Sharp force trauma death in a young individual from Medieval Gloucester

Satu Valoriani, MA,* Constantine Eliopoulos, PhD,* Matteo Borrini, PhD*

* From the School of Natural Sciences and Psychology, Liverpool John Moores University, Byrom Street, Liverpool L3 3AF, United Kingdom.

Corresponding author: Constantine Eliopoulos C.Eliopoulos@ljmu.ac.uk

Abstract

The authors of the present work evaluate the trauma observed on the skeletal remains of an individual from medieval Gloucester and reconstruct the events that led to his death. The almost complete skeleton was recovered from the cemetery of St Owen and dates to the late medieval period. Several methods were employed to determine the sex and age of the individual. The anthropological examination showed that the remains belonged to a young male, between the ages of 17 and 19 years. The young man also had antemortem pathologies that were related to his diet and lifestyle, as he appears to have suffered from iron-deficiency anaemia and Schmorl's nodes. The trauma observed on the remains consisted of three cut marks located on the cranium, left radius and right scapula. The cuts seem to have been inflicted by a heavy weapon, such as a sword. The trauma pattern observed is consistent with defensive action and the fact that this skeleton was the only one in the collection that has evidence of trauma suggest that this was a case of interpersonal violence.

Keywords: Medieval; skeletal trauma; sharp force; Gloucester; defence wounds.

INTRODUCTION

This article will examine a case of interpersonal violence that led to the death of a young male in the 16th century in the city of Gloucester, England. The archaeological work at Gloucester began in 1983 and the excavation at the cemetery of St Owen's church, where the individual under examination comes from, took place in 1989[1]. The Gloucester site represents contexts that date between the Iron Age and the post-medieval periods. The work was funded by both national and local, private and public sources under the supervision of the Museum of Gloucester[1].

The sites of Southgate Gallery and Southgate Street represent different occupation stages: the Roman, the Saxon and the medieval periods. The excavation demonstrates that for the late medieval period there has been evidence of interruption of the building sequence in this area, when the properties appear to have been abandoned until a reorganization in the mid-15th century. This period coincides with a growth in the density of burials in the cemetery of St Owen[2]. Atkin[1] suggests that this increase is due to a localized epidemic at the time of the Black Death. More than 300 medieval burials were discovered in the churchyard, followed by later burials from the Independent Chapel and Royal Infirmary Graveyards.

The significance of the individual examined in this report stems from the fact that he was not a victim of the plague, but instead has fatal injuries from an edged weapon.

MATERIALS AND METHODS

This study has been carried on skeleton 1303, recovered from grave 1304 in the Southgate Street site 3/89, subdivision IV, layer II. The remains are currently housed at Liverpool John Moores University, on a loan by the Museum of Gloucester.

The individual was buried in a grave pit oriented with his head towards the west and the feet towards the east. The burial did not contain any goods and it seems that the individual was placed supine in the grave with his arms folded over the abdomen. The context record form reports that the skeleton is in a good condition, but it is incomplete because of two post-depositional cuts: the right pelvis and leg were removed by grave 1254; the left tibia, fibula and foot were removed by a 1983 trial trench and the right humerus was removed by grave 1301. The skeletal elements from skeleton 1303 that have been recovered can be seen in figure 1.

The anthropological examination aims to reconstruct the biological profile of the individual and this is achieved by use of methods that have been tested and have gained a general acceptance within the field. These techniques utilize both morphological and metric approaches of various anatomical structures within the skeleton. One of the first steps of the anthropological analysis is to restore the human remains. In this case, the cleaning had been carried out at the Museum of Gloucester. The skeletal elements that had postmortem fractures have been reconstructed with reversible paraloid glue according to the recommendations of the British Association for Biological Anthropology and Osteoarchaeology (BABAO) and following permission by the Museum of Gloucester.

RESULTS AND DISCUSSION

Biological Profile

Even though it is apparent that the individual under examination is young, it has been possible to provide a sex determination. Based on the criteria by Buikstra and Ubelaker[3] this individual is male.

The age estimation has been performed based on the dental eruption and on the fusion of the epiphyses, some of which appear partially fused. According to the method by AlQahtani et al.[4], the dental eruption suggests an age between 17 and 19 years old, as the roots of the third molars have nearly completed their growth.

In addition, the fusion of the epiphyses confirms the age of this individual to be between 17 and 21 years. Another skeletal element that confirms the age range is the left os coxae: the anterior inferior iliac spine and the triradiate complex are completely fused and this indicates an age of around 18 years[5,6]. Finally, the epiphysis of the ischial tuberosity and the anterior iliac crest are not completely fused and they place the age range between 17 and 21 years[5,6,7]. After evaluating all the available methods, it is most likely that the individual is between 17 and 19 years of age.

The next stage of the analysis was the estimation of the individual's stature. The maximum length for femur, tibia and humerus could not be obtained due to postmortem damage, therefore the height of the person has been calculated by using the left ulna and radius. When the Trotter and Gleser[8] method was applied, the stature obtained was: 178, 04 +/- 4.32 for the radius and 179, 5 +/- 4.32 for the ulna.

An examination for skeletal pathologies demonstrated that skeleton 1303 shows cribra orbitalia in both anterolateral orbital roofs: this can be caused by iron deficiency anemia and is usually frequent in infants and younger children. In this case, the cause may be a dietary deficiency, or malabsorption of iron[9]. The teeth are in good condition, with an exception of a single caries in the crown of the upper left first incisor. A pathology that has affected the vertebral column is Schmorl's nodes: these can be observed on all vertebral bodies from the fifth thoracic (T5) to the

second lumbar (L2). This pathology is caused by a repeated stress applied to the spinal column by activities such as lifting of heavy objects and may be associated to a spondylolysis present in L5. Spondylolysis is the failure of the union of the pars interarticularis of the vertebra, resulting in separation into a ventral and a dorsal part[9]. This pathological condition more frequently affects young individuals due to stress applied to the lower part of the vertebral column[10].

Sharp force trauma

Skeleton 1303 has evidence of perimortem sharp force trauma in three different regions of the body: one on the cranium, one on the left radius and one on the right scapula.

The cranial lesion (Figure 2) is located on the right parietal bone, horizontally above the squamosal suture. The lesion has an elliptical shape, regular in the superior wall and more irregular in the inferior one; there is a complete detachment of this cranial part that is missing as a result of the injury. It is possible to see how the bone is severed, exposing the diploe. Also a radiating fracture that runs along the posterior edge of the cut through the lambdoid suture to the occipital bone is noticeable and it can be due to the force applied by the weapon[11]. The cut is 19 mm from the coronal suture and 26 mm from the lambdoid suture. Furthermore the superior edge of the cut is situated 63 mm from the sagittal suture and the inferior one 62 mm from the mastoid angle. The cut's maximum length is 78.6 mm, while the maximum width is 27.3 mm. The superior edge of the cut is characterized by a smooth surface, while the inferior by an irregular one caused by the detachment of the cranial vault fragment.

The cut on the forearm (Figure 3) is situated on the posterior surface of the distal end of the left radius. This runs obliquely from superior to inferior in the compact bone: the beginning of the cut is situated 39mm above the dorsal tubercle, while the end is 19 mm above the apex of the styloid process. One inner wall of the cut mark is smooth, while the outer is irregular due to a detachment of bone flakes caused by the extraction of the blade. The section is V-shaped and the evidence is compatible with the blade that injured the head of the individual[12]. The direction of the cut and its location suggest a defensive position of the victim during a frontal attack.

The third and last cut mark is located on the right scapula (Figure 4) and has caused the detachment of the acromion and has exposed the trabecular bone. This blow has most probably caused a detachment of the supraspinatus, as the evidence of avulsion within the supraspinous fossa suggests. Unfortunately a large portion of the scapula is damaged and missing due to postmortem damage, therefore the evidence present is not sufficient for a more detailed analysis.

It is noticeable that these cuts are perimortem: there is no evidence of bone remodeling in any of the three cuts and the bone structure affected appears to have been elastic at the moment that the injuries were inflicted. In addition, the colour of the fractured edges is the same with the rest of the bone, which is clearly different when compared to the lighter-coloured postmortem fractures. Furthermore, if the victim had survived this trauma, infection would most likely take place in such deep wounds, but here there is no evidence of bone reaction around the cut marks. As Wenham[13] states in his research involving similar murder cases, the immediate effects of the blows to the head would have caused bleeding and possibly loss of consciousness. Death may have followed immediately from shock to the central

nervous system or from blood loss. This means that this individual from Gloucester died during or immediately after the attack.

It is not possible to state which of the three injuries has been inflicted first, but is reasonable to suggest that the one on the skull was the last one. The cut on the radius is consistent with a defensive action, therefore it is likely that the victim was facing his murderer and tried to defend himself by raising his arm. It is also possible that he then tried to escape, as the cut on the skull appears to have been inflicted from the back, but it is not possible to state which of the two (scapula or cranium) was the first one. All the three cuts seem to be inflicted with a weapon that Kimmerle and Baraybar[14] classify as a long-heavy weapon. This class of weapons is employed using either one or two hands, depending on the weight of the object. In terms of the marks left on bone tissue, Lewis[15] states that the average mark length is relatively consistent across sword classes, while knife marks are much shorter. According to Lewis sword marks are wide, deep and usually associated with a large amount of damage to the sides of the cut, very much like the detachment of the skull part on the cranium and the flaking on the left radius. As he states, 'sword marks in cross-section most often display one curved, smooth wall and one straighter, sometimes roughened wall' [14(p.2004)]. This exact characteristic can be observed on the cut mark of the left radius. Wenham [13(p.132)] also confirms this regarding skull trauma, by reporting that 'injuries frequently show large areas of bone broken away from beneath the blade as it passed through. This bone detachment takes the form of large chunks rather than smaller flakes'.

Another case of sharp force trauma with detachment of a cranial fragment, is reported by Weber and Czarnetzki[16]. In their research they analyzed 304 crania coming from Southwestern Germany, dating to the early medieval period. One of

these (grave no. 169 from Nusplingen) has the same cut mark as skeleton 1303. They state that the fractures caused by a sharp weapon exhibit a straight, smooth edge and then arch at the point where bone stability stops the penetration of the weapon. These wound traits can also be observed in the individual from Gloucester.

The cut mark on the cranium is also consistent with the one reported by Giuffra et al.[17] from the square surrounding the Cathedral of S. Giovanni in Turin. Grave 92 contained the remains of an adult male with a sharp force trauma on the left side of the cranium. As in skeleton 1303, the superior margin is clean, while the lower one is irregular. The portion of the skull where the cut mark is located, has been detached and radiating fractures extend from the anterior and posterior angles of the lesion. The authors suggest that the cut was inflicted with a sword or a large axe by a right handed aggressor standing in front of the victim.

Patrick[18] reports a similar case of sharp force trauma injury on the cranium. One of the cuts on the skull from Cambridge that she examined is similar to the one on skeleton 1303, as the weapon caused crushing on the bone on entry and flaking of the outer table on exit.

Other examples of sharp force trauma on the skull have been published by Anderson[19], Facchini et al.[20], Nagaoka et al.[21] and Borrini[22]. The diagnosis made for these two anatomical parts cannot be performed for the cut mark on the scapula, because the acromion was severed and it is not possible to examine the entire section of the cut. The only statement that can be made with certainty is that the surface of the cut is smooth and is clearly inflicted by a non-serrated weapon.

As mentioned above, the skeleton has been recovered from a medieval cemetery where victims of the Black Death may have been buried. As Patrick[18] underlines, the

spatial analysis of the cemetery can give us advice on the context. Skeleton 1303 is the only one with cut marks that are perimortem in nature and they most likely caused the death of this young male. At first sight it could be possible to state that this may be the victim of a battle, but there should be more than one individual with lethal cut marks in this skeletal assemblage. Battle victims would be evidenced by the presence of multiple graves, as the mass burials from Uppsala[23] for example, and would be possibly linked to a historical event happened in that area.

Powers[24] reports how this period in England has a reputation of a high rate of crimes and interpersonal violence. Walker[25] also underlines how men are more likely to get involved in violence, compared to women. Furthermore, the head is the most common anatomical part to attack, as it is the most vulnerable[24].

Another clear sign that confirms the case of interpersonal violence is the cut on the forearm, as an action of self-defence. As stated above, the injury on the head seems most likely to have been afflicted from the rear, which confirms that the attack is not typical of face to face combat[13]. Furthermore, if this person was a soldier, he would have displayed some signs of healed trauma as a result of previous fights.

This leads to the theory that the young Gloucester man was a victim of interpersonal violence.

CONCLUSIONS

The analysis of the cut marks found on the cranium, left radius and right scapula of skeleton 1303 exhibits all the traits of perimortem injury. These were inflicted on a young adult (17-19 years old) excavated from a Gloucester medieval site. It is most likely that this sharp force trauma led to the person’s death, as no bone reaction is

evident. Furthermore, skeleton 1303 is the only one in the skeletal collection that shows this kind of perimortem wounds. If he had been a battle victim, more examples would have been found in this skeletal assemblage. This suggests that the individual is a possible murder victim and an example of interpersonal violence in the medieval period.

REFERENCES

1. Atkin M. Excavations in Gloucester 1989-An interim report. *Glevensis. The Gloucester and District Archaeological Research Group Review* 1990; 24: 2-13
2. Atkin M and Garrod AP. Archaeology in Gloucester 1989.*Transactions of the Bristol and Gloucestershire Archaeological Society* 1990; 108: 185-192.
3. Buikstra, J E and Ubelaker DH. *Standards for data collection from human skeletal remains.* Arkansas archaeological survey research series. 44. 1994
4. AlQahtani SJ, Hector MP and Liversidge HM. *Brief Communication: The London Atlas of Human Tooth Development and Eruption. American Journal of Physical Anthropology. 2010: 142; pp. 481-490*
5. Schaefer M. A summary of epiphyseal union timings in Bosnian males. *International Journal of Osteoarchaeology*, 2008: DOI: 10. 1002/oa. 959
6. Coqueignot H and Weaver T. Infracranial maturation in the skeletal collection from Coimbra, Portugal: new aging standards for epiphyseal union*. American Journal of Physical Anthropology*. 2007: 134 (3); pp. 424-437
7. Cardoso H. Epiphyseal union at the innominate and lower limb in a modern Portuguese skeletal sample, and age estimation in adolescent and young adult male and female skeletons*.* American Journal of Physical Anthropology, 2008;135 (2): pp. 161-170
8. Trotter M and Gleser GC. *Estimation of stature from long-bones of American Whites and Negroes. American Journal of Physical Anthropology, 1952; 10: 463-514*
9. Aufderheide AC and Rodriguez-Martin C. The Cambridge Encyclopedia of Human Paleopathology. New York: Cambridge University Press, 2012.
10. Mann RW and Hunt DR. *Photographic regional atlas of bone disease.* 2nd Ed. C.C. Thomas Publisher, L.T.D. Springfield. IL, 2005.
11. Berryman HE and Symes A. Recognizing gunshot and blunt cranial trauma through fracture interpretation*.* In: Reichs, K. J. (Ed.) *Forensic Osteology advances in the Identification of Human Remains.* Charles C Thomas Publisher, LTD; 1998: pp. 333-352
12. Sauer NJ. The timing of injuries and manner of death: distinguishing among antemortem, perimortem and postmortem trauma*.* In: Reichs, K. J.: *Forensic Osteology*. Springfield; 1998: pp. 321-332
13. Wenham SJ. *Anatomical interpretations of Anglo-Saxon weapon injuries*. In: Hawkes, S. C. (Ed.) Weapons and warfare in Anglo-Saxon England. Oxford University, Oxford, UK; 1989: pp. 123-139
14. Kimmerle EH and Baraybar JP. *Skeletal trauma. Identification of injuries resulting from human rights abuse and armed conflict.* CRC Press, 2008
15. Lewis JE. Identifying sword marks on bone: criteria for distinguishing between cut marks made by different classes of bladed weapons*. Journal of Archeological Science*. 2008; 35: pp. 2001-2008
16. Weber J and Czarnetzki A. Brief Communication: Neurotraumatological Aspects of Head Injuries Resulting From Sharp and Blunt Force in the Early Medieval Period of Southwestern Germany*. American Journal of Physical Anthropology* 2001; 114: pp. 352-356
17. Giuffra V., Pejrani Baricco L., Subbrizio M. and Fornaciari G. Weapon-related Cranial Lesions from Medieval and Reinassance Turin, Italy. *International Journal of Osteoarchaeology* 2015; 25: pp. 690-700
18. Patrick P. Approaches to Violent Death: A Case Study from Early Medieval Cambridge*. International Journal of Osteoarchaeology* 2006; 16: pp. 347-354

19. Anderson, T. Cranial Weapon Injuries from Anglo-Saxon Dover. *International Journal of Osteoarchaeology* 1996; 6: pp. 10-14
20. Facchini F, Rastelli E. and Belcastro MG. Peri Mortem Cranial Injuries from a Medieval Grave in Saint Peter's Cathedral, Bologna, Italy. *International Journal of Osteoarchaeology* 2008; 18: pp. 421-430
21. Nagaoka T, Kazuhiro U and Hirata K. Evidence for weapon-related traumas in medieval Japan: observations of the human crania from Seiyokan. *Anthropological Science* 2010; 118 (2): pp. 129-140
22. Borrini M. Forensisch-anthropologische Analyse der perimortalen Verletzungen anhand der Skelettüberreste von Giuliano de' Medici infolge des Attentats am 26. April 1478 \ L'attentato a Giuliano de' Medici il 26 aprile 1478. Analisi antropologico-forense della dinamica dei fatti e dell'arma del delitto. In *Die Medici. Menschen, Macht und Leidenschaft*. Wieczorek A, Rosendahl G, Lippi D (Eds.), 2013
23. Kjellström A. A sixteenth-century warrior grave from Uppsala, Sweden: The battle of Good Friday. *International Journal of Osteoarchaeology 2005;* 15: pp. 23-50
24. Powers N. Cranial trauma and treatment: a case study from the medieval cemetery of St. Mary Spital, London. *International Journal of Osteoarchaeology 2005*; 15: pp. 1-14
25. Walker PL. A bioarchaeological perspective on the history of violence. *Annual Review of Anthropology* 2001; 30: pp. 573-596

FIGURE 1. Overall view of skeleton 1303 in anatomical position

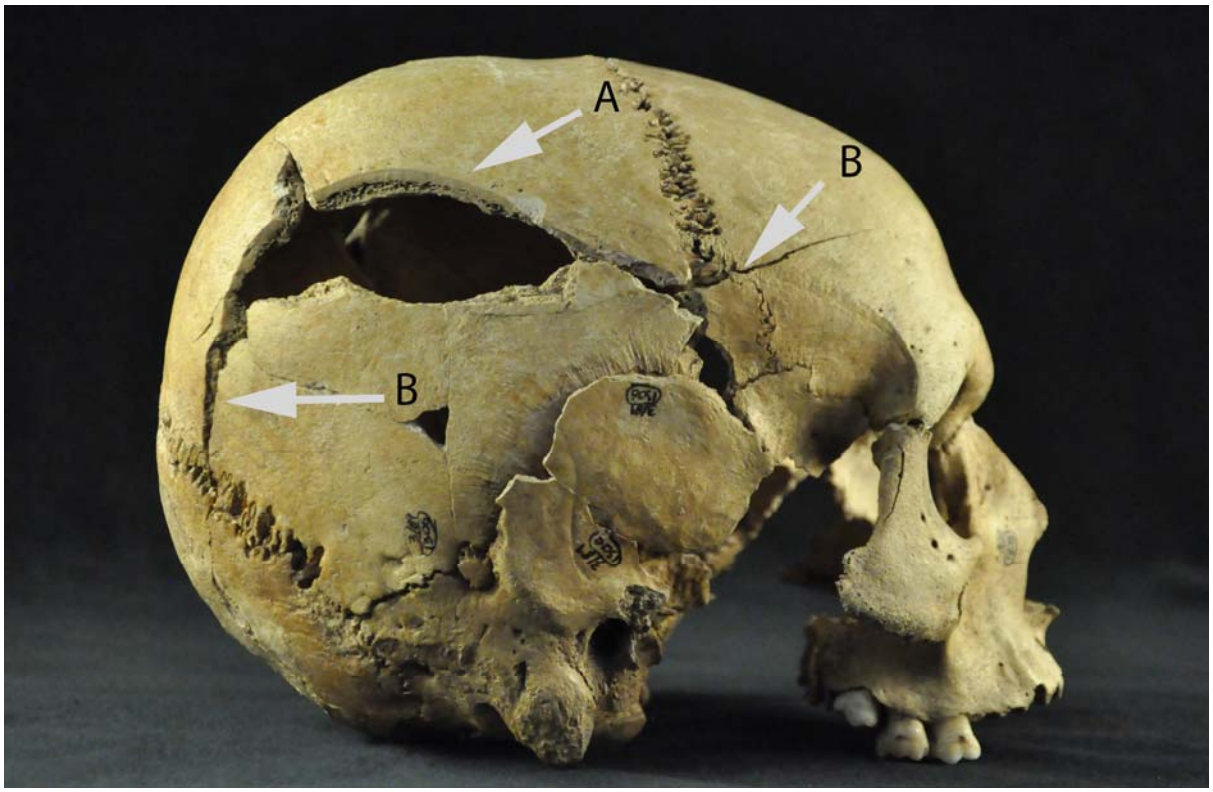

FIGURE 2. Right lateral view of the cranium, showing the perimortem injury (A). Note the radiating fractures (B).

FIGURE 3. Close-up of the trauma to the posterior distal radius. Note the partially fused epiphysis.

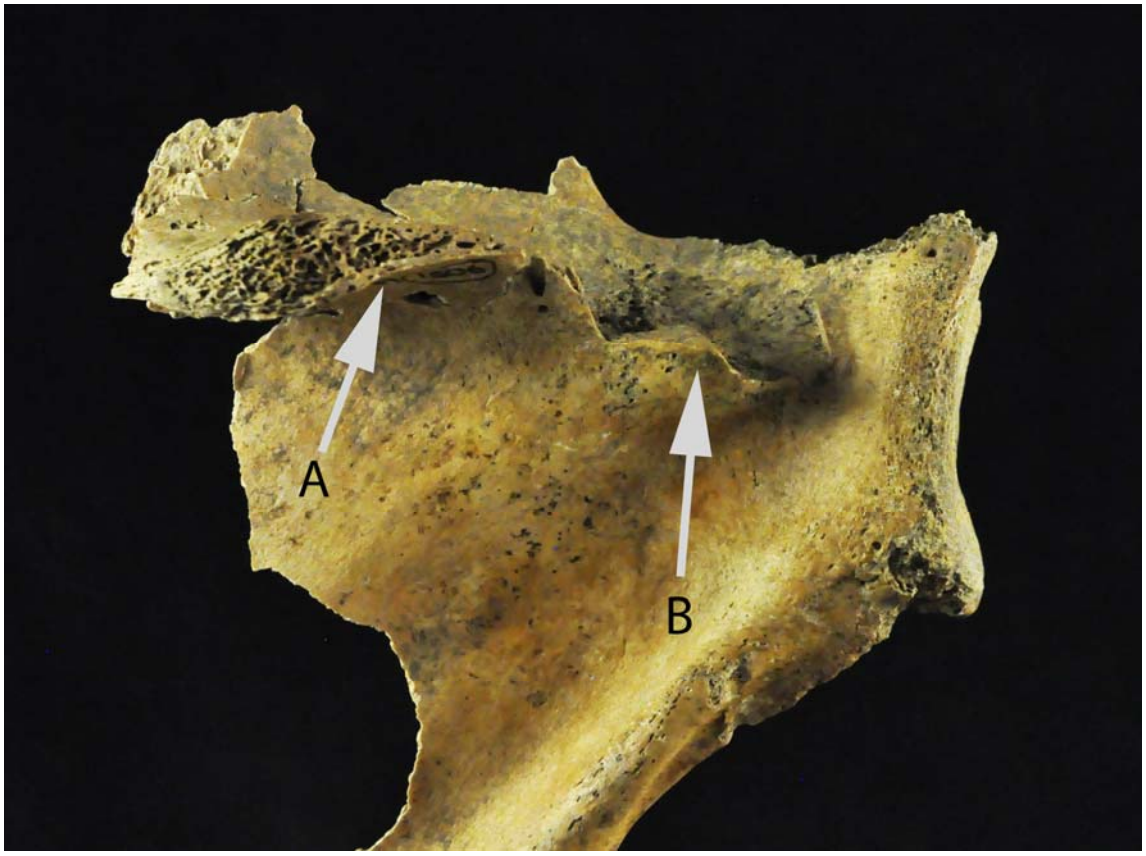

FIGURE 4. Close-up of the posterior scapula showing the cut mark (A) and the avulsion fracture (B)