Austin Journal of Forensic Science and Criminology

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Austin Publishing Group

Case Report

A Multidisciplinary Approach to the Forensic Identification of a Late Discovery Victim of a Motorcycle Accident

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Received: September 29, 2014; **Accepted:** November 25, 2014; **Published:** December 02, 2014

Abstract

This paper presents a case of a late discovery of a motorcycle accident victim. The fact that the remains were almost skeletonized required the input of several disciplines in order to identify the victim. Therefore, anthropology, odontology, facial reconstruction, and genetics were employed. It was found that the victim was male, between the ages of 35 to 55 with a number of healed fractures. In addition, perimortem trauma with a pattern that was consistent with a motorcycle accident was found in the head and upper body regions. Dental findings included a tooth out of alignment with the rest of the dental arcade, as well as a heavily decayed tooth that was replaced by a dental bridge. Both of these findings were supported by ante mortem photographs of the victim. A two-dimensional facial reconstruction was carried out and produced a very good likeness of the deceased. The above findings were confirmed by DNA analysis that matched a bone sample to those of the family of the deceased. This case illustrates the benefits of combining several different methods to make an initial assessment of a case and narrow the list of potential candidates. This can help speed up the process of identification and save resources for law enforcement agencies.

Keywords: Forensic anthropology; Forensic dentistry; Facial reconstruction; Motorcycle accident; Identification

Introduction

The identification of human remains is a vital element of the medico-legal investigation of death. Ideally the investigation will employ a multidisciplinary approach, especially when the remains are decomposing, skeletonized, or otherwise unrecognizable [1-3]. By providing specific information about the remains, the forensic anthropologist can help law enforcement agencies to construct a biological profile of the victim. This information can be matched to a missing person's file, leading to a positive identification.

The present case demonstrates how forensic anthropology can be incorporated in to the broader field of death investigation and help establish the identification of human remains in a case of a motorcycle accident. It also exemplifies how forensic specialists from different disciplines can work together to achieve a personal identification.

Case Presentation

A mostly disarticulated human skeleton was found in a shrubby area alongside a provincial road to the town of Chalcis in central Greece. According to the police report, the skeleton was found under a large motorcycle which had evidence of damage on the front end, most likely caused by an impact when it veered off the road. All the skeletal elements were recovered in the immediate vicinity of the motorcycle, while the skull was found within the protective helmet worn by the victim. In addition to the skeletal elements, several articles of clothing including a long-sleeved shirt and blue jeans, a leather belt, a pair of socks with foot bones inside and shoes was also found in the area. It is surprising that the body had not been discovered earlier by passing motorists, as this is a relatively busy road, used by many vehicles every day. Following recovery by police, the remains were transferred to the Department of Forensic Medicine and Toxicology at the University of Athens Medical School for evaluation.

Anthropological analysis

The anthropological analysis revealed that the remains originated from a 35-55 year old Caucasian male, with a living stature of approximately 180-186 cm. The morphological assessment of the pelvis and skull indicated that the remains belonged to a male. The age was based upon the morphology of the pubic symphysis, the

Figure 1: Fracture of left distal fibula treated by internal fixation.

Citation: Moraitis K, Eliopoulos C, Zorba E, Mitsea AG, Falsetti C and Spiliopoulou C. A Multidisciplinary Approach to the Forensic Identification of a Late Discovery Victim of a Motorcycle Accident. Austin J Forensic Sci Criminol. 2014;1(2): 4.

auricular surface, and the sternal 4th rib end [4-6]. Caucasian traits included a narrow nasal aperture, sharp nasal sill, and parabolic palate [7]. The stature was derived from the left femur using a regression formula developed by Trotter [8]. Antemortem pathologies included healed fractures of the nasal bones, the left 5th and 6th ribs, and the left fibula which was internally fixed by two surgical screws (Figure 1). Perimortem trauma was observed on the skull, vertebrae, thorax and shoulder girdle, which is consistent with a motorcycle accident. Depending on the environmental conditions during the postmortem interval and from the soft tissues remaining over the bones, it was roughly estimated that the remains had been exposed for at least three years.

The information obtained by the anthropological examination was entirely consistent with the biological profile, and time since death of an individual who had been reported missing in the area four years ago. According to information gathered by police investigators, the suspected victim had left the city of Chalcis to go to Athens late one evening following the consumption of food and alcohol. The healed fractures of the nasal bones, the ribs and fibula held the potential of identifying this individual, but unfortunately there were no radiographs of these injuries in the possession of his family. However, they did provide a recent photograph of their relative and his health insurance booklet in which there was mention that he had suffered a fracture of the left lateral malleolus, twenty years prior to his death, which was treated by internal fixation. These clues pointed towards a match with the victim, but more concrete evidence was needed for a positive identification.

Dental examination

A dental examination was performed at the Forensic Odontology Unit at the University Of Athens Dental School. The police investigation did not yield any antemortem dental records from the suspected victim's general dentist. However, a comparison of the postmortem dental findings with dental evidence on the anterior teeth as they appeared in the victim's photograph provided an acceptable positive identification. Specifically, the dental examination indicated that the socket of tooth 12 was positioned lingually, out of alignment compared to its neighboring teeth (Figure 2). In the antemortem photographs of the suspected victim, it can be observed that tooth 12 is also lingually positioned (Figure 3). In addition, tooth 23 was missing and in the corresponding area there was a fixed prosthesis (bridge) with a cantilever (Figure 2). In the antemortem photograph taken a few years prior to the victim's death, tooth 23 appears to be heavily decayed and probably only its root was present (Figure 3). The extent of the lesion had most likely led to the extraction of tooth 23 and the re-establishment of the area with a dental bridge.

Figure 2: Lingual positioning of the socket of tooth 12 (white arrow) and antemortem loss of tooth 23 (black arrow).

Figure 3: Antemortem photograph of the victim showing the lingual positioning of tooth 12 and the heavily decayed tooth 23.

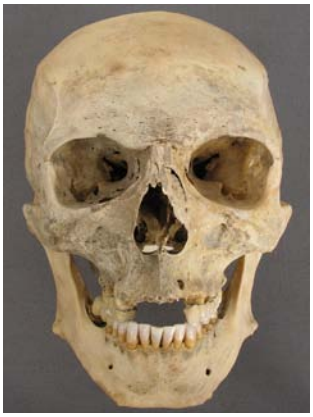

Figure 4: Frontal photograph of the recovered skull.

Facial reconstruction

A two-dimensional facial reconstruction was attempted based on frontal and lateral photographs of the skull taken with a digital SLR camera having a 55mm lens (Figure 4). In order to avoid distortion of the image it was photographed at the Frankfort horizontal plane and a scale was included. Using Adobe® Photoshop® CS4 the frontal and lateral photographs were printed to scale. Tissue depth measurements were taken from an anatomical study conducted by Manhein et al [9]. The glabella measurement and the measurement taken under the mandibular symphysis were indicated on the printed photographs to show the outline of the tissue over the skull. Measurements defined by Gatliff of the width of the nostrils on each side of the nasal cavity were used [10]. Taylor's method was used to examine the shape of the nasal aperture to determine the shape of the tip of the nose [11]. Vellum paper was placed over the photograph and the face shape was created and drawn on the paper with graphite pencils of differing hardness (Figure 5). The reconstruction was performed blind, where the forensic artist was only supplied with the skull photographs and biological profile information.

Figure 5: Two-dimensional facial reconstruction of the deceased.

Finally, DNA analyses from a midshaft femoral sample, and blood from the victim's wife and son were performed.

Discussion

Road traffic accidents are considered one of the top leading causes of death in Greece, especially among young people [12]. However, the recovery of the victim in a state of advanced decomposition is rare for Greece, a country with a relatively high population density. The forensic investigation of road traffic accidents in the case of late discovery of the victim must employ a multidisciplinary approach not only for the determination of cause and manner of death, but also for the positive identification of the remains.

The presented case documents how specialists from different forensic disciplines can contribute to the identification process. Forensic anthropological analysis can assess the ancestry, sex, age-at-death and stature from skeletal remains, allowing the construction of the biological profile of the victim [13,14]. In the present case, these elements and also the internally fixed malleolar fracture of the left fibula helped to narrow down the list of potential victims and directed the investigative efforts in the right direction, thus saving time and resources. Orthopedic fixation devices or other surgical implants associated with skeletal remains have been reported to assist in identification, especially if the manufacturer's logo or name is engraved on the device [15-17]. It is also important to note that the anthropological examination provided information about how the victim died, something that is difficult to assess by the use of forensic pathology alone.

Dental identification is based on the uniqueness and durability of the human dentition [18]. Information gathered from the dentomaxillofacial region may be used to perform a comparison between postmortem findings and antemortem dental records, including clinical records, x-rays, and dental models or casts of the deceased [19]. When these records are unavailable, dental comparison of postmortem findings with antemortem photographs of people displaying uncommon dental features visible in a smile may increase the probability that the suspected missing person was the individual represented by the remains.

In those cases where the skull is recovered and is relatively complete, a forensic artist or an anthropologist skilled in facial reconstruction may be able to render a likeness of the deceased that members of the public recognize [20-22]. Even though this cannot provide a positive identification, it may provide supportive information for matching human remains with a missing person.

Ultimately, the result of DNA profiling of the victim revealed direct relationship with the victim's wife and son. While the value of DNA technology cannot be underestimated, the combination of several methods of analysis from different forensic disciplines provided corroborative information that was instrumental in solving the case. The majority of these techniques are quick to perform, highly reliable and have the potential of providing the police investigation with significant help by narrowing the search parameters. Another lesson learned from this case is that once an individual is classified as missing, all medical and dental records should be retained, preferably by law enforcement authorities.

Acknowledgment

The authors wish to thank the family of the deceased for kindly granting us permission to present this case.

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Austin J Forensic Sci Criminol - Volume 1 Issue 2 - 2014
ISSN : 2380-0801 | www.austinpublishinggroup.com

Citation: Moraitis K, Eliopoulos C, Zorba E, Mitsea AG, Falsetti C and Spiliopoulou C. A Multidisciplinary Approach to the Forensic Identification of a Late Discovery Victim of a Motorcycle Accident. Austin J Forensic Sci Criminol. 2014;1(2): 4.