An arrowhead injury in a Neolithic human axis from the natural cave of Lapa do Bugio (Sesimbra, Portugal)

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Received 20 June 2009; accepted 3 February 2010

Abstract Lapa do Bugio is a small natural cave located in a limestone cliff hanging over the sea at Azóia, Sesimbra, around 40 km south of Lisbon. This cave was used as burial place in the Late Neolithic. The necropolis comprised ten individual graves, an ossuary and a small cache, but today it is impossible to assign bones to individual graves. Therefore the anthropological remains were studied as if they were from an ossuary. The human remains from this site housed in the Museu Municipal de Sesimbra were recently re-studied by the current authors. Based on the number of mandibles, the remains represent at least 16 individuals, 15 adults and one sub-adult. Among the three vertebral remains, an arrowhead was found embedded in the second cervical vertebra of an adult of unknown sex. The tip had entered into the vertebral body and the other end of the arrowhead was lodged against the spinous process, indicating that this projectile had entered from behind. Therefore, this injury penetrated through the spinal cord of the individual, who could not possibly have survived. X-rays and computer tomography confirmed that there were no signs of healing. No other indications of trauma were observed in the human bone sample. The aim of this paper is to describe this projectile injury. It represents the first Portuguese Late Neolithic case in which an arrowhead has been found embedded in bone and adds to the very few archaeological case descriptions available worldwide.

Key words: arrowhead injury, spine, Neolithic, Portugal

Introduction

In the last decade, interest and research in interpersonal violence have risen considerably in anthropology. In Portugal, as in other parts of Europe, prehistoric interpersonal violence and warfare have been discussed based on evidence from ditched and walled settlements, possibly weapons, and, more recently, human skeletal remains (Walker, 1989; Monks, 1997; Oosterbeek, 1997; Kunst, 2000; Schulting and Mysocki, 2002; Dawson et al., 2003; Silva, 2003a).

In Portugal, human remains dating generically to the Middle and Late Neolithic/Chalcolithic period (3500–2500 BC) are mainly recovered from collective burials with no, or almost no, anatomical connection due to burial practices, post-deposition activities and excavations utilizing outdated methodologies. Recently, more attention has been given to traumatic lesions in these assemblages since these can provide valuable insights into human behaviour, in terms of the nature and frequency of interpersonal aggression in past human communities (Silva, 1996a, b, 1999, 2002, 2003a, b, c, d, 2007; Silva and Ferreira, 2008; Lambert, 2002; Thorpe, 2005; Jiménez-Brobeil et al., 2009; Jurmain et al., 2009).

In 1997, during a re-examination of human bones recovered from the natural cave of Lapa do Bugio (Sesimbra, Portugal) and housed in the Museu Municipal de Sesimbra (MMS), an arrowhead was found embedded in a human vertebra. The aim of this paper is to report this injury. Besides being one of the few examples of interpersonal violence in Portuguese Late Neolithic human populations, it is also the only Portuguese case in which an arrowhead has been found embedded in bone. It also adds information to the few cases worldwide of projectile injuries from the Neolithic era.

Archaeological Background

Lapa do Bugio is a small natural cave located in a limestone cliff hanging over the sea at Azóia near Sesimbra, around 40 km south of Lisbon (Portugal). This cave, discovered in 1957 by R. Monteiro (Monteiro and Serrão, 1959), is 9 m long and has a maximum width of 5.5 m (Figure 1). Several archaeological excavations took place between the late 1950s and the 1960s. The human remains and the associated spolia were deposited in two museums: MMS and the Museu de História Natural of the University of Porto, where they have remained since then.

The necropolis comprises ten individual graves, apparently similar to each other (Figure 1). Another grave is an ossuary and a small cache. According to Monteiro et al.
only one grave was found undisturbed. This last one was partially excavated into the bedrock and used the rock itself on the left side of the grave. The grave was 1.50 m long and had a maximum width of 1 m. The bottom of the grave was levelled by limestone slabs and at the head of the grave area there was a type of box structure. The walls of the grave were vertical slabs, covered by thin lintels, with stones on top of them. In this grave the individual was deposited dorsal decubitus with flexed legs to the left. With the exception of graves 2 and 6, which each contained two individuals, the remaining seem to have been singular depositions. According to the plan published by Monteiro et al. (1971), the inhumations were conducted with different orientations. Despite the fact that the graves were individual depositions, it is now impossible to assign bones to individual graves. Therefore the anthropological remains were studied as if they were from an ossuary.

The known spolia indicates a funerary use of the cave between the middle of the 4th until the second half of the 3rd millennia BC. The two radiocarbon dates, GrN-5628, 4850 ± 45 BP: 3750–3520 cal BC and OxA-5507, 4420 ± 110 BP: 3500–2870 cal BC, obtained respectively from an unidentified sample of a fragment of charcoal and from the shaft of a hairpin, seem to partially verify this period (Monteiro et al., 1971; Cardoso et al., 1992).

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In 1964, Agostinho Isidoro published some data about the human bones uncovered from Lapa do Bugio, but since then these specimens received no further scholarly attention until the late 1990s (Silva and Marques, 2009; Silva and Wasterlain, 2010).

The portion of human remains housed in the MMS was recently re-studied by the present authors. This assemblage contains 105 human bones or teeth. Based on the number of mandibles, they represent at least 16 individuals, 15 adults and one sub-adult (Silva and Marques, 2009).

Among the three vertebral remains recovered, an arrowhead was found embedded in the second cervical vertebra of an adult individual (Figure 2a, b). According to the first report published, this vertebra was found on the surface of the cave (Monteiro and Serrão, 1959: 424).

**Anthropological Data**

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**Descriptions**

The axis belongs to an adult individual. It was not possible to determine the sex of the individual to whom this bone belongs or to provide a more accurate estimate of the age at death. The arrowhead is embedded in the inferior part of the vertebral body and has a maximum length of 36.6 mm and a maximum width of 13.7 mm (Figure 2a, b). The tips has entered about 10.4 mm into the vertebral body, at an angle of
around 90° in relation to the base of the vertebral body. The other end of the arrowhead has lodged against the spinous process. These data indicate that the projectile entered from behind, perhaps when the individual was trying to run away, and cut the spinal cord. X-ray and computer tomography examination of this vertebra confirms the entrance of the arrowhead tip into the vertebral body. As expected, no signs of remodelling are visible (Figure 3, Figure 4).

Among the other human remains preserved, no sign of traumatic injury was found.

**Discussion**

Evidence of projectile injuries in Portuguese Late Neolithic human samples is sparse, although their recognition is difficult due to the commingled and fragmented conditions of these assemblages, with crania frequently reduced to small fragments, a total absence of facial bones, and the postcranial skeleton reduced to pieces.

To date, projectile injuries have been recorded for only one Portuguese prehistoric site. In 2002, Silva described a lesion in an adult frontal bone, behind the left orbit, uncovered from the Dolmen of Ansião. On the tip of the lesion, the perforation is complete. Signs of healing were visible on the external and internal surfaces. This injury was interpreted as the result of an impact of a projectile, probably an arrowhead, that struck the individual from left and behind (Silva, 2002, 2003a). This author described another frontal bone from this sample, with a similar lesion, but due to post-mortem damage no interpretation could be offered.

Considering the rest of the Iberian Peninsula, only five Spanish prehistoric sites have reliable evidence of wounds made by arrowheads: the Hypogeum de Longar (four cases: Armendariz et al., 1994), Dolmen de Collet Su (one case: Figure 2. (a) Inferior view of the adult spine from Lapa do Bugio with the embedded arrowhead. (b) Superior radiograph of the human spine from Lapa do Bugio

Figure 3. X-ray of the human spine from Lapa do Bugio with the embedded arrowhead: (a) superior view; (b) inferior view.
Campillo, 1977), Cova H de Arboli (one case: Campillo, 1983), San Juan ante Portam (nine cases: Etxeberria and Vegas, 1992) and San Quicel del Valles (one case: Campillo et al., 1993). These injuries were found in individuals of both sexes and include wounds with signs of healing and others that lack these signs and probably caused the death of the individual. Concerning the location, they include cases in several cranial bones, ribs, vertebrae, and in the superior portion of the humerus. However, among the cases involving vertebrae, these were thoracic or lumbar ones.

Although there is little evidence of arrow-inflicted injury from the Iberian Peninsula, from France, primarily in the south, larger numbers of projectile-inflicted injuries have been described. According to Guilaine and Zammit (2005), a survey of 48 French Late Neolithic burial sites revealed roughly 75 individuals, out of 2000–3000 buried in the tombs, to be injured. Moreover, all parts of the body were targets for the archers, namely head, thorax, pelvis, arms (especially humerus and radius), legs, and feet. According to these authors, the vertebrae are the place were most projectiles were lodged.

In sum, the available data suggest a low number of arrow-inflicted injuries in Portuguese Middle/Late Neolithic burial sites. However, for now, it is impossible to know the real meaning of these data.

Conclusion

This paper reports the second Portuguese case of a projectile injury dated to the Late Neolithic. Furthermore, it is the first one where the weapon, an arrowhead, was found in situ. The location of the injury suggests that the individual was fleeing when he was hit by the projectile and probably died, although a tragic accident cannot be excluded. No other signs of traumatic lesion were seen in these human remains. Moreover, a survey of skeletal injuries on Portuguese Late Neolithic skeletal samples, which includes cranial injuries, projectile injuries, and cut marks, suggests that some interpersonal violence occurred in these communities but this probably represented occasional episodes.

Acknowledgments

The authors thank the Museu Municipal de Sesimbra were the bones are housed; Rui Boaventura for improvements to the English version of this paper; Teresa Rafael of the Clínica Universitária de Imagiologia dos Hospitais da Universidade de Coimbra for producing the X-rays and CT images.

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