

TRAUMA TO THE SKULL: AN ANALYSIS OF INJURIES IN ANCIENT SKELETONS FROM NORTH WEST LOMBARDY ARCHAEOLOGICAL SITES

TRAUMA LUBANJE: ANALIZA OZLJEDA NA DREVNIM KOSTURIMA S ARHEOLOŠKIH NALAZIŠTA U SJEVEROZAPADNOJ LOMBARDIJI

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SUMMARY

Traumatic lesions are among the most important sources of data providing information associated to interpersonal violence within ancient populations. The investigation on weapon-related traumas on human remains allows us to reconstruct the dynamic of the violent episodes. The purposes of this study are to describe the types of skull traumas discovered in several skeletons from medieval necropolis of the North West Lombardy (8th-16th) and to examine their presence and distribution. The injuries observed in our osteoarchaeological collection were in the form of depressed and penetrated traumas. The injuries were revealed on the middle aged and older men, but also on women and subadult. Fractures of skulls were analysed with macroscopical and radiological observations. In particular, CT investigations were essential to understand the extent of the injury and to hypothesis the cause.

Key words: *cranial trauma; North West Lombardy; antemortem trauma; perimortem trauma; violence.*

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Skeletons offer important information for the historical investigation of archaeological sites and for medical history researches [1]. One of the most interesting aspects of paleopathology is traumatology. Traumatic injuries in ancient human remains represent a direct source to analyse the lifestyle of the past populations, unlike the historical and archaeological records that are subject to the interpretative obstacles [2]. Traumatic lesions are familiar to anthropologists because the traces of lesions suffered during life are frequently conserved in bone remains after death. In paleotrauma analysis, the correct examination of types of lesion gives information about interpersonal violence, intergroup conflict or warfare, and daily activities, chiefly when the paleoepidemiological viewpoint investigates the differential exposures to risk in different age groups and between the sexes [3]. It is important to explain that in osteoarchaeological collections, the investigation on the incidence of trauma is difficult to evaluate and to interpret for a number of reasons. The first restriction is that the archaeological bones usually are poorly preserved and their fragmentation may obscure a correct diagnosis. For example, in osteoarchaeological material, the facial bones are frequently missing or fragmentary and consequently are not considered. Post-mortem (post-depositional) events (diagenetic and taphonomic effects) represent the second limit in the paleopathological studies. In fact, the post-depositional bones alterations can be confused with traumas. In addition, injuries sustained during juvenile may result remodelled at the time of death, especially if their occur very early in life [4]. Another limit in the paleopathological interpretation of the ancient trauma is the absence of clinical literature on accumulative injury [5].

To investigate the episode of violence in antiquity, it is necessary to identify traumatic lesions by causes and by the time of injury. Traumatic lesions can be consequence of accidental or intentional agencies; the accidental agencies are caused by general lifestyle occupation (daily work activity), while the intentional injuries are subsequent from confrontational combat, assault, execution, sacrifice, and surgery (i.e. trepanation, amputation) [6]. Lesions can be *antemortem*, when the subject survived to injury, or *perimortem*, when trauma was fatal to the victim.

Numerous bioarchaeological studies have revealed the high frequency of skull lesions in ancient human remains from archaeological contexts. The skull, as the most vulnerable part of the skeleton to intentional trauma, provides information about the presence of interpersonal conflicts. For these

investigations skull fractures can be classified by localisation and shape of the mark to determine the dynamics of the struggle and the weapon used.

This study represents the first report on the paleotrauma investigation of ancient skeletal populations of Varese province with the aims to analyse the weapon-related traumas on skulls and to examine their presence and distribution. More detailed research is required to understand the overall picture of violence in North-West Lombardy ancient societies.

MATERIALS AND METHODS

The current sample comprises cranial specimens conserved at the Department of Biotechnology and Life Sciences of Varese. The skeletal remains were excavated in several archaeological sites in Varese province between 1998 to 2013 (Caravate 2001-2002, Biumo Inferiore 2001, Cittiglio 2006 and Sarigo 2013), by the Archaeological Superintendence of Lombardy. The bone remains were submitted for anthropological and pathological analyses.

Archaeological sites - All archaeological sites are located in Varese province (figure 1).

The Caravate necropolis - The cemetery of Saint Agostino was discovered in 2002. The archaeological excavations has brought to light a part of necropolis (fourteen tombs and human rests of twenty individuals) dated between 8th and 9th centuries (figure 2) [7].

Biumo Inferiore, St. Peter and Paul Church - During the restoration works conducted inside the church in 2001, an ancient burial was found. The tomb was situated below the floor of the apse church (northwest corner) and was limited by large stones. Archaeological investigation dated the tomb between 10th and 13th centuries (figure 3) [8].

Cittiglio, St. Biagio Church - During the restoration works carried out under the floor of the medieval church in 2006, twenty burials were discovered at the level of apse. Archaeological investigation dated the tombs between 11th and 13th centuries [9].



Figure 1: Geographical location of the Varese Province.

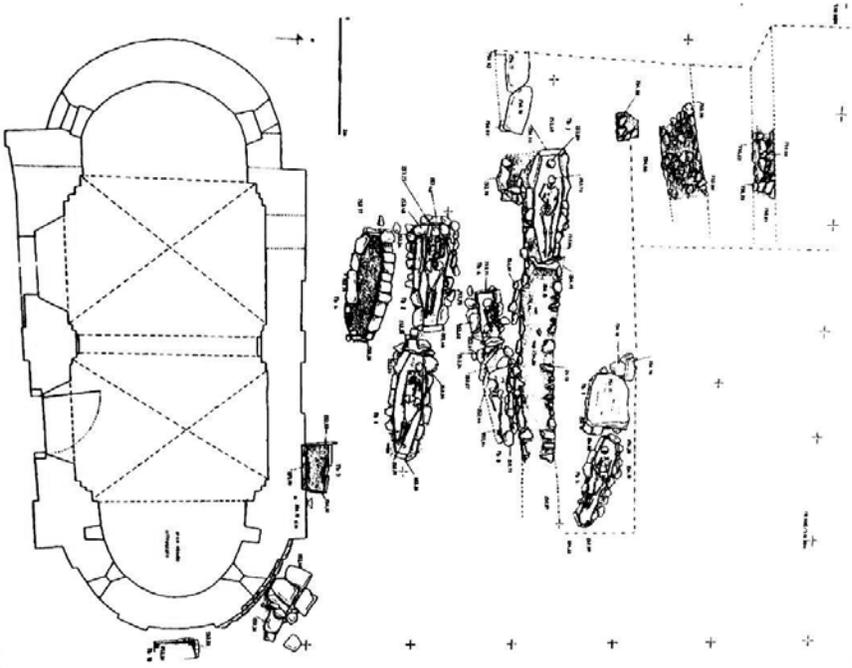


Figure 2: General planimetry of Caravate necropolis.

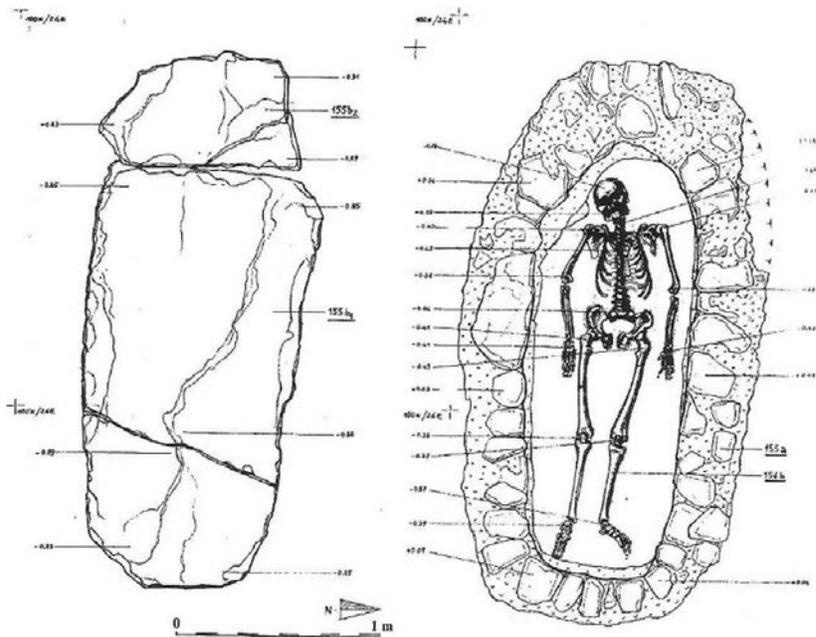


Figure 3: Tomb of Biumo Inferiore. Planimetry.

Sarigo, St. George Church - The archaeological excavations conducted inside the church revealed the presence of thirty-one inhumations dated between 12th to 16th centuries (the archaeological investigation are currently underway).

Anthropological investigations -The skeletons were examined to determine the age at death, to confirm their gender and to investigate the stature. Age at death of adult subjects was determined from scores obtained from the degenerative changes of the pubis, changes to the pubic symphysis [10] and to the *facies auricularis* of the pelvic bones [11] to the degree of suture closure [12] and the sternal rib modification [13]. The age of juvenile individuals was estimated on the basis of development and eruption of teeth, closure of epiphyses and apophyses, as well as length of the long bones [14].

Sex estimation was carried out using standard pelvic and cranial morphological indicators in according with the methods given by Buikstra & Ubelaker (1994) [15]. The dimorphic characteristics of the pelvis comprised the presence or absence of evidence of the ventral arch and subpubic concavity, the aspect of ischio-pubic ramus. For each skull, the following characteristics were observed: nuchal crest, glabella, mastoid process, mental eminence and supraorbital margin. *Intra vitam* body stature was calculated as the mean of the different values obtained by several commonly used methods, based on measurement of the length of the femur [16, 17].

RECORDING TRAUMA

Time of injury - An initial categorization in the paleotrauma examinations of the skulls was conducted to distinguish their occurrence: *antemortem*, *perimortem* and *postmortem*. Lesions were analysed for the remodelling around it, the colour of the fracture, the fracture line, the injured area and the mark of the wound. If it was present a bone callus rounding of the limits of fracture, trauma was recognised as *antemortem*. When no bone remodelling was noted and the internal and external line of the trauma had the same colour, trauma was classified as *perimortem*. *Postmortem* trauma was identified by the different colour between the internal and external surface of the fracture.

Point of injury - Each trauma case was recorded according to the skull bones (frontal, parietal and occipital) and sides (right, left)

Classification of injury - The wounds recognised on the skulls were classified into blunt, sharp and projectile force trauma.

Blunt force trauma - The fracture is characterised by a great variety of fracture shapes. Blunt weapons cause depressed lesions with concentric and radiated fracture margins [18].

Sharp force trauma - Sharp weapons, such as the sword and hatchet, cause an obvious cut. When the lesion has other fractures on the same edge, it can be assumed that the weapon became embedded in the bone and was removed using force. The orientation of the cut marks is determined by a direction of the blow.

Projectile trauma - The pointed weapon passes through the bone and leaves a hole in the bone that measures the diameter of the point. The velocity of the projectile is a very important factor in the resulting injury.

Four skulls were examined using X-rays and CT analysis in order to clarify the entity of injuries.

RESULTS

We present the results of anthropological and paleopathological investigations of the subjects showing skull trauma.

CARAVATE

Tomb 1 - The first skeleton is a 40-50 years old female measuring about 150 cm in height. The skull presents a small quadrangular perforation on the right frontal of the skull, perhaps caused by a pointed weapon with a pyramidal trunk head. The bone remodelling confirmed that the wound was not fatal (figure 4).

Tomb 2 - The skeletal remains belonged to a middle-adult man, aged over 40, 160 cm tall. The skull presents a circular depression measuring 1 cm in diameter

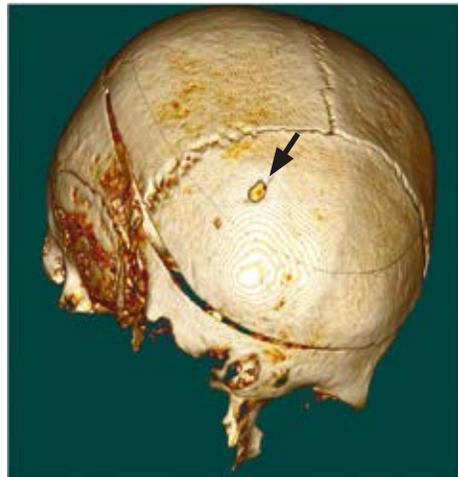


Figure 4: The skull [of] tomb 1, Caravate. CT analyses of the skull. Projectile trauma on the right side of the frontal bones.

on the left side of the parietal region. The injury, completely healed, was caused by a blunt instrument. The subject presents also the deviated nasal septum that was probably the result of a traumatic event, but a congenital origin cannot be excluded. The skull presents some “scratches” (measuring 4 cm in length) along the left and the right frontal region that were associated with vascular imprints (figure 5).

Tomb 7- In the same burial were recovered the bone remains of two individuals that show cranial lesions.

Tomb 7 US 118b1 - The human remains belonged to a subadult subject whose age at death was estimated between 12 and 14 years. The skull presents a lesion completely healed on the left side of the frontal bone that has ossified part of the coronal suture.

Tomb 7, US 118 - The skeleton belonged to a 13-15 years old subject and presents a depressed fracture completely resolved on the right parietal.

Tomb 12 - The skeleton belonged to an adult female measuring 144-145 cm in height which presents a small perforation of the right parietal. The bone remodelling established that the wound was not lethal.

BIUMO INFERIORE

Tomb 1- The skeleton belonged to an elderly male. Height was calculated to be about 180 cm. The subject presents a fracture on the left supraorbital of the skull. The lesion was an oblique cut with the formation of bony callus on the right side along the whole border of the wound (figure 6).

CITTIGLIO

Tomb 13 - The skeleton belonged to a young adult male height about 170 cm. The skull presents three cut lesions in the right side of the skull, two at



Figure 5: The skull tomb 2, Caravate. CT analyses of the skull. Blunt force trauma typical healed depressed circular fractures on the left parietal, nasal septum deviation and peculiar scratches on the left and right frontal region.



Figure 6: Skull tomb 1 Biumo Inferiore. CT analyses of the skull. Lesion sharp force trauma on the left frontal (supraorbital).

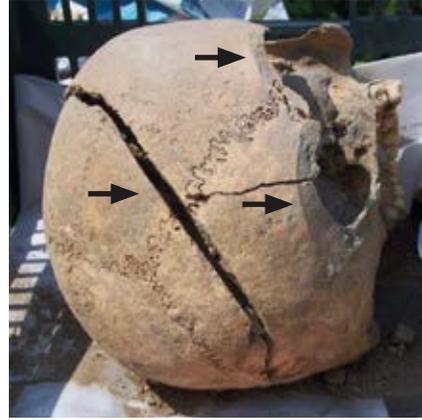


Figure 7: Skull tomb 13 Cittiglio. Sharp force trauma. Three lesions: two at the level of occipital bone (right side) and one at the level of parietal-occipital bone.

the level of occipital bone and one at the parietal region (from the right parietal to the left side of occipital bone). These traumatic lesions have revealed a decapitation (figure 7).

SARIGO

Tomb 24 - The skeleton belonged of a man aged 30 years (the postcranial skeleton is absent and it was not possible to determine the stature). The skull



Figure 8: Skull tomb 24 Sarigo. Macroscopic view, sharp force trauma, left parietal bone.

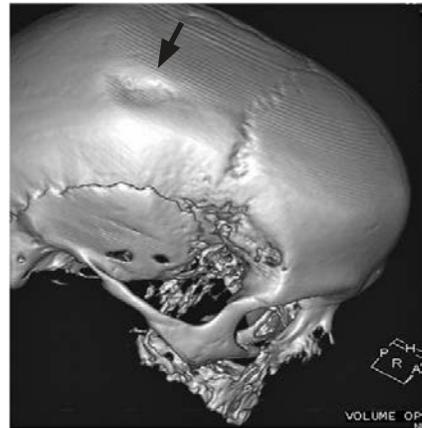


Figure 9: Skull 1, tomb 31 Sarigo. CT analyses. Healed depressed circular fractures on the right parietal.

presents a sharp force trauma at the level of the left parietal, length 4 cm, and completely resolved, (figure 8).

Tomb 31 - Inside the tomb 31 several bone remains were recovered. They belonged to six subjects and two present skull trauma.

Tomb 31, skull 1- The first skull recovered inside the tomb 31 belonged to an adult male that presents a depressed fracture on the right posterior parietal region with a diameter of 2.5 cm and deep 2-3 mm. The injury, completely healed, was caused by a blunt weapon (figure 9).

Tomb 31, skull 6 - The skull belonged to an adult man and presents a depressed fracture on the left parietal region, diameter of 2 cm, caused by blunt instrument.

DISCUSSION

This study presents an example of a survey on head trauma in antiquity. Today is premature to develop a hypothesis related to the degree of incidence of skull trauma during medieval times in the Varese province. Firstly, many skeletons of our collection present a fragmented and incomplete skull and secondly, the most of necropolis archaeological contexts have only been partially investigated. For example, the paleotrauma investigations on the human rests of Caravate had revealed five individuals with *antemortem* skull trauma: an adult man, two adult women and two subadult subjects. Considering that the survey was possible only for ten individuals, because the others skeletons have fragmented skulls, the paleotrauma data revealed is very significant. At this point, in order to investigate the degree of incidence of trauma and to advance hypothesis on episode of violence it is necessary to explore the entire area of the necropolis to obtain other bioarchaeological material. The case of the skeleton of Biumo Inferiore is singular because it was the only deposition discovered inside the ancient church. This is a significant archaeological data to understand the important social role of man. In addition, the paleotrauma investigations, that revealed a lesion on the supraorbital region as a result of "face to face" combat, a lesion on the third lumbar vertebrae, caused by falling from a height (perhaps from horse?) and the development of the *linea aspra* (rough line) of the femur, may indicate that the subject habitually used weapons. Unfortunately, archaeological and anthropological analyses are the only sources useful to clarify some aspects of local history; there is no information on medieval society from Biumo Inferiore.

The only case of *perimortem* trauma comes from the church of Cittiglio. The three lesions observed on the occipital and parietal bones suggest decapitation of the subject. In this case the localization of injuries has led to a debate: was that an execution for justice or the lesions received during a battle? Paleotrauma investigations are still ongoing to clarify the nature of the episode but an archaeological record could suggest the hypothesis of combat. In fact, subsequent archaeological investigations inside the church have unearthed another skeleton that showed an arrowhead at the level of ribs. Future archaeological investigations of the entire area of necropolis could clarify the extent of the episode of violence. Our interpretations cannot be totally representative because the prevalence of trauma reported here reflects only the burials that were excavated, and the skeletons with cranial preserved for analysis. However, based on the small sample available, we present the skull trauma distributions, related to age and sex, in the figure 13, while tables 1-4 list the type of trauma by sex and age.

Table 1 - Individuals with traumatic lesions of the skull

Age	Females	Males	Individuals	Total
< 15			2	
15 - 20				
20 - 30	1			
30 - 40		2		
40 - 50	1	3		
50		1		
Total	2	5	2	10

Table 2 - individuals with typical healed depressed circular fractures

Age	Females	Males	Individuals	Total
< 15			1	
15 - 20				
20 - 30				
30 - 40				
40 - 50		3		
50				
Total		3	1	4

Table 3 - Individuals with sharp force trauma to the skull

Age	Females	Males	Individuals	Total
< 15			1	
15 - 20				
20 - 30				
30 - 40		1		
40 - 50		1		
50		1		
Total		3	1	4

Table 4 - Individuals with projectile trauma to the skull in the form a bullet's entry wound

Age	Females	Males	Individuals	Total
< 15				
15 - 20				
20 - 30	1			
30 - 40				
40 - 50	1			
50				
Total	2			

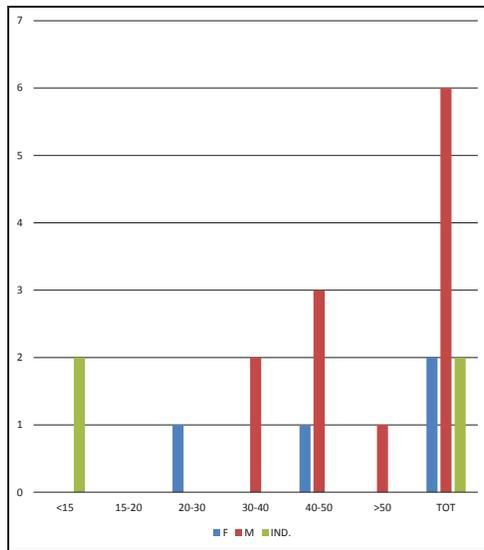


Figure 13 - Distribution of skull injuries from investigated archaeological sites of Varese

CONCLUSION

It is not easy to understand the paleotrauma data because bioarchaeological analyses are impacted by incomplete, unexcavated, and poorly preserved skeletal material. A chronic problem of all laboratories of physical anthropology is the incompleteness of the osteoarchaeological material. In our case, the most part of human remains comes from archaeological excavations “*of emergency*” in which the investigations stop before completing the excavation of the entire archaeological area. For this reason, in our opinion, it is necessary to rewrite new guidelines for the archaeological and anthropological studies. In our case, we propose to complete the excavations of the necropolis in which the initial archaeological researches were interrupted. In particular, two projects are currently underway to bring to light the uncovered necropolis areas of Caravate and Cittiglio to discover the nature of violent episodes.

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SAŽETAK

Traumatske lezije su među najvažnijim izvorima podataka za pružanje informacija povezanih s međuljudskim nasiljem u drevnim zajednicama. Istraživanje trauma nastalih upotrebom oružja na ljudskim ostacima omogućavaju nam rekonstruirati dinamiku nasilnih epizoda.

Ciljevi ovog istraživanja su opisati vrste trauma lubanja otkrivenih na nekoliko kostura iz srednjovjekovne nekropole Sjeverozapadne Lombardije (8.–16. st.) i ispitati njihovu prisutnost i distribuciju. Ozljede uočene u našoj osteoarheološkoj zbirci su u obliku natučenih i ubodnih trauma. Ozljede su uočene na muškarcima srednje i starije dobi, ali i na ženama i djeci. Frakture lubanje analizirane su makroskopskim i radiološkim promatranjima. Konkretno, CT istraživanja su neophodna za razumijevanje opsega ozljede i hipoteze uzroka.

Ključne riječi: trauma lubanje; Sjeverozapadna Lombardija; antemortem trauma; perimortem trauma; nasilje.