Funerary practices of the Iberomaurusian population of Taforalt (Tafoughalt, Morocco, 11–12,000 BP): the case of Grave XII

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A R T I C L E   I N   P R E S S

A B S T R A C T

The Iberomaurusian necropolis of Taforalt (Morocco, 11-12000 BP), excavated by Roche in the 1950s, contains 28 multiple graves. The funerary practices of the Taforalt population have been the focus of a previous work (Mariotti et al., 2009). In the absence of the excavation records of the necropolis, these funerary practices were investigated through the analysis of the contents of each grave and the distribution of intentionally modified specimens (ochre-dyeing, cut marks). Previous research has drawn particular attention to Grave XII (containing three male adults and two juveniles), where many intentionally modified specimens were identified. The present study focused specifically on the human remains recovered from Grave XII. Analysis of these remains has provided evidence of interventions, such as dismemberment and defleshing of the cadaver, and the use of ochre to colour the bones. Furthermore, the presence of lesions on two skulls suggests the possibility of intentional killing and cannibalism among the Taforalt population. This study further supports our previous impression of the complex and diversified funerary practices, characterising the social life of the Iberomaurusian population of Taforalt.

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Introduction

The funerary practices of the Iberomaurusian populations of North Africa have not been adequately investigated thus far, in spite of evidence of the existence of interesting rites and practices among these human groups, as revealed at many sites (e.g., Afalou) (Arambourg et al., 1934; Roche, 1963).

The subject of funerary practices has attracted our attention since 1999, when we began the study of the Taforalt human skeletal collection (Tafoughalt; Morocco, 11–12,000 BP), with the aim of contributing to the study of the microevolutionary changes in these Mediterranean populations during the Pleistocene/Holocene transition. The Iberomaurusian necropolis of Taforalt, containing 28 multiple graves, was excavated by Roche in the 1950s (Roche, 1953, 1963, 1976; Ferembach, 1962), and a synthesis of its archaeological context was recently published (Mariotti et al., 2009). Different biological and cultural aspects of Taforalt have been analysed (Mariotti et al., 2002, 2004; Belcastro et al., 2003, 2006a, b; Bonfiglioli et al., 2004, etc.), including a general overview of the funerary practices of the population buried in the Taforalt cave (Mariotti et al., 2009). In the latter study, the bones of adolescents and adults were inventoried to calculate the minimum number of individuals (MNI) in each grave, as well as from the entire necropolis. The distribution of intentionally modified specimens (with ochre-dyeing and cut marks) was also analysed. The results suggested that the necropolis represented a group of primary and secondary burials, even within the same “grave,” of about 40 adolescents and adults (thus reducing the previous sample size estimate of 86 individuals; Ferembach, 1962). The analysis of the distribution of ochre and cut marks on bones revealed the particular situation of Grave XII (containing three adult males and two juveniles). In the entire necropolis, intentionally modified specimens were found scattered in different graves, and ochre and cut marks were generally not associated on the same bone. However, in Grave XII, ochre and cut marks were found on the bones of possibly a single individual, where the colouring was performed some time after the modification of the cadaver, which left the cut marks. The aim of the present study was to further investigate the case of Grave XII, where evidence of traumatic events was also found, particularly involving the skulls.

Materials and methods

The study sample included the cranial and postcranial bones of Grave XII, which contained three male adults (Individual1,
Individual 4: middle-aged adults; Individual 5: adult) and two juveniles (Individual 2, Individual 3) (Tables 1 and 2).

The sex and age attribution of the adult specimens has already been discussed (Mariotti et al., 2009). The age of Individual 2 was estimated at about three to four years. In this individual, the sutura intra-occipitalis anterior, which is normally completely closed between the ages of five to seven years, was still open, while the sutura intra-occipitalis posterior, which closes between the first and third year, was completely fused (Scheuer and Black, 2000). The age of Individual 3 was estimated to be about 12 years, based on the dentition (Ubelaker, 1989).

The attribution of bones to the same individual was based on size criteria and on the presence and pattern of ochre-dyeing and cut marks. Only in some cases was it possible to verify the articulation (e.g., ulna-radius). The stature of the adult specimens was estimated following Pearson (1899). For each bone, we recorded whether it had been completely/extendively or partially dyed with red ochre, if there were only traces of colour, or if colouration was absent.

Each bone was analysed for the presence of tool-induced modifications of three types: cut marks (sharp, elongated grooves with a transverse V-shaped section; containing within its edges multiple, fine, parallel striations oriented longitudinally; caused by the sawing motion of a blade), scrape marks (a dense series of usually superficial, parallel striations across a broad area of bone; caused in the attempt to remove soft tissue from the bone surface, especially periosteum), and chop marks (broad grooves, V-shaped in cross section; caused by percussion with the edge of a stone tool to cut soft tissue or break bones) (Shipman and Rose, 1983; White, 1992). For each potential modification, we carried out a scanning electron microscopy (SEM) analysis (Jeol SEM 5200). The silicone resin replicas for the SEM analysis were obtained using a stone tool to cut soft tissue or break bones (Aiello and Dean, 1990; Aiello and Reichs, 1998; Cattaneo and Grandi, 2004; Kimmerle and Baraybar, 2008). In the present study, the following terminology was adopted: skull (cranium and mandible), cranium (skull without mandible), calvaria (cranium without face) (Aiello and Dean, 1990; White and Folkens, 2000; SOM—Table 1 in Mariotti et al., 2009).

The term peri mortem refers to injuries that may have occurred in the recent ante mortem period (up to three weeks before death) and that are therefore unhealed, or that alternatively may have occurred in a post mortem period that is of indeterminate length (perhaps weeks or months) but during which the bone is still relatively fresh and its organic components not yet deteriorated (Lovell, 1997).

Results

The inventory of bones in Grave XII is presented in Table 1. The attribution of bones to the different individuals and the distribution of ochre and tool-induced modifications is presented in Table 2.

Juvenile remains

The juveniles were represented only by the cranial skeleton; the calvaria for Individual 2 (Tf XII-C2; three to four years) and the cranium (calvaria and face separated) for Individual 3 (Tf XII-C3; 12 years). Both calvariae were extensively dyed with ochre; the greatest amounts were found in rough areas or in the interstices (e.g., sutures), while the smooth surfaces presented only traces of colour. In norma basilaris (Fig. 1), the preserved parts of the cranial base, including the sutures and articular surfaces (cranial condyles

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**Table 1**

Inventory of the human osteological material of Grave XII of the Taforalt Necropolis.

<table>
<thead>
<tr>
<th>Bone</th>
<th>ID mark</th>
<th>Side</th>
<th>Preservation</th>
<th>Ochre a</th>
<th>Cut b</th>
<th>Sex/age</th>
<th>Individual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skull</td>
<td>Tf XII-C1</td>
<td>Incomplete cranium (lacking I. part of face)</td>
<td>Y</td>
<td>Y</td>
<td>M/MA</td>
<td>Individual1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tf XII-C1</td>
<td>Mandible</td>
<td>Y</td>
<td>N</td>
<td>Individual1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tf XII-C4</td>
<td>ca. Complete cranium</td>
<td>(Y)</td>
<td>N</td>
<td>M/ MA</td>
<td>Individual4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tf XII-C4</td>
<td>R mandibular fragment</td>
<td>(Y)</td>
<td>N</td>
<td>Individual4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tf XII</td>
<td>Various cranial fragments</td>
<td>Y</td>
<td>N</td>
<td>M/NI</td>
<td>Individual5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tf XII-C2</td>
<td>Calvaria</td>
<td>Y</td>
<td>3–4 y.</td>
<td>Individual2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tf XII-C3</td>
<td>Calvaria + face</td>
<td>Y</td>
<td>12 y.</td>
<td>Individual3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vertebræ</td>
<td>S XII</td>
<td>C1; T12; L1-5</td>
<td>Y</td>
<td>Y</td>
<td>Individual1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S XII-C4</td>
<td>C1-7</td>
<td>N</td>
<td>N</td>
<td>Individual4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S XII</td>
<td>4L + fragments</td>
<td>(N)</td>
<td>N</td>
<td>Individual4 or 5?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sternum</td>
<td>Tf XII</td>
<td>Manubrium + corpus with xiphoid process ossified</td>
<td>Y</td>
<td>N</td>
<td>Individual1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tf XII</td>
<td>Manubrium (fragment)</td>
<td>N</td>
<td>N</td>
<td>Individual4 or 5?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ribs</td>
<td>Tf XII</td>
<td>Left (1,2,3,5,7,8,9,11) and right (1,3,4,6,7,8,9,11,12) ribs often lacking the extremities + fragments</td>
<td>Y</td>
<td>Y</td>
<td>M/Adult</td>
<td>Individual1</td>
<td></td>
</tr>
<tr>
<td>Scapula</td>
<td>Tf XII</td>
<td>R Fragment</td>
<td>(Y)</td>
<td>nr</td>
<td>Individual4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humerus</td>
<td>Tf XII-C4</td>
<td>“niveau inf. devant c4”</td>
<td>R Complete</td>
<td>N</td>
<td>M/Adult</td>
<td>Individual4</td>
<td></td>
</tr>
<tr>
<td>Ulna</td>
<td>Tf XII Niveau inf</td>
<td>L Complete</td>
<td>N</td>
<td>N</td>
<td>M/Adult</td>
<td>Individual4</td>
<td></td>
</tr>
<tr>
<td>Tf XII</td>
<td>L Distal half</td>
<td>Y</td>
<td>N</td>
<td>M/Adult</td>
<td>Individual1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radius</td>
<td>Tf XII-P niveau inf</td>
<td>L ca. Complete</td>
<td>N</td>
<td>N</td>
<td>M/Adult</td>
<td>Individual4</td>
<td></td>
</tr>
<tr>
<td>Tf XII</td>
<td>L ca. Complete</td>
<td>Y</td>
<td>N</td>
<td>M/Adult</td>
<td>Individual1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hands</td>
<td>Tf XII</td>
<td>All metacarpals; I, II, III proximal phalanges; II, III intermediate phalanges; carpals</td>
<td>Y</td>
<td>N</td>
<td>M/Adult</td>
<td>Individual1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tf XII</td>
<td>R Phalanx</td>
<td>N</td>
<td>N</td>
<td>Individual1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pelvis</td>
<td>Tf XII-B2</td>
<td>2 Phalanges</td>
<td>N</td>
<td>N</td>
<td>Individual4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tf XII-B1</td>
<td>Pelvis lacking R pubis</td>
<td>Y</td>
<td>Y</td>
<td>M/ OA</td>
<td>Individual1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tf XII-B1</td>
<td>1S; R fragment (acetabulum + pubis)</td>
<td>N, (Y)</td>
<td>N</td>
<td>M/ OA</td>
<td>Individual5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tf XII</td>
<td>R pubis fragment</td>
<td>Y</td>
<td>N</td>
<td>NI/Adult</td>
<td>Individual5</td>
<td></td>
</tr>
<tr>
<td>Patella</td>
<td>Tf XII-B2</td>
<td>Sacrum, L coxal bone</td>
<td>(Y)</td>
<td>N</td>
<td>M/Adult</td>
<td>Individual5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tf XII-B1</td>
<td>R Complete</td>
<td>Y</td>
<td>N</td>
<td>M/Adult</td>
<td>Individual1</td>
<td></td>
</tr>
<tr>
<td>Fibula</td>
<td>Tf XII</td>
<td>L Complete</td>
<td>Y</td>
<td>N</td>
<td>M/Adult</td>
<td>Individual1</td>
<td></td>
</tr>
</tbody>
</table>

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a Y = bone completely or extensively dyed with ochre; (Y) = partially dyed with ochre; (N) = traces of ochre, probably not deliberate; N = not dyed with ochre.

b Y = cut marks present; N = cut marks absent; nr = not recordable.
deep cut marks were seen that were continuous with those on the right frontal bone, near the frontozygomatic suture, at the inferior limit of the zygomaticomaxillary suture (Figures 3, 6). The right zygomatic was detached from the right zygomatic. The most superior part of the face; MD: mandible. FR: fragments. x Piece present. few pieces present.

Table 2

<table>
<thead>
<tr>
<th>SEX-AGE</th>
<th>CRANIAL SKELETON</th>
<th>VERTEBRAE</th>
<th>RIBS</th>
<th>SIDE</th>
<th>L</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>INDIVIDUAL 1</td>
<td>M - middle-old adult</td>
<td>180.75 cm</td>
<td>xco-ct</td>
<td>xco-ct</td>
<td>xco-ct</td>
<td>xco-ct</td>
</tr>
<tr>
<td>INDIVIDUAL 2</td>
<td>NI - 3–4 years</td>
<td>181 cm</td>
<td>xco-ct</td>
<td>CAco-ct</td>
<td>xco-ct</td>
<td>xco-ct</td>
</tr>
<tr>
<td>INDIVIDUAL 3</td>
<td>NI - 12 years</td>
<td>xco-ct</td>
<td>CAco-ct</td>
<td>CAco-ct</td>
<td>(x)po</td>
<td>FRco</td>
</tr>
<tr>
<td>INDIVIDUAL 4</td>
<td>M - middle-old adult</td>
<td>164.56 cm</td>
<td>(x)*</td>
<td>(x)*</td>
<td>FRco</td>
<td></td>
</tr>
<tr>
<td>INDIVIDUAL 5</td>
<td>M - adult</td>
<td>Radius = 170.94 cm</td>
<td>C: MD (right FR)</td>
<td>C: MD (right FR)</td>
<td>FRco</td>
<td></td>
</tr>
</tbody>
</table>

co: completely or extensively dyed with ochre; po: partially dyed with ochre; ct: cut marks/scrape marks present. Cranial skeleton: C: cranium; CA: calvaria; SF: superior part of the face; MD: mandible. FR: fragments. x Piece present.

(‡)Few pieces present.

Individual 2 exhibits a roughly squared depressed fracture on the right parietal, penetrating the anterolateral corner, and associated with two linear fractures radiating laterally and medially from the anterior side of the modification (Fig. 8). The depressed surface showed scrape marks extending on the surface surrounding the modification. These scrape marks were oblique to the MSP. Some ochre had accumulated along the medial margin of the fracture. In the inner table, a decorticated area around the penetrating area of the fracture was visible (Fig. 8). On the left occipital squama near the coronal suture, another less invasive depressed fracture was observed. Here, the ochre also accumulated along the medial margin of the lesion (Fig. 8).

Adult remains

All of the bones attributed to Individual 1 were dyed with ochre (Table 2). The pigment covered the skull, with the exception of the glenoid cavities and part of the cranial condylar surface (Fig. 9). In the vertebral column, the ochre coloured the anterior part of the vertebral bodies. On the atlas, the superior facets and the articulation for the dens of the axis were uncoloured. The intervertebral articular surfaces of all vertebrae were also uncoloured. The sternum was irregularly dyed on both its anterior and posterior surfaces. The preserved hand bones, with the exception of the hamate, were completely dyed, both on the palmar and dorsal surfaces but not on the articular surfaces. The pelvis was extensively dyed, but the acetabula were uncoloured. Taking into account the possibility that the bones of the same individual were buried in different graves (Mariotti et al., 2009), it is possible that the right tibia, T2 X, belongs to Individual 1 of Grave XII. Its dimensions are comparable with those of the contralateral fibula. T2 XIII, and both bones are almost completely dyed with ochre. In particular, the tibia shows a uniform colouration, including the condylar surface, and only the distal end is uncoloured (Figs. 2 and 4 in Mariotti et al., 2009).
The bones of Individual 1 display many lesions. On the left superciliary arch, at least three parallel, shallow grooves are present and are oriented perpendicularly to the orbital margin. Their surface is lined by many parallel striae. Above the grooves, a bony flake was removed, and the area of detachment is covered by obliquely oriented scrape marks (Fig. 10). Other areas of flake detachment are visible on the cranial vault (at least five, which are about one to 1.5 cm long, one on the left frontal bone and one on the right side, near the coronal suture and temporal line, one on the left parietal near bregma and one on the right parietal near to the sagittal suture). The surfaces of all of these lesions are covered by scrape marks (Fig. 11).

Other lesions included a linear fracture starting from the left superciliary arch and affecting the whole orbital cavity, and the removal of a wide flake from the supraorbital margin (Fig. 9), leaving the frontozygomatic suture intact. The broken surface is rough. Both of these fractures are unhealed. The left part of the face is missing. On the medial part of the scraped area on the right part of the frontal bone, a roughly circular depressed fracture was observed (about 1.5 cm in diameter), which invaded the inner table of bone. The scrape marks apparently did not extend beyond the margins of the fracture. Ochre had accumulated along its medial margin. In the inner table, three linear fractures were apparent (Fig. 12). Ochre was observed on all of the lesions described thus far.

The axis and C-6 exhibit cut marks on the ventral surfaces of their bodies. Deep cut marks are also present on several ribs. The pelvis displays different types of cut marks. On the left coxal bone, they involve the superior part of the acetabular rim, the regions near the greater sciatic notch and above the ischial tuberosity, and the superior ramus of the pubis (Fig. 13). On the right coxal bone, a series of cut marks were found on the lateral face of the ilium above the inferior gluteal line.

On Individual 4, ochre is particularly evident on the left parietal, where an accumulation of about one cm in diameter is seen in the centre of a wide stain. The right scapular fragment is also partially coloured. The pelvic fragments present traces of colour on the symphysis. All of the cranial fragments in Individual 5 were dyed with ochre. In particular, the zygomatic, mandibular and maxillary fragments are completely coloured, including the occlusal surface of the teeth (Fig. 5 in Mariotti et al., 2009). The left coxal bone is coloured on the lateral face of the ilium, but to a lesser extent on the medial surface. No ochre is present in the acetabulum. The sacrum also displays traces of ochre (although the auricular surfaces did not), as does the pubic symphysis.
Discussion

Juvenile remains

In both individuals, the distribution of ochre suggests that the colouration was carried out on disarticulated and defleshed skulls. The abundance and distribution of cut marks in these individuals indicates intentional defleshing of the skulls (Figures 3, 7). In particular, the facial skeleton of Individual 3 presents a high concentration of cut marks on the entire surface, attesting to extensive defleshing (Fig. 3). The absence of the entire facial skeleton in Individual 2 and the detachment of the upper facial skeleton from the calvaria in Individual 3, as well as the absence of breakage in all of the articular regions preserved, suggest removal of the face after decomposition. In the dyeing process, the ochre would have been kneaded to adhere to the bone. Exhumation, possible treatment with ochre and secondary bone deposition was previously

Figure 4. TF XII-C2: cut marks on the left temporal squama (occipital to the left) (top) and SEM image of the same cut marks with ochre accumulation (bottom).

Figure 5. TF XII-C2: frontonasal region of the frontal bone. The arrows indicate the position of the cut marks.

Figure 6. TF XII-C2: cut marks on the left temporal squama (occipital to the left) (top) and SEM image of the same cut marks with ochre accumulation (bottom).

Figure 7. TF XII-C3: frontozygomatic region. The arrows indicate the position of the cut marks, the triangle indicates the osseous flake removed near the inferior orbital margin.
Figure 8. Calvaria Tf XII-C2. Top left: position of the depressed fractures. Top and bottom right: depressed fracture on the right parietal (ectocranial and endocranial surfaces). Bottom left: depressed fracture on the left occipital squama.

Figure 9. Tf XII-C1 in norma basilaris. Note ochre distribution. Right: particular of the left orbital region showing the linear fracture and the removal of the flake from the supraorbital margin.
The bone (Fig. 2). Unfortunately, the accumulation of ochre on the bony flake covered by scrape marks from the superior part of the grooves attributed to direct blunt traumas with small objects (pebble, extremity of a stick, etc.) (Lovell, 1997). For the parietal fracture, the presence of scrape marks on the depressed fracture and surrounding surface lead us to believe that the blow was inflicted after defleshing, and thus after the death of the child. The decorated area on the endocranial surface suggests the presence of soft tissue when the traumatic event took place (Berryman and Symes, 1998; Powers, 2005). This endocranial area is dyed with ochre, so the trauma preceded colouring. Also, for the occipital fracture, the morphology of the damage suggests a peri mortem event. Ochre had accumulated on the border of this lesion too, indicating that dyeing followed the blow.

Some hypotheses on the sequence of the events are reported in Table 3.

### Adult remains

In Individual 1, the distribution of ochre on all of the bones indicates that the colouration was carried out after the modifications had occurred. The skull, mandible, vertebral column, sternum and ribs may still have been in articulation when the pigment was applied, or some facets may have been accidentally or intentionally spared from dyeing, due to their anatomical conformation (e.g., sternum-rib joints). In some cases, it is likely that the colouring was carried out on bones already devoid of soft tissue (Mariotti et al., 2009). In fact, the ulna, radius, patella, fibula and tibia Tf X (supposedly belonging to Individual 1), are almost completely and uniformly dyed, including their joint surfaces. The left hand may have been articulated when the dyeing was carried out, however the fact that the hamate as well as the radial distal epiphysis are completely coloured, suggests at least partial decomposition (the right hand is only represented by two coloured phalanges). The acetabular cavities may have easily been spared, even in the case of an absent femur. We suggest a state of advanced decomposition for the trunk, since the ventral faces of the ribs, sternum and vertebrae are all coloured.

The scrape marks associated with the area of bony flake detachment on the cranial vault indicates skull defleshing. The scrape marks on the depressed fracture of the frontal bone suggest that the blow was subsequent to the defleshing, and was thus inflicted after the individual’s death. Ochre was applied subsequently, as it accumulated on the borders of the lesion (see Fig. 2 in Mariotti et al., 2009).

The linear fracture observed on the left orbital region may have been the result of direct blunt trauma, possibly suggesting that the individual suffered a post mortem blow in the region of the left eye, causing the fracture (punch, throw of a stone, fall, etc.). As a result of this blow, the zygomaticomaxillary region (except the frontozygomatic joint that is not damaged) may have been fractured. Taking into account that the zygoma, maxilla and orbital margin are mutually supportive, a fracture of one of these bones usually involves the fracture of at least one of the others (Lovell, 1997). The wide fracture on the orbital margin may have occurred at the same time or later on. The absence of evidence for intentional disarticulation of the left part of the face is explained by the hypothesis that the blow compromised stability and that this region:

1. Was detached post mortem for accidental reasons;
2. Was detached easily at the moment of post mortem manipulation (e.g., ochre colouring);
3. Was intentionally removed at the moment of peri or post mortem manipulation (e.g., ochre colouring), and that possible cut marks were present only on the part that is not preserved.

### Table 3.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Was detached post mortem for accidental reasons;</td>
<td></td>
</tr>
<tr>
<td>2. Was detached easily at the moment of post mortem manipulation (e.g., ochre colouring);</td>
<td></td>
</tr>
<tr>
<td>3. Was intentionally removed at the moment of peri or post mortem manipulation (e.g., ochre colouring), and that possible cut marks were present only on the part that is not preserved.</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 10.** Tf XII-C1: grooves on the left superciliary arch, lined by many parallel striae. Note the area of removal of the bony flake covered by scrape marks from the superior part of the grooves.
On the postcranial skeleton, the cut marks on the anterior part of the vertebral body of C-2 and C-6 were probably made to sever the anterior longitudinal ligament that links all of the vertebrae by binding each vertebral body. The position of the cut marks on the dorsal surfaces of the ribs indicates the possible removal of serratus anterior, originating from the first eight or nine ribs and inserting on the medial scapular margin. The cutting of this muscle contributed to the disarticulation of the scapula. The cut marks on

Figures 11-12. 

Figure 11. Tf XII-C1: areas of flake detachment on the frontal (left) and left parietal (right) bones.

Figure 12. Tf XII-C1: depressed fracture on the right part of the frontal bone. Views of the scraped area (top right), of the scrape marks on the depressed surface (bottom left), and of the endocranial surface of the lesion (bottom right).
the coxal bones indicate many attempts to sever ligaments and muscles of the hip. Those on the lateral surface of both ilia may be related to the cutting of the lesser gluteal muscle. Those above the ischial tuberosity may be the result of severing the semitendinosus and the long head of the biceps muscles that insert on the medial surface of the tibia and on the fibular head, respectively. The cut marks on the superior part of the acetabular rim may be related to the cut of the hip capsula, or possibly the reflected tendon of the rectus femoris. Finally, those on the superior ramus of the pubis may be related to cutting of the pectineal muscle that links the coxal bone and the femur. All of these cut marks are clearly related to the disarticulation of the femur, which is absent.

In the Taforalt necropolis, the distribution of ochre and cut marks at Grave XII represents a unique case. In fact, it is the only burial where all of the skulls were at least partially dyed with ochre; all of the bones attributable to the same individual (the tallest and most robust male) were coloured, and all of the bones presenting tool-induced modifications were also dyed with ochre (in addition to the specimens of the burial under examination, only the skull, Tf VIII-XIII, of Grave VIII presented both ochre and cut marks; Mariotti et al., 2009). Two other particular cases are represented at Grave X, which contained only two ochre-dyed specimens (a calotte and a tibia, the latter possibly belonging to Individual 1 of Grave XII), and Grave V, which contained various bones with cut marks (Mariotti et al., 2009).

On the basis of the contents of each grave and of the distribution of ochre and cut marks in the whole necropolis, a general overview of the funerary practices of the Taforalt population has been presented (Mariotti et al., 2009). A detailed documentation of the context in which the human remains were discovered is not available. However, our study of the collection led us to the hypothesis that many of the graves contained both primary burials, with the skeleton always incomplete, particularly due to the subsequent removal of bones, and secondary depositions of skeletal parts. The abundance of bones in secondary burial and the presence of cut marks on only a small number of specimens suggest that bone removal from primary inhumations (or from corpses left in the open to decompose, even if signs of carnivore or rodent teeth have not been observed, with the exception of a few doubtful cases) usually occurred in already largely skeletonised remains. The pattern of bone colouring suggests that ochre-dyeing of bones probably took place after decomposition of soft tissue. Thus, the funerary practices of the Taforalt population included rituals carried out well after death.

In the case of the Grave XII, it seems that the major part of the bones recovered were in secondary deposition. The most problematic case is Individual 1 (the most complete skeleton), for which the primary or secondary character of the deposition is unclear. We observed that the ochre-dyeing of bones took place after treatment of the cadavers. We do not know how the pigment was applied to bones, but the procedure was precise, at least in some cases (radius, tibia X, the face of Individual 3, etc.). It is interesting to note that
many ostrich egg fragments, abundant in some archaeological levels, were stained with ochre (Roche, 1963), perhaps indicating that the pigment was mixed with egg. We can suggest that the ochre was applied after at least partial decomposition. In some cases (radius, tibia X, etc.), the uniformity of dyeing implies that the bones were completely skeletonised. For the treatment of the skull in particular, we hypothesise both defleshing and disarticulation (maybe not at the same time), while in the postcranial bones, only disarticulation was likely.

The significance of the depressed fractures on the cranial vaults of Individuals 1 and 2, and of the traumatic event that involved the anterior part of the skull of Individual 1, remains unknown. The depressed fractures likely occurred after defleshing of the skull. In the juvenile skull, we assume that the pressure exerted during defleshing was so strong that it broke the thin cranial bones. This hypothesis is less likely for the more robust adult skull. Moreover, the similar morphology and dimension of the modiﬁcations suggest that the blow was inflicted with a similar object, maybe in a speciﬁc ritual context. Thus far, we only have taken into consideration the hypothesis of an intervention after the death of the individuals. However, we cannot exclude an intervention related to homicide or human sacriﬁce. In fact, the fractures on the anterior part of the skull of Individual 1, as already pointed out, could have occurred accidentally or intentionally, in any case peri mortem, as indicated by the fact that they were unhealed. This speciﬁc damage could be directly related to the cause of death. In the juvenile skulls, the opening of the cranial base, if intentional and practiced for the cleaning of the skull, does not exclude the possibility of cannibalism. However, it must be pointed out that the pattern of damage currently used as evidence for cannibalism was not observed (Villa et al., 1986; White, 1992; Defleur et al., 1999). The hypothesis of intentional killing has been proposed for double and triple Upper Palaeolithic burials containing patholog-ical individuals, even in the absence of damage of the skeletons (Formicola, 2007).

While it is possible to propose a likely sequence for some of the events in which the individuals were involved (skull scraping, traumas provoking the depressed fractures, ochre-dyeing, etc.), it is difﬁcult to reconstruct their precise timing or to outline the whole ritual or rituals. In any case, a broad spectrum of interventions seems more likely than a single standardized ritual. In fact, analysis of all the graves suggests the presence of various and complex types of funerary behaviour (Mariotti et al., 2009). Different funerary practices may have had different meanings and could have involved different individuals on the basis of their biological or social status. The fact that in Grave XII, all of the adults were males and that the most complete skeleton, showing the results of various interventions (blowing or killing, defleshing, disarticulation, ochre-dyeing, etc.) was one of the tallest and most robust individuals, may have a special signiﬁcance.

A ﬁnal remark concerns the meaning of ochre use by the Taforalt population. Ochre characterises both the archaeological deposit, where lithic tools, parure elements, etc. were coloured, as well as the spatially separate necropolis, where some levels were soaked with ochre (Roche, 1963). Moreover, pebbles and stones showing traces of percussion and ochre were recovered. They have been interpreted as pestles and mortars for preparation of the pigment (Roche, 1963). Ochre was commonly used (also in association with burials) by the Iberomaurusians and Capsians of North Africa (Roche, 1963; Balout, 1987; Ighilhariz, 1996; Haverkort and Lubell, 1999), as well as by European populations of the Upper Palaeolithic, Mesolithic, and Neolithic (Marshack, 1981; May, 1986; Binant, 1991; Guerreschi, 1992; Gimbutas, 1997, 1999; Alciati et al., 2005; Formicola, 2007). The association of ochre with artefacts and human burials clearly began in the Middle Palaeolithic and involved a broad geographical area. The symbolic meaning of this pigment has been discussed (Marshack, 1981; d’Errico, 2003; Hovers et al., 2003; Bouzouggar et al., 2007; Zilhão et al., 2010). The use of ochre as a technological aid in hide tanning, in hafting, etc., and for hygienic and medical purposes has also been suggested (May, 1986; Ighilhariz, 1996; Zilhão et al., 2010).

Conclusion

The study of Grave XII conﬁrmed our previous ideas of complex and diversiﬁed funerary practices in the Iberomaurusian population of Taforalt. Besides funerary treatment of the corpses and secondary burial practices observed in other graves of the necropolis, there is evidence that the population of Taforalt also carried out some forms of violence on living individuals or on cadavers, which was likely in both cases to have been related to speciﬁc rituals, the signiﬁcance of which remains unknown. The different rituals could have different meanings and could relate to the biological or social status of the individuals. Our study illustrates the importance of carrying out further investigation on the funerary practices of Iberomaurusian populations.

Acknowledgements

We wish to thank Professor Henry de Lumley and Professor Dominique Grimaud-Hérvé, who permitted us to study the skeletons in the collections of the Institut de Paléontologie Humaine in Paris. We wish also to thank Dr. Roberta Randi and Dr. Chiara Consiglio for their technical assistance in the SEM analysis. Finally, we extend a very special thanks to the Abbé Jean Roche for his helpful recollections in regard to the Taforalt excavation.

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Please cite this article in press as: Belcastro, M.G., et al., Funerary practices of the Iberomaurusian population of Taforalt (Tafoughalt, Morocco, 11&n... J Hum Evol (2010), doi:10.1016/j.jhevol.2010.03.011


