture of skull then in male, it is not smooth i.e. rugged but in female, skull is smooth and the mandible part of male that reveals it is larger, thicker and ramus is less obtuse and also the condyle part is larger than female but the female's mandible is rounded and in male, it is a squared, mastoid process is not similar as compared with female's skull. Zygomatic bone is very noticeable in male but less pronounced in female; in male's skull temporal ridge is more prominent than female (Crogman, 1962; Sikka and Jain, 2016 & Nagare, 2019).

Table 1: The Difference in Skull Morphology among Male and Female

Traits	Male	Female
Size of Skull	Bigger	Smaller
Zygomatic Bone	More pronounced	Less pronounced
Mandible Bone	Squared	Rounded
Condylod Process	Bigger	Smaller
Mastoid process	Larger	Small
Supraorbital Margin	Rounded	Sharp
Gonial Angle	Flared	Less flared

Determination of Age through Skull Sutures

Skull is an important component in forensic anthropology which helps to determine the sex and also to estimate the age of the individual and osteology part is played an essential role in forensic anthropology. Osteology is an important part in biological anthropology which how the human body parts are structured with bones; also is a great opportunity for the archaeological sites to find the skeletal remains and the sutures are very valuable to find and record the age through study and determination from the skull (Hall *et al.*, 2008). Study from the Cranial sutures show the age of individuals from the sutures which each parted bones from the skull are not similar because some parts are closed early but some are fused late accordingly and the fusion of sagittal and lambdoid suture, both are began to be close towards the end of 21 to 30 years of age and the fusion of coronal suture is completely closed at the age of 40 to 50 as brought to light by the researchers (Todd and Lyon, 1924; Kumar, 2012). The three special parted skull bones i.e. coronal, sagittal and lambdoid sutures are started to close earlier in females than in males skull; the suture starts from the bregma which bore in male and female and fusion of sagittal, coronal and lambdoid suture that starting between 20 and 29 years of age. Completion of suture closure occurs between 60 and 69 years in case of sagittal suture and in case of coronal and lambdoid suture between 50 and 59 years in human skull (Johnston, 1961; Ramanan, 2016 and Gosh, 2019).

Table 2: Three Sutures in Human Skull that Complete Closed

Traits	Beginning of Suture Closure	Complete Closed that Depends on Age
Coronal Suture	25 - 30	50 - 59
Lambdoid Suture	20 - 29	50 - 59
Sagittal Suture	20 - 29	60 - 69

Sex Determination through Pelvic Girdle in Forensic Anthropology

In forensic anthropology, pelvic girdle, the appendicular skeleton part that shows the way how to determine the sex through intensive investigation, visual assessment or by comparison between two pelvic bones from both sexes etc., and it provides to identify whether the bone is male or female; it support our organs like bladder, uterus, rectum, other important abdominal organs etc., and also a core support for our body and is a crucial part in legal scenario and also in the field of forensic anthropology. Pelvic girdle and vertebral column helps to support our body with various articulated bones and pelvic bone is made up of three bones i.e. ilium, ischium and pubis (Holden, 1885). Pelvic, as a whole it is a massive and rugged in male but less massive and smoother in female's pelvic bone. Female's pelvic bone is broader than male and in male it is formed like a heart-shaped and narrower than female's pelvic bone. In pelvic girdle, pubic symphysis is broad and more triangular in male, acetabula is narrower than male's pelvic bone and in female, sacrum is shorter and broader but in male, it is not similar by comparing through visual assessment because it is relatively high and narrow, and V-shaped in male but broader U-shaped in female's subpubic arch. Acetabulum articulates with the femoral head of the femur which formed the hip joint and allow us to walk or move freely, and larger in male but smaller in female's pelvic bone (Norton, 1866; Klepinger, 2006 and Garg, 2021).

Figure 3: The Difference in Pelvic Girdle Morphology among Male and Female

Trait	Male	Female
Pelvic (as a whole)	Massive and rugged	Less massive, gracile and smoother
Pubic symphysis	Broad, more triangular and higher	More narrow and rectangular; flat posteriorly and lower
True pelvis	Relatively smaller	Oblique, shallow, spacious
Pelvic inlet or Brim	Heart-shaped	Circular, elliptical
Sacrum	Relatively high and narrow	Shorter and broader
Ilium	High, tends to be Vertical	Lower, more flaring in upper part
Iliac tuberosity	Large, not pointed	Small or absent, pointed or varied
Obturator foramen	Large	Small, triangular
Pubic bone shape	Triangular	Rectangular
Preauricular sulcus	Generally absent to small	Commonly better developed
Ischiopubic rami	Slightly everted	Strongly everted

Conclusions

Skull and pelvic girdle are played an important role in the discipline area of forensic anthropology that facilitates to identify and determination of sex. Both are helping to estimation of age through valuable bones which these are very essential aspects in forensic anthropology, forensic sciences and medical fields too. Not only skulls or cranium, pelvic bones etc., all human bones are very important facets either the fragment parts, remaining of bones which exhumed from the ground etc., these are valuable source for intensive study or examination through investigation so that helps to comprehend and also to garner knowledge in the vast field of forensic anthropology and even in the area of academia. Each parted bones are very special and a distinct characteristics that brings to light the secret story. Through employing of multifaceted tools and techniques i.e. biological profiling, DNA analysis, CT scan, MRI or hi-tech of other equipments etc., pave the way to investigation in the field of forensic anthropology and also helps to solve the intricated hidden stories by telling the skeletal remains or fragment of bones which exhumed from the ground. Bones are very unique, a powerful and also facilitates the forensic anthropologists to do the visual assessment how tall he or she is or either the bone is male or female, age and in this way identify and done sex determination in the field of forensic anthropology. In the field of forensic anthropology, skeletal remains or exhumed from the ground is very imperative components which clear the encompassed under suspicion and a clamant facet is very much helpful for the public in the modern world that the frame of mind led to set goal and brings satisfied the people through multifarious methods that has been done in the legal scenario. Skeletal remains are very crucial component which makes explicit the doubts and the aspects of limelight in forensic anthropology that brings us to achieve success through

put effort and keeps to set goal through employing of scientifically which multifarious hi-tech equipments. These tools and techniques makes entrap all the stagnant of perplexed which brings to change the world into better and uplifting to unrivalled in the field of forensic anthropology.

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