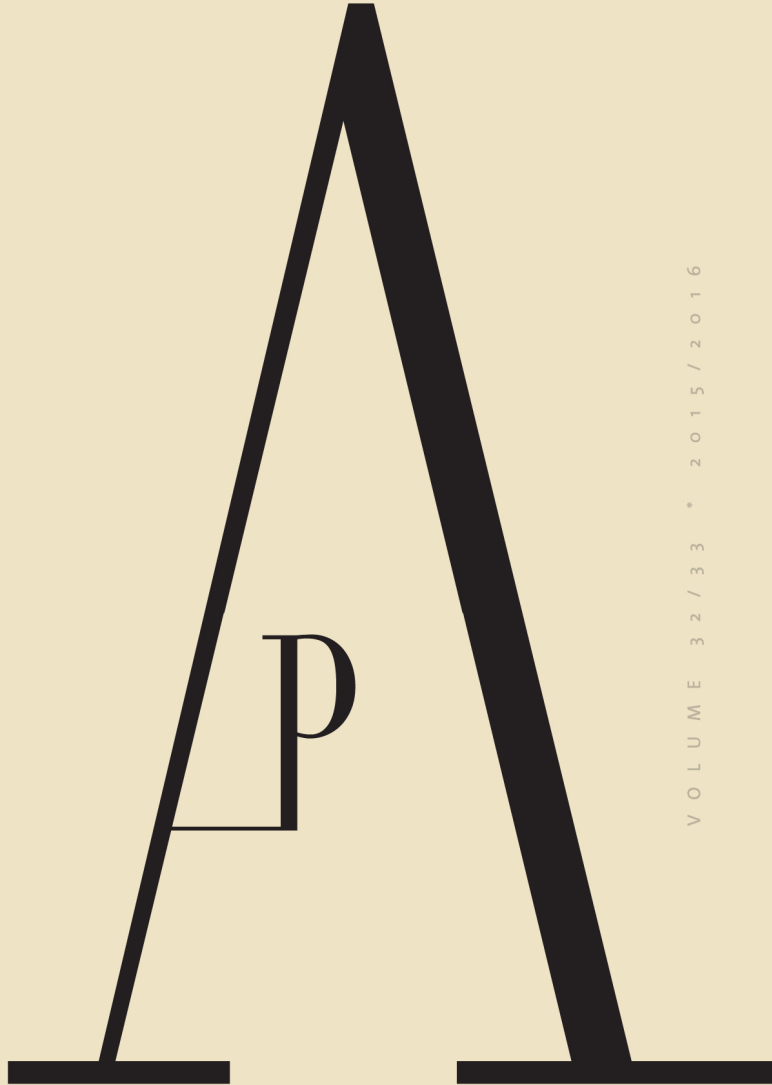


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# Prehistoric trepanation in the Iberian Peninsula: a new case from the province of Badajoz (Extremadura, Spain)



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## Trepanações pré-históricas na Península Ibérica: um novo caso proveniente da província de Badajoz (Extremadura, Espanha)

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**Abstract** Trepanation is a recurrent subject in the literature, with the earliest known examples of this surgical procedure belonging to the Mesolithic/Neolithic periods. The Iberian Peninsula is no exception to this tendency, where most of the known trepanation cases were found in coastal areas (Silva, 2003; Campillo, 2007).

We present the results of the human osteological assessment of Cueva de los Postes, a cave located in southern Badajoz

**Resumo:** A trepanação é um tema recorrente na bibliografia científica especializada, pertencendo os exemplos mais antigos conhecidos ao Mesolítico/Neolítico. A Península Ibérica não é exceção a essa tendência, com a maioria dos casos de trepanação identificados provenientes de regiões próximas do litoral (Silva, 2003; Campillo, 2007).

Neste artigo será descrito um crânio exibindo uma lesão traumática no osso parietal direito

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province, inland Spain, with a particular focus on a skull with a traumatic lesion compatible with a trepanation on the right parietal bone. This is the first reported case of a prehistoric trepanation in this region. A brief comparative analysis with other known Iberian prehistoric trepanations is included, regarding location of the lesions and method of trepanation selected to the procedure.

**Keywords:** Trepanation; drilling method; Mesolithic; Neolithic; Iberian Peninsula.

## Introduction

The study of Neolithic communities in the Spanish Extremadura region was limited, until a few decades ago, to the Megalithic phenomenon and later communities. Much like in the neighboring Portuguese region of Alentejo, no Holocene settlement prior to the construction of megalithic monuments was recognized, thus leading to the notion that these areas were destitute of people until, at least, the beginning of the IV millennium cal BC. Recent works, however, allowed the identification of some sites containing evidence of earlier occupations in the Spanish Extremadura region (González Cordero, 1996; Cerrillo-Cuenca, 2005; Cerrillo-Cuenca and González Cordero, 2011).

compatível com uma trepanação, exumado de Cueva de los Postes (Fuentes de León), uma gruta localizada no Sul da província de Badajoz. Trata-se do primeiro caso de trepanação pré-histórica identificado nesta província de Espanha. Realiza-se uma breve análise comparativa com outros casos de trepanação conhecidos da pré-história da Península Ibérica, incidindo em aspetos como a sobrevivência do indivíduo, o método de trepanação e a localização da lesão.

**Palavras-chave:** Trepanação; método de perfuração; Mesolítico; Neolítico; Península Ibérica.

In 2001, a group of caves in the town of Fuentes de León (Badajoz, Spain) was considered Natural Monument of Extremadura by the regional authorities. Karstic cavities are quite rare in this Spanish region, thus making the caves of Fuentes de León the most important example of this type of feature in Southern Extremadura. Five main caves are known: Cueva de los Caballos, Cueva de los Postes, Cueva del Agua, Cueva de la Lamparilla and Cueva Masero (Algaba Suárez et al., 2000).

Since 1997, a research project ("*Estudio de la Ocupación Humana en el Monumento Natural Cuevas de Fuentes de León*") is under development, with the objective of providing an archaeological and palaeoenvironmental characterization of

this cave complex. Intensive surveys have revealed the presence of archaeological and paleontological remains in four caves (Postes, Caballos, Agua and Masero), as well as rock art in one of them (Agua). Such results led to excavations in both Cueva de los Postes and Cueva de los Caballos in 2004. Ever since, Cueva de los Postes has been excavated and is now known to hold a long stratigraphic sequence.

The human remains recovered from Cueva de los Postes were the subject of a recent osteological analysis, revealing the presence of a minimum number of more than 50 individuals including both sexes and all age groups (Tomé, 2011). Among them, an incomplete skull fragment presented a traumatic lesion — perforation — consistent with a complete trepanation. The aim of this article is the description of the observed cranial lesion and its comparison with the available data on prehistoric trepanation cases in the Iberian Peninsula.

## Archaeological chronostratigraphy of Cueva de los Postes

Cueva de los Postes has an area of 180m<sup>2</sup>, composed of two rooms, separated by an alignment of stalactites and stalagmites. Such speleothems have given the cave its name, since

they resemble posts. Excavation in the first room revealed a long stratigraphic sequence, over 4.2 m deep, complemented with the deposits identified in the second room.

Material culture, absolute dating, sedimentology and palaeoenvironment studies (Duque Espino, 2011; Collado Giraldo, 2014; Ortega Martínez et al., in press) have allowed the definition of four major phases in the occupation of Cueva de los Postes:

Phase 1: Corresponding to the uppermost layers, this phase comprises Stratigraphic Units 1 to 4. This is a highly disturbed deposit, due to the action of archaeological looters, the use of the cave for herding purposes and animal activities, such as burrowing, resulting in the mixing of materials from different chronologies. These included Modern/Contemporary ceramics, but most of the materials corresponded to the Roman Era, including lamps, *terra sigillata* vessels and coins. Some materials seem to correspond to indigenous occupations as well, due to their similarity with the materials recovered from the nearby excavations at the Capote Hillfort, in Higuera la Real (Berrocal-Rangel, 1992; 1994; 1998; Berrocal-Rangel and Ruiz Triviño, 2003).

Phase 2: Grouping together Stratigraphic Units 5 to 10, this phase corresponds to a collective burial deposit, including at least 50 individuals,

33 adults and 17 sub-adults. Radiocarbon dating indicates a Neolithic chronology to this deposit, ranging from the V to the III millennium cal BC (Table 1). Material culture was predominantly composed of small to medium sized oval/spheric ceramic pots, mostly undecorated, although incised, impressed and almagra decorations are present. Lithic industry includes microliths, blades, bladelets, arrow points, halberds and polished axes. Several types of beads were also recovered.

Phase 3: This includes Stratigraphic Units 11 to 14 and represents what seems to be the earliest funerary deposit in Cueva de los Postes. The sub-sample of human remains contained in this horizon corresponded to a MNI of 6 individuals, 5 adults and 1 sub-adult. Radiocarbon dating of charcoal samples (Table 1) indicates a VII millennium cal BC interval. Although apparently the funerary ritual presents similarities with the one recorded for Phase 2, the material culture accompanying the deceased is different. Indeed, ceramics are completely absent

from this funerary deposit, with lithic industry being limited to geometric microliths and a majority of macrolithic tools, produced on local pebbles. Such tools are characterized by limited flaking, mostly on the distal edge. Additionally, three small limestone slabs presented engraved motifs, of both a symbolic and figurative nature (Collado Giraldo and García Arranz, 2010: 1184).

Phase 4: For the time being, the identification of this phase is limited to a small test-pit performed on the deeper room of Cueva de los Postes. This occupation was covered by a calcite coating, dated with the Uranium-thorium series method ( $193 \pm 14$  ky). The presence of flint tools along with the remains of large mammals suggests that there may have been an occupation of Cueva de los Postes during the Middle Paleolithic.

**Table 1.** Radiocarbon dates from the burial deposits of Cueva de los Postes (Collado Giraldo, 2014; Ortega Martínez et al., in press).

Phase	Sample	Provenance	Reference	BP	CAL BC 2 $\sigma$
2	<i>Homo</i>	SU5	Poz-44045	4140 $\pm$ 35	2875–2620
	Charcoal	SU8	Poz-13703	5455 $\pm$ 40	4370–4230
3	Charcoal	SU12	Poz-14616	7360 $\pm$ 50	6370–6080
	Charcoal	SU13	Poz-18774	7440 $\pm$ 50	6420–6220
	Charcoal	SU14	Poz-33226	7780 $\pm$ 60	6770–6460

## Materials and methods

As abovementioned, Cueva de los Postes held a large Holocenic human skeletal sample, comprising over 50 individuals, representing both sexes and all age groups. These skeletal remains were disarticulated and exhibited high levels of fragmentation. Skeletal reassembly was mostly impossible, with only limited secondary connections being identified during the paleobiological assessment. In the present study, one incomplete skull, comprised of a portion of the frontal, both parietals, occipital and left temporal bones, was considered. Skull C6.165 was recovered from Stratigraphic Unit 12, corresponding to the earlier funerary horizon — Phase 3 — of Cueva de los Postes and belonging to an adult individual of unknown sex. No postcranial remains could be associated with this skull and, as such, age-at-death estimation was limited. We can only establish that this individual died somewhere between his thirties and fifties based on the degree of obliteration of the sutures (Ferembach et al., 1979; Masset, 1982).

Regarding chronology, one must bear in mind that radiocarbon dating for this deposit was so far only achieved on charcoal samples, with samples taken from human remains revealing insufficient preserved collagen from which to extract a sufficient amount of carbon as to allow radiocarbon dating. As such, one cannot

assume without caution that this skull has indeed a 7th millennium BC dating, although no disturbances were recorded in this deposit and the material culture is consistent with a Mesolithic chronology. Even so, issues such as the “old wood effect” must not be overlooked in the interpretation of this specimen. Direct radiocarbon dating of the human remains recovered in these deposits should be performed if possible, in order to provide a better insight on the chronology of this funerary context.

The presence of a perforation suggestive of a complete trepanation on this cranial vault led to a detailed differential diagnosis of this lesion, aiming at the clarification of its aetiology.

## Description of the lesion

The lesion is located on the right parietal, *circa* 18mm away from the sagittal suture and 48mm from the bregma. With a sub-circular shape and beveled edges, the lesion has an anteroposterior diameter of 12 mm and a mediolateral diameter of 11 mm on the exocranial surface, with slightly smaller dimensions on the endocranial surface (Figures 1 and 2).

The perforation was complete. Some traces of bone remodeling are observable around the edges of the

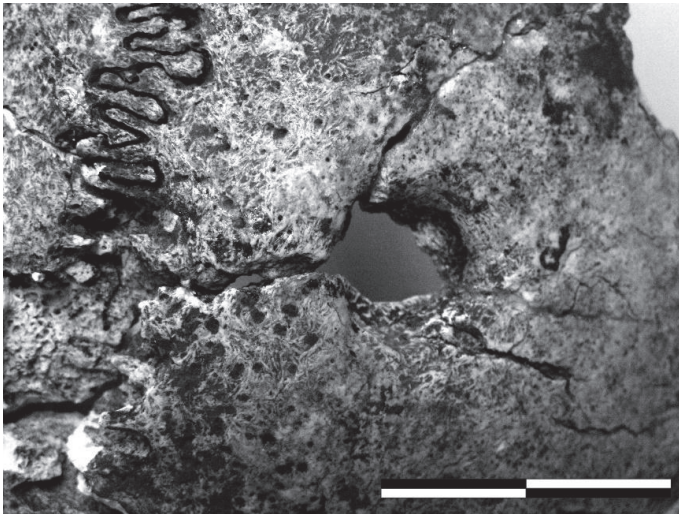


**Figure 1.** Superior view of the skull C6.165 from Cueva de los Postes, presenting a perforation on the right parietal bone compatible with a complete trepanation.

lesion, including some areas of the diploe covered by compact bone, indicating remodeling and thus that the individual survived the procedure. The general

appearance of the lesion suggests the use of the drilling method.

Previous studies on the time course of bone remodeling following trepanation



**Figure 2.** Close-up view of the described lesion of skull C6.165 from Cueva de los Postes with visible bone remodeling.

suggest that slight remodeling, as is the case with the skull presented here, can occur up to one year after the trepanation procedure (Nerlich et al., 2003). As such, one may not exclude that this individual had a somewhat lengthy survival to this procedure. No evidences of infection were identified.

Differential diagnosis of the lesion included taphonomic perforation and fracture. Although some taphonomy-related alterations were visible in the area of the lesion, such as several fractures radiating from the perforation, these seem to have been related to depositional conditions — possibly relating to the pressure overlying these remains, coupled with the structural fragility that the presence of a perforation in that area would imply. A taphonomic origin of the perforation was excluded due to the visible signs of bone remodeling. The characteristics of the perforation, a circular opening with the external table slightly wider than the inner one, permitted to exclude the fracture hypothesis. Therefore, trepanation seems to be the more reasonable diagnosis.

### **Prehistoric trepanation in Iberia — a short review**

Trepanation has been consistently described in archaeological literature

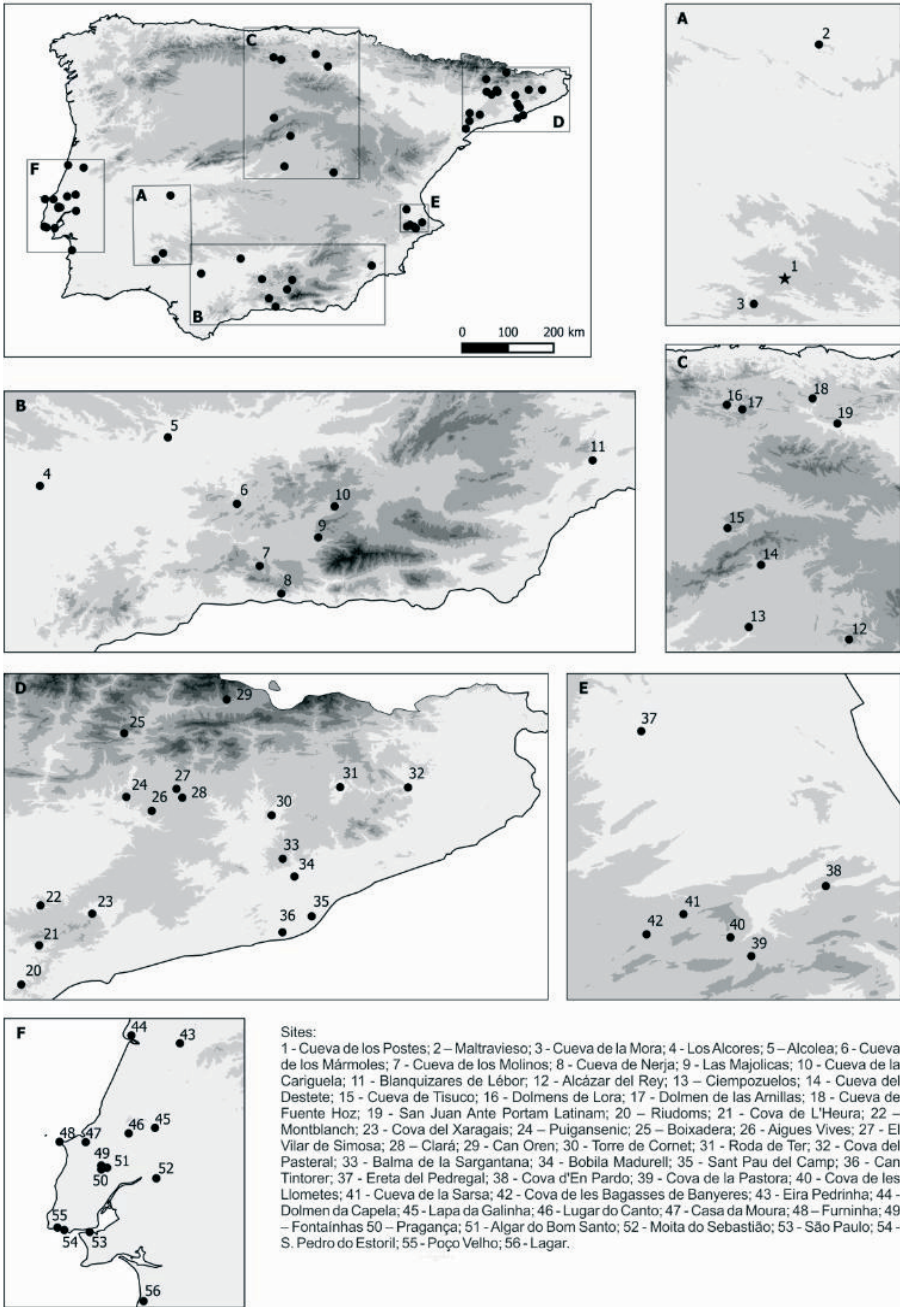
throughout the world, with the oldest known examples dating to the Mesolithic/Neolithic periods (Campillo, 1976; 1984; 2007; Ortner, 2003; Weber and Wahl, 2006; Andrushko and Verano, 2008; Bennike, 2008).

Regarding the Iberian Peninsula, the earliest example comes from the Moita do Sebastião Mesolithic shell midden, but trepanations occur predominantly in later contexts (Crubézy et al., 2001; Silva, 2003; Campillo, 2007). Trepanation can be performed for a variety of reasons, namely the removal of bone splinters or blood accumulations resulting from traumatic injuries, as well as for ritual reasons (Weber and Wahl, 2006; Campillo, 2007; Bennike, 2008; Waldron, 2009). Techniques for performing trepanations include scraping, grooving, sawing, drilling, boring or chiselling (Campillo, 2007; Bennike, 2008).

The location of Cueva de los Postes raises some issues in terms of the most appropriate contexts for comparative purposes. Indeed, most of the Spanish trepanation cases come from funerary sites located further away from Cueva de los Postes than their Portuguese counterparts. As such, both Portuguese and Spanish contexts must be taken into consideration (Figure 3).

The most recent review of Portuguese prehistoric trepanations (Silva, 2003) lists a total of 22 cases, found exclusively in coastal areas. However, differential





**Figure 3.** Map of sites containing prehistoric trepanned skulls in the Iberian Peninsula.

preservation can play an important role in this issue. Indeed, several coastal areas of Portugal correspond to limestone massifs, while inland areas are mostly composed of granite and schist massifs, usually associated with poor bone preservation. Until the present day, no trepanations are known from Portuguese territories in closer vicinity to Cueva de los Postes. Nevertheless, this may change in the near future, as new prehistoric burial sites are being discovered and studied in Portuguese territories close to the Badajoz province (Gonçalves and Sousa, 2000; Valera et al., 2000; Miguel and Godinho, 2009; Valera, 2010; Valera and Filipe, 2010). Regarding the Portuguese coastal examples, scraping and incision are the most common trepanation methods, although some cases of drilled trepanations are known, mostly on more ancient cases (Silva, 2003). As for the location of lesions, parietals are clearly the most commonly affected bones (85%). Survival to the procedure also seems to be frequent in these individuals. Trepanation seems to have been performed mostly on male individuals. As is the case with the Cueva de los Postes specimen, most of the Portuguese cases exhibit no indications of the justification for the performance of cranial surgery, such as traumatic injuries (Silva, 2003).

A similar tendency seems to occur in Spain, with trepanations being more

commonly found in sites located at peripheral, coastal areas (Liesau von Lettow-Vorbeck and Pastor Abascal, 2003; Campillo, 2007). It is worth noting that Spanish prehistoric trepanations were performed mostly with the drilling method (Campillo, 1976; 1986; 2007), the same technique applied to the individual from Cueva de los Postes. Sites such as Cova de la Pastora (Alicante), for instance, are indicative of this predominance of drilled trepanations (Campillo, 2007; McClure et al., 2011). A few other examples are known from inland Spanish areas, such as the Meseta, from either Late Neolithic megalithic burials or from cave burials, possibly of a Neolithic chronology (Liesau von Lettow-Vorbeck and Pastor Abascal, 2003; Campillo, 2007).

Regarding the Spanish Extremadura, there is only one other described trepanation, found at the Cave of Maltravieso, in Cáceres. It is from a female individual that presents a left parietal lesion, larger (38 x 28 mm) than the one described for Cueva de los Postes. Bone remodeling is also noted (Álvarez Rojas, 1984; Campillo, 2007). This skull is associated with a Bell Beaker context (Liesau von Lettow-Vorbeck and Pastor Abascal, 2003). Up until now, prehistoric trepanations were unknown in the province of Badajoz. Nevertheless, a reference is necessary to a case located quite close to the one now presented. Cueva de la Mora (Jabugo), in the

province of Huelva, yielded a skull belonging to an adult male, presenting a large trepanation, produced with incision technique, affecting the frontal and both parietal bones. This trepanation is described as having been performed *postmortem* (Campillo, 2007; Guillén Arenas, 2015).

In terms of chronology, the specimen from Cueva de los Postes may represent one of the earliest cases of trepanation known in the Iberian Peninsula, given that the earliest examples come from sites with a contemporary chronology to the intervals obtained for the Phase 3 of Cueva de los Postes (VII millennium cal BC).

## Final remarks

Trepanation occurred in the Iberian Peninsula at least from the Mesolithic onward. Several prehistoric cases were described ever since the 19th century, concentrating mostly on coastal regions (Crubézy et al., 2001; Liesau von Lettow-Vorbeck and Pastor Abascal, 2003; Silva, 2003; Campillo, 2007).

The specimen reported here represents the first known case of a prehistoric trepanation in the province of Badajoz (Spain). Other known cases from the Iberian Peninsula suggest that parietal lesions are predominant. In

terms of the technique, the Cueva de los Postes specimen seems to fit within the tendency for Spanish prehistoric trepanations being mostly performed with the drilling method (Campillo, 2007). This method was also used in Portuguese prehistory, although not in such a predominant way and apparently in the oldest cases (Silva, 2003). One other common feature of several prehistoric trepanned skulls is the presence of bone remodeling, indicating the survival of the individual to this surgical procedure or other complications, such as infections (Campillo, 1976; 1984; 2007; Silva, 2003). The Cueva de los Postes individual described here also shows these traces.

Although coastal areas concentrate the majority of prehistoric trepanations known in the Iberian Peninsula, examples such as the case described here from Cueva de los Postes, the female individual from Maltravieso — both in the Spanish Extremadura —, among others known from the Spanish Meseta and Andalucía, demonstrate that trepanations were also a practice of inland communities. The preservation issues that are known to affect human skeletal remains in inland Iberian regions are, quite likely, also responsible for the shortage of trepanation cases thus far confirmed in such areas. The ongoing development of projects focusing on prehistoric funerary practices on inland territories of the Iberian Peninsula will likely lead

to further identification of trepanation being performed by such communities. The case described here from Cueva de los Postes represents a contribution to our understanding of the medical knowledge of prehistoric communities in inland Iberia, suggesting that cranial surgery was performed by both coastal and inland communities at least as far back as the VII millennium cal BC.

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