

## The megalithic builders: new data on old bones from Megalitho do Facho (Figueira da Foz, Portugal)

Ana Maria Silva

University of Coimbra, Research Centre for Anthropology and Health, Department of Life Sciences,  
Laboratory of Prehistory, Coimbra, PT

University of Coimbra, Centre for Functional Ecology, Department of Life Sciences, Coimbra, PT

UNIARQ – University of Lisbon, Lisbon, PT

amgsilva@antrop.uc.pt

**ABSTRACT** – *Between the end of the 19<sup>th</sup> and beginning of the 20<sup>th</sup> centuries, António dos Santos Rocha excavated several prehistoric megalithic monuments in the region of Figueira da Foz (Portugal). Some of them revealed human bones, albeit very disturbed and fragmented, which ended up forgotten in the Municipal Museum of Santos Rocha (Figueira da Foz), as did the individuals to which they belonged. Here, I revisit the human bone collection preserved from Megalitho do Facho to access demographic and morphological data; physiological stress indicators; pathologies and injuries that these individuals suffered, thus revealing insights on the lives of those who were deposited in this dolmen. The majority of this collection is composed of unburned bones and a small subsample of burned ones. Both were radiocarbon dated to the Chalcolithic period (first half of the 3<sup>rd</sup> millennium BC). The analysis confirmed that non-adult and adult individuals of both sexes were deposited in this dolmen. These individuals were affected by biomechanical stress since early in life and display mild signs of physiological stress associated with remodelled lesions, suggestive of a relatively good health status. These data are discussed in the context of other coeval sites.*

**KEY WORDS** – *megalithic tombs; unburned and burned human bones; biological and paleopathological profiles; Chalcolithic; Western Central Portugal*

### **Graditelji megalitov: novi podatki iz starih kosti na najdišču Megalitho do Facho (Figueira da Foz, Portugalska)**

**IZVLEČEK** – *António dos Santos Rocha je konec 19. in v začetku 20. stoletja v regiji Figueira da Foz na Portugalskem izkopal številne prazgodovinske megalitske spomenike. Pri izkopavanjih so odkrili tudi človeške kosti, ki so bile zelo uničene in razdrobljene ter so ostale v lokalnem muzeju Santos Rocha (Figueira da Foz) skoraj tako pozabljene kot posamezniki, katerim so pripadale. V članku predstavljam zbir človeških kosti iz najdišča Megalitho do Facho za pridobitev podatkov o demografiji in morfologiji, o kazalnikih fiziološkega stresa, o patologijah in poškodbah, ki so jih utrpeli ti posamezniki, s čimer bom razkril vpogled v življenje tistih, ki so bili položeni v ta dolmen. Večji del zbira sestavljajo nežgane kosti, ožgane kosti pa predstavljajo le manjši vzorec. Obe skupini kosti smo datirali s pomočjo radiokarbonske metode v čas halkolitika (prva polovica 3. tisočletja pr. n. št.). Analiza je potrdila, da so bili v dolmen odloženi tako neodrasli kot odrasli posamezniki obeh spolov. Ti posamezniki so bili v zgodnjem življenju izpostavljeni biomehanskemu stresu in kažejo na blage znake fiziološkega stresa, povezanega s preoblikovanimi lezijami, kar kaže na njihovo razmeroma dobro zdravstveno stanje. O teh podatkih razpravljam v kontekstu drugih sočasnih najdišč.*

**KLJUČNE BESEDE** – *megalitske grobnice; nežgane in žgane človeške kosti; biološki in paleopatološki profili; halkolitik; zahodna osrednja Portugalska*

## Introduction

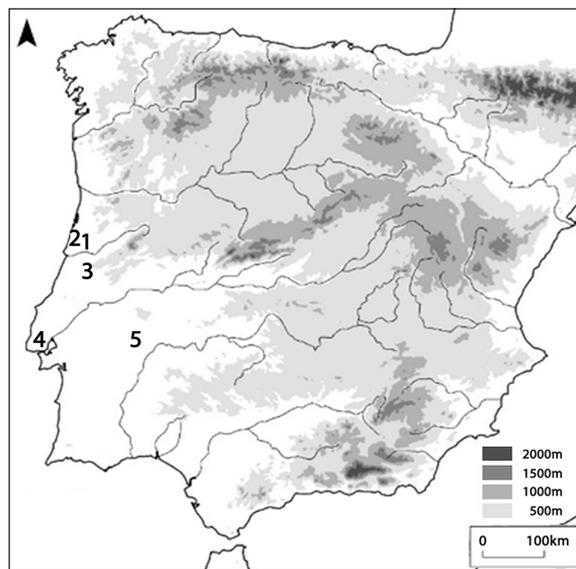
Between the end of the 19<sup>th</sup> and beginning of the 20<sup>th</sup> centuries, the archaeologist António dos Santos Rocha excavated several megalithic tombs in the *Serra da Boa Viagem*, located in the region of Figueira da Foz (Coimbra, Portugal). This Necropolis is composed of approx. 21 dolmens that are located between *Cabo Mondego* and *Serra de São Bento* (Santos Rocha 1900.239) in Western Central Portugal. The majority of the intervened tombs dated to the Neolithic and Chalcolithic periods were found very disturbed. Some revealed human bones, although very fragmented, poorly preserved and commingled. The collected data then were published in four volumes of *Antiguidades Prehistoricas do Concelho da Figueira* (1888; 1895; 1897; 1900). This work contains very complete descriptions of the finds, taking into account the science at the time, and an inventory of all the recovered remains (artefacts, human and non-human bones). Anthropological considerations, such as flattening of the tibia and severe dental wear were briefly discussed, along with ethnographic data. Later, in 1969, Vitor Guerra (at the time the director of the Municipal Museum of Santos Rocha) published a series of manuscripts prepared by Santos Rocha for a scientific meeting he would attend in April 1910 that unfortunately did not occur, since he died the previous month. These collections thus ended up forgotten in the Municipal Museum of Santos Rocha (Figueira da Foz) without ever having been studied in an exhaustive manner, with occasional exceptions such as the publication of an incomplete trepanation observed in one adult male skull recovered from the Dolmen *Megalitho da Capella* (Silva 2003a). Moreover, in view of how long ago the excavation of these tombs took place, an unknown part of these collections has been lost due to, among others, reorganisations, movements, loaning and/or offers of subsamples.

My primary objective here is therefore to provide a complete anthropological analysis of the human remains now curated in the Municipal Museum of Santos Rocha/*Museu Municipal Santos Rocha* (MMSR) to obtain insights on the biological profile, lifestyle, and health status of the individuals that were deposited in the *Megalitho do Facho*<sup>1</sup> one of the dolmens of this remarkable necropolis. The importance of these remains derives not only from their recovery from a large necropolis of at least 21 megalithic

tombs, but also because they come from a period and geographic area that are poorly represented by human remains, and thus they represent one of the few ways we have of gaining biological knowledge of these past populations.

### *Megalitho do Facho*

Santos Rocha published data on this tomb in his last volume of *Antiguidades Prehistoricas do Concelho da Figueira* (1900). This dolmen is located on the eastern limit of the necropolis (Fig. 1), in the *Serra de São Bento* (Maiorca, Figueira da Foz). It has a polygonal chamber and a small corridor (Fig. 2), whose largest axes are 2.5m and 1.1m respectively, oriented NW-SE, with the entrance at SE. The chamber was around 1.55m in diameter at its mid-point, and 2m at its NW end. It is formed by 10 orthostats described in Table 1, and a small area of dry masonry. It was discovered without the roof slabs and with signs of old and recent disturbances in the archaeological levels (as attested by the presence of fractures and hoe blow marks observed on some bone fragments). As such, it is not surprising that all of the contents of the tomb were mixed at the bottom of the monument. According to Santos Rocha's descriptions, mixed charcoal, human bones and artefacts were recovered scattered throughout the debris. The 0.7m



**Fig. 1.** Map of Iberian Peninsula showing the locations of *Megalitho do Facho* and other sites mentioned in this study. Tombs 1 and 2 belong to the Megalithic necropolis excavated by Santos Rocha. Legend: 1 *Megalitho do Facho*; 2 *Cabeço dos Moinhos*; 3 *Dólmen de Ansião*; 4 *Dólmen do Carrascal*; 5 *Anta da Sobreira 1*.

<sup>1</sup> The original designation of Santos Rocha, *Megalitho*, is used. However, *Megalitho*, dolmen and the Portuguese expression *Anta*, represent tombs without major architectural differences.

wide corridor was nearly completely covered by two limestone slabs, measuring between 1m to 1.25m in length, 0.48m and 0.5m in width, and 0.12m to 0.14m in depth. The height of the chamber and corridor are around 1.7m (Santos Rocha 1900.209).

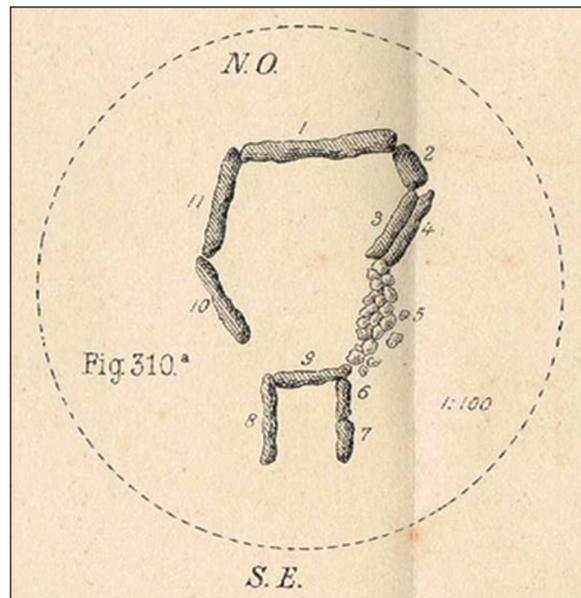
The human bones were only found in the chamber, including a group of bones that, due to their good preservation, led Santos Rocha to suggest that they were recent. However, AMS radiocarbon dating confirmed their Chalcolithic chronology (see below). Two mortuary deposits were detected near the entrance of the gallery, probably still intact. However, their very poor state of preservation only allowed a few fragments to be recovered by the team working for Santos Rocha. Next to them, a flint blade and pottery fragments were recovered (Santos Rocha 1900.209).

The artefact assemblage includes stone axes, hand stones, blades, retouched tools scrapers, arrowheads, bone flints, flint retouched tools, lignite beads, several fragments of schist plaques, one black clay vase and fragments of three others. One triangular red flint arrowhead measuring 3cm long was found cemented in the internal part of a human rib fragment. However, when the tuff was dissolved it was confirmed that it was not embedded in the bone. Still, the most peculiar artefact is a polished grey schist plaque that represents the outline of a human foot (Fig. 3). It has a plan surface on one side and the characteristic curve of a foot sole, including the heel, which is in relief on the opposite side. The toes are

N	Nature of the slab	Height	Width	Depth
1	Sandstone	±1.7m	1.65m	0.27m
2	Grey sandstone (?)	'almost' 1.7m	—	0.25m
3	Grey sandstone	1.7m	0.9m	0.4m
4	Grey sandstone	1.7m	0.9m	0.4m
5	Portion of dry masonry forming a wall	—	—	—
6	Grey sandstone	1.7m	0.56m	0.2m
7	Grey sandstone	1.7m	0.54m	0.3m
8	Limestone	±1.7m	1m	0.15m
9	Grey sandstone	Small slab that crosses the gallery forming a step with 0.1 to 0.2m height.		
10	Limestone (?)	1.7m	1 m	0.2m
11	Limestone	1.45m	1.3m	0.33m

**Note:** All measurements were taken from the present surface level; ? – not indicated.

**Tab. 1. Summary of the data of the orthostats of the Megalitho do Facho, according to Santos Rocha (1900.209).**



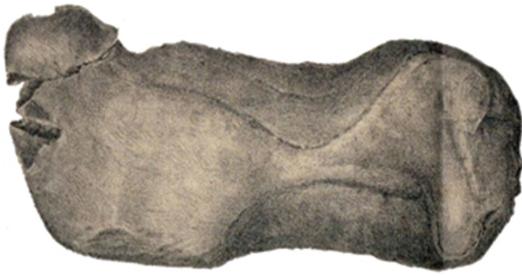
**Fig. 2. Plan of the dolmen of Megalitho do Facho after the intervention according to Santos Rocha (1900.Fig. 310).**

not represented by divisions or strokes and it seems to represent the right foot. The analysis of all these artefacts by Carlos Batista (technician of the *Museu Municipal Santos Rocha*) and Raquel Vilaça (University of Coimbra) is still under way.

#### **Anthropological data: the documentary sources**

Santos Rocha attributed the human bone remains to 11 skeletons, including very young individuals. His descriptions comprised an exhaustive inventory of the recovered bone pieces, which included skull and hip bone fragments, jaws, six loose teeth, *vertebrae*, ribs, clavicles, humerus, cubits, radius, femurs, tibiae, *fibulae*, *patellae*, and hand and foot bones (Santos Rocha 1900.214–216). He noticed that skull remains were under-represented compared to postcranial bones, and attributed this to the perturbations that the monument suffered. The inventory includes bones from all parts of the skeleton. Santos Rocha also emphasized that ribs, hand and foot bones were numerous, but strangely, only two patellae were recovered. The non-human bones include rabbit, sheep and some unidentified species, some of them burned, besides fragments of *Triton nodiferus* (some also with evidence of burning) and valves from *Cardium edule* and *Mytilus galloprovincialis*.

In 1899, at the request of Santos Rocha, this bone assemblage was briefly studied by Ricardo Severo (da Fonseca e Costa) and Fonseca Cardoso (Artur Augusto da Fonseca Cardoso). According to their notes,



**Fig. 3. Original drawing of the schist podomorph (apparently a right foot) found in the Megalitho do Facho (in Santos Rocha 1900.Fig. 317).**

this sample was very fragmented, and it was only possible to measure one femur “420 + 2, corresponding to a stature of 1625mm and living size of 1605mm” and the observation of flatness in some tibia fragments (Santos Rocha 1900.268–271).

### Material and methods

The human bone assemblage was cleaned, labelled and marked, and an inventory of the bone sample was prepared using an Excel database. The minimum number of individuals (MNI) was estimated based on the adaptation by Silva (1993) of the method of Herrmann *et al.* (1990). For the non-adult sample, skeletal maturation was also taken into account, as recommended by Silva (1996; 2002). Age-at-death of the non-adults was estimated using dental mineralization according to AlQahtani *et al.* (2010) and, for long bones, the recommendations of Scheuer and Black (2000). For adult individuals, epiphyseal union of the iliac crest (Ferembach *et al.* 1980) and the fusion of the sternal end of the clavicle (MacLaughlin 1990) allowed the identification of young adults (< 30 years). Degenerative alterations of the auricular surface (Lovejoy *et al.* 1985) and the obliteration of cranial sutures (Masset 1982) were considered for estimating age-at-death for the adult sample. Sex diagnosis was only possible based on morphological traits, scored according to Ferembach *et al.* (1980) and metric analysis of talus (Silva 1995). Morphological analysis included metric parameters and an estimation of the platimeric and platynemic indices (Martin, Saller 1956) to provide data on the flatness of lower long bones, and thus inferences on daily behaviours. To assess the variability and affinity of these individuals, several non-metric postcranial traits were recorded following Saunders (1978) and Finnegan (1978). Dental non-metric traits were scored following the ASUDAS protocol (Turner *et al.* 1991; Scott, Irish 2017) and the mandibular molar pit-tubercle (MMPT) according to Marado and Silva (2016).

To evaluate the childhood illness experience of these individuals, linear enamel hypoplasia (LEH, a non-specific stress indicator), *cribra orbitalia* and porotic hyperostosis (specific stress indicators) were recorded. All bones were carefully examined for evidence of pathologies or lesions.

The bone weight methodology proposed by Silva (2002; Silva *et al.* 2009) to evaluate bone representation in a sample was adapted to infer the representation of some types of bones of this collection, such as the skull, femurs and tibias. It was not possible to include all skeletal elements due to the known loss of a considerable number of bone pieces.

### Results

#### *What can the surviving bone collection tell us about these individuals?*

At present, the human bone collection curated in the MMSR is comprised of 361 fragments from all parts of the skeleton. Of these, eight exhibit chromatic changes compatible with exposure to fire, revealing a bluish colour. This set includes remains that correspond to at least one adult individual and one non-adult. The latter includes three cranial fragments, a crown of a lower right first molar and a small fragment of the diaphysis of a long bone. All are compatible with a non-adult of approximately three years of age, using the dental calcification scheme of AlQahtani *et al.* (2010), although it cannot be excluded that they belong to different individuals. A small accessory cusp, C6, is visible on the crown of the preserved tooth. The remaining non-metric dental data are provided in Table 2. The cranial remains include a left orbit with mild signs of *cribra orbitalia* (Fig. 4), an indicator of specific physiological stress generally associated with chronic anaemia, although other suggested aetiologies include eye infections (Walker *et al.* 2009). A small fragment of parietal bone and two of long bones compose the adult subsample.

The majority of bone fragments do not exhibit any changes related to exposure to temperature. They display other taphonomic changes, such as the presence of limestone concretions, small cracks related to exposure to water, the presence of root marks, and small black or orange spots. While the black spots can be attributed to the presence of manganese in the soil, the orange spots are compatible with the use of pigment. The bones are very fragmented, but well preserved. All parts of the skeleton are represented, including small hand and foot phalan-

ges. Despite the considerable number of bone fragments, cross-checking with the descriptions published by Santos Rocha confirms the loss of a considerable number of pieces, including some with pathologies, as well as maxillary fragments, patellae and loose teeth (with exception of one).

To confirm the chronology of these human remains two samples were selected for AMS dating: a rib fragment from the unburned set and a cranial fragment with signs of fire exposure. The results confirm that both are contemporary and date to the Chalcolithic period, that is, to the first half of the 3<sup>rd</sup> millennium BC (Tab. 3).

Currently, considering all human remains (burned and unburned), at least 11 individuals are represented. Interestingly, this is an identical estimation as the one advanced by Santos Rocha. They include seven adults (based on tibia fragments) and four non-adults. The latter were identified by several bone types and include non-adults who died at approx. 24 months, three years (burned sample, described above), six years, and nine to ten years of age. Some fragments of long bone diaphyses suggest the presence of adolescents, but the absence of epiphyses makes confirmation impossible. Among the adult individuals, there are at least two who died between the ages of 20 and 25 (due to the presence of two non-compatible fragments of iliac crest in process of fusion). The presence of older adults, including those over 30 years old, is attested by the observation of fused sternal ends of clavicles ( $n = 2$ ) and by a cranial fragment with the sutures close to being completely obliterated. If the burned and unburned fragments were analysed separately, the number of adults would increase by one (burned sample: one adult and one non-adult; unburned sample: seven adults and three non-adult individuals).



**Fig. 4. Cribra orbitalia in the left orbit of a non-adult individual recovered from Megalitho do Facho. This bone also displays chromatic alterations compatible with the exposure to high temperatures.**

Traits	Observation/Grade
Number of Cusps	5
Groove pattern	Y
Presence of C6	2
Presence of C7	o
Deflecting wrinkle	o
Protostylid	o
Mandibular molar pit-tubercle	o

**Tab. 2. Non-metric dental traits observed in the only preserved tooth from Megalitho do Facho (lower first right molar).**

The presence of individuals of both sexes is confirmed by the hip bone sample, as well as by the sexual dimorphism observed in some long bone fragments. The metric analysis of a left talus allowed us to identify a female individual. Also noteworthy is skull fragment 122, formed by the parietal and occipital bones belonging to a young adult (all cranial sutures are open), which display a very marked nuchal crest (Fig. 5).

Due to the magnitude of bone fragments that were lost from this collection it was not possible to use the bone weight methodology proposed by Silva (2002; Silva et al. 2009) to check for any abnormality in the representation of all skeletal elements, a valuable approach for inferences about the burial practices (Silva et al. 2017). However, the representativeness of the three most common skeletal elements recovered were investigated using this method: skull, femur and tibia. Considering the MNI of seven adults, it was also possible to estimate the percentage of preserved to expected bones in these three bone categories (Tab. 4). The obtained percentages are very similar, at 50%, and about half of the expected value.

Among the metric analyses, flatness of the femurs and tibias was investigated. The mean value of the cnemic index was 73.31 ( $n = 4$ ), confirming the presence of flatness in the proximal region of the tibia diaphysis. The only fragment of a femur that allowed this analysis also confirmed the presence of flatness (right femur; 71.43) (Fig. 6). The bone remains of this collection are small, but robust. A thick cortical layer was observed in small fragments of the diaphysis of one femur and one fibula.

The search for non-metric characters allowed observation of a septal aperture in the only distal humerus recovered, two femurs display a hypotrochanteric fossae ( $n = 3$ ) (Fig. 6) and an acetabular fold was

Ref.	Bone sample	Conventional	cal BC	cal BP
Beta 542625	Rib fragment (Facho 82; unburnt)	4180 ± 30 BP	2817–2666 cal BC (73.7%) 2887–2835 cal BC (21.7%)	4766–4615 cal BP (73.7%) 4836–4784 cal BP (21.7%)
Beta 549966	Cranial fragment (Facho 312; burnt)	4170 ± 30 BP	2819–2662 cal BC (73.7%) 2882–2833 cal BC (20.0%) 2649–2636 cal BC (2.2) %	4768–4611 cal BP (73.7%) 4831–4782 cal BP (20.0%) 4598–4585 cal BP (2.2%)

**Tab. 3. Results of radiocarbon dating of both subsets from the collection of Megalitho do Facho.**

noted in one left acetabulum fragment. The last feature is rarely documented, either in prehistoric or historical populations.

Pathologies were observed that reflect signs of infection and physiological stress indicators, *enthesal* changes and degenerative joint pathology. The last was observed in a right fragment of the temporomandibular joint, in the coxo-femoral joint of a fragment of one iliac bone, and in the body of a thoracic vertebra that also displays flattening of its body. In fragments of the proximal diaphysis of two left femurs, *enthesal* changes of the *gluteus maximum* are marked. Signs of infection are registered in the medullary canal of a distal diaphyseal fragment of one left femur (Fig. 7). In some cranial fragments, porosity compatible with porotic hyperostosis is registered, a specific physiological stress indicator usually related to anaemia. It should be noted that all observed pathologies and lesions are remodelled.

### Discussion

Between the end of the 19<sup>th</sup> and the first decades of the 20<sup>th</sup> centuries, numerous megalithic tombs were excavated in the present-day Portuguese territory. Despite the fascination they created, the recovered human bone assemblages usually ended up forgotten in museums or private collections, waiting for an exhaustive analysis to be performed by an expert. This situation changed in the late 1990s when a systematic analysis of these collections was initiated due to the recognition of their potential in providing valuable information about the biological profile, health status and lifestyle of these individuals (Silva 2003b; 2004; 2005; 2008; 2012; 2017; Silva et al. 2006; 2012; 2014; 2019; Silva, Ferreira 2007; 2016/2017; Boaventura et al. 2013; 2014b; 2016). This analysis was achieved through the combination of appropriate anthropological methodologies and approaches, specifically adapted to these types of assemblages that are very disturbed, fragmented and commingled (Silva 2017; Silva, Ferreira

Bone Fragment	Weight	% Expected bone weight
Skull	2013.92g	50%
Femurs	2253.18g	52.5%
Tibias	1319.82g	53.72%

**Tab. 4. Results of the percentage of expected bone weight of skull, femurs and tibias from Megalitho do Facho, considering the reference values of Silva (2002; Silva et al. 2009).**

2016/7; Silva et al. 2019). It was under this scope that the analysis of the human remains from the different dolmens of the necropolis excavated by Santos Rocha and currently curated in the MMSR was undertaken. To date, besides *Megalitho do Facho*, other collections exhumed from dolmens with an exhaustive anthropological study include *Megalitho do Cabeço dos Moinhos*, another tomb from this necropolis, the *Dolmen de Ansião* (Coimbra, Silva 2002),



**Fig. 5. Skull fragment 122 from Megalitho do Facho with a very marked nuchal line.**



**Fig. 6. Marked flatness and presence of the hypotrochanteric fossa (arrow) in a right femur from Megalitho do Facho.**

*Dolmen do Carrascal* (Sintra, Lisbon, *Silva et al. 2019*) and *Anta da Sobreira 1* (Elvas, *Boaventura et al. 2014b*) (see Fig. 1), here compared in discussing the results on the scope of other coeval populations that buried their dead in dolmen-style tombs.

### **Tomb descriptions and chronology**

In Table 5, the architectural aspects and chronology of these tombs are synthesized. These dolmens have a polygonal chamber and corridor (Fig. 8). For all, chronology is confirmed by AMS radiocarbon dating of human bone samples; human bone loss is documented, and thus interpretations are imposed with caution, but at the same time this is the only available information about these past populations. All human remains were dated to the Late Neolithic period with the exception of the subset of burned bones recovered from *Cabeço dos Moinhos* and both sets from *Megalitho do Facho*, with AMS radiocarbon dating confirming their Chalcolithic chronology (first half of the 3<sup>rd</sup> millennium BC).

### **Human remains**

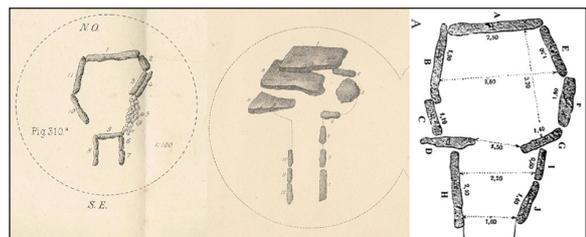
These tombs were found disturbed with very fragmented and commingled human bones. The *Megalitho do Facho* sample is composed of unburned human bones and a small subsample of burned ones. The latter comprise only 2.2% of the collection (seven bone fragments and one tooth) and the observed colour changes are compatible with exposure to low temperature and thus do not allow exclusion of unintentional burning. Radiocarbon dates confirm the contemporaneity of both subsets. The coexistence of burned and unburned human bones was also attested for *Cabeço dos Moinhos*, another tomb from this necropolis. However, there are significant differences. For the latter, evidence of exposure to higher temperatures is apparent by the pattern of colour changes, including ten calcined fragments. So, for this collection, evidence of intentional burning is more certain. Moreover, radiocarbon dates confirmed different chronologies for the two sets, Neolithic (unburned subset) and Chalcolithic (burned subset). In fact, the importance of fire in funerary practices has gained relevance in Chalcolithic funerary contexts in the current Portuguese territory, including in diverse funerary contexts at Perdigões (*Silva et al. 2014a; 2017; Valera et al. 2014*). However, the architecture of the tombs discussed here is different from those at Perdigões and, the human remains, slightly older (*Valera, Silva 2011; Valera et al. 2014*). The conclusion of the study of the human remains from all tombs in this necropolis, supported by an expanded program of radiocar-



**Fig. 7.** Signs of remodeled infection in the medullary canal of a distal diaphyseal fragment of left femur from *Megalitho do Facho*.

bon dating, may contribute to a better understanding of the funerary practices of these communities.

All anatomical parts of the skeleton are represented in the collection of *Megalitho do Facho* and, considering the documentary sources, it seems that complete individuals were deposited in this tomb. Santos Rocha had the impression that skull bones were under-represented in relation to long bones. However, the bone weight approach applied here to skull, femurs and tibias indicated that all are represented in a very similar percentage of over 50% in relation to expected. The skull sample is thus not under-represented in relation to long bones. In sum, all the collected evidence, including the presence of two apparently still intact skeletons in the entrance of the gallery of this tomb, suggest that this tomb was a primary place of deposition. Moreover, the documentary sources of other less disturbed dolmens from this Necropolis include descriptions of in situ skeletons. One example is the *Megalitho de Cabecinha*, in which the chamber was found intact. Next to some of the supports of the chamber, Santos Rocha (1900. 198–199) documented the presence of skeletons in articulation.



**Fig. 8.** Plans of the dolmens of *Megalitho do Facho*, *Cabeço dos Moinhos*, *Carrascal* and *Sobreira 1* (adapted from Santos Rocha 1900; Ribeiro 1880; Viana 1950).

Sample	Monument	Chronology (Conventional)
Megalitho do Facho	Polygonal chamber: 2.5m long; 2m wide Corridor: 1.1m long; 0.7m wide	4180±30 BP (Beta 542625)* 4170±30 BP (Beta 549966)**
Cabeço dos Moinhos (Santos Rocha 1900)	Polygonal chamber: 3m long; 3.5m wide Corridor: minimum of 5m long; 1m wide	4960±30 BP (Beta 383084)* 4360±30 BP (Beta 383085)**
Dolmen de Ansião (Silva 2002)	Destroyed	4640±90 BP (SAC 1559)
Dolmen do Carrascal (Silva et al. 2019)	Polygonal chamber: ± 3.5m Short corridor (2.4m)	4766±30 BP (OxA 35900) 4752±31 BP (OxA 35901) 4640±40 BP (Beta 225167) 4770±40 (Beta 228577)
Anta da Sobreira 1 (Boaventura et al. 2014b)	Polygonal chamber: 2.4m long; 1.5m maximum width; corridor – destroyed	4770±40 BP (Beta-233283)

Legend: \* Sample of unburned human bone; \*\* Sample of burned human bone.

**Tab. 5. Tomb descriptions and chronology based on human bones of the dolmens mentioned in the text.**

More consistent evidence of manipulated funerary contexts in the present Portuguese territory, with possible co-existence of different mortuary practices such as primary burials, secondary deposits, and removal of bones, is documented for collective burials at tombs 1 and 2 at Perdígões, tholoi type tombs from the first half of the third millennium (Silva et al. 2017; Evangelista 2019; Garcia 2018; Valera et al. 2014). Moreover, later re-use of dolmens (and other types of tombs) extending to the Medieval period is also documented. Inside the *Dolmen de São Gens* (Nisa) where a non-adult individual of 12 to 15 years old at death was deposited between the 11<sup>th</sup> to 13<sup>th</sup> centuries according to AMS radiocarbon analysis (Boaventura et al. 2014b).

**Population demography**

Non-adults and adults of both sexes are represented in all tombs, and no evidence of selection based on these criteria was noted. The proportion of non-adults is between 36 to 38%, with the exception of *Sobreira*, where it is at 50% (Tab. 6). However, all are in the expected range for an Archaic population, that is, between 36% to 50% of non-adults (Ascádi, Nemeskéri 1970). Moreover, these values are also consistent with other Late Neolithic/Chalcolithic collections unearthed from other types of tombs from the present Portuguese territory, such as hypogea and natural and artificial caves (Cunha et al. 2015; Silva 2002; 2003b). Another common point is the underrepresentation of children younger than five years, particularly less than one year of age. There is no doubt that taphonomic agents play an important role in the lack of preservation of small and fragile non-adult bones, including post-excavation loss, but other explanations such as diffe-

rent mortuary treatments cannot be ruled out. However, frequently the presence of a significant number of bones and/or teeth belonging to very young individuals were emphasized in the excavation notes, as for *Megalitho do Facho*, but these are unfortunately now missing. Occasionally, these bones ended up stored with non-human remains, and thus lost or forgotten (Silva, Ferreira 2016/2017).

Although sex was assigned mostly by morphological features, it was possible to confirm the presence of individuals of both sexes in these tombs. Therefore, sex does not seem to be a criterion for exclusion from these sepulchres.

**Morphological traits and bone pathologies**

The presence of the proximal shaft flatness is prevalent in the femurs and tibias of individuals from all tombs (Tab. 7). Silva (2002) reported flatness indices for 535 femurs and 253 tibias from eight Late Neolithic graves and compared these results with other Mesolithic and Neolithic samples from the present Portuguese territory. For the femurs, no consistent pattern of flatness reduction was identified. For the tibias, a slight trend of decreasing flatness was detected, with some groups revealing means in the range of mesocnemia (absence of flatness). Silva (2002) attributed these results to the continuity of high lev-

Sample	Bone fragments	Teeth	Adults	Non-adults
Megalitho do Facho	360	1	63.6% (7/11)	36.4% (4/11)
Cabeço dos Moinhos	1214	16	80% (8/10)	20% (2/10)
Dólmen de Ansião	1670	533	62.2% (23/37)	37.8% (14/37)
Dólmen do Carrascal	109	138	64.3% (9/14)	35.7% (5/14)
Anta da Sobreira 1	128	21	50% (3/6)	50% (3/6)

**Tab. 6. Proportion of adults versus non-adult individuals obtained in several dolmens with human remains dated to the Neolithic or Chalcolithic periods in Portugal.**

els of biomechanical stress on the proximal end of the femurs of these individuals during the Neolithic and Chalcolithic periods. This type of stress could be related to a high level of mobility of these human groups, even after the introduction of agriculture, and to activities such as pastoralism or trade.

Among morphological traits, the presence of hypotrochanteric *fossae* stand out in these assemblages (Tab. 8). This trait is frequently observed in prehistoric populations from the present Portuguese territory, but rarely noted in recent individuals. This fossa seems to be a varied manifestation of the attachment of the *gluteus maximus*, a muscle responsible for the movement of the hip and thigh. According to several authors, the development of this fossa may be related to the increased development of this muscle to reduce the mechanical stress on the femoral diaphysis. This biomechanical stress may be due to high levels of physical activity, such as prolonged locomotion, which is worse on irregular terrain. The dolmens of *Facho*, *Cabeço dos Moinhos*, and *Ansião* are located in or next to slight mountainous regions where these high levels of physical activity would be easily achieved in daily locomotion. Other indicators of high levels of biomechanical stress are the observed flatness of the proximal femur, marked and rugose gluteal ridge on proximal femur (*Megalitho do Facho*), signs of coxo-femoral arthrosis (*Megalitho do Facho*, *Sobreira 1*), and a thick cortical layer of long bones diaphyses of lower limbs (*Megalitho do Facho*, *Carrascal*). In the *Sobreira 1* collection, one right femur sexed as female stands out since although being from a young adult (it was still possible to observe the epiphyseal line, in some parts), several mechanical stress markers had already developed: slight *entheses* alterations of the *linea aspera*, and the beginning of degenerative changes of the proximal end and flatness.

It is not easy to draw the pathological profile of these samples due to their fragmentary and commingled nature, or to compare them, due to differential pre-

Sample	Platimeric index	Platicnemic index
Megalitho do Facho	71.43 (n = 1)	73.31 (n = 4)
Cabeço dos Moinhos	75.5 (n = 3)	–
Dólmen de Ansião	77.94 (n = 21)	76.19 (n = 1)
Dólmen do Carrascal	66.7 (n = 1)	–
Anta da Sobreira 1	81.5 (n = 1)	67.7 (n = 1)

**Tab. 7. Mean of platymeric and platynemic indexes in the samples discussed in the present study.**

servation of skeletal elements. For example, no data on oral pathologies is available for *Megalitho do Facho*, since only one tooth (in calcification) was preserved. Still, despite all these limitations, the observed pathologies give us relevant insights on the lives of these human communities and how they were adapted to their environment. For that purpose, relevant stress indicators, such as *cribra orbitalia*, porotic hyperostosis, enamel hypoplasia and periostitis, were studied since together they can be informative on the health status of the populations. Childhood health is a particularly good indicator of community health status, since children are more susceptible to metabolic stress due to infectious diseases, poor nutrition and parasitism (*Cunha et al. 2015*).

Overall, few pathologies were noted in the remains of these assemblages (Tab. 9). *Cribra orbitalia* was observed in one non-adult orbit from *Megalitho do Facho* and two (n = 4) from *Ansião*. This pathological condition is due to genetic or acquired chronic anaemia, most frequently caused by inadequate nutrition, such as due to iron, magnesium, vitamin B deficiencies, parasitism, weanling diarrhoea or to chronic disorders (*Novak et al. 2017; Rinaldo et al. 2019*), although other pathological conditions can't be excluded (*Walker et al. 2009; Brickley 2018*). This indicator was also observed in one adult from *Ansião*. Linear enamel hypoplasia was only observed on permanent teeth and in low frequency. For *Sobreira 1*, the apparent high frequency of this type of stress marker results from having three out of the five teeth with enamel hypoplasia belonging to the same individual, which confirms that this individual survived a very severe stress episode that left its mark on at least three teeth. Evidence of porotic hyperostosis was scarce in these individuals. It is notable that this pathological condition is easily observed in fragmentary material but, even so, the careful observation of all cranial fragments from these assemblages detected only two cases: one at *Megalitho do Facho* and another at *Carrascal*. For the former, one fragment of parietal bone displays small holes compatible with this pathology (although taphonomic alterations cannot be excluded). In the *Carrascal* assemblage, mild remodelled porosity was observed in an incomplete skull (frontal and parietal bones). According to several authors, these skeletal changes are related to the healing of an infection or to metabolic disease. Among the latter, anaemia has long been suggested, whether acquired from parasites, nutritional deficiencies or through genetic conditions (*Rivera, Lahr 2017*).

Sample	Septal Aperture	Hypotrocanteric fossa	Third trochanter
Megalitho do Facho	1/1	2/3	–
Cabeço dos Moinhos	–	3/4	1/4
Dólmen de Ansião	2/6	7/28	1/11
Dólmen do Carrascal	–	1/1	0/1
Anta da Sobreira 1	1/1	–	–

**Tab. 8. Morphological non-metric traits observed in the samples discussed in the present study.**

Evidence of infections in the form of periostitis was observed in the human remains from all tombs with the exception of *Sobreira 1*. The affected bones include skull and long bones, in low prevalence, and with few exceptions represent remodelled and old lesions. At *Megalitho do Facho*, two bones display this pathology, a fragment of parietal bone and a diaphyseal fragment of a left femur. The latter exhibits evidence of remodelled intramedullary long bone infection. In the assemblage of *Carrascal*, *periostitis* was noted only in adult bones as remodelled lesions, with the exception of a fragment of a right parietal bone where it may be linked to a trauma (depressed fracture), and in one distal fragment of diaphysis of a tibia with deposition of new bone. Only at *Ansião* *periostitis* was observed in one non-adult bone, a distal fragment of the diaphysis of a right *humerus* with deposition of new bone, that is, an active lesion at time of death. The adult sample of this dolmen, including few fragments of skull, femurs, tibias and fibulae, display alterations due to remodelled lesions which were not active at death. The exceptions are one fragment of left tibia and a right one, that had active lesions at death expressed by the presence of new bone deposition.

All these lesions reflect periods of physiological stress that these individuals endured. Similarly to

populations today, it is expected that they had to face some periods of nutrition deficiencies and/or illness during their lives. Still, the low frequencies of observed stress indicators and the predominance of remodelled lesions suggest that they were resilient and survived various health problems. This evidence is reinforced by the low frequencies of linear enamel hypoplasia, a permanent record of physiological stress.

Concerning oral pathology, another indicator of health and well-being of an individual, the cariogenic lesions are not significant, with frequencies lower than 3%. Other relevant parameters of oral pathology such as *antemortem* tooth loss, periapical lesions and periodontal disease cannot be evaluated due to the total or almost total absence of maxillary bones. The exception is *Ansião*, were *antemortem* tooth loss (4.3%; 6/139) and periapical lesions (1.4%; 2/139) were registered affecting the individuals in low frequencies.

#### **Bone trauma**

The analysis of trauma patterns can provide relevant information on the lifestyle of past populations. Trauma was only observed in cranial bones from *Carrascal* and *Ansião*. In the former, signs of trauma include depressed cranial fractures, trepanation and two possible osteolytic lesions, despite the low number of preserved fragments. For *Ansião*, depressed fractures and two perforating lesions were described, probably due to arrowheads, all remodelled lesions (*Silva 2003a*). Cranial lesions such as depressed fractures can result from either everyday accidents or interpersonal violence. Accidents related to daily activities can occur more easily in mountainous or irregular terrains, such as where *Ansião* is

	Megalitho do Facho	Dolmen Ansião	Dolmen Carrascal	Anta da Sobreira 1
Caries	–	2.6% (2/40)	1.7% (2/117)	0% (0/21)
LEH	–	1.2% (6/506)	8.2% (8/97)	23.8% (5/21)
Cribra orbitalia	Left orbit non-adult	Non-adults: 2/4; adults: 1/12	Not observed	Not observed
Porotic hyperostosis	One parietal bone fragment	Not observed	1 incomplete skull	Not observed
Infections	One cranial bone; diaphysis of left femur	Skull and long bones	Skull and Long bones	Not observed
Osteoarthritis	Slight (skull, long bones and vertebrae)	Slight	Slight	Slight
Enthesal changes	Slight	Slight	Slight	Slight
Trauma	Not observed	5 depressed fractures; 2 skull perforations;	2 depressed fractures; Trepanation	Not observed

**Legend:** LEH – Linear enamel hypoplasia.

**Tab. 9. Summary of the pathologies observed in bones in the samples discussed here.**

located, although violence cannot be excluded. As for the two perforation traumas, probably due to arrowheads, violence may be a more plausible explanation.

Besides these traumas, signs of a complete and remodelled trepanation in an adult right parietal bone was described from *Carrascal*. This intervention was performed by a drilling method which, according to Silva (2003a; 2017), is described for older discoveries from this region of the Iberian Peninsula, being later replaced by the scraping method. No evidence of trepanation was found in the remaining samples, but the poor preservation of skulls in these assemblages, reduced to small pieces due to taphonomic factors, makes recognition difficult.

Although no postcranial trauma was detected in these collections, Santos Rocha (1900.215) mentioned the presence of a remodelled trauma on the distal part of a diaphysis of a right humerus from Facho. This trauma, with a long axis of 22mm, was observed on the medial surface of the bone fragment. Unfortunately, this bone fragment is now missing.

In sum, these individuals seem to have been affected by biomechanical stress since early in life, reflected by the flatness of their long bones and enthesal and osteoarthritic changes. Mild to moderate signs of physiological stress were recorded for these individuals, which together with the predominance of healed lesions is suggestive of relatively good health status within these prehistoric populations.

### Final remarks

The study of long excavated osteological collections, which are often poorly preserved, is always a challenge. The magnitude of bone loss is variable and related to several actions over time, frequently starting before excavation due to prior disturbance of the archaeological levels in the tombs. The excavation procedure in itself can result in the loss of bone elements, particularly the smallest or more fragile ones. Other factors contributing to bone loss are the conditions under which the remains are stored and curated, reorganized and moved. However, their study continues to be irreplaceable for the understanding of these human communities. Moreover, the application of similar criteria and protocols in the study of these collections in recent decades has

allowed not only the assessment of their anthropological profile, but also provided data for comparative analyses (Silva, Ferreira 2016/2017; Silva 2017).

In these dolmen burials, individuals from both sexes and apparently from all age groups are present, although frequently individuals less than five years in age are under-represented. That can reflect egalitarian groups where almost all members were able to be buried in the collective tomb of their clan/community. Since early in life, these individuals were affected by significant biomechanical stress, attested by the presence of several indicators (flatness of their long bone, enthesal and osteoarthritic changes), that are strongly suggestive of high daily mobility. Signs of physiological stress were mild to moderate, with the predominance of healed lesions, indicative of relatively good health among these prehistoric populations. More variability was found in the trauma patterns. This type of pathology was only described in cranial bones in two collections: *Dolmen do Carrascal* and *Dolmen de Ansião*. The majority are healed depressed fractures that probably resulted from accidents, although interpersonal violence cannot be ruled out. This last explanation fits better for the two perforation lesions reported from *Ansião*. According to Santos Rocha (1900.215), the collection of Facho included a trauma in a distal fragment of right humerus. Unfortunately, this bone fragment has been lost, but it attests the presence of trauma in postcranial bones.

In sum, the anthropological analysis of old collections, such as *Megalitho do Facho*, continues to be highly significant for our understanding of prehistoric populations, allowing unique insights into their way of life.

### ACKNOWLEDGEMENTS

*The author expresses their gratitude to the Museu Municipal Santos Rocha (Figueira da Foz) for access to the collection, and all the collaborators from the museum, in particular Ana Margarida Ferreira, Rodrigo Pinto and Carlos Batista. Steve Emslie for the English revision and for useful suggestions that improved the manuscript. Thanks are also due to the two reviewers for their helpful comments. André Afonso Pereira helped in editing some of the Figures. CIAS (PEst-OE/SADG/UI0283/2020) provided financial support for the radiocarbon dating.*

## References

- Acsádi G., Nemeskéri J. 1970. *History of human life span and mortality*. Akadémiai Kiadó. Budapest.
- AlQahtani S. J., Hector M., and Liversidge H. 2010. Brief communication: the London atlas of human tooth development and eruption. *American Journal of Physical Anthropology* 142(3): 481–490. <https://doi.org/10.1002/ajpa.21258>
- Boaventura R., Ferreira M. T., and Silva A. M. 2013. Perscrutando espólios antigos: A Anta de Sobreira I (Elvas). *Revista Portuguesa de Arqueologia* 16: 63–79.
- Boaventura R., Ferreira M. T., Neves M. J., and Silva A. M. 2014a. Funerary practices and anthropology during the middle-late Neolithic (4<sup>th</sup> and 3<sup>rd</sup> Millennia BCE) in Portugal: old bones, new insights. *Anthropologie* LII(2): 183–205.
- Boaventura R., Ferreira M. T., and Silva A. M. 2014b. Perscrutando espólios antigos 2: Um caso de reutilização funerária medieval na anta de São Gens 1 (Nisa, Norte alentejano). *Almadan online 2<sup>a</sup> série*(1): 60–76.
- Boaventura R., Silva A. M., and Ferreira M. T. 2016. Perscrutando espólios antigos: o espólio antropológico do Tholos de Aqualva. In A. C. Sousa, A. Carvalho, and C. Viegas (eds.), *Água e Terra, Colher Sementes, Invocar a Deusa. Livro de Homenagem a Victor S. Gonçalves*. Estudos e Memória 9. UNIARQ. Lisboa: 295–307.
- Brickley M. B. 2018. Cribra orbitalia and porotic hyperostosis: A biological approach to diagnosis. *American Journal of Physical Anthropology* 167(4): 896–902. <https://doi.org/10.1002/ajpa.23701>
- Cunha C., Silva A. M., Pereira D., Tomé T., Paredes J., and Cabrita C. 2015. Children of the Grave. Contribution of non-adult individuals in some human osteological series from collective burials of the Late Prehistory of the Iberian Peninsula. In L. Rocha, P. Bueno-Ramirez, and G. Branco (eds.), *Death as Archaeology of Transition: Thoughts and Materials Papers from the II International Conference of Transition Archaeology: Death Archaeology*. British Archaeological Reports IS 2708. Archaeopress. Oxford: 177–188.
- Evangelista L. S. 2017. *Resting in peace or in pieces? Tomb I and death management in the 3<sup>rd</sup> millennium BC at the Perdígões Enclosure (Reguengos de Monsaraz, Portugal)*. PhD thesis. Department of Life Sciences, University of Coimbra. Coimbra.
- Ferembach D., Schwidetzky I., and Stloukal M. 1980. Recommendations for age and sex diagnosis of skeletons. *Journal of Human Evolution* 9: 517–549.
- Finnegan M. 1978. Non-metric variation of the infracranial skeleton. *Journal of Anatomy* 125: 23–37.
- Garcia M. S. 2018. *Revolvendo o nosso passado. Um contributo para a análise das práticas funerárias no Calcolítico. Estudo de vestígios osteológicos humanos provenientes da Câmara do Sepulcro II dos Perdígões (Reguengos de Monsaraz)*. Master thesis. Mestrado em Evolução e Biologia Humanas. Departamento Ciências da Vida, Faculdade de Ciências e Tecnologia da Universidade de Coimbra. Coimbra.
- Lovejoy C., Meindl R., Pryzbeck T., and Mensforth R. 1985. Chronological metamorphosis of the auricular surface of the ilium: a new method for the determination of adult skeletal age at death. *American Journal of Physical Anthropology* 68: 15–28. <https://doi.org/10.1002/ajpa.1330680103>
- Herrmann B., Grupe G., Hummel S., Piepenbrink H. and Schutkowski H. 1990. *Praehistorische Anthropologie. Leitfaden der Fels- und Labormethoden*. Springer Verlag. Berlin.
- MacLaughlin S. M. 1990. Epiphyseal fusion at the sternal end of the clavicle in a modern Portuguese skeletal sample. *Antropologia Portuguesa* 8: 59–68.
- Marado L. M., Silva A. M. 2016. The mandibular molar pit-tubercle (MMPT) dental nonmetric trait: comprehensive analysis of a large sample. *HOMO-Journal of Comparative Human Biology* 67(6): 462–470. <https://doi.org/10.1016/j.jchb.2016.09.003>
- Martin R., Saller K. 1956. *Lehrbuch der Anthropologie, Vol. 3*. Gustav Fisher Verlag. Stuttgart.
- Masset C. 1982. *Estimation de l'âge au décès par les sutures crâniennes*. Thèse de Doctorat. Université Paris VII. Paris.
- Novak M., Howcroft R., and Pinhasi R. 2017. Child health in five early medieval Irish sites: a multidisciplinary approach. *International Journal of Osteoarchaeology* 27(3): 398–408. <https://doi.org/10.1002/oa.2549>
- Ribeiro C. 1880. *Estudos prehistoricos em Portugal: noticia de algumas estações e monumentos prehistoricos*. Typographia da Academia. Lisboa.
- Rinaldo N., Zedda N., Bramanti B., Rosa I., and Gualdi-Russo E. 2019. How reliable is the assessment of Porotic Hyperostosis and Cribra Orbitalia in skeletal human remains? A methodological approach for quantitative verification by means of a new evaluation form. *Archaeological and*

*Anthropological Sciences* 11(7): 3549–3559.  
<https://doi.org/10.1007/s12520-019-00780-0>

Rivera F., Lahr M. M. 2017. New evidence suggesting a dissociated etiology for cribra orbitalia and porotic hyperostosis. *American Journal of Physical Anthropology* 164(1): 76–96. <https://doi.org/10.1007/s12520-019-00780-0>

Santos Rocha A. 1887. *Antiguidades Prehistoricas do Concelho da Figueira. Segunda Parte*. Imprensa da Universidade de Coimbra. Coimbra.

1888. *Antiguidades Prehistoricas do Concelho da Figueira. Primeira Parte*. Imprensa da Universidade de Coimbra. Coimbra.

1889. *Antiguidades Prehistoricas do Concelho da Figueira. Terceira Parte*. Imprensa da Universidade de Coimbra. Coimbra.

1900. *Antiguidades Prehistoricas do Concelho da Figueira. Quarta Parte*. Imprensa da Universidade de Coimbra. Coimbra.

Saunders S. 1978. *The development and distribution of discontinuous morphological variation of human infra-cranial skeleton*. Dossier 81. National Museum of Man, Mercury Series. University of Ottawa Press. Ottawa.

Scheuer L., Black S. 2000. *Developmental Juvenile Osteology*. Academic Press. London.

Scott G. R., Irish J. D. 2017. *Human tooth crown and root morphology*. Cambridge. University Press. Cambridge.

Silva A. M. 1993. *Os restos humanos da gruta artificial de São Pedro do Estoril II. Estudo Antropológico*. Relatório de investigação em Ciências Humanas. Departamento de Antropologia, Faculdade de Ciências e Tecnologia da Universidade de Coimbra. Coimbra.

1995. Sex assessment using calcaneus and talus. *Antropologia Portuguesa* 13: 85–97.

1996. *O Hipogeu de Monte Canelas I (IV–III milênios a.C.): Estudo paleobiológico da população humana exumada*. Trabalho de síntese. Provas de Aptidão Pedagógica e Capacidade Científica. Departamento de Antropologia, Faculdade de Ciências e Tecnologia da Universidade de Coimbra. Coimbra.

2002. *Antropologia funerária e Paleobiologia das populações Portuguesas (Litorais) do Neolítico final/Calcolítico*. Unpublished PhD thesis. University of Coimbra. Coimbra.

2003a. Trepanation in the Portuguese Late Neolithic, Chalcolithic and Early Bronze Age periods. In R. Ar-

nott, S. Finger and C. U. M. Smith (eds.), *Trepanation. History–Discovery–Theory*. Swets & Zeitlinger. Lisse: 117–129.

2003b. Portuguese Populations of the Late Neolithic and Chalcolithic Periods exhumed from Collective burials: an overview. *Anthropologie XLI(1–2)*: 55–64.

2004. *Os ossos humanos da Necrópole do Neolítico Final de Pragais: um testemunho do passado*. Coleções de Francisco Tavares Proença Júnior. Instituto Português de Museus. Lisboa: 112–117.

2005. A Antropologia das Grutas de Alapraia e S. Pedro do Estoril. In V. S. Gonçalves (ed.), *Cascais há 5000 anos*. Câmara Municipal de Cascais. Cascais: 29–31.

2008. Os ossos humanos. In V. S. Gonçalves (ed.), *A utilização pré-histórica da gruta de Porto Covo (Cascais)*. Câmara Municipal de Cascais. Cascais: 148–157.

2012. *Antropologia funerária e Paleobiologia das populações Portuguesas (Litorais) do Neolítico final/Calcolítico. Textos Universitários de Ciências Sociais e Humanas*. Fundação Calouste Gulbenkian Fundação para a Ciência e a Tecnologia. Lisboa.

2017. Illness and injuries in Prehistory: the challenge of paleopathological study of old bones. In M. Díaz-Zorita Bonilla, J. Escudero Carillo, I. López Flores, J. Lucena Romero, E. Mora Rosa, and S. Robles Carrasco (eds.), *Paleopatología y Bioarqueología, contextualizando el registro óseo*. Actas del XIII Congreso Nacional de Paleopatología. Asociación Profesional de Bioarqueología y Asociación Nacional de Paleopatología. Sevilla: 45–65.

Silva A. M., Ferreira M. T. 2007. Os ossos humanos “esquecidos” da Praia das Maças. Análise antropológica da amostra óssea do Museu Arqueológico de São Miguel de Odrinhas. *Conimbriga* 46: 5–2.

2016/2017. Perscrutando espólios antigos 5: Contributo da análise dos restos ósseos humanos. *Estudos Arqueológicos de Oeiras* 23: 219–232.

Silva A. M., Ferreira M. T., and Codinha S. 2006. Praia da Samarra: análise antropológica dos restos ósseos humanos depositados no Museu Arqueológico de São Miguel de Odrinhas. *Revista Portuguesa de Arqueologia* 9(2): 157–170.

Silva A. M., Boaventura R., Ferreira M. T. and Marques R. 2012. Skeletal evidence of interpersonal violence from Portuguese Late Neolithic Collective burials: an overview. In R. Schulting, L. Fibiger (eds.), *Sticks, Stones, and Broken Bones: Neolithic Violence in a European Perspective*. Oxford University Press. Oxford: 317–340.

- Silva A. M., Boaventura R., Pimenta J., Detry C., and Cardoso J. L. 2014. Perscrutando espólios antigos: A Gruta de Pedra Furada 1 (Vila Franca de Xira). *Estudos Arqueológicos de Oeiras* 21: 159–182.
- Silva A. M., Crubézy E., and Cunha E. 2009. Bone weight: new reference values based on a Modern Portuguese Identified Skeletal Collection. *International Journal of Osteoarchaeology* 19(5): 628–641.  
<https://doi.org/10.1002/oa.998>
- Silva A. M., Garcia M., Leandro I., Evangelista L., Rodrigues T., and Valera A. C. 2017. Mortuary practices in Perdígões (Reguengos de Monsaraz, Portugal): Bio-anthropological approach to Tomb 2. *Menga* 8: 71–86.
- Silva A. M., Sousa A. C., Boaventura R., and Scarre C. 2019. The forgotten bones of the Dolmen of Carrascal (Aqualva, Sintra, Portugal), Examining old remains. *Trabajos de Prehistoria* 76(2): 345–356.  
<https://doi.org/10.3989/tp.2019.12242>
- Turner C. G., Nichol C. R. and Scott G. R. 1991. Scoring procedures for key morphological traits of the permanent dentition: The Arizona State University Dental Anthropology System. In M. A. Kelley, C. S. Larsen (eds.), *Advances in Dental Anthropology*. Wiley-Liss. New York: 13–31.
- Walker P. L., Bathurst R., Richamn R., Gjerdrum T., and Andushko V. 2009. The Causes of Porotic Hyperostosis and Cribra Orbitalia: A Reappraisal of the Iron-Deficiency-Anemia Hypothesis. *American Journal of Physical Anthropology* 139: 109–125.  
<https://doi.org/10.1002/ajpa.21031>
- Valera, A. C., Silva A. M. 2011. Datações de radiocarbono para os Perdígões (1): Contextos com restos humanos nos sectores I & Q. *Apontamentos de Arqueologia e Património* 7: 7–14.
- Valera A. C., Silva A. M., Cunha C., and Evangelista L. S. 2014. Funerary practices and body manipulations at Neolithic and Chalcolithic Perdígões ditched enclosures (South Portugal). In A. C. Valera (ed.), *Recent Prehistoric Enclosures and Funerary Practices*. British Archaeological Reports IS 2676. Archaeopress. Oxford: 37–57.
- Viana A. 1950. Contribuição para a arqueologia dos arredores de Elvas. *Trabalhos de Antropologia e Etnologia* 12(3–4): 289–322.
- Vitor Guerra A. 1969. Novas pesquisas no Megalitho da Cumieira. Manuscrito de António dos Santos Rocha. *O Arqueólogo Português* 3(3): 274–277.