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Case Report Article

Importance of the comparative anatomy in Forensic Anthropology – case report

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Abstract

Introduction: In forensic sciences, reconstructive victim profile is a commonly used procedure to provide individual data in cases of complex human identifications. In forensic anthropology, valuable data are obtained from skeletal and dental analysis such as gender, age, ancestry, stature, and differentiation between human and non-human remains. **Objective:** To highlight the relevance of comparative anatomy analysis to differentiate human and non-human remains. **Case report:** Four bone fragments and one tooth were found on a potential crime scene, and were submitted to forensic examinations. The examinations revealed non-human anthropological remains. Additionally, the analyzed bones and tooth were classified as animal remains, specifically from a domestic dog (*Canis lupus familiares*). **Conclusion:** In this context, it is relevant to be trained and aware of the usefulness of comparative anatomy into the forensic anthropology routine in order to perform complete and accurate examinations.

Introduction

The Forensic Anthropology can be conceptualized as the practical application to Law of a set of knowledge of general Anthropology aiming to respond to both the questions regarding to the forensic identity and the judiciary or police identity [4]. In other words, it is the branch of the forensic sciences that studies the anatomic particularities of the men, dead or alive, intact or fragmented aiming to determine the biological profile (species, age, gender, ancestry, manual skills, and height), as well as the cause and nature of the death to solve legal questions [14]. In the alive person, the Forensic Anthropology can be adequately applied in investigations of the gender determination in complex cases (such is the presence of ambiguous genitalia) [5] an in the investigations of age estimative, such as in the cases of doubts regarding to the age of criminal responsibility of subjects committing crimes [12]. In dead individuals, the anthropological examinations have been performed to determine the biological profile in skeletonized, decomposing, mutilated and charred bodies attempting to decrease an universe of search for human identification in addition to contribute for the determination of the *causa mortis*, identification of the instrument or *modus operandi* or other circumstances that caused the death.

Concerning to the determination of the biological profile, there is specifically a greater difficult in responding the following question whether "the material is or is not of human origin" when the sample analyzed is fragmented, damage or incomplete. For this purpose, and depending on the type of the material referred (bone, tooth, blood, hair etc.), a macroscopic or microscopic analysis can be attempted to search either the normal characteristics of the human being or any animal species [9-11], or even the execution of the chemical reactions in the sense of characterizing that determined material is or is not human [2, 5, 13].

Generally, teeth and bones are the non-human materials most referred to the laboratories of the Forensic Anthropology and the use of comparative anatomy techniques can be extremely useful for the inclusion or exclusion of a material of human specimen. In this context, the present study aimed to report a forensic case in which it is demonstrated the importance of the application of techniques of comparative anatomy for the differentiation between human and non-human remains, when a biological material of bone and dental nature is found in a presumed crime scene of concealment of corpse.

Case report

In the middle of 2005, fragments of a skeleton were found at a desert place which initially would be of a missing person victim of homicide. Aiming to know whether this aforementioned material was of human origin (from *Homo sapiens* species), the material was referred for forensic examination in the Section of the Forensic Anthropology and Forensic Dentistry of the Forensic Institute of Goiânia (GO).

In a preliminary analysis, it was possible to observe that the material was composed by five pieces: four bones and one tooth (figure 1). Three bone pieces were long, compatible with the upper or lower extremity showing no fractured points. The smallest bone was fractured with irregular aspect compatible with a vertebra fragment. The tooth referred had one root with a curve crown/root and a flattening at mesial-distal direction.

Figure 1 – Material sent for forensic examination: four bone fragments and one tooth

By analyzing the morphology of the bone pieces, especially the epiphyses and the areas of muscle origin and insertion associated to their dimensions (reduced) and lack of evident fusion points (growth centers) between the epiphyses and diaphysis, it was concluded that this material was of non-human origin, belonging to an adult animal of medium size.

By comparing the tooth referred for examination with a permanent mandibular human canine tooth, it was possible to observe that the tooth did not

have a similar shape and dimensions with a human canine tooth, fact that also excluded this material from human origin (figure 2).

Figure 2 – Tooth sent for analysis (A) compared with a human canine tooth (B)

Attempting to determine the animal specimen from which the pieces had been referred for examination, they were assessed in the Department of Morphology of the Federal University of Goiás. By comparing the anatomic characteristics of both the bones and the tooth, it was possible to observe the compatibility between the forensic material with bones (tibia and femur) and canine tooth of a domestic dog (*Canis lupus familiares*), of medium size (figures 3 and 4).

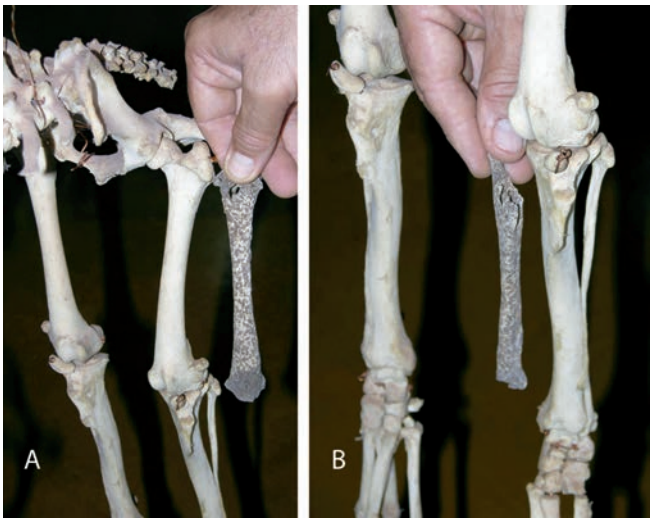

Figure 3 – Comparison between the examined femur (A) and the tibia (B) with the skeleton of the domestic dog

Figure 4 – Tooth sent for analysis compared with a canine tooth of a domestic dog

Discussion

The Forensic Anthropology through the knowledge of the normal anatomic particularities associated with other forensic techniques normally is capable of providing adequate explanations for the police procedures when there are doubts regarding the origin of certain mortal remains or biological vestiges found in crime scenes. Considering the scope of the police investigation in which normally the search for a missing person is being carried out, the most important question to be answered is: Is the material found in the crime scene of human origin? The response "yes" or "no" usually is enough for the investigations. However, some authors of Forensic Medicine and Anthropology use the following expressions: diagnosis of the species [7], investigation of the animal species [2, 5, 13] or determination of the species [3]. Such expressions, when disposed in the form of question to be responded at forensic environment, need a more detailed analysis of the material referred because it is understood that the identification of the animal species is relevant, even when it is a non-human material, as in the cases of environmental crimes involving the death of animals. In the case present here, it was possible to identify with absolute certainty that the material examined was not of human origin. Also, the morphological compatibility between the material referred and the part of the skeleton of a dog of medium size was obtained.

However, it was not possible to establish through comparative anatomy, the race of the animal (subspecies).

By comparing the taxonomic classifications of the man (*Homo sapiens*) and domestic dog (*Canis lupus familiaris*), it is emphasized the necessity in most of the police investigations of the differentiation between human and non-human material because both species analyzed are only coincident up to their class (*Mammalia*) (table I). Depending on the species to be examined, such as some primates (gorillas and chimpanzees), the deepening of the forensic examinations should really be made possible, once there is morphological similarities in some bones and mainly in genetics between the species when DNA examination is conducted. Genetically, the similarities can be of such magnitude that Wildman *et al.* [15] proposed that the chimpanzees (*Pan troglodytes*) had been included in genus *Homo*, due to the coincidence of about 99.4% of the genomes from this species with the genomes of the men.

Table I – Comparison of the taxonomy classification among the domestic dog, gorillas and chimpanzees and men

	Domestic dog	**Gorillas**	**Chimpanzees**	**Men**
Domain	Eukaryota	*Eukaryota*	*Eukaryota*	*Eukaryota*
Kingdom	*Animalia*	*Animalia*	*Animalia*	*Animalia*
Phylum	*Chordata*	*Chordata*	*Chordata*	*Chordata*
Class	*Mammalia*	*Mammalia*	*Mammalia*	*Mammalia*
Order	Carnivora	Primates	Primates	Primates
Family	Canidae	Hominidae	Hominidae	Hominidae
Subfamily	Caninae	Homininae	Homininae	Homininae
Tribe	*Canini*	*Gorillini*	*Hominini*	*Hominini*
Genus	*Canis*	*Gorilla*	*Pan*	*Homo*
Species	*Canis lupus*	*Gorilla gorilla*	*Pan troglodytes*	*Homo sapiens*
Subspecies	*Canis lupus familiaris*	*Gorilla gorila gorilla*	*Pan troglodytes troglodytes*	–

Thus, the use of the comparative anatomy with forensic purpose is an important stage for the differentiation of human bone/tooth material from non-human biological evidences because the dentition and the human skeleton has unique characteristics of its relief and constitution that in most times makes possible to affirm absolutely that a given piece studied is or is not of the human species. Additionally, the comparative material is very practical, of low cost for the forensic services, normally requiring a multi-institutional cooperation for the access of the collections of animal anatomy available in the higher education institutions. In cases of absence of institutional partnership, atlas of bone animal anatomy can be employed [1, 6, 8], even with little literature on the recording of the anatomic particularities of animals raised or natives of Brazil.

Conclusion

Considering the potential of forensic information that can be obtained in the comparative anatomic examination and the differentiation between human and non-human bone/dental remains, it is fundamental that the Forensic Anthropology experts master the knowledge on human anatomy and had the possibility of proper access to the departments of animal morphology or anatomy to investigation the species, when necessary.

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