Skeletal evidence of interpersonal violence from Portuguese Late Neolithic collective burials: an overview

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ABSTRACT
This chapter reviews bone injuries detected from Late Neolithic Portuguese skeletal collections, with a focus on those that may represent cases of interpersonal violence. Forty-three traumatic lesions from 16 Portuguese samples are discussed. Cranial injuries (86%), particularly cranial depressed fractures (70%), were the most frequent traumatic injury found, including the only trauma observed in a subadult individual. In the postcrania, with the exception of an embedded arrowhead in a vertebra (C2), all other injuries were cut marks \((n = 5)\). The majority of cranial lesions show signs of healing. The collective burial practices of these prehistoric populations combined with an imbalanced sample size, poor preservation, and incompleteness of the commingled human remains assemblage makes it difficult to interpret the overall importance of possible cases of interpersonal violence within a global perspective of these populations.

INTRODUCTION
During the last decade, research and interest in interpersonal violence has risen considerably in archaeology as well as in anthropology.
Evidence of frequent episodes of large-scale violence in the past is documented by written sources, the presence of weapons (or tools that could have been used as such), depictions of violence, fortifications, and large-scale destruction (Thorpe 2005), or indirectly by ancient written sources referring to more early times. However, evidence based directly on skeletal remains is less common (Walker 1989; Monks 1994; Dawson et al. 2003). As in other regions of Europe, interpersonal violence and warfare have been discussed in the Portuguese Neolithic based on evidence of ditched and walled settlements, interpreted by most authors as fortifications, and on possible weapons (Monks 1994, 1997; Oosterbeek 1997; Kunst 2000). This type of interpretation has increased markedly in the last two decades due to several publications, especially from northern and central Europe, where human remains show evidence of trauma likely originating from acts of violence (Guilaine and Zammit 2001; Walker 2001; Schulting and Wysocki 2002, 2005; Gilchrist 2003; Thorpe 2003; Christensen 2004; Wild et al. 2004; Jiménez-Brobeil et al. 2009, among others). Injuries most frequently associated with interpersonal violence and observable in archaeological skeletal remains include cranial vault and facial injuries attributed to direct blows or punctures, multiple lesions from frequent or severe assaults and distal ulna shaft fractures (Judd 2004; Jurmain et al. 2009).

In Portugal, human remains dating generically to the Middle and Late Neolithic period (4000–2500 BC) are mainly known from collective burials such as natural caves, dolmens, rock-cut tombs, and vaulted chamber tombs, but are often fragmented and commingled. These burials represent a set of magical and funerary practices that have been designated as the phenomenon of Megalithism (Sherratt 1995; Gonçalves 2003; Boaventura 2009).

In this work, 54 collective burials, consisting of 16 dolmens, 24 natural caves, nine rock-cut tombs, and five vaulted chamber tombs, have been considered. The minimal number of individuals (MNI) varies between tombs, from less than 10 to more than 400 individuals (Silva 2003d; Boaventura 2009). Moreover, the human remains were recovered with no, or almost no, anatomical connection due to burial practices, post-deposition activities, and excavations utilizing outdated methodologies. To date, among those collections studied, more than 3200 individuals from this period have been estimated, recovered mainly from the region of the Estremadura in the west-central part of Portugal (Silva 2002b; Boaventura 2009). This is a
consequence of the better preservation of human remains in this region, due to the geological compositions of limestone and silt, which resulted in less acidic soils. Nevertheless, despite the existence of hundreds of known burials, only a few dozen have been studied. In neighbouring regions, such as the Alentejo and northern parts of Portugal, despite the thousands of dolmens and other types of graves that have been identified and excavated (Leisner and Leisner 1959; Leisner 1965; Senna-Martinez 1989; Jorge 1990; Leisner and Kalb 1998; Cruz 2001), very small amounts of preserved human remains have been revealed. The geological compositions here, predominantly of granite and schist, may explain this unfortunate loss of evidence. However, it is probable that there were many thousands of individuals present.

The systematic study of human remains from these Neolithic communities began in the 1990s, including aspects of funerary anthropology, demography, morphology, and pathology (Silva 1996a,b, 1999, 2002, 2003a–d, 2007; Cunha et al. 2007). Trepanation is the most studied lesion. Still, only 22 trepanations performed in 18 individuals are reported for Portuguese Neolithic or Early Bronze Age samples. The two methods used were scraping and incisions. The trepanations were performed above all in male individuals, although some findings belong to individuals of unknown sex. The parietal bone (85%) was the most frequently trepanned skull element followed by the frontal (10%) and temporal (5%) bones. More than half of interventions performed on the parietal bone were on the right side (one covering both sides; nine right; five left; and two unknown). Only one trepanation (Eira Pedrinha, see below) was linked with a previous traumatic event (for a survey of Portuguese trepanation, see Silva 2003c).

Recently, more attention has been given to traumatic lesions, as these injuries can provide valuable insights into human behaviour, namely data about the nature and frequency of interpersonal aggressions in prehistory (Lambert 2002; Jurmain et al., 2009). However, the commingled and fragmented conditions of Portuguese human bone assemblages makes its study difficult, with crania frequently reduced to small fragments, a total absence of facial bones, and the postcranial skeleton reduced to pieces.

This contribution reviews bone injuries from skeletal collections recovered in Portugal and attributed generically to the Middle and Late Neolithic that could represent cases of interpersonal violence.
The chronological attribution of the human remains discussed here is based on associated funerary objects and on several radiocarbon dates, the latter obtained mostly from single human bones from each burial structure. None of the discussed specimens below has yet been directly dated.

The cases listed below are based on personal observations with the exception of material from Algar do Bom Santo and Cerro das Cabeças, which rely on published sources. The region of Tomar is not discussed here as another chapter deals with its data (see Oosterbeek and Tomé, this volume, Chapter 16).

The traumatic lesions considered in this chapter include cases of cranial injuries (depressed and puncture injuries), projectile injuries, and cut marks. We excluded cases of trepanation in the present study unless they showed clear signs of a previous or associated trauma.

TRAUMA CASES SUGGESTIVE OF INTERPERSONAL VIOLENCE FROM PORTUGUESE LATE NEOLITHIC BURIALS

Skeletal injuries possibly related with acts of violence were observed in 16 Portuguese Late Neolithic burial collections listed below. The site numbers relate to the map legend (Figure 17.1).

Dolmen of Ansião (1)

The Dolmen of Ansião (Leiria) was discovered in the late nineteenth century during construction of the road between the towns of Ansião and Coimbra, in a mountainous area of the Alta Estremadura. The recovered finds (Leisner and Kalb 1998) place the use of this tomb in the second half of the fourth millennium bc, which seems to be confirmed by a single radiocarbon date (Sac-1559, 4640 ± 90 BP: 3640–3100 cal bc) obtained from a femur fragment (Silva 2002b). (All radiocarbon dates mentioned in the text are presented at two sigma and were calibrated with OxCal 4.0.5 (Bronk Ramsey 2001, 2008), using the calibration curve IntCal04 (Reimer et al. 2004).) At the beginning of the twentieth century, these human remains were transferred to what is now the Department of Life Science (previously the Department of Anthropology), University of Coimbra, where
they are currently housed. From this collective burial a minimum number of individuals (MNI) of 37 has been identified, with 23 adults (both sexes) and 14 subadults (all age groups are represented).

In this sample, only skull injuries on adult individuals of unknown sex were detected. These included two probable projectile injuries and depressed cranial fractures (DCF). Behind the left orbit of a fragment of frontal bone belonging to an adult of unknown sex, a triangular lesion is visible (Figure 17.2). On the lateral side of the bone, a post-mortem fracture led to the loss of some bone, making it impossible to determine the exact dimension of the injury; its estimated maximum exocranial dimension is 30 mm × 15 mm. On the tip of the lesion, the perforation is complete. This roughly ellipsoid opening measures approximately 5 mm × 2.5 mm. Signs of healing are visible on the external and internal surfaces, including margins of the hole. In the endocranial view, smooth margins of the defect are even more prominent. Lateral to the hole there is a small and roughly circular bone mass, probably associated with the traumatic event that is fused with the inner table of the frontal bone. There are no signs of infection or other complication around the lesion. This injury seems to be the result of a projectile impact, probably an arrowhead that would have struck the individual from the left and from behind (Silva 2003a).

Six other cranial fragments belonging to adult individuals of unknown sex exhibit DCFs. The locations of these injuries occur on two frontal bones, two above the sagittal suture, one on the right parietal bone and one on the occipital bone. The contours of these cranial depressions are circular or oval, ranging from 10 to 20 mm maximum

Figure 17.2. (a) Exocranial view of the left side of the frontal bone (DEA. 843) from the dolmen of Ansião showing an injury interpreted as caused by an arrowhead. (b) Details of the lesion.
diameter and a depth of about 1 mm. All are completely healed. The exact prevalence of these lesions is difficult to establish, as we cannot exclude that some fragments could belong to the same individual. Considering the frontal bone, the prevalence of this skull injury for the adult individuals would be 9.5% (two of 21). Moreover, the frontal bone (DEA116) displays another injury besides the DCF. This partial perforation lesion with a minimum anteroposterior length of 10 mm × 4 mm (the bone is broken post-mortem) is very similar to the projectile injury described above. Considering all types of injuries presented, at least three adult individuals (14.3%) from this site display cranial injuries.

**Covão d’Almeida (Eira Pedrinha) (2)**

Covão d’Almeida is one of a group of natural caves used as a funerary space, collectively known as Eira Pedrinha. The recovered finds and a radiocarbon date (Beta-134363, 4480 ± 60 BP: 3370–2930 cal bc) on human bone place its use during the Late Neolithic (Gama and Cunha 2003). The bones were recovered selectively by the excavators, mainly complete skulls, mandibles, and long bones, and represent an MNI of 144 individuals, including 31 subadults. One male cranium presents an ovoid/elliptical-shaped, healed lesion in the middle portion of the left frontal bone. On its central portion another depression of 18 mm × 8 mm is visible. On the exocranium, an area of reactive and smooth bone surrounding the central depression is visible. In the endocranium, an osseous callus with a transverse diameter of 27 mm and longitudinal diameter of 1 mm is visible. A subsequent study reinterpreted this lesion as a trepanation, performed after a cranial trauma resulting in a severe depressed fracture (Gama and Cunha 2003).

**Lugar do Canto (3)**

Lugar do Canto (Alcanede, Santarém) is a natural funerary cave. It was discovered in 1975 and excavated sometime soon after. The finds associated with primary and secondary deposits—the latter probably resulting from the reduction and rearrangement of previous primary deposits—places its use broadly in the Middle and Late Neolithic, between 4200 and 3500 BCE (Leitão et al. 1987; Cardoso and Carvalho 2008), consistent with the single radiocarbon
date (Sac-1715, 5120 ± 80: 4230–3700 cal bc), obtained on bone fragments from the same skeleton (Cardoso and Carvalho 2008).

The human remains were first studied by S. Rolston (cited in Leitão et al. 1987) who proposed a maximum number of 48 individuals of both sexes, and adults and subadults of different age groups. The skeletal collection suffered some losses, but a part was kept at the Smithsonian Institute (Washington DC) and another was recently deposited at the Museu Nacional de Arqueologia (Lisbon) by J.L. Cardoso. Both portions of the collection are presently under study by the authors (AMS, RB, and MTF), upon request and return of the collection from abroad. These results should be considered as preliminary. (Recently, more bones from this collection were identified (including cases of cranial trauma) but it was not possible to include them in the present work.)

Two incomplete crania under study in the Department of Life Sciences of the University of Coimbra (n = 7) display signs of trauma. The first is a middle-aged individual of unknown sex. On the anterior part of the left parietal bone, near the coronal suture, a healed oval-shaped depression is visible. The maximum length (anteroposterior) is 40 mm, 20 mm wide, and 1 mm deep (Figure 17.3). An old and incomplete crania, probably female, exhibits on its left parietal bone, an oval-shaped depressed fracture that extends 30 mm in maximum length and 15 mm wide.

Figure 17.3. Superior view of adult crania of unknown sex of Lugar do Canto exhibiting a healed, depressed fracture on the left parietal bone.
Serra da Roupa (4)

In 1971, a collective burial place on a small limestone massif near the village of Columbeira was found by three collaborators of the Museu Municipal do Bombarral (Silva 2002b, 2003b). Owing to extensive destruction by erosion, the total original area of the platform is unknown as is the magnitude of the loss of human remains. However, it is assumed that this tomb, Serra da Roupa, could have taken advantage of some sort of rock shelter. The radiocarbon date (Sac-1611, 4560 ± 110 BP: 3630–2920 cal bc) on human bone places that individual and presumably the others in the second half of the fourth millennium bc. The MNI is 40, 28 adults and 12 subadults, including individuals of both sexes and different age groups (Silva 2003b).

Among the cranial fragments from this burial are two crania exhibiting DCFs, representing about 9.1% of the individuals represented by cranial bones (two of 22).

An adult female skull of middle age from Serra da Roupa displays two circular depressed cranial fractures with diameters of 10 mm and about 1.5 mm depth, both remodelled. One is located on the left parietal bone, 25 mm from the lambda and near the sagittal suture, and the other on the right parietal bone, in a mesial position. The second specimen diagnosed with a cranial vault injury is an adult male skull showing a healed circular depression on the right parietal bone, in a location very similar to the second DCF described for the previous female cranium.

Fontainhas (5)

Fontainhas (Cadaval) is a natural burial cave located in the Montejunto mountains. It was excavated by the Geological Services in the nineteenth century, and the finds are housed at the Museu Geológico (Lisbon). The condition in which the human bones were found is unknown, but they were recovered together with finds that place deposition between the second half of the fourth and first half of the third millennia bc. The radiocarbon date (TO-358, 4170 ± 60 BP: 2900–2580 cal bc) on a human rib (Jackes et al. 1997) seems to partially confirm that assumption. The study of the human bone collection indicated an MNI of 17, but there was no sex and age information (Jackes et al. 1997), although a similar pattern can be assumed from other necropoli.
One adult cranium exhibits a small oval depression on the left frontal bone with signs of healing. This depression measures 25 mm in length, 14 mm wide, and a maximum of 1.0 mm in depth. This lesion was first interpreted as a trepanation but now it is considered a cranial trauma (Silva 2003c; Campillo 2007).

**Pragança (6)**

In the region of Serra de Montejunto, many caves were explored from the late nineteenth century to the 1930s. The materials were later deposited in the Museu Nacional de Arqueologia and Museu Etnológico (both in Lisbon; Gonçalves 1990–1992). Among them, a cranium of a middle-aged male individual is currently housed in the Museu Nacional de Arqueologia, and is labelled as coming from the cave of Furadouro da Alargada (Pragança). It is dated to the Late Neolithic by Gonçalves (1990–1992). However, apparently, the same cranium was described in 1946 by Mac White as being exhumed from ‘Pragança Val Tomate’, a cave dated to the Early Bronze Age. Therefore, the exact provenience and dating of this cranium is not completely clear (Silva 2003c). It shows signs of sharp force trauma in the form of a complete perforation to the right parietal bone along the right coronal suture (Figure 17.4), extending 115 mm to the right of

![Figure 17.4. Superior (a) and lateral (b) views of the skull from Vale Côvo (Pragança). The incisions performed on the left parietal bone were interpreted as a possible case of trepanation. However, those visible on the right lateral side of the parietal bones represent another trauma.](image-url)
bregma. The hole is irregularly rectangular, measuring 115 mm mediolaterally and 10 mm anteroposteriorly along the coronal suture, mostly on to the right parietal bone. There are two small areas in this hole that seem to show tenuous signs of healing, as it appears that the compact bone began to cover the diploid tissue. Two more parallel cut marks exist on the anterior part of the left parietal bone, 35 mm long and running approximately parallel to the anterior sagittal suture, and 2 mm in depth upon the outer table, with no visible signs of healing. The interpretation of these cut marks is difficult. One hypothesis could be that incisions on the right parietal bone represent a sharp force trauma and the two parallel incisions represent signs of trepanation, that is, a case where a trepanation was performed after another cranial trauma (Silva 2003c).

**Cabeço da Arruda I (7)**

Cabeço da Arruda 1 (Torres Vedras) seems to have been a rock-cut tomb, although it was partially destroyed upon discovery in 1933, limiting its identification (Trindade and Ferreira 1956; Silva 2002b). According to the associated finds and the radiocarbon dating obtained on bone remains (Silva 2002b) this tomb was used between the second half of the fourth and the first of the third millennia BCE. The human remains were commingled and fragmented. The study of the skeletal collection indicated an MNI of 19, with both sexes and five subadults (Silva 2002b). Among the adult cranial sample, an ovoid depressed fracture was located on a left parietal bone near the lambda (1 of 14 = 7.1% of the adult individuals). This healed lesion extends to a maximum of 10 mm.

**Algar do Bom Santo (8)**

Algar do Bom Santo is a natural cave located in the mountain range of Montejunto (Alenquer). It was used as a collective burial place during the Middle and Late Neolithic, according to the finds and radiocarbon dating between 3900 and 2900 cal BC (Duarte 1998). Partial excavations suggest both primary and secondary deposition, the latter due probably to the reduction and rearrangement of skeletal remains, resulting in the commingled condition of the assemblage. Until now, at least 121 individuals are represented (Duarte 1998). A partial study
of palaeopathology conducted by McGarvey (2002) analysed 21 crania. Among this sample, four crania display signs of traumatic lesions.

The first case belongs to one adult cranium, probably male, and presents a depressed fracture on the left parietal boss, 49 mm from the sagittal plane. The surface of the cranium is partially perforated. The fractures measures 20 mm in diameter medial–lateral and 13.9 mm in diameter superior–posterior. The ectocranial margins exhibit an inward bevel and the endocranial aspect being larger. The margins are very sharp and no evidence of sclerosis or bony reaction was observed. This injury was identified as a depressed fracture resulting from a blunt force impact with an oval/triangular-shaped object (McGarvey 2002, p.32).

The second case corresponds to the cranium of a middle-aged individual, probably male, with a semicircular depression on the left parietal bone, 45.5 mm posterior to the coronal and 72.3 mm lateral to the sagittal suture, along the temporal line. This lesion measures 17.2 mm in diameter and seems well-healed (McGarvey 2002, p.33).

An old male adult cranium exhibits three, possibly four (even though in the statistical analysis, only three traumas were considered), peri-mortem lesions of different sizes consistent with DCFs. On the right parietal bone, two small concentric depressed fractures were observed. The first is elliptical, located just above the temporal line, on what is probably the coronal suture, measuring 11.8 mm mediolaterally and 6 mm superoposteriorly. The inner table and diploë seem to be affected. On the posterior part of this bone, 15.5 mm above the lambdoidal suture and 37.2 mm lateral to the sagittal suture a second small concentric fracture is present, measuring 5.3 mm mediolaterally and 7.3 mm superoposteriorly. No signs of infection or healing are evident. Besides these two injuries, a linear fracture, measuring 53.9 mm, radiates from a large fracture on the right lateral aspect of the occipital bone. This fracture, with no signs of healing or infection, is characterized by complete perforation of the occipital, 45.2 mm anteroposterior length and 22.6 mm along its widest margin (McGarvey 2002, p.47).

The last case reported by McGarvey (2002, p.67) is an old adult incomplete cranium where the left temporal and parietal bones share a circular perforation, just adjacent to the parieto-mastoid and occipital-mastoid articular region. Some remodelling is visible around the perforation that extends 9.1 mm at its maximum diameter. Several diagnoses were proposed for these perforations, as
the author did not exclude DCF and trepanation, more probable but others, as osteomyelitis or granuloma. However, this specimen was not directly observed by us.

Samarra (9)

The tomb of Samarra (Sintra, Lisbon) was discovered in 1948 (França and Ferreira 1958). Although it was not possible to ascertain the type of tomb, as it was destroyed at the time of discovery, it was probably a vaulted chamber tomb because of the amount of stone blocks found mixed with the burial remains. This assumption is also consistent with the finds, which are similar to those frequently found in that type of tomb in the region. These tombs seem to have been built and primarily used between 2900 and 2400 BC. The only existing radiocarbon date (Sac-1827, 3820 ± 60: 2470–2060 cal BC) obtained on human bone (Silva and Ferreira 2008) indicates at least one later deposition in the second half of the third millennium BC.

Figure 17.5. Lateral side of a right adult parietal bone exhumed from the collective burial of Samarra (Portugal) with signs of a complete incision. (a) incomplete perforation; (b) thinning of the cranium vault.
The excavation of this collective burial revealed a great number of commingled and fragmentary human remains. Currently, a significant portion of these remains is deposited in the Museu Arqueológico de São Miguel de Odrinhas (Sintra) and corresponds to an MNI of 55 adults of both sexes. Among the crania fragments, a right parietal bone, belonging to an adult of unknown sex, displays signs of four traumatic injuries (Figure 17.5), comprising two DCFs and two incisions (Silva and Ferreira 2008). On the lateral side of the parietal bone fragment, a complete perforation of at least 60 mm in diameter is visible (the bone has a post-mortem fracture). Near the coronal suture, the cutting was incomplete, perforating only the outer table. Macroscopic signs of remodelling are visible along the margin, with smoothing of the margin edges. Furthermore, loss of typical layering of the cranial bone at the defect margins, in particular the loss of the diploid structure, had already begun. At the posterior end of the incision, the parietal bone is very thin, exhibiting almost half of the thickness of the surrounding bone, suggesting a depressed fracture. The left margin of the parietal bone fragment, measuring 80 mm, shows signs of a complete incision. Here, the cutting line is curved, in the direction of the endocranium. At the mid-portion of this incision, resorption of the marginal bone edges had begun and new bone formation is visible. Moreover, partial loss of the diploid structure occurred. On this side of the fragment, the parietal bone near the coronal suture is also very thin. This last alteration was also interpreted as a depressed fracture. The two perforating traumas could be caused by a sharp force cranial injury, although a case of trepanation cannot be excluded as these incisions are very similar to trepanation by the incision method performed on a young adult male from the rock-cut tomb of São Pedro do Estoril II (Silva 1999).

Poço Velho (10)

The natural caves of Poço Velho (Cascais, Lisbon) were discovered in the nineteenth century. These caves seemed to have been used as a collective burial place in the Late Neolithic. Based on the recovered finds and radiocarbon dates, obtained from several human bones, its use seems to have been concentrated between 3400 and 2200 cal BC (Gonçalves 2009). A recent study of human remains proposed an MNI of 115, comprising 93 adults (both sexes) and 22 subadults (Antunes-Ferreira 2005).
Three crania from this sample show DCFs and one incision. This site yields the only trauma observed in a subadult. This is a cranium aged 5 years $\pm$ 16 months showing a circular depressed fracture, 8 mm in diameter, localized in the central part of the frontal bone. The lesion seems remodelled (Antunes-Ferreira 2005, pp.88–89). The second case from this site is an adult female skull with two depressed fractures, one on the right side of the frontal and one on the left parietal. The third case involves the cranium of a male with a circular cranial depression of 9 mm in diameter, on the right parietal. The final case exhibiting cranial vault injury is an adult frontal bone, probably male, exhibiting a 50 mm long incision. Signs of healing are visible (Antunes-Ferreira 2005). This injury is very similar to those from the dolmen of Ansião already mentioned, which could have resulted from a projectile impact.

Considering the cranial adult sample from this site (MNI = 63 adults) the prevalence of cranial injuries in this sample is about 4.8% (three of 63).

**São Pedro do Estoril II (11)**

The rock-cut cave of São Pedro do Estoril II (Cascais) was excavated in 1944. Human remains were found commingled and fragmentary, although some anatomical connections were identified during fieldwork (Leisner et al. 1964). However, these were lost after the fieldwork. At least an MNI of 54 was present, with 41 adults and 12 subadults (Silva 1999). Among the individuals represented by cranial remains, one cranium from a middle-age male (about 3.5%; one of 28), displays a healed circular depression on the left side of the frontal bone, with a diameter of 10 mm (Figure 17.6).

**Dolmen of Carcavelos (12)**

The dolmen of Carcavelos is a Late Neolithic tomb located near Lisbon. It was first excavated during the early 1990s and more recently in 2005–2006 (Boaventura and Estevão in press). During this latter and partial excavation, human remains were commingled with no clear anatomical connections detected. Two radiocarbon dates from human skeletal material placed the main use of this site between 3000 and 2600 cal bc, although early and later uses were detected (Hillier et al. 2009; Boaventura and Estevão in press). To
date only the adult remains from Carcavelos have been studied, with an MNI of 80, of both sexes (Hillier et al. 2009). Preliminary analysis of the skeletal remains from the site revealed the presence of cut marks on a cranium and two humeri (Hillier et al. 2009).

A partial cranium consisting of right and left partial parietals and occipital bone presents 27 cut marks, restricted to two clusters: the first cluster is near the sagittal suture at obelion and the second near the posterior portion of the temporal line on the right parietal. The cut marks range in length from 2.37 mm to 11.4 mm (Figure 17.7).

Among the postcranial bones, a partial left distal humerus exhibits cut marks on the posterior surface immediately superior to the lateral and medial supracondylar crests (Figure 17.8). Only four (located

Figure 17.6. Healed depressed skull fracture on the left frontal bone of middle-aged adult male from SPE II.

Figure 17.7. Cranium with cut marks from the dolmen of Carcavelos. Photo of J.P. Ruas, IGESPAR (in Hillier et al. 2009).
medially) were measurable and these range in length from 5 mm to 8.9 mm. They are horizontally oriented with a slight inclination distally toward the midline of the bone. The angle of force of the cuts appears to be inferior, rather than perpendicular. In addition to these, minute cut marks are located upon the edge of the olecranon fossa. These cut marks could be compatible with a defensive position of the arms.

A second specimen, a right distal adult humerus displays possible cut marks on the posterior surface, with one located laterally and four located medially, ranging in length from 4.6 mm to 7.8 mm. They are located near or in areas of soft tissue attachments and resemble the pattern observed in archaeological human and faunal remains associated with removal of soft tissue and disarticulation.

Although body preparation (disarticulation and defleshing) for secondary burial seems to be one possible explanation, due to the absence of other signs of trauma, others cannot be excluded.

Lapa do Bugio (13)

Lapa do Bugio is a small natural cave, 9 m × 5.5 m, located in a limestone cliff overlooking the sea at Azóia, Sesimbra, about 40 km south of Lisbon. The cave was discovered in 1957 by R. Monteiro (Monteiro and Serrão 1959). Several archaeological excavations took place between the late 1950s and the 1960s. The human remains are deposited in two museums: Museu Municipal de Sesimbra (MMS) and Museu de História Natural of the University of Oporto.
The known finds indicate the cave’s funerary use between the middle of the fourth and the second half of the third millennia. The two radiocarbon dates (GrN-5628, 4850 ± 45 BP: 3750–3520 cal BC; OxA-5507, 4420 ± 110 BP: 3500–2870 cal BC), obtained respectively from unidentified charcoal fragments and from the shaft of a hairpin seem to partially verify this time span (Monteiro et al. 1971; Cardoso et al. 1992).

The human remains housed in the MMS were recently re-analysed by two of the authors (AMS and RM). They represent an MNI of 16: 15 adults and one subadult, based on the mandibles. Among the three vertebral remains, an arrowhead was found embedded in the second cervical vertebra of an adult of unknown sex. As can be seen in Figure 17.9, the tip enters into the vertebral body. The other end of the arrowhead is leaning against the spinous process indicating that this projectile entered from behind. The radiograph and computed tomography images of this vertebra confirm the entrance of the arrowhead tip into the vertebral body. As expected, no signs of remodelling are visible (Silva and Marques 2010). According to the first report published (Monteiro and Serrão 1959), this vertebra was found on the surface of the cave.

![Figure 17.9. Inferior view of adult axis with an embedded arrowhead recovered from Lapa do Bugio (Sesimbra).](image)
Alcalar 9 (14)

Alcalar 9 is a vaulted-chamber tomb, excavated by A. Santos Rocha in 1900. A remaining section of the corridor was excavated in 2004, together with a niche discovered inside the chamber. In the corridor, a secondary deposit was found inside two overlapping bowls, corresponding to an adult male. The human remains recovered in the later work correspond to an MNI of six, comprising three adults and three subadults. On the right side of the frontal bone of an adult male a circular depression is visible, measuring 15 mm × 17 mm and about 1 mm depth. It seems to correspond to a well-healed old trauma (Ferreira and Silva 2008).

Monte Canelas I (15)

The rock-cut tomb of Monte Canelas I (Alcalar, Algarve) was excavated between 1991 and 1994, producing more than 6000 fragments of human bone corresponding to an MNI of 171 (Silva 1996a,b). The majority of the bones were found commingled and dispersed in this collective tomb but it was possible to identify five primary inhumations, in a fetal position, and 30 anatomical connections. The associated finds and radiocarbon dating place the tomb’s main use between the second half of the fourth and first centuries of the third millennia BC (Parreira and Serpa 1995; Silva 1996a). Depressed fractures were observed on two incomplete crania (of 97/2%). The first case belongs to the cranium of one of the primary inhumations, a middle-aged male. On the right side of the frontal, a remodelled circular depression is visible, 10 mm in diameter. The second case corresponds to a young adult cranium of unknown sex, recovered from the commingled sample and exhibits an oval depression on the right parietal. Despite some visible healing of this injury, there are still signs of infection around the depression.

Cerro das Cabeças (16)

In 1993 during construction of a parking lot located on a hill, about 1 km northeast from Silves (Algarve), a pit burial with two inhumations was found and attributed to the Late Neolithic (Gomes and Paulo 2003). However, the type of burial and associated artefacts make it more plausible to ascribe it to the Middle/Late Neolithic
transition. The better-preserved inhumation belongs to a young adult male, deposited in a fetal position. Among the recovered human bones, one rib fragment shows a rectilinear cut and the diaphyses of two long bones display fine parallel cuts. These cut marks were initially considered as post-mortem and interpreted as part of an unknown ritual behaviour (Gomes and Paulo 2003, p.94). The incompleteness of this skeleton and the impossibility to observe it prevents us from giving an opinion about these cut marks.

SKELETAL INJURIES IN PORTUGUESE LATE NEOLITHIC SAMPLES: ACCIDENTS OR INTERPERSONAL VIOLENCE?

This survey of skeletal injuries in the Portuguese Late Neolithic reported 43 traumatic lesions (37 cranial and six postcranial; Table 17.1) from 16 sites representing a minimum number of 620 adult individuals, although not all of them are represented by all skeletal elements. In addition, this account has to take into perspective the total number of Neolithic individuals studied until now and mentioned above.

These injuries were scored on a minimum of 28 individuals (one subadult and 27 adults), including individuals of both sexes. These

Figure 17.10. Distribution of the depressed fractures in adult individuals by crania element.
<table>
<thead>
<tr>
<th>Site</th>
<th>Demographic data</th>
<th>Type of injury</th>
<th>Locations</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Dólmen de Ansião</td>
<td>Adult, unknown sex</td>
<td>Projectile</td>
<td>Behind left orbit</td>
<td>Remodelled</td>
</tr>
<tr>
<td>1: Dólmen de Ansião</td>
<td>Adult, unknown sex</td>
<td>DCF</td>
<td>Frontal bone</td>
<td>Remodelled</td>
</tr>
<tr>
<td>1: Dólmen de Ansião</td>
<td>Adult, unknown sex</td>
<td>DCF and projectile</td>
<td>Frontal bone</td>
<td>Remodelled</td>
</tr>
<tr>
<td>1: Dólmen de Ansião</td>
<td>Adult unknown sex</td>
<td>DCF</td>
<td>Middle part of sagittal suture</td>
<td>Remodelled</td>
</tr>
<tr>
<td>1: Dólmen de Ansião</td>
<td>Adult, unknown sex</td>
<td>DCF</td>
<td>Middle part of sagittal suture</td>
<td>Remodelled</td>
</tr>
<tr>
<td>1: Dólmen de Ansião</td>
<td>Adult, unknown sex</td>
<td>DCF</td>
<td>Right parietal bone</td>
<td>Remodelled</td>
</tr>
<tr>
<td>1: Dólmen de Ansião</td>
<td>Adult, unknown sex</td>
<td>DCF</td>
<td>Occipital bone</td>
<td>Remodelled</td>
</tr>
<tr>
<td>2: Covão de Almeida</td>
<td>Middle age male</td>
<td>DCF</td>
<td>Left frontal bone</td>
<td>Remodelled</td>
</tr>
<tr>
<td>3: Lugar do Canto</td>
<td>Middle age adult, unknown sex</td>
<td>DCF</td>
<td>Left parietal bone</td>
<td>Remodelled</td>
</tr>
<tr>
<td>3: Lugar do Canto</td>
<td>Old female</td>
<td>DCF</td>
<td>Left parietal bone, near lambda</td>
<td>Remodelled</td>
</tr>
<tr>
<td>4: Serra da Roupa</td>
<td>Middle age female</td>
<td>DCF</td>
<td>Left parietal bone; Right parietal bone</td>
<td>Remodelled</td>
</tr>
<tr>
<td>4: Serra da Roupa</td>
<td>Adult male</td>
<td>DCF</td>
<td>Right parietal bone</td>
<td>Remodelled</td>
</tr>
<tr>
<td>5: Fontainhas</td>
<td>Adult, unknown sex</td>
<td>DCF</td>
<td>Left frontal bone</td>
<td>Remodelled</td>
</tr>
<tr>
<td>6: Pragarca</td>
<td>Middle age male</td>
<td>Perforation, Incisions</td>
<td>Right parietal bone; Anterior part of left parietal bone</td>
<td>Remodelled; No remodelling</td>
</tr>
<tr>
<td>7: Cabeça da Arruda I</td>
<td>Adult, unknown sex</td>
<td>DCF</td>
<td>Left parietal bone, near lambda</td>
<td>Remodelled</td>
</tr>
<tr>
<td>8: Algar do Bom Santo</td>
<td>Adult, probably male</td>
<td>DCF</td>
<td>Left parietal boss</td>
<td>Signs of healing</td>
</tr>
<tr>
<td>8: Algar do Bom Santo</td>
<td>Middle age, probably male</td>
<td>DCF</td>
<td>Left parietal bone</td>
<td>Remodelled</td>
</tr>
<tr>
<td>8: Algar do Bom Santo</td>
<td>Old adult, probably male</td>
<td>DCF 2 Linear fracture</td>
<td>Right parietal bone; Right parietal bone; Right occipital bone</td>
<td>No signs of remodelling</td>
</tr>
<tr>
<td>8: Algar do Bom Santo</td>
<td>Old adult, unknown sex</td>
<td>DCF (?)</td>
<td>Left parietal and temporal bone</td>
<td>Signs of remodelling</td>
</tr>
<tr>
<td>9: Samarra</td>
<td>Adult</td>
<td>2 DCF, 2 Incisions</td>
<td>Right parietal bone</td>
<td>Remodelled</td>
</tr>
<tr>
<td>10: Poço Velho</td>
<td>Adult female</td>
<td>2 DCF</td>
<td>Right frontal bone; Left parietal bone</td>
<td>Remodelled</td>
</tr>
<tr>
<td>10: Poço Velho</td>
<td>Adult male</td>
<td>DCF</td>
<td>Right parietal bone</td>
<td>Remodelled</td>
</tr>
<tr>
<td>10: Poço Velho</td>
<td>Adult male (?)</td>
<td>Projectile (?)</td>
<td>Frontal bone</td>
<td>Remodelled</td>
</tr>
<tr>
<td>11: São Pedro do Estoril II</td>
<td>Adult male</td>
<td>DCF</td>
<td>Left side of frontal bone</td>
<td>Remodelled</td>
</tr>
<tr>
<td>12: Dolmen de Carcavelos</td>
<td>Adult, unknown sex</td>
<td>Cut marks (two clusters)</td>
<td>Near sagittal suture; Right parietal bone</td>
<td>–</td>
</tr>
<tr>
<td>12: Dolmen de Carcavelos</td>
<td>Adult of unknown sex</td>
<td>Cut marks</td>
<td>Left distal humerus</td>
<td>–</td>
</tr>
<tr>
<td>13: Lapa do Bugio</td>
<td>Adult, unknown sex</td>
<td>Projectile</td>
<td>Axis</td>
<td>No remodelling</td>
</tr>
<tr>
<td>14: Akalar 9</td>
<td>Adult male</td>
<td>DCF</td>
<td>Right side of frontal bone</td>
<td>Remodelled</td>
</tr>
<tr>
<td>15: Monte Canelas I</td>
<td>Middle age male</td>
<td>DCF</td>
<td>Right frontal bone</td>
<td>Remodelled</td>
</tr>
<tr>
<td>15: Monte Canelas I</td>
<td>Young adult, unknown sex</td>
<td>DCF</td>
<td>Right parietal bone</td>
<td>Remodelled</td>
</tr>
<tr>
<td>16: Cerro das Cabeças</td>
<td>Young adult male</td>
<td>Cut marks</td>
<td>Rib fragments; two diaphysis of long bones</td>
<td>–</td>
</tr>
</tbody>
</table>
data suggest that cranial injuries were much more frequent than postcranial injuries. Modern population data show that high cranial trauma is related to interpersonal violence, whereas postcranial injuries are much more often associated with occupation or activity (Walker 2001). Thus, the observed pattern may be suggestive of some interpersonal violence, which is not unexpected as some degree of violence was always present in human history (Monks 1994; Guilaine and Zammit 2001).

The cranial injuries include: 29 DCFs (including the subadult), one linear fracture, three projectile lesions probably due to arrowheads, three puncture injuries and one case of several minute cut marks (Figure 17.10; Table 17.1).

The DCF were circular (17 of 29 = 58.6%) to ovoid (12 of 29 = 41.4%) in shape, measuring between 5.3 mm and 45 mm, and about 1 mm in depth. The mean diameter of these lesions is 14.1 mm (including the subadult from Poço Velho).

In the adult sample, 10 DCFs were observed in male individuals, five in females, and 13 on crania of indeterminate sex. These results suggest a male preponderance, as seen in the modern pattern of violence, in which males tend to suffer more from all types of traumatic lesion throughout their lives (Walker 2001; Judd 2004). The average diameter of DCF is slightly larger in males (mean = 14.71 mm) than in females (mean = 13.46 mm) but this is not statistically significant (Mann–Whitney U = 21.5; P = 0.658; for the statistical analysis, maximum diameter was considered.) Twelve DCFs were scored on the left side of the cranium, 12 on the right side, and the remainder on the middle part of the cranium. The size of the DCF on the left side (mean = 17.2 mm) of the cranium are larger than on the right side (mean = 11.3 mm), but again this is insignificant (Mann–Whitney U = 45.5; P = 0.116). The parietal (n = 19; 67.9%) was the most affected skull element followed by the frontal (n = 8; 28.6%) and occipital bones (n = 1; 3.6%). Among the DCFs, all injuries show signs of healing with the exception of the three or four lesions detected on the old male cranium of Algar do Bom Santo.

Projectile injuries were identified on the frontal bone of one adult male and of two individuals of unknown sex (Poço Velho and Dólmen de Ansião), and an arrowhead was found embedded in a second cervical vertebra from Lapa do Bugio. All the projectile injuries were inflicted from behind suggesting that the victim was fleeing or ‘caught by surprise’ by the attacker. However, all the cranial
lesions show signs of healing. The other postcranial injuries includes cut marks on two humeri from the Carcavelos dolmen, and cut marks on a rib and two long bone shafts of an individual exhumed from Cerro das Cabeças, which could be related to body preparation.

Multiple traumas were found on five adult individuals (two males, one female, and two individuals of unknown sex). These include an adult frontal bone from the dolmen of Ansião (DCF and possible projectile injury), a middle-aged female crania from Serra da Roupa (two DCFs), an elderly male cranium from Algar do Bom Santo (three or possibly four DFCs), one right parietal bone from Samarra exhibiting evidence of four traumas (two DCFs and two complete penetrating injuries), and one individual from Cerro das Cabeças with cut marks on a rib and two long bone shafts.

Are these injuries the result of accidents or do they represent signs of interpersonal violence? For the projectile injuries (dolmens of Ansião, Poço Velho, and Lapa do Bugio) or those cases where evidence of some type of weaponry is likely (Pragança, Algar do Bom Santo, and Samarra) the hypothesis of interpersonal violence is more plausible.

The presence of DCFs may not be a clear sign of violence. These injuries either may have been caused by an intentional blow with a blunt object or have resulted from an accident, as according to modern medical literature, depressed fractures are caused by road traffic, industrial or domestic accidents, assault, and sports (Braakman, 1972). Also relevant are the ethnographic and comparative clinical data. As noted by Judd (1970), stoning is a form of belligerence observed in past populations as it represents an individual spontaneous act with intent to injure or to defend oneself. Moreover, the usual target in stoning is the head, due its close association with the identity of the individual, to its vulnerability, and to produce maximum damage (Judd 1970; Knüsel 2005).

**FINAL REMARKS**

This work attempted to summarize traumatic lesions present on skeletal remains from Late Neolithic Portugal that could be related to interpersonal violence. For most of the described lesions, it is impossible to reject the hypothesis of accidental trauma. Moreover,
the collective burial practices of these prehistoric populations, associated with poor preservation and incompleteness of the humans remains, recovered mostly without any anatomical connection, makes it difficult to detect and interpret lesions, including traumatic lesions due to interpersonal violence. Therefore, it is difficult to have a perspective on interpersonal violence concerning those populations.

DCF was the most frequent skeletal trauma found and we cannot exclude that these blunt force injuries were caused by accidents. However, if we assume these possible injuries as signs of interpersonal violence, and we cross it with chronological data from the same burials, it seems possible to verify slight trends.

It is among burials dated to the early and second half of the fourth millennium BC that we find most of these cases. Although we do not yet have direct dating for any of these specimens, the absence of certain artefacts or later dates in some of the burials allows us to make this case. The settlements for this period are difficult to detect. The few known sites seem to indicate communities not completely settled, probably due to their economic activities, namely herding. Individuals that were more mobile and living in less protected settlements were more likely subjected to raids and ambushes.

Meanwhile, during the last centuries of the fourth and first half of the third millennium BC, when several settlements present walls and ditches probably for defence, cases of possible acts of violence have been less frequently detected. The evidence of these walled sites may testify to a higher degree of stable settlements with activities developed closer to home, which would dissuade raids and unexpected ambushes. In some ways, this was a period of deterrence.

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