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Forensic Anthropology Population Data

An osteological revisitation of autopsies: Comparing anthropological findings on exhumed skeletons to their respective autopsy reports in seven cases

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ABSTRACT

Forensic anthropologists and pathologists are more and more requested to answer questions on bone trauma. However limitations still exist concerning the proper interpretation of bone fractures and bone lesions in general. Access to known skeletal populations which derive from cadavers (victims of violent deaths) who underwent autopsy and whose autopsy reports are available are obvious sources of information on what happens to bone trauma when subjected to taphonomic variables, such as burial, decomposition, postmortem chemical and mechanical insults; such skeletal collections are still however quite rare. This study presents the results of the comparative analysis between the autopsy findings on seven cadavers (six of which victims of blunt, sharp or gunshot wounds) and those of the anthropological assessment performed 20 years later on the exhumed dry bones (part of the Milano skeletal collection). The investigation allowed us to verify how perimortem sharp, blunt and gunshot lesions appear after a long inhumation period, whether they are still recognizable, and how many lesions are no longer detectable or were not detectable at all compared to the autopsy report. It also underlines the importance of creating skeletal collections with known information on cause of death and trauma.

1. Introduction

Contrary to what happens when dealing with a well preserved cadaver, data available on skeletal material rarely allow the precise reconstruction of a lethal event, although signs of trauma may persist in bone [1,2] and strongly suggest foul play. In fact, examination of a skeleton differs widely from examination of a well preserved cadaver, essentially because of the presence of soft tissues in the latter which obviously provide much more information on cause of death, usually lost with decomposition of a corpse.

Many studies have investigated different types of trauma involving bone with the intent of establishing patterns of all types of lesions, though none truly verify how and how many signs of trauma show up on bone after natural decomposition and taphonomic insults [3–18].

The aim of this work was to provide through seven cases a rare illustration of how skeletal lesions appear after burial and decomposition compared to their appearance on the fresh cadaver. The novelty of such material lies in the fact that of these seven skeletons autopsy reports and photographs were available, describing the soft and hard tissue lesions found on the well preserved cadaver. The bodies were then buried and exhumed after 15 years, once skeletonized – providing a unique chance of verifying the persistence of bone trauma after natural decomposition and a comparative analysis of signs found at autopsy vs those found upon skeletal analysis.

This study was possible thanks to Italian Police Mortuary Regulations, which allows skeletal remains of known individuals to be studied if the remains have not been claimed by relatives. This material provides insight concerning the changes a body, and in

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particular its skeleton, undergo in 15 years of inhumation. Several skeletal collections have already been used for anthropological studies (e.g. Robert J. Terry Anatomical Skeletal Collection, George Huntington Collection, Collection of Identified Human skeletons housed at the Bocage Museum, William M. Bass Donated Skeletal Collection, Dart Collection of Human Skeletons) [19–21]. These collections however have ante mortem information mainly on sex, age, and time of death, but few have known causes of death, particularly violent deaths, and especially autopsy reports available. If in fact for some skeletal collections the cause of death of individuals is known, they almost exclusively include individuals who have died of natural death and rarely of violent deaths.

The Laboratorio di Antropologia e Odontologia Forense (LABANOF), situated at the Dipartimento di Scienze Biomediche della Salute (University of Milan), houses numerous skeletal and osteological collections accumulated since 1995, which have become the Milano Osteological Collection. The various collections consist in complete and partial skeletons derived from archeological contexts, mass graves, and modern cemeteries but also identified and unidentified skeletons (complete and incomplete) from forensic cases.

In particular, the lab houses a well-documented skeletal collection, coming from the Cimitero "Maggiore" of Milan, which offers over 1300 complete skeletons, unclaimed, belonging to individuals who died between 1990 and 1998 and who were buried for 15 years prior to exhumation. For each skeleton all relevant demographic information (resulting from death certificates) are available as well as, for a smaller group of skeletal remains, data on health issues and autopsy reports. The cause of death for many is traumatic, which makes the collection an interesting model also for trauma analysis.

Furthermore, the state of preservation is similar since all individuals were buried in similar wooden coffins, in the same cemeterial plot and exhumed 15 years later with an excavator.

In this perspective, this study aims to compare these seven cases what the pathologist saw at the autopsy and what the anthropologist found 15 years later on the same individual with the intent of observing the survival of signs of trauma on bone after several taphonomic variables were involved.

2. Material and methods

2.1. Seven unique cases

The sample of this study consists of seven individuals with complete autopsy case files involving well preserved cadavers of individuals who died from different causes in 1990–1991, and the consequent anthropological analysis performed 20 years later on the exhumed skeletonized remains. The collection, still under construction, at the moment involves a much larger number of skeletons (over 1300), and the study of the skeletons and acquisition of autopsy files and ante mortem clinical data are still underway; the authors wish to focus on the first seven most complete and interesting cases so far encountered which had been subjected to autopsy, in order to demonstrate the unique comparison between autopsy and anthropological data.

For each skeleton of the seven selected cases a detailed autopsy was available; the seven autopsies were performed by different forensic pathologists between 1990 and 1991 on well-preserved cadavers at the Institute of Legal Medicine of Milano. Each autopsy file contains essential data: demographic information (age at death, sex, and possible pathology), death certificate, external body examination, photographs or sketches, and autopsy findings. The exhumations were carried out after 15 years as mentioned previously and the remains moved separately to metal boxes in an ossuary where they remained for the following 5 years. It is necessary to specify that the exhumation was conducted by cemetery workers with no anthropological support and was performed with a small excavator and shovels; this may have caused additional postmortem fractures: thus the handling of remains, together with the mechanical damage they might have been exposed to, could inevitably have provoked some damage to bone elements. The exhumation consists of the use of excavators to reach the buried coffin which is already frequently open because it has collapsed. Then the remains are manually moved to a container, dried, put into closed metal boxes and transported to the University. It appears clear, once more, how some postmortem damage can occur in each of these phases. However it is important to stress the fact that all skeletons have the same taphonomic history and might show similar postmortem features and patterns with respect to environmental events.

The gathering and study of the seven skeletons, and in general of the skeletal collection, was performed according to article n. 43 of the mortuary police D.P.R. n. 28 (September 10, 1990), which authorizes studies on human remains not claimed by relatives.

The selected cases consist of individuals who have died of different violent causes and include diverse types of trauma: gunshot (2 examples), sharp force (1 example) and blunt force trauma (3 similar examples of traffic accident) (summarized in Table 1). In addition, a case of natural death (lack of traumatic lesions) was included in which surely there was no trauma found upon autopsy but only taphonomic fractures.

The study was performed by first cleaning the skeleton and verifying sex, age, ancestry and pathology, then trauma analysis was carried out blindly (before consulting the details of autopsy reports) by a trained forensic anthropologist on the seven individuals considered. For trauma analysis, the anthropologist was asked to describe and classify all bone trauma observed on each skeleton; all alterations were differentiated as perimortem and postmortem, and then transferred to a chart with specific color codes for perimortem and postmortem trauma. Then they were asked to differentiate between blunt force, sharp force and gunshot wound according to morphology.

For the differentiation of perimortem from postmortem alterations the anthropologist used multiple features typical of patterns of lesions of dry and wet bones according to the criteria suggested in the anthropological field by many authors [22–25]. Mainly, the evaluation was based on macroscopic fracture

Table 1
General data of each of the seven cases.

Case number	Sex	Age	Event	Cause of death
1	Female	81	Natural death	Purulent pneumonia
2	Female	79	Traffic accident	Multiple skeletal and visceral lesions
3	Female	83	Traffic accident	Multiple skeletal and visceral lesions
4	Male	60	Gunshot injury	Abdominal lesions
5	Male	76	Sharp force injury	Multiple stab lesions
6	Male	28	Gunshot injury	Cranial and cerebral lesions
7	Male	78	Traffic accident	Multiple skeletal and visceral lesions