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A Case Report: Analysis of the Skeletal Remains of a Teenager

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Abstract

Cases studies give us the opportunity to apply forensic anthropology techniques on real cases to individual skeletal remains. The purpose of this paper is to describe the last forensic anthropological techniques to analyse human skeletal remains to determine sex, race, stature, age, and to make a positive identification of a teenager who disappeared more than 3 years ago. At the beginning of June, 2017, several human skeletal remains were found under a tree in a little forest of Punta Espinillo location, near the Montevideo City, and later carried to the Central Judicial Morgue to be analyzed by the local forensic anthropologist. The analysis indicated that the victim was a white man of between 15 and 18 years old and about 170 cm tall. The cause of death was by a severe trauma on the left malar region. Based on preliminary evidence it was suspected what the victim might be John Doe, a teenager who disappeared more than 3 years ago when he was 16 years old. Therefore, it is a cold case now opened. Based in actual evidences and the confession of one of the perpetrator it knows that he was murdered by him and his friends of the New Communist Party and later left him unburied on the ground of the forest, where his body was attacked by several depredator animals. Certainly the examination of the remains revealed that the skull had a hard injury on the left malar bone who broken it. A DNA analysis was made by a later identification based on the anthropological data approved by the forensic anthropology studies. Therefore, this case shows how Forensic Anthropology techniques can be successfully used in medico-legal investigations linked with cold cases of more than 3 years ago.

Keywords: Forensic Anthropology; Skeletal Remains; Cold Case; Cause of Death; Uruguay

Introduction

Forensic anthropologists have developed numerous demographic techniques to understand the biology of people around the world. Many of these techniques derived from skeletal remains of known identity. For this reason case studies are ideal to test the validity of this techniques and Forensic Anthropology may function as a testing ground for this aspect of Biological Anthropology [1]. For almost three decades, Forensic Anthropology has been an active part of the coroner system in Uruguay and the number of cases has increased considerably since the inclusion of a resident forensic anthropologist to the medico-legal team and judicial system [2-5]. This eventually led to a higher rate of positive identification of unknown human skeletal remains [6-11]. On June 26th, 2017, several human skeletal remains were found on the ground, not buerid into a little forest in Punta Espinillo a location near the Montevideo City. After preliminary observations in situ, the remains were transported to the Central Judicial Morgue for an in depth analysis by the local resident forensic anthropologist, especially to determine sex, race, stature, age at death, cause

of death, and eventually its identity. Once placed the skeletal remains on the autopsy´s table in anatomical position to be analyzed the author notes that all the human skeletal remains corresponding to a young single individual. The victim was wearing sport shoes, a shirt and a pair of trousers, no bullets were found with the skeletal remains. The skeleton is almost complete, in good stage of preservation but showing attacks evidence from animal predators, especially on long bones. It was suspected that skeletal remains could correspond to a John Doe a missing teenager last seen in this location three years ago. Once, being found John Doe skeletal remains, his killer confesses that he and his friends gave him a great beating while they fought from a lot of money. Indeed, the victim received a very hard trauma in the left facial region and later his body was leaved on the ground. The purpose of this work is to display the details of this rare cold case as an example of fatal violence, and how through anthropological methods can get to identify the skeletal remains of missing people disappeared many years ago.

Materials and Methods

Osteological Analysis

A set of anthropological procedures was followed to analyse the remains. The first was following a correct chain of custody and the inventory of bones. Once inventory was finished, I noted that only very few bones were missing and the skeleton was almost complete (Figure 1). Several dental pieces were extracted for DNA analysis. Further examinations revealed evidence that the remains had been attacked and damaged by predator or scavenging animals, also some insects were found. The first sets of anthropological analysis dealt with the determination of sex, race, stature and age at death. Diagnosis of sex was made using skull and pelvis both morphological and metric features [12,13]. As is typical for males, the skull was large and rugged with well-developed supraorbital ridges and mastoid processes. The occipital bone showed pronounced nuchal lines and protuberance, small frontal and parietal eminences, and a sloped forehead. The pelvis was also of a male type with a narrow sub pubic angle, large acetabulum and narrow, deep greater sciatic notch [14,15]. In addition to morphological analysis, determination of sex was made by discriminant function analysis of the skull; these formulae tested indicated the victim was a male [16]. About racial affinity since a morphological point the victim showed a number of white characteristics such as deep nasal depression, a narrow nasal aperture, sharp sills, and a round and high skull [12-15]. To confirm this, cranial and mandibular dimensions were put into discriminant function formulae derived from an American white sample [17]. Stature estimation is another way to determine if the victim's body size was within the range of the reported missing people and also to rule it out if there is a large discrepancy. There are very few standards to estimate height from the skeleton. The most reliable is obtained from the long bones of the lower and, to a lesser degree, of the upper extremities. The given standard error of estimate can cover a safety range around the mean. In this case the estimation of stature was made using lengths of the femur and tibia and applying them to Trotter's regression equations for white males [18]. The average stature was found to be 170 cm with about +- 3, 27 cm standard error of estimate. Age at death may be estimated from several methods.

Figure 1: Inventory of bones.

One of the most reliable morphological age estimations is the assessment of the costochondral junction of the ribs. When applied to this case for white male, it was observed that the edges are sharper and have a scalloped appearance. The inner surface is beginning to look V shaped, ribs end begins as a fairly flat surface. The edges are smoothly rounded and the surface is undulating. These characteristics correspond to stage 1 and 2, an age between mid-teens to early twenties at time of death [19]. Ectocranial suture closure was one of the oldest techniques developed to estimate age at death [20]. In this case the technique development by the author [21] using a Uruguayan sample. It is calculated from the total score of each section of suture and applying it to the regression equation: Y = 0:950468x -2:63467. The total score was obtained using the traditional 0 (open) to 5 (closed) scale patterns and added up to a maximum score of 95. In this case the total score was about 20 points which made the age about 16, 36 years old, with a range of 16, 36±5 years. Evaluation of the male pubic symphysis pattern was based on Todd´s [22] studies. Symphysis face rugged, traversed by

horizontal ridges separated by well-marked grooves, there being no distinction in size between the upper and lower ridges nodules fusing with the surface, a delimiting margin, or definition of extremities. This correspond to Todd´s I phase analysis, this is an average age of 18 years old. Age estimation was also made from the size of the medullary canal of the proximal epiphysis of the humerus [23], results indicated that the victim was about 18 years old with a range of 15 to 25 years old using the formula: Y = 58:08 +1.47(x-6:03), where x refers to the medullary canal size. This technique was derived on a Cuban sample of 94 males and females. The homers were first sagittal sectioned in its upper third to determine how far the medullary cavity was advancing into the epiphyseal region. The surgical neck of the bone is taken as a reference point. If the cavity has not reached this point, the metric value is negative suggesting a young person. If the canal has advanced into the neck and even to the head, the person is in an older age category. Therefore, it is clear that the rib phase analysis, ectocranial suture closure pattern, pubic symphysis metamorphosis and medullary canal enlargement suggested a lower range of 15 and gave an upper range of 21 years old at time of death. Then, a mean age of about 18 years old was estimated for the skeletal remains. All the osteological analysis of the skeleton has shown that these were the remains of an approximately 18 years old white male and about 170 cm tall.

Interval Since Death

Postmortem interval of time since death is one of the most difficult aspects of forensic assessment [24-27]. In general, the time interval since death is determined by analysing the remains through external observation, chemical-physical testing and estimating the deterioration time of artefacts like clothing, shoes, etc. External observation includes factors like temperature, scavenging by animals and insect invasion [28-30]. In general the decomposition process in Uruguay is slow and may take as long as 2 or 3 years, when the remains were buried in a coffin. But the process of decomposition should proceed at a faster rate in cases like this where the body was not buried in a coffin like in this case. So, in this case the body is totally skeletonized. Therefore, we determined the interval of time since death according to our forensic experience, the general aspect of the remains and any chemical-physical methods. Bones showed good aspect and consistency, they were not crisps, showing very little porosity, there was not adipocyte remains and the medullar cavity of long bones was empty, these indicating an interval since death of at least 3 years ago. Chemical-physical method of the test for carbonate was also used, this is when a piece of bone is exposed to a few drops of 20 percent hydrochloric acid and produce foam, and this indicates the presence of dolomite-petrification. Younger specimens show a weaker reaction to the hydrochloric acid like in this case; this also is indicating a time since death of at least 3 years [14]. Based on the evaluation of these facts, it was estimated that death might have occurred at the time John Doe´s disappeared, this is about 3 years ago. I could find any contradiction neither skeletal examination nor the data submitted by the authorities and relatives.

Cause of Death

Once a deep analysis of the bones was made, it was obvious that the skull shows a severe trauma in the left malar region, and several ribs are broken, but did not show any discernible ante-mortem health problems. Dental health was good suggesting a person of media socioeconomic status. All these funds could be congruent with the fact that John Doe was killed by a severe injury in the left malar region that penetrated into his face damaging bones and soft tissue and could causing his death as was later confessed by his killer (Figures 2-5).

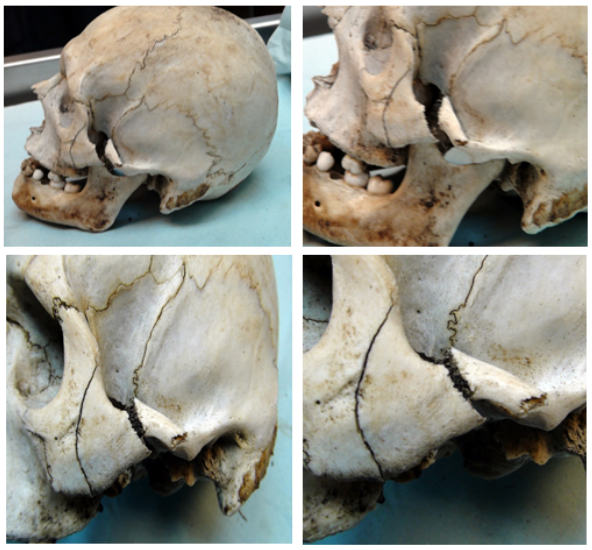

Figure 2: Skull shows a severe trauma in the left malar region and several ribs are broken.

Identification

A complete forensic anthropological report on age, sex, race, stature, cause of death, and time since death was made by the author and sent to the judge in charge. As showed the analysis of the skeletal remains the victim was a white teenager between 15 and 18 years old and approximately 170 tall, who died at least more than 3 years ago. As a positive identification was needed a number of anthropological procedures were put together to make it. These included skeletal characteristics, and if it is possible to find any dental evidence. It was suspected that skeletal remains might have belonged to John Doe, a white teenager who was 16 years old at the time of his disappearance in 2013. Upon the suspicion that the victim was John Doe, it was decided that positive

identification could be made comparing dental records and DNA analysis. Therefore, at the end of 2017 a DNA analysis was requested using several dental pieces and a right femur diaphysis sample. DNA evidence supported indeed, the skeletal remains belonged without any doubt to John Doe, reported missing three years ago. Finally, the judge in charge of the case accepted that the remains were those of John Doe, who was killed by the leader of the New Communist Party of Uruguay and his partners.

Discussion and Conclusion

One of the most challenging aspects of the forensic sciences is the identification of the victim from the remains. As long as the anthropological characteristics do not exclude the victim, factors of individualization are needed to make a positive identification [5,14]. The aim of individualization is to make sure that the victim can only match one individual. Then, a very important aspect is to test scientific standards based on a large sample [14]. Tests as such can only come from case studies as presented in this paper. Identification of skeletal remains is complex and requires careful assessment of both skeletal remains and personal belongings. If possible, additional techniques should be incorporated in the final decision. As was done in this case, a DNA analysis added further assurance that the deceased person was John Doe. The investigation started with the initial observation about sex, age, race and stature, cause of death and time since death. These techniques seemed to have worked well in this case. It was confirmed that the remains belong to a white teenager, who was about 18 years old and 170 cm tall at the time his disappearing. It was estimated that the time of death was at least, more than 3 years ago before the remains were found, at the beginning of June 2017. Then, they were carried out to the Central Judicial Morgue to be analyzed. As we known later, the victim was killed by the leader of the New Communist Party who gave him a hard beating that damaged his facial region and at least caused his death. To obtain a positive identification the skeletal remains were identified by a DNA analysis and dental comparisons. In conclusion, this study shows that a positive identification can be made using traditional anthropological techniques and DNA profiles and as well as dental comparisons. It is, therefore, highly recommended that coroners and law enforcement agents obtain anthropological opinions when they are dealing with human skeletal remains of cold cases to analyse and eventually identified them.

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