

Forensic Anthropology: Identity of John/Jane Doe

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AUTHOR BIO

Xinning (Fiona) is from Shanghai, China, and currently attend a boarding high school in Indiana, United States. Fiona's interest in criminal psychology is developed since little, through reading detective novels by Agatha Christie, Conan Doyle, etc. She is also a fan of *Criminal Minds*. After taking pre-college courses on criminal psychology offered at Johns Hopkins University and Brown University, Fiona is determined to turn this interest into profession and continue pursuing this field in college, and this paper is a reflection to what she has learned. Alongside criminal psychology, Fiona is also interested in clinical psychology, centering on mental health. After interning at Mindfront psychological counseling clinic, she realized the lack of awareness on mental well-being in current society, and is convinced to delving deeper into the field of clinical psychology in college in order to continue nurturing mental health in her career in the future.

ABSTRACT

This paper looks into the field of forensic anthropology and its application in criminology. Its techniques include human anatomy, bone and trauma analysis, and their role in determining the unidentified deceased in criminal scenes. It also examines the importance of forensic anthropology in contemporary society. This paper is a reflection after completing the pre-college course "Forensic Anthropology: Who is John/Jane Doe?" offered at Brown University.

INTRODUCTION

Forensic anthropology is an applied science field within biological anthropology. Founded by Hans Gross, forensic anthropology first appeared as criminal profiling that applied scientific methods to crime scenes. With rapid development, the technique of forensic anthropology has become more advanced and efficient. As it is the study of humans for the purpose of the court or forensics, its goal is to establish the identity of the deceased focusing mainly on skeletal evidence.

SEX & AGE ESTIMATION

When describing a deceased person whose identity remains unknown, investigators usually use the name “John Doe” if the deceased is a male and “Jane Doe” if the deceased is a female. Thus, the investigators usually start by analyzing sex of the deceased. As investigators proceed to find out more details to identify John/Jane Doe, age and pathology will all be revealed from skeletal evidence and will help with establishing the identity.

The Skull

To begin with, the skull is a significant indicator of sex. Overall, the skull of a male is more robust and thick than that of a female. Specifically, the skull of a male has a prominent projection of brows, while on a female the forehead is more smooth. Additionally, the mandible of a male is more prominent, defined, and square-like; while for a female, the mandible will be less projecting. Ultimately, a male has a larger mastoid process than a female does. Thus, all the features of the skull of a female are more gracile than those of a male.

Furthermore, the skull can also help with establishing an age range of the deceased. If the skull is solid, dense, smooth and hard, it is likely that it is from an adolescent or an adult

who is around 20 years old. On the other hand, if the deceased individual is older, probably middle-aged, the texture of the skull will be rougher, the eye socket will be sinking and the jaw will start to recede. As a result, the skull will also provide a rough range of age estimation, but it cannot go any further or more detailed.

The Pelvic Girdle

The pelvic girdle is an essential part of the skeleton that would aid with sex determination. In males, the entire pelvic girdle is heavier than females'. In females, the overall features of the pelvic girdle are more stretched and elongated. The pelvic cavity in females is wide, rounded and oval-shaped. While in males, the pelvic capacity is narrow and heart-shaped. Thus, it will be easy to differentiate between a female and a male's pelvic girdle. However, as the pelvic girdle in females only begins to widen and become visually different than males' during puberty, it is nearly impossible to identify sex from the pelvic girdle during child stage.

In addition, the pelvic girdle can also provide investigators with a rough age range. The pelvic girdle is composed of ilium, ischium and pubis. As they all fuse between age 12 to age 17, a complete or incomplete fusion will enable investigators to determine whether the deceased is younger or older than age 12 to 17. Unfortunately, the estimation cannot go more detailed beyond this. Thus, while the pelvic girdle might provide the two age ranges, it will not be helpful if the deceased is an older individual.

The Long Bones

The long bones mainly consist of two parts: the upper limb and the lower limb. Beginning with the upper limb, it is composed of the humerus, ulna and radius. The upper limb is not a great help for sex identification, but it to some degrees does provide information about

age. The humerus starts ossification by age 14 to 21 and completes by age 25. The ulna and radius fuse at 19 in females and at 21 in males. Thus, if the deceased individual shows signs of complete upper limb ossification, the investigators will be able to conclude that the individual is beyond 25 years old. However, more skeletal evidence will be needed to narrow down the age range estimation.

The other part of the long bones is the lower limb, which consists of femur, tibia and fibula. The head of the femur in males is larger and more ball-shaped, generally with a vertical diameter more than 47 mm. On the other hand, the vertical diameter of the head in females is usually less than 45 mm. Also, through looking just at the femur, sex can be estimated knowing that the femur will stand mostly vertical if it is from a male, while it will drastically angle off to the side if it belongs to a female.

Determining the sex is an essential step prior to determining the age through the lower limb. The tibia starts fusing at age 12 and finishes the fusion at age 14 in males and 16 in females. There are differences in the fusion of femur between females and males as well, since the femur fuses at 16 in females and 18 in males. Hence, it is important to determine the sex before attempting to analyze the age as there are multiple differences in the age of fusion between sexes.

The Hands & Feet

Both hands and feet are useful skeletal evidence for determining age. Starting with hands, the bones in hands ossify at different ages. Generally, all bones begin to fuse at around age 14 to age 19. As different stages of ossification happen at varying age ranges, the investigators usually provide an age estimation in ranges, rather than an exact number.

In addition, the feet consist of phalanges, metatarsals and tarsals, which all fuse at different ages. Metatarsals and phalanges fuse between age 17 and 18, while the tarsals fuse at around age 12 to 22. Overall, females show earlier skeletal maturity than males in foot. Thus, the foot will also provide helpful information about age estimation.

PATHOLOGY

Besides age and sex, pathology will also be revealed from skeletal evidence, and it will be a strong tool for investigators to narrow down the candidates pool of the identification of the deceased combined with other evidence, as much pathology is unique.

For instance, osteoporosis, the breaking down of bones, can be found through skeletal analysis. This disease will cause bones to become brittle and weak, which is commonly associated with fractures. Most obviously, those bones will become spongy, which makes this pathology easy to identify.

Compared to osteoporosis which is bone breakdown, osteoarthritis is bone growth. This pathology is marked by the extensions of the margins and the overlapping of bones. And while normal bones usually have smooth surfaces, the bone growth will make the surface textured and rough. As a result, this pathology is also obvious through bones and will help with identification.

The last but not least example is rickets, which is the weakening and softening of bones. This is usually caused by a deficiency in Vitamin D, calcium and phosphorus. The lower limbs are the ones usually affected by this disease, and it is marked by bone bowing and bending. Therefore, this disease can also be found out through skeletal analysis.

TRAUMA ANALYSIS

Traumas to bones can be categorized into three types: antemortem, perimortem and postmortem.

To begin with, antemortem trauma is the injuries that occur before death. This trauma is usually characterized with healed bone fractures. Thus, even though the injury is healed, it will still be visible through skeletal analysis. Usually, antemortem trauma will provide information about the deceased's life history, indication of abuse, which will narrow down the candidates pool of the unidentified based on their medical history when they were alive.

Furthermore, perimortem trauma occurs at or around time of death. This will provide information regarding the cause or manner of death. Obviously, the perimortem trauma will not show signs of healing. Investigators will look for evidence that the bone is living while being broken by the force. Often, warping is a great indicator, which shows that the bone is compressed before it breaks.

Ultimately, postmortem trauma happens after death. This trauma is characterized by color difference between the surface and the broken place, and provides information about where or how the body is disposed, and attempts to destroy the body if there is any. Usually, the outside of the bone will be darker, while the broken place will be lighter if it occurs postmortem. Examples of postmortem damage include carnivores or rodents gnawing, weathering, etc. For postmortem traumas, there will be no signs of the bone withstanding the force.

CURRENT SITUATION: WHY IS FORENSIC ANTHROPOLOGY IMPORTANT?

While it might seem like an odd combination, forensic anthropology is deeply connected with human rights. Forensic anthropologists work for the United Nations, The U.S. Department of Justice, and many other organizations. As we are all granted with human rights, the deceased also have rights of the dead, which are the right to identification, the right to return to families, and the right to proper burial. Currently in the United States, there are 21,797 missing persons cases and 14,065 unidentified persons cases. Many generations of families have spent years and years looking for their loved one's body and waiting for it to be returned. Thus, it is the job for forensic anthropologists to find the missing persons, establish correct identities for those unidentified deceased and return them to their families for proper burial. In short, forensic anthropologists help preserve the rights for the deceased and the information and evidence that is gathered will be significant for courts.

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