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FUNERARY PRACTICES AND ANTHROPOLOGY DURING MIDDLE-LATE NEOLITHIC (4th AND 3rd MILLENNIA BCE) IN PORTUGAL: OLD BONES, NEW INSIGHTS

ABSTRACT: This paper reviews and updates the anthropological knowledge about Middle-Late Neolithic populations in Portugal. This territory is rich in prehistoric burial sites, particularly those of the designated Middle and Late Neolithic/Chalcolithic periods (4th-3rd millennia BCE). In the past 150 years, more than 3000 tombs, namely natural caves used as tombs, dolmens, rock cut tombs and tholoi (vaulted chamber tombs) were identified and hundreds of them explored. Within these funerary structures, generally used as collective burials, the bones were frequently found and registered as disturbed and in a very fragmentary condition with total or almost total absence of anatomic connections. The systematic study of these human remains started in the 1990's and are mainly based on data obtained from tombs located in Estremadura and Algarve, two regions with limestone bedrocks that contributed to a better bone preservation. Those studies led to the assessment of anthropological profiles of several tombs. Among the more relevant data is the frequent sex ratio in favor of females, a greater mobility than that expected for agricultural communities and a low rate of main types of pathologies. Meanwhile, mainly due to an increase of Management Archaeology in South Portugal hinterland (Alentejo) new sites and types of tombs were located in the last 15 years: rock cut tombs were unknown in Alentejo, as well as pit graves; also pockets of cremated human bones have been found, as well as human bones lying inside ditches. Besides suggesting a more diversified funerary practice by those prehistoric populations, this new data raises many more questions: Were all contemporaneous? Was there different treatment according to belonging within the groups? Are there regional patterning for those differences?

KEY WORDS: Mortuary practices – Middle Neolithic – Late Neolithic/Chalcolithic – Collective burials – Inhumations – Cremations – Portugal

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INTRODUCTION

Portugal is rich in prehistoric burial sites, particularly those of the designated Middle and Late Neolithic/ Chalcolithic periods (4th-3rd millennia BCE). In the past 150 years, more than 3000 tombs, namely natural caves used as tombs, dolmens, rock cut tombs (also designated by other authors as hypogea) and *tholoi* (vaulted chamber tombs) were identified and hundreds of them explored (*Figure 1*). Despite those explorations most researchers gave little attention to human remains and its detailed distribution, when these were the most direct and tangible evidence of people from that past. The focus was on typologies of tombs and archaeological artefacts and objects (Boaventura 2009, Silva 2002, 2003a, 2012, Tomé 2011).

Getting to know the people that were involved in the phenomenon of Megalithism and used those tombs during the 4th and 3rd millennium BCE is an uneven possibility when studying populations from the Portuguese territory. This is due firstly to the quality of collection of data, but as well as to the type of bedrock and its acidity which affected the level of preservation of organic material in three quarters of its territory, namely human bone.

Thanks to the study of human remains we have obtained information regarding the individuals buried inside, that at some point were themselves buriers of fellow group members and families. This allowed the evaluation of certain assumptions about this period based on the estimation of age classes, sexes, lesions and pathologies of the deceased, as well as their feeding habits.

Limited by the available data, the identification of who were the first buried individuals in each tomb is an almost impossible mission. However it seems probable that at the beginning of this funerary practice the number of individuals was low, sometimes even limited to a couple of them, as artefacts and chronology by tomb seems to indicate. Also, it became important to verify the biological profile of the individuals deposited by type of tomb (Boaventura 2009, Silva 2002, 2003a, 2012, Tomé 2011).

LIMITATION ON THE SAMPLE OF HUMAN REMAINS

The high quantity of human skeletal remains registered inside tombs from the region of Estremadura disguises the limited quality of information gathered and available at the time of its archaeological exhumation (Silva 2002, 2003a). In fact the recording of many of the excavations of those sepulchers conducted in the 19th and the first two thirds of the 20th century do not answer to present questioning, namely how artefacts laid and related between each other and with skeletal remains. The descriptions for many tombs explored in past centuries passed on a picture of broken and commingled remains, without any clear contexts, except when artefacts or better preserved skeletal remains (per instance crania or long bones) were detected. Unfortunately the treatment on publication and museum curation was different for artefacts and skeletal remains. Main artefacts were highlighted in publication and even sometimes located within the tomb plan. This helped to locate later on those items in deposit, moreover because they were listed in museum catalogues. On the other hand skeletal remains, even when complete, would normally receive some attention on publication and location spots of distribution were mentioned, including possible skeletons in situ. But later on rarely those remains were kept with specific identification at museum storage. Therefore, despite the reference to specific bones or assemblies of bones sometimes described as one skeleton, in most cases among the collections of bones that got to us it is impossible to retrieve such information anymore. That is the case of some publications in which individual burial or inhumation are ascribed by field notes to concentrations of bones without the later necessary lab work of the remains examples of this are some excavations of the Serviços Geológicos de Portugal with its team of collaborators that despite their plausible and probable interpretations for inhumations at the dolmen of Pedras da Granja (Zbyszewski et al. 1977) and in the natural cave of Lugar do Canto (Leitão et al. 1987), it is today difficult to assign the majority of individual bones to those referred in the plans.

The critique to the limitations of previous archaeological record cannot let to forget human action on the funerary deposits, either coeval of the deceased or throughout times. Moreover, taphonomy caused by natural elements such as water and temperature, or by rodents and scavengers, as well as plants are also constraints to be considered. The dolmen of Carcavelos is a good example: partially excavated by one of the authors (RB), despite a detailed and systematic recording of elements and contexts it was not possible to identify to the present any anatomical connection. It was possible though to identify concentrations of commingled bones, possibly originated by reduction, rearrangement or



FIGURE 1. Sites mentioned in the text. 1, Cabeço dos Moinhos; 2, Ansião; 3, Lugar do Canto; 4, Serra da Roupa; 5, Paimogo 1; 6, Algar do Bom Santo; 7, Cova da Moura; 8, Cabeço da Arruda 2; 9, Carcavelos; 10, Pedras da Granja; 11, Carenque; 12, Poço Velho; 13, São Pedro do Estoril; 14, São Paulo 2; 15, Casal do Pardo; 16, La Pijotilla; 17, Perdigões; 18, Olival da Pega 2; 19, Santa Margarida 3; 20, Sobreira de Cima; 21, Monte das Covas 3; 22, Ribeiro de São Domingos 1; 23, Outeiro Alto 2; 24, Monte do Carrascal 2; 25, Horta do João da Moura; 26, Monte do Pombal 1; 27, Vale de Barrancas 1; 28, Monte do Cardim 6; 29, Monte Canelas. Map adapted from Carta Hispométrica de Portugal, 1:1.000.000.

partition of skeletons pushed or taken to the corners of the tomb. Also, those intentional agglomerations were affected by taphonomic conditions such as bioturbation, gnawing, root etching or chemically altered by precipitation through time.

As mentioned above, within those funerary structures, generally used as collective burials, the bones were frequently found and registered as disturbed and in a very fragmentary condition with total or almost total absence of anatomic connections. This simplistic view usually led to the interpretation that those deposits represented secondary burial places and there of little information. Moreover, the majority of these sites were excavated with little concerns to detailed recording of human remains, making it impossible to reconstruct their context and taphonomy processes. Consequently, present knowledge about funerary practices of these Neolithic groups is still uneven. Therefore a considerable lack of information persists about the individuals buried and how the funerary structures were organized within (Boaventura 2009, Diaz-Zorita et al. 2012, Silva 2002, Tomé 2011).

However, thanks to appropriate methods and methodologies (Herrmann et al. 1990, Silva 2002, Ubelaker 1989) also evaluated critically (Duarte 2003, Silva 1996a, 2002, Wood et al. 1992, Wright, Yoder 2003) the above limitations have been minimized and useful information is possible to be gathered from it: the verification of minimal number of individuals, sex, age at death, morphological aspects, lesions and pathologies. Moreover, the comparison between different collections is only possible because similar criteria and protocols have been adopted by different researchers, namely within major studies on collections on Central-South Portugal (Boaventura 2009, Silva 1993, 1996a, b, 1999a, b, 2002, 2003b, Tomé 2011), as well as others (Cunha et al. 2007, Silva, Cunha 2001, Silva, Ferreira 2007, Silva et al. 2006). Therefore, an important level of information has been attained and will be discussed below.

The systematic study of human remains housed mainly in museums started in the 1990's (Boaventura 2009, Silva 1993, 1996a, b, 1999a, b, 2002, 2003a) and was based predominantly on data obtained from tombs located in Estremadura and Algarve, two regions with limestone bedrocks that contributed to a better bone preservation. Those studies led to the assessment of anthropological profiles of the individuals that were buried in these regions (Boaventura 2009, Silva 2002, 2012, Tomé 2011).

Finally, given the identification of those skeletal remains, this made possible as well an informed

evaluation of isotopes to evaluate consumption habits and more clear and systematic radiocarbon dating.

MIDDLE-LATE NEOLITHIC ANTHROPOLOGICAL PROFILES: DATA FROM OLD COLLECTIONS

As mentioned above, the majority of the osteological data regarding Neolithic populations in Portuguese territory comes from the coastal regions of Estremadura and Algarve (Boaventura 2009, Silva 2002, 2012, Tomé 2011). This needs to be highlighted as for the rest of the other three quarters of the territory the degree of preservation is very poor, thus limiting the information regarding those specific populations. However, as long as these limitations are not forgotten in the equation, certain extrapolations can be considered for those less fortunate regions.

According to data collected the minimum number of individuals (MNI) exhumed from Middle-Late Neolithic tombs is very variable, ranging from less than ten until more than 400 – inside the *tholos* of Paimogo 1 there is an estimate of 413 individuals (Silva 2002, 2003a). However in some tombs the evidence for chronological sequence of depositions might explain those figures, resulting from an accumulation process. Nevertheless, tombs with use dating to Late Neolithic/Chalcolithic (3rd millennium BCE) seem to present higher MNI, namely *tholoi*.

Percentage of non-adults varies in each tomb between 18% to almost 50% of the total number of estimated individuals. A more detailed analysis of these non-adults' mortality profiles, comparing with expected coefficients of mortality tables (Ledermann 1969) show a generalized under-representation of individuals under the age of five, and more particularly under one year of age. For the remaining age groups (5-9 years; 10-14 years; 15-19 years), the mortality curve line is more or less in accordance with the expected for natural populations according to mortality tables of prehistoric populations (Ledermann 1969). Adult samples inferences about age at death are few. Nevertheless in some tombs (such as tholos of Paimogo 1 and rock cut tomb of São Paulo 2) there is a wide evidence for adults that died older than 30 years of age (based on the fused sternal epiphysis of clavicle) (Silva 2002).

Generally sex diagnosis in these collections could not be performed with the most accurate bones (pelvis and skull) due to the low preservation rate. This demographic parameter has been obtained by using discriminant analysis of the talus and calcaneus, and sometimes with the femoral head diameter. Measurements indicate systematically a sex ratio in favor of females. Several explanations can be advanced for this unusual trend: methodological problems (discriminant measured points are inadequate for these prehistoric populations) or related to funerary practices, that is, some male individuals of these groups were buried in other sites, which have not been detected by archaeological surveys (Silva 2002).

Morphological aspects of these populations do not reveal a consistent pattern of flatness reduction of the proximal femur shaft, normally related to the transition and intensification of agriculture. Furthermore, the mean value of the platymeric index is 78.37 (n = 535 femurs of 8 tombs – for details see Silva 2002, 2012) revealing flatness of the proximal diaphysis of the femur, and therefore suggesting a greater mobility than one usually associated with fully sedentary agriculture populations. This is also supported with the mean value of the femoral neck-shaft angle of these individuals. The mean values obtained between 124.7°-127.3° are in the range of population with a greater mobility as foragers. These morphological data obtained for the hip joint and proximal area of the femur suggests that at least some individuals displayed greater mobility than that normally associated with agricultural populations. The presence of livestock, mainly sheep and goat, as well as an important presence of game on archaeological record might explain such mobility. Heavy physical effort upon the hip joint since childhood, denounced by the low femoral neck-angle and flatness of proximal part of femur could also be related to pastoralist activities and/or daily dislocation in hilly regions (Silva 2002, 2003a).

Other data that could be linked with that mentioned above are the cases of *osteochondritis dissecans* (OD) detected in some bones of several samples. Among the human remains recovered from the *tholos* of Paimogo 1, seven cases of OD were detected in one non-adult and six adults. The non-adult was an individual with an age at death between 10-14 years old and displayed two circular areas of necrosis on a distal epiphysis of a right femur. The remaining cases of adults were registered on ulna (proximal epiphysis), femur (one on the proximal epiphysis and one on distal end) and tibia (one on the proximal epiphysis and one on distal end). With the exception of the lesion observed in the proximal end of a right femur, all were active lesions. Clinical studies of this benign, non-inflammatory condition have led to the suggestion that trauma, especially repeated low grade chronic or micro trauma may have played a role in the aetiology of this process (Silva 2002). Evidence for population long range mobility has also been obtained from isotope analysis on strontium ratio (87Sr/86Sr) in dental enamel (Hillier et al. 2008, Hillier et al. 2010, Waterman et al. 2014). A preliminary study on a group of eight human individuals from Late Neolithic tombs of Estria and Carcavelos (Portuguese Estremadura, on Atlantic coast) exhibited ⁸⁷Sr/⁸⁶Sr isotope ratios predominantly with a local range, exception made for one individual of Estria. The same study included also eight samples from tomb 1 of Perdigões, in Alentejo. Among those, only two males are within the bioavailable strontium range of this area, suggesting that the remaining were non-local. Waterman et al. (2014) analyzed the strontium isotope ratios in dental enamel to verify non-local individuals from seven Late Neolithic-Early Bronze Age (3500-1800 BCE) tombs in the surroundings of the settlement site of Zambujal, Torres Vedras (approximately 30 km northeast of Carcavelos and Estria tombs). Of the total individuals tested 9% (5 out of 55 human samples) were classified as non-local. Moreover, two of the non-local individuals from the natural cave of Cova da Moura, had 87Sr/86Sr ratios that could match the older geological formations of Alenteio region of Portugal, as Perdigões (approximately 200 km southeast of Zambujal). This would also correspond to known exchange patterns of raw material, as variscite, slate, amphibolite, arsenical copper ore and other materials from Alentejo. All the mentioned data suggests that people, in addition to materials, were also moving within regions of Portugal, and probably beyond.

Presently more dental enamel samples of the different funerary contexts of Perdigões (see below) are being analyzed to study the population mobility and long distance trade during Middle and Late Neolithic/ Chalcolithic human populations in Portuguese territory.

A certain degree of endogamy is noticed in some samples by different criteria. In the samples from the cave of Cova da Moura, and the tholoi of Paimogo 1 (PM1) and Cabeço de Arruda 2 (CA2), all from the Estremadura region, an atypical morphology of the proximal end of the femur is observed (Figure 2). This is characterized by an unusual short femoral neck so that the top of the proximal epiphysis of the femur is more or less at the same level or even below the more proximal point of the great trochanter. Values lower than 0.4 cm for this distance were scored on 7.7% of femurs from Cabeço da Arruda 2 (3/39); on 22.2% (2/9) femurs from natural cave of Cova da Moura; and on 18.2% (14/77) femurs from tholos of Paimogo 1 and 25.0% for the shelter of Serra da Roupa. This unusual morphology was interpreted has skeletal dysplasia, which includes a large



FIGURE 2. Atypical morphology of the proximal end of a left femur recovered at the natural cave of Cova da Moura. Note the short femur neck and low level of the proximal end.

group of conditions affecting bone and cartilage growth which are inherited (Silva 2002, 2003a).

Other evidence of endogamy is the high number of extra suture bones registered, particularly on the

lambdoid suture observed in several skulls from the natural cave of Lugar do Canto (Estremadura) and the rock cut tombs of Monte Canelas 1 (Algarve) and São Paulo 2 (Silva 1996a, 2002, 2012).

On the cranium some cases of depressed fracture of skull vault are reported. All concerned of small more or less circular lesions and generally well healed at the time of death. The exact number of cases is unknown but the absence of other injuries suggests that the majority might possibly result from accidental events, although interpersonal violence cannot be discarded (Silva *et al.* 2012). It is noteworthy that the majority of cases are from samples from mountain regions (such as dolmen of Ansião and rock shelter of Serra da Roupa), where falls could have been more frequent in their daily activities. On postcranium bones the signs of *ante mortem* fractures are rare. Most detected cases are from metacarpal or metatarsal bones. There are, however, three exceptional cases that are worth to mention:

- From the cave of Lugar do Canto, a fusion between a right ulna and radium (*Figure 3*). A complete bone fusion is visible in the distal third of the diaphysis of both bones. The lesion is completely remodeled and no signs of complications are visible, as infectious or degenerative diseases. Both forearm bones are well aligned and the bone bridge is around 15 mm large and probably developed during the healing/repair process of a forearm fracture. This last event happened many years before the death of the individual, maybe during childhood.
- From the *tholos* of Paimogo 1 a proximal third portion of an adult right femur probably belonging to a female individual, exhibits an intra-capsular fracture (*Figure 4*). The fracture is oblique and trans-



FIGURE 3. Complete fusion of a right radium and ulna from an adult individual unearthed at the natural cave of Lugar do Canto.



FIGURE 4. Intracapsular fracture of a fragmented adult female right femur (PM.9604) exhumed at the *tholos* of Paimogo 1.

cervical, and is well remodeled. The femoral head shows signs of secondary development of osteoarthritis, including eburnation (Curate *et al.* 2011, Silva 2002, 2012).

 From the cave of Poço Velho (Cascais) a right tibia (PV233.2058) belonging to an adult female exhibit signs of a poorly aligned but well healed fracture in the distal third of the diaphysis (Antunes-Ferreira 2005: 85).

These three traumatic cases are exceptional since although completely healed should have represented severe traumatic events.

Trepanations were not frequently reported for Portuguese osteological collections until a recent survey, which counted at least 22 cases (Silva 2003b). However, this low number of cases reported at least partially can be a consequence of the generally poor preservation of the skulls, frequently reduced to small pieces and consequently difficult to access for a diagnosis. The bone collection dated to the Middle Neolithic from the cave of



FIGURE 5. Complete trepanation on a right parietal bone from an adult male skull (LC. 1137.45) recovered at the natural cave of Lugar do Canto.

Lugar do Canto presently under study by some of the present authors (AMS, RB and MTF) will add more cases (*Figure 5*). Preliminary results revealed three adult skulls (7%; 3/44) with complete trepanations all in the right parietal bone. The method used was scraping and all are well healed lesions.

Dentition of these populations is characterized by a low-moderate dental attrition, a low prevalence of *ante mortem* tooth loss and periapical lesions. Cavity frequencies show greater variability between tombs, generally less than 7% of the teeth (tooth count method, n = 3814) and probably reflect variability of cariogenic fruits in different geographical regions (Silva 2002, 2012).

OLD BONES, NEW SITES AND INSIGHTS

In the last 15 years, due to an increase of Management Archaeology in South Portugal hinterland

(Alentejo) new sites and types of tombs have been located.

Although natural caves and dolmen continue to be studied, its majority has been excavated decades ago. Algar do Bom Santo is probably one of the most recently explored natural caves and its study is ongoing. However, the information published (Duarte 1998) seems to indicate that it was being used during the middle of the 4th millennia BCE, a period when dolmen and rock cut tombs were also being constructed and used (Boaventura 2009).

The dolmen of Santa Margarida 3 (Reguengos de Monsaraz, Alentejo) is one of the most recently excavated that provided human remains, although in a poorly preserved state (Gonçalves 2003). Despite that it was possible to verify some partial anatomical connections, reinforcing the idea of primary deposition and the trend of simple disposal of the dead (see Sprague 2005 about this

terminology). Also, its dating by radiocarbon and artefact typology seems to indicate that this tomb was erected in the first centuries of the 3rd millennium BCE, a period when the majority of archaeological evidence indicates that dolmens stopped being built (Boaventura 2009).

Therefore, without forgetting natural caves and dolmens, this paper will highlight new recent discoveries, namely contexts with rock cut tombs, *tholoi*, pit graves, pockets of cremated human bones, and human bones lying inside ditches, discussed separately. This new data, besides suggesting more diversified funerary practices by those prehistoric populations, raises many more questions: Were all contemporaneous? Was there different treatment according to belonging within the groups? Are there regional and ethnic patterning for those differences? Unfortunately, contrary to the degree of bone preservation from limestone areas, bone preservation of these new collections from Alentejo is



FIGURE 6. Aspect of burials at the rock cut tomb of Monte Canelas 1 (Alcalar, Portugal).

generally poor; still with some exceptions as Sobreira de Cima and Monte do Carrascal 2. Therefore anthropological data is often limited, although information regarding mortuary practices has been gathered thanks to more rigorous recording of field procedures and notes.

The new discoveries in Alentejo also brought light over the evolution of funerary practices into the Bronze Age. Besides continuing to be buried in the same areas of previous collective tombs, as well as hewed in the bedrock as before, there seems to be a trend for each structure to receive solely a few individuals per tomb, losing its collective characteristics.

ROCK CUT TOMB

Rock cut tombs usually occurred in clusters, presenting similar design to dolmen and *tholoi* types of tombs, with a chamber and a passage – this passage could have been a typical corridor or a vertical pit. Radiocarbon dating and artefacts typologies place generally its construction between 3500–2500 BCE (Middle-Late Neolithic/Chalcolithic), although in some cases continued to be utilized after that time period (Boaventura 2009).

Until the end of the 20th century rock cut tombs were known mainly in the limestone coastal regions of Estremadura and Algarve (Figure 1). Some were identified earlier as the 19th century, such as the tombs of Casal do Pardo (Palmela) and in the first half of the 20th century, such as Carenque (Amadora). Later other discoveries brought new insights about this type of tomb thanks to a better recording, namely São Pedro do Estoril (Cascais) with two tombs, São Paulo (possibly two tombs), and Monte Canelas (with at least 4 tombs, of which the tomb 1 was thoroughly excavated. In fact Monte Canelas 1 was one of the first tombs to be excavated with an interdisciplinary team of archaeologists and anthropologists that conducted a systematic recording of the remains (Figure 6). This allowed that 20 years later it is still possible a detailed spatial analysis of the deposits. This tomb presented essentially an accumulation of human bones without anatomical connections, in which was possible to identify five still in situ individual burials (four adult females and one adult male, Figure 7) and 32 anatomical articulations, result of intentional and accidental recurrent secondary manipulation of body parts (Silva 1996a, b) (Table 1).

More recent discoveries of rock cut tombs and some pits have occurred in Alentejo hinterland. Many of these new tombs were clustered as those from coastal areas.



FIGURE 7. Primary burial #337 of an old adult female individual unearthed at the rock cut tomb of Monte Canelas 1.

Sobreira de Cima (Vidigueira) was the first cluster to be detected with at least seven rock cut tombs, of which five were excavated, but only two of them found sealed and complete (Valera 2013). The archaeological and anthropological analyses of these human remains are in course, but it is possible to ascribe those tombs to the Middle Neolithic and the beginning of Late Neolithic (3600–3000 BCE) (Boaventura 2009, Valera et al. 2008). Other rock cut tomb sites have also been identified, namely Outeiro Alto 2 and Vale de Barrancas 1. However in both cases within the areas of each site, structures of different chronologies have been detected, from Middle Neolithic to Bronze Age. Also, besides brief field reports, only these two sites have already more detailed anthropological studies available solely for the Neolithic structures (Outeiro Alto 2 - Fernandes A. I. 2013; Vale de Barrancas 1 – Fernandes P. 2013) (Table 1).

Monte do Carrascal 2 site (Ferreira do Alentejo) was discovered during the construction of an irrigation system in 2010 and partially excavated by two different teams (Neves *et al.* 2011, Santos 2011). Two rock cut tombs and a portion of a ditch (Santos 2011) were detected, among other archaeological structures from different prehistoric chronologies (Valera 2012a, b). Yet, due to upper layers ablation no stratigraphic relation can be easily established between these different archaeological structures. Nonetheless, within these structures the natural and anthropogenic deposition of sediments has permitted a fairly good preservation of skeletal funerary deposits.

The two rock cut tombs revealed a complex and diachronic use, having post-depositional effects affected them in quite different ways. Yet, due to the implementation of a thorough field protocol with the use

Rock cut tomb	MNI (minimal number of individuals)	Non-adults (%)	Approximate area (m ²)
São Pedro do Estoril 2 (Silva 1993)	53 individuals (41 adults, 12 non-adults)	22.6	16.0
São Paulo 2 (2905–1950 cal BC: UBAR-629) (Silva 2002, 2012)	254 individuals (131 adults, 123 non-adults)	48.4	40.0
Monte Canelas 1 (3340-2900 cal BC: OXA-5514) (Silva 1996a, b)	171 individuals (109 adults, 62 non-adults)	36.3	
Tomb 5 (Outeiro Alto 2) (Fernandes A. I. 2013)	23 individuals (7 adults, 16 non-adults)	69.6	3.0
Tomb 14 (Outeiro Alto 2) (Fernandes A. I. 2013)	5 individuals (3 adults, 2 non-adults)	40.0	1.5
Tomb 16 (Outeiro Alto 2) (Fernandes A. I. 2013)	17 individuals (9 adults, 8 non-adults)	47.0	4.5
Tomb 1 (Vale Barrancas 1) (Fernandes P. 2013)	10 individuals (5 adults, 5 non-adults)	50.0	5.2
Tomb 2 (Vale de Barrancas 1) (Fernandes P. 2013)	7 individuals (5 adults, 2 non-adults)	28.6	8.0
Tomb 3 (Vale de Barrancas 1) (Fernandes P. 2013)	14 individuals (6 adults, 8 non-adults)	57.1	4.2
Tomb 4 (Vale de Barrancas 1) (Fernandes P. 2013)	3 individuals (2 adults, 1 non-adult) ^a	33.3	7.9
Tomb 5 (Vale de Barrancas 1) (Fernandes P. 2013)	5 individuals (4 adults, 1 non-adult)	20.0	5.9
Tomb 7 (Vale de Barrancas 1) (Fernandes P. 2013)	4 individuals (3 adults, 1 non-adult) ^a	25.0	3.4
Tomb 8 (Vale de Barrancas 1) (Fernandes P. 2013)	9 individuals (6 adults, 3 non-adults)	33.3	9.4
Tomb 1 – Monte Carrascal 2 (Neves <i>et al.</i> 2011)	62 individuals (40 adults, 22 non-adults) ^b	35.5	
Tomb 2 – Monte Carrascal 2 (Neves <i>et al.</i> 2011)	38 individuals (31 adults, 7 non-adults) ^b	18.4	

TABLE 1. Minimum number of individuals and area of chamber per rock cut tomb.

^a Data have to be considered with caution since Tomb was disturbed by more recent structures.

^b Preliminary data since excavation is not finished.

of state-of-the-art technologies from geoarchaeology, archaeothanatology, geomatics (GIS and 3D modeling) and geophysics (GPR and magnetic surveying) the stratigraphic complexity and funerary practices (including bone dislocations due to body decomposition and other non-anthropic post-depositional processes and anthropic manipulations) were successfully identified. However it must be stressed that the partial excavation of the two tombs is an obstacle to a full understanding of the structures synchrony and diachronic uses. Rock cut tomb 1 of Monte do Carrascal 2 corresponds to an underground circular chamber with a later access through a lateral vertical pit. The original entrance is unknown as the tomb was not completely excavated. The chamber was naturally filled with a colluvium deposit that covered the last funerary act of the structure. This unit which presents a remarkable state of preservation is characterized by a vast accumulation of material culture items attributed to the 3rd millennia BCE and human bones mainly in anatomical connection. These partial account of remains corresponded to the deposition of 62 individuals: 22 belonging to non-adults and 40 to adults, of which three were men, 17 women and the remaining of unknown sex. Ten successive phases of body depositions were documented in the central part of the tomb. The analysis of the bone disposition and the state of anatomical connections indicates that the bodies were disposed on the surface and not covered with sediment (*Figure 8*), juxtaposing directly human remains in different states of preservation. This resulted in some commingled bones from skeletonized individuals. Some of these bones along with other objects were accumulated against the walls of the tomb, but the vast majority of the remains presented a good degree of preservation. Therefore some of the skeletons were incomplete due to anthropic factors and the action of natural processes such



FIGURE 8. Juxtaposition of skeletons from the most recent burials of the rock cut tomb 1 at Monte do Carrascal 2. Image obtain by using GIS and planar photography.



FIGURE 9. First phase of burials inside the rock cut tomb 1 at Monte do Carrascal 2. Consisted of commingled human bones without anatomical connections.

as the action of gravity responsible by the dislocation of crania or the action of scavengers. As an anthropic factor it was possible to pinpoint the disposal of new cadavers that affected more or less the integrity of skeletal elements or the intentional removal of some parts related either to cleaning activities, the rearrangement of bones or secondary inhumation practice. The remaining skeletons were found in lateral decubitus position (right and left). The orientation of the depositions was quite diverse with the head normally towards easterly directions and feet towards westerly points.

Grave goods and personal ornaments spatial distribution corresponds to those of the dead, but due to juxtaposition of the cadavers was not possible to ascertain with whom they were deposited.

Other burial phases were also identified but excavated only in a small and peripheral area of the tomb (*Figure 9*). In these strata the presence of commingled bones is the main aspect with rare anatomical connections. The presence of small bones such as feet

and hand phalanges and of some skeletons in anatomical continuity reinforces the hypothesis that in those previous phases the site was also used as a primary burial place. Further results are expected to be obtained by the pursuing of the series and site study.

Rock cut tomb 2 from Monte do Carrascal 2 revealed different funerary levels, although none of them completely excavated. The complex stratigraphy accumulated inside the tomb and the architectonic changes detected within, as well as the post-depositional processes that affect the ensemble and the number of human remains found highlights the importance of this site for the understanding of funerary practices in the 4th and 3rd millennia BCE in South Portugal.

The most recent moment of funerary use in Monte do Carrascal 2 - tomb 2 was excavated in an extended area, but not completely. This level suffered an intense post-depositional deformation which provoked a strongly depressed morphology of the deposit (*Figure 10*). The existence of a few anatomical connections and the



FIGURE 10. Aspect of the most recent burials inside the rock cut tomb 2 at Monte do Carrascal 2. The depression and vertical orientation of human bones seems to have resulted from post-deposition processes.

presence of a wide spectrum of human bones, allowed the establishment of a primary use of the monument during its final phase, being identified 38 individuals (seven non-adults and 31 adults of both sexes).

The tomb was initially formed by a circular chamber and a corridor. Primary depositions occurred inside the chamber, being possible to identify in a small area at least five inhumations. In an intermediated use phase the structure suffered a major alteration with the introduction orthostats abutting the walls of the chamber and corridor (*Figure 11*). Four individuals ascribed to this phase were identified in the corridor. The mentioned phases were visible in stratigraphy as they were sealed by thick layers of sedimentation.

These new rock cut tombs from Alentejo as well as those from coastal regions seem to have been constituted by primary burials as simple disposal of cadavers, although varying in MNI for each tomb. Coastal hypogea were larger probably due to the bedrock qualities and had higher MNI by each structure, but the numbers of tombs by cluster are lower. However, these results have to be studied more in depth and detail (*Table 1*).

Where detailed recording was conducted it was possible to verify *in situ* burials more or less complete and variable amounts of commingled bones that resulted from intense intentional and/or accidental rearrangement of previous skeletonized cadavers, namely to make space for new deposits. Other indicators of the primary nature of these burials are the presence of small skeletal bones such as phalanges and sesamoid bones.

A relevant aspect of anthropological data is the demographic profile: adults and non-adults are present, the later frequently with high percentages suggesting that they represent natural populations and therefore, no differential selection of individuals for burial is visible. Moreover, in these samples proportion of both adult sexes seems to be balanced, despite coastal samples, where more adult females were usually recorded.

Regarding the clusters of rock cut tombs, one important question remains: What do they represent?



FIGURE 11. Upper image, chamber and passage of rock cut tomb 2 at Monte do Carrascal 2. Lower image, architectural remodeling of the passage of the rock cut tomb 2 at Monte do Carrascal 2.

Different families of the same clan? Burial places built diachronically? Some limitations are obscuring the answers: Old excavations with unchartered loss of bones (as in Casal do Pardo, Carenque, and São Pedro do Estoril); not all clusters of rock cut tombs were excavated such as Monte Canelas and Sobreira de Cima; a poor degree of bone preservation such as in Outeiro Alto 2 and Vale de Barrancas 1 (Alentejo). Studies using ancient DNA analysis, isotopes and reassessing non-metric dental traits are being conducted to answer these questions.

THOLOI

Tholoi are another type of tomb less widely distributed than dolmens and with a more recent chronology. In fact, radiocarbon dating for this type of tomb places its construction and use during the first half and third quarter of the 3rd millennium BCE (Late Neolithic/Chalcolithic).

As it happens for rock cut tombs anthropological data from individuals deposited inside *tholoi* comes mainly from the region of Estremadura, although this type of structure is also known in Alentejo and Algarve.

Some of the highest MNI from tombs during the 4th and 3rd millennia have been registered inside *tholoi* such as Paimogo 1 (Estremadura), Perdigões – tomb 1 (Alentejo) or La Pijotilla – tomb 3 (Spanish Extremadura, region neighboring Alentejo). The *tholos* of Paimogo 1 has an estimated 413 MNI, of which 290 were adults and 123 non-adults. The other two tombs have an estimated MNI of 101 (Valera *et al.* 2007) and 300 individuals (Hurtado *et al.* 2000) respectively. Other *tholoi* have similar MNI to different type of tombs, but in some cases skeletal material was not preserved or collected (Boaventura 2009).

In the last decade new *tholoi* have been discovered in Alentejo hinterland within ditched enclosures of Perdigões (tomb 2) and nearby the ditched enclosures of Porto Torrão, namely Horta do João da Moura 1 (two *tholoi*), Monte Cardim 6 and Monte Pombal 1 (Valera 2010, 2012a, b). These new excavations brought new information regarding funerary practices, as some seem to be related with a composed disposal of human remains, as field notes (and not final studies) proposed those structures as secondary burial places.

At Horta do João da Moura 1 two collective tombs were identified, *tholos* 1 and *tholos* 2, a few meters distant from each other, and were excavated by two different teams in two separate phases (Corga *et al.* 2011, Pereiro 2010, Valera 2010). A joint analysis of both archaeological and anthropological material is still in process. Nevertheless based on the type of structures and on the archaeological material recovered these two *tholoi* seem to have been used during the Chalcolithic period, between 2900 and 2400 BCE (Corga *et al.* 2011, Pereiro 2010, Valera 2010). However, the disposal of the bodies in each tomb seems to have been subject of different treatment.

In tholos 1 – Horta do João da Moura 1 – the human bones were fragmented, but tended to preserve the continuity of the bone piece. The skulls were deformed and with several post mortem damage. All bones showed numerous old post mortem damage and breakage that happened already with dry bone, maybe resulting from sediment pressure. Due to poor preservation and the two phase excavation, the MNI is not possible to estimate based only in field data. Also, the analysis of bone representation is still preliminary. The large bone fragmentation and disarticulation (only one anatomical connection was detected; Figure 12) and the arrangement made by sets of bones, only possible after the complete decomposition of soft tissues (*Figure 13*), together with concentrations of clasts and shards, seems to indicate a secondary disposal of the dead. No evidence of ochre pigmentation was found as well.

In tholos 2, the skeletons were severely damaged, with bone surface exfoliation and loss of all long bones extremities and trabecular bone of vertebra. Despite that condition some bones showed pink coloration possibly due to ochre. Consequently, the excavation, identification and exhumation of bone pieces were very difficult, and conditioned later interpretation of burial practices. Nevertheless, it was possible to verify partial anatomical connections with ceramic vessels associated (Figure 14) (Corga et al. 2011) and the identification of 36 individuals, which points to a primary burial use of this tomb. Also limited, the palaeodemographic analysis succeeded to recognized 26 adults (including two males and three females) and ten non-adults (one new-born, seven children and one juvenile). The presence of individuals of all age classes and sex suggests a natural population that was disposed in that tomb over time, despite the small size chamber. This sequential occupation is mirrored not only in numbers, but also in the skeletal remains positions: some individuals have been deposited (or pushed still with soft tissues) along the walls (e.g., Individual #26, whose lower limb bones were found in a more or less vertically against the wall of the tholos).

The situation of these two *tholoi* located very close of each other, but with possible different disposal



FIGURE 12. The only anatomical connection (adult right hip) found in *tholos* 1 at Horta do João da Moura 1. Also note the predominance of long bones and their fragmentation.

strategies raises a series of important questions. In that sense, besides GIS analysis, the human remains of both tombs will be tested for isotopes and ancient DNA to verify possible patterning of individuals' relationships.

PITS

The recent work of rescue archaeology in Portugal has permitted the detection of an increasing number of pit graves from different time periods, dated from Late Neolithic until Final Bronze Age. In general these pits have a circular plan with several depths and sizes. The human remains placed inside are found in different levels singled or grouped (Valera 2012b).

At Perdigões ditched enclosures during the campaigns of 2007–2008 twelve pits excavated in the bedrock were identified. In two of them (Pits 7 and 11) partial human skeletal remains were found in primary context and anatomical connections. These two pits were

part of a sequence of four pits that intersected and cut them. From Pit 7 were exhumed some elements of lower limbs of an adult female, as well as fragments of phalanges of a non-adult and fragments of an adult skull. Their presence may have resulted from a soil movement that altered its original position, displacing them to this pit or might have belonged to another burial deposit present in Pit 7 which was partially removed elsewhere. Associated with those human remains there was a pig paw. Radiocarbon dating showed that one of these burials (UE114, Pit 7) occurred in the beginning of Late Neolithic (around 3340–2920 BCE) (Valera, Silva 2011).

Pit 11 contained the skeletal remains of three nonadult individuals. Preliminary results of ancient DNA analysis indicate that the three non-adults were male. The individual UE76 belongs to haplogroup U5 (through mutations of HVRI), individual UE 77 belongs to haplogroup H (through restriction polymorphisms) and the individual of UE78 belongs to haplogroup U4, with no matrilineal relationship between the three. However,



FIGURE 13. Arrangement made by sets of clasts, ceramic fragments and bones deposited after the complete decomposition of soft tissues. Correspond to the first deposition in *tholos* 1 at Horta do João da Moura 1.

patrilineal relationship has yet to be evaluated. Also, isotope analysis (Sr, O, C, N) is being conducted to ascertain individuals' place of birth. Together with the remains of these non-adults were also found a pig paw and a cockle shell.

At Outeiro Alto 2, pit graves were also excavated. If the majority are likely attributed to Bronze Age, one burial pit (Pit 32) was associated to the three Middle Neolithic rock cut tombs already mentioned above. Inside at the base of the pit there was a poorly preserved skeleton of a non-adult, covered by clayish sediment with no associated objects (Valera 2012b).

Other pits were recently excavated, as Ribeira de São Domingos 1 and Monte das Covas 3. The evaluation of anthropological data from these pit burials has yet not been published. Moreover, in many of those tombs no associated objects have been found, which makes it difficult to place them in time. Some radiocarbon dating seems to indicate a few Neolithic chronologies and the majority attributed to Bronze Age. Therefore, although not quite understanding what do they represent, at the moment is important to mention it as a new possible form of burial for the Late Neolithic/Chalcolithic period.

CREMATED HUMAN BONE DEPOSITS

Until now, all of the described Neolithic/Chalcolithic funerary contexts were inhumations. However, discoveries in the *tholos* of Olival da Pega 2 (Gonçalves 1999), and more recently the contexts discovered at Perdigões (Silva *et al.* in prep., Valera 2010, 2012a, b,



FIGURE 14. Individual #17 *in situ* (adult, undetermined sex) from *tholos* 2 at Horta do João da Moura 1. Note the deposition of two ceramic vessels nearby the skull, and the severe fragmentation and degradation of osteological material.

Valera, Silva 2011) have changed that view: in the central area of the site of Perdigões, dated to the Chalcolithic period, at least two context with collective burials with cremations have been discovered.

In Pit 16 a conical shape deposit with human cremated remains was found (*Figure 15*). The stratigraphic evidence shows that the cremation took place elsewhere and that the remains were placed there. The human remains corresponded to a minimum number of nine individuals (six adults and three non-adults) and were mixed with faunal bones (pig, sheep, goat, cattle, dog, deer, and rabbit) and fragments of artefacts (pots, ivory idols, and arrow heads), all of it with signs of having been submitted to fire. Evidence of ochre was also found, but only on human remains, suggesting that these bones were sprinkled with this pigmented. The cremated human bone assemblage (4845.18gr) displayed some color variation indicating that different elements of the body were exposed to different temperatures

during distinct lengths of time. However, the dominating colors were grey (incompletely oxidized) and white $(> 600^{\circ})$ confirming the exposition to high temperatures during some time. The presence of thumbnail fractures is generally associated with the presence of soft tissues when it was cremated, suggesting that at least some individuals were cremated as fleshed bodies. It is unclear why and where were these individuals cremated. However, there seems to be no doubt that they were intentionally cremated and carefully collected and finally deposited in this pit. This is suggested by several evidences: the level of cremation of bones, the recovery of apparently all skeleton elements, the presence of red ochre, burned fauna and artefacts (Silva et al. in prep.). The radiocarbon date of two human bones, an axis (Beta 289262: 3990 \pm 40 BP, 2580–2460 cal BCE, 2 σ) and a metacarpal bone (Beta 289264: 3940 ± 40 BP, 2560–2300 cal BCE, 2σ) confirm the Chalcolithic chronology of these human remains (Valera, Silva 2011).

Nearby pit 16, there is an open area (still under excavation) that revealed an apparently circular stone structure with several deposits of human burned bones. and also non-human bones and artefacts, all submitted to fire. The MNI has already surpassed 100, with a high number of bones belonging to non-adults. Once again, color changes suggest bones submitted to high temperatures. Also the presence of many small skeleton bones suggested great care in the collection of the human bones, which includes distal phalanges of hands and feet, sesamoid bones and among other small skeletal elements that were not burned there. Moreover, at tomb 1 of Perdigões there are also charred bones. Despite the difficulty of interpretations of these two mortuary contexts there seems no doubt that the use of fire was an important element in the funerary practices of these Chalcolithic human communities.

Ethnographic sources reveal several reasons for cremating human corpses such as to control the spread of disease or to make it easier to transport the remains, for example when death occurred far from home. In Portuguese archaeological record several Late Neolithic/Chalcolithic funerary spaces were interpreted by some authors to have been emptied of human bones for new depositions but without evidence of the use of fire. In another case, at Olival da Pega 2b, located a few kilometers from Perdigões, a mass of in loco cremated human bones was found inside the tomb and were covered by thin slabs for sequent funerary use - this was interpreted as a form of "sanitizing" the space, although the burnt bones were not removed from the tomb (Gonçalves 1999). The funerary context of Pit 16 seems to be different from the above mentioned case, although it could be argued that in some situations, such as this the human bones were removed and brought to Perdigões for final disposal.

At Monte do Carrascal 2, besides the two rock cut tombs mentioned above, one of the most recent deposits on a nearby ditch presented as well an ossuary with cremated or charred human bones (Valera 2012). Its context is not clearly published, yet.

Evidence of burnt bones from Portuguese Late Neolithic/Chalcolithic funerary contexts are described since the end of the 19th century (Boaventura 2009, Silva 2002, 2003a, Silva *et al.* in prep.). These findings, recovered from collective burials of different types (natural caves, rock shelters, dolmens, *tholoi*, stone structure in a walled enclosure) were accompanied by the discussion whether burning was accidental or intentional, and promoted by practical or ritual considerations (Weiss-Krejci 2005). The major problem



FIGURE 15. Pit 16 at Perdigões ditched enclosures with the conical deposit of human cremated remains.

with these funerary contexts is that they were excavated many years ago and nowadays there are no or few information about the disposition of the recovered human remains. So, interpretations of these funerary contexts are limited, besides the lack of radiocarbon dates of the burnt and unburnt human bones from the same site to confirm chronology. A review of Portuguese Middle-Late Neolithic/Chalcolithic burials suggests that when burned bones are present, they are usually a small part of the recovered human remains. Moreover, the dominant color changes are black and brown, that is, they represent charred human bones (exposed to temperatures around 300°C). Therefore, these data are not enough to interpret these contexts, namely to decide if they are accidental or intentional burning. Dolmen of Cabeço dos Moinhos (Figueira da Foz), cave of Cova da Moura, *tholos* of Paimogo 1 are examples of tombs where few burned human bones (with black color) were recovered when compared with unburnt ones. Thus, the evaluation of burned human bones within these contexts is still unchartered waters.

HUMAN BONES INSIDE DITCHED ENCLOSURES

During the last decade the number of identified ditched enclosure sites has increased. Although Santa Vitória was one of the first known sites of that type in Portuguese territory, it was with the site of Perdigões and the research that followed that this type of site became part of the research agenda. The focus of that research has been the Guadiana river basin and Alentejo, and this might be part of the explanation for the concentration of ditched enclosures in that area (Valera 2012a, b). The main chronology for these ditched enclosures is the Late Neolithic/Chalcolithic period, but until now only in large enclosures dated from the Chalcolithic, such as Perdigões and Porto Torrão human remains (mostly parts of skeletons) were recorded inside ditches. However, the presence of human remains among the ruins of walled Chalcolithic sites was already known which might relates not with specific negative structures, but with certain Chalcolithic practices within their settlements, that at that time could have been still inhabited but in decline or already abandoned (Boaventura 2009).

FINAL REMARKS... THIS IS NOT THE END OF THE STORY!

In the last years new discoveries have revealed that the funerary practices from the Middle-Late Neolithic/Chalcolithic in nowadays Portuguese territory are even more diverse than previously thought. This diversity is visible in terms of funerary structures, but as well as on the type of disposal of the dead. The majority of the known cases continue to be of primary and simple disposal of the dead. However more rigorously collected evidence seems to note composed disposal of cadavers, with phased and truly secondary depositions.

Nevertheless some characteristics are similar between different types of tombs, namely its collective nature – wishing to join a group of individuals in the same tomb,

intense manipulations of the human remains resulting in a mass of commingled bones, found very disturbed and fragmented with total or almost total absence of anatomic connections.

In terms of anthropological profile, these tombs included individuals from both sexes and apparently all age groups (although there is a frequent sub representation of individuals with less than 5 years of age) which can indicate egalitarian groups, where almost all were entitle to rest in a collective tomb of their clan. However, a few recent findings seem to remind us that it cannot be the case for all.

The increasing number of burnt human bones contexts detected, as well as inside ditches, seems to highlight changes in funerary practices during the 3rd millennium BCE that are not completely understood, yet.

Besides the more classic approaches to human remains, new methodologies and techniques such as isotope studies and ancient DNA (Silva 2007) will certainly bring new insights to the subject matter. As already mention, recent isotope study of strontium on individuals from Lisbon and from Perdigões showed that although the majority was local, some individuals were born outside their resting place, namely from Alentejo and Estremadura (Boaventura 2009).

Another challenge regarding clusters of rock cut tombs is to evaluate each chronology and whom was deposited inside. This could eventually help to explain its sequence of construction.

The interdisciplinary work conducted in the last decade, together with more rigorous and thorough field recording of archaeological remains has made simultaneously more complex and easier the understanding of those funerary practices. Moreover when it is followed by systematic lab work, and enhanced by GIS management capabilities.

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