The palace of Muweis and its Medieval necropolis

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Figure 1. Muweis, Palace A, from south-east (© 2011, Louvre-Mission archéologique de Muweis. Marc Maillot).

Introduction

The major discovery of the first excavation season of the Louvre Museum in Muweis, in 2007, was that of a Meroitic palace in the southern part of the site (Baud 2008). The large ruin had already been identified in 1969 and protected thereafter, but it remained of an undefined nature due to the lack of excavations. The survey performed by Sokari and Lenoble in 2003 pointed out that here lay an important structure, as shown by the dense cover of red bricks, the presence of small black ferricrete sandstone slabs, and white lime plaster fragments. Thanks to the potsherds collected on the surface and those coming from ditches recently dug on the mound, they proposed to date the monument to the Classical or Late Meroitic period (Lenoble and Sokari 2005, 28). During the surface clearings, mud-brick walls 1.5m to 1.7m thick (four bricks of 340-370mm) soon began to appear. The strategy adopted then and later consisted in following the walls both on the top and at the foot of the 4m-high mound (Figure 1). As the description and analysis of the palace has already been presented elsewhere (Maillot 2016), the archaeological context of this article will focus on the small house located on top of the monumental building, and the medieval necropolis that lies underneath.

The medieval house

The palace hilltop, almost flat, is entirely occupied by a destroyed building (Figure 2), of which subsist only portions of walls. The western wall, of a slightly curved path (which may be due to ground movements), is the best preserved, with three courses of bricks in several spots. This is the only part of the building built of mud bricks. Their module is 310/320x160x70mm to the south, and 350x180x80mm north, a heterogeneity indicating that it is reused material.

The other walls, reduced at best to a single course, are all in fired brick, of a 350/360x170/190x70/90mm module. None, however, is complete: it is always fragments that were used. Their provenance is certainly the underlying building, namely the Meroitic palace, which is also probably the case for the mud bricks. It is to be noted among the

Figure 2. Muweis, Palace A, Medieval House, Hilltop (© 2008 -Louvre-Mission archéologique de Mouweis-Michel Baud/ Marc Maillot).

fired bricks, the recurring presence of bricks with a face more or less deeply marked by fingerprints (drawn as parallel streaks on the plan), characteristic of vault brick.

The layout of the exterior wall, as incomplete as it is, allows for the reconstruction of an almost square-plan building of 8.6m from east to west and 9.05m from north to south, measures which correspond to the interior space of the building. The north-west corner is largely destroyed, along with the south wall, corners included; the central part of the eastern wall is damaged, a break which could be facilitated by the presence of a door. These destructions were facilitated, or directly caused, by erosion, the walls lying on the hillside. The slope is steep everywhere, except in the east, where a small flat space is located in front of the building; this hint allows us to situate the main access there. Behind the building traces of a wall, half a brick wide, have been recognised over a length of nearly 1m; it theoretically is positioned *c.* 400mm from the destroyed rear wall of the building.

The thickness of the walls could not be recognised anywhere. The west wall could be a wall of a brick header wide (*c.* 350mm), but its central portion shows, in one spot, a stretcher abutting an incomplete header, so that the total thickness of the wall must be extended to a brick and a half. It is therefore missing, on most of the plan preserved and facing west, a strip of bricks arranged in stretchers. So here the wall measured *c.* 0.55m thick. The remains preserved of the north, east and south walls only show inner facing bricks, where some alignments are distinguished; however, no outer limit appears. These walls certainly comprised two facings and an internal filling made of small fragments of red brick. The state of this wall layout suggests the wall is *c.* 0.60m thick, which fits quite well with the deductions made for the west wall.

Inside the building, the archaeological evidence is scarce. The excavation was complicated by the nature of the debris, nothing allowing us to distinguish the underlying demolition of the palace from the one of the upper building, since both were composed of the same material. The levelled courses of the palace lie at the same level of the foundation of the building's northwest corner, where the preservation state of the palace is the best; the indurated clay layer that appears in the extension of the north wall is already the washed level of the palatial wall F10 (alt.

72.37m). Moreover, the difference is *c.* 300mm in the eastern half of the house (foundation alt. 72.45m on average, vs. leveled palace courses to 72.15m), and can go up to nearly 500mm under the southern half of the western wall, where the underlying wall F11 is disturbed by *sebakhin* pits.

Few structures have thus been discovered inside the building. Against the eastern wall is a kind of bench built of fired bricks and mud bricks: because of its layout, perpendicular to the main wall, and of its location, it could be a feature associated with the entrance, probably a sheer wall. There is no counterpart to the north, the area being destroyed. Not far from the possible entrance, two built features appeared farther west. Although incomplete in plan and also much leveled, we can assume a square plan of 0.90m a side, which leads us to consider them as pillar or column bases. Their alignment on the same north-south axis, roughly in the orientation of the building, and their regular spacing, in harmony with the framing walls, reinforces this interpretation. In detail, however, it is noted that, if the south base is correctly oriented, the northern one is significantly skewed.

The presence of these two bases allows us to draw a series of perpendicular lines that divide the interior space, showing an organisation in three equal north-south spans, each *c.* 3m, and in two east-west spans, one occupying a third of the space on the entrance side, and the other the remaining two thirds, inwardly. No trace of additional pillars was found in the latter, while at the southwest location that would suit, a pit disturbs a large brick cluster.

Regarding the floor of the building, almost no trace remains: everywhere the debris of broken bricks stuck in a clay matrix dominates. In a few places, along the edge of the entrance or in the southern part of the central strip, beaten earth layers could function as an occupation surface, if it is not simply the natural washing of the underlying palace debris. The only true evidence for the floor is located at the foot of the west wall, where a thick brown clay layer covers a foundation strip made up of small brick fragments. Neither a special feature, nor any sign of activity has been uncovered in the building. The debris only delivered Meroitic ceramic material, so that the construction date remains unclear. The stratigraphic position of the building, above the Medieval necropolis (AD 12th-14th century), nevertheless allows us to identify a *terminus post quem* date. The arrangement of space in regular spans, with the presence of pillars, is strongly reminiscent of another house at the Muweis site, which could be of Funj date, *c.* AD 16th-17th century.

The Medieval necropolis

The ground occupied by the palace comprised a small Medieval necropolis composed of around 28 graves ('Fo') that were discovered and excavated (Figures 3 and 4). The necropolis, was excavated under a situation of extreme emergency in accordance with the excavation programme agenda. Indeed, at least six other graves were identified but not excavated ('Fo INE' 22, 23, 24, 25 and 34 (Figure 4)). Most of the graves were cut in the rubble or near the walls, but the mounds of the palace walls were also disturbed by several Medieval burials (Fo3, Fo 11, Fo12, Fo 36, Fo37 (Figures 3 and 4)).

Analyses were done primarily *in situ* or secondarily using field records and photographic coverage.[1] The anthropological remains (articulated individuals, mainly adults) were exhaustively studied to obtain individual biological parameters (such as age, sex and pathologies), used to characterise this small sample.

Bone samples from graves have been AMS-radiocarbon dated at AD 695-1017.[2] Thus, the necropolis could have been occupied between the Early (AD 600-850) and Classic Christian (AD 850-1100) periods of medieval Sudan (AD 550-1500) (Adams *et al.* 1999). Unusually the Muweis necropolis was isolated without any visible link to a church, as is the case for most Christian Nubian cemeteries, especially during the Early Christian period (Adams *et al.* 1999). This aspect is shared with sites from the same region (e.g. Wad ben Naga and the site of Abu Erteila) where former Meroitic buildings were also disturbed by Medieval burials (Fantusati *et al.* 2012; Maillot 2017).

Burials: brief archaeothanatological observations

A total of 28 burials (mainly individual) were recorded. Burial typology is uniform and consists of oblong and sometimes narrow pits that are always adapted to the size of the individual. The vast majority of the graves follow the same

[1] The archeothanatologist study followed recommendations presented in literature and generally accepted (Duday 2005; Crubezy *et al.* 2000; Duday *et al.* 2009).
[2] Poznan Radiocarbon Laboratory, OxCal Calibration POZ-67312: 1150 ± 70 BP, 0;15MgC; 2,4% N 2, 7% C; 695–1017 AD (*c.* 95.4%).

Figure 3. Muweis, Palace A Plan (© 2011 -Louvre-Mission archéologique de Mouweis-Marc Maillot).

orientation as the structure of the palace, along a west-east axis. Except Fo15, no body or head covering have been found in identified graves. There is no visible grave marker of any kind on the site. Unsurprisingly no ceramic artefacts were found in association with the burials. The few grave goods (not offerings) found *in situ* are ornaments (iron ankle bracelet, bone or coralline pearls, Baud 2008) while personal jewellery is common in Christian graves (Lebedev and Reshetova 2017).

Fo15 (a young adult; Figure 5) is the only grave with an identifiable funerary layout. A cover of wooden beams placed on a rim partially overlapping another grave is found at two levels of inhumation (Baud 2008). Shrouds are represented in seven graves of the corpus and attest to the presence of perishable materials surrounding and holding the body that could have influenced decomposition processes. Furthermore, various types of shroud have been recorded (traces for Fo3, Fo10, Fo13 and Fo14, thick or with double layer Fo36, Fo37a and Fo43).

The necropolis is almost exclusively composed of individual burials. Burials Fo20 and Fo21 contained individuals found in secondary positions, and several bones of another individual were found in the filling of grave Fo38. This gives evidence for disturbances that probably occurred during the digging of the later tombs. This homogeneity of burials is echoed by their orientation, which mainly follows that of the walls of the palace (NW/W-SE/E for 21 graves), give or take a few misalignments. Only two burials follow a north-south orientation (Fo11 and Fo40) and the orientation remains unknown for five individuals. Orientation of the subjects inside the burials however is more diversified (Figure 6).

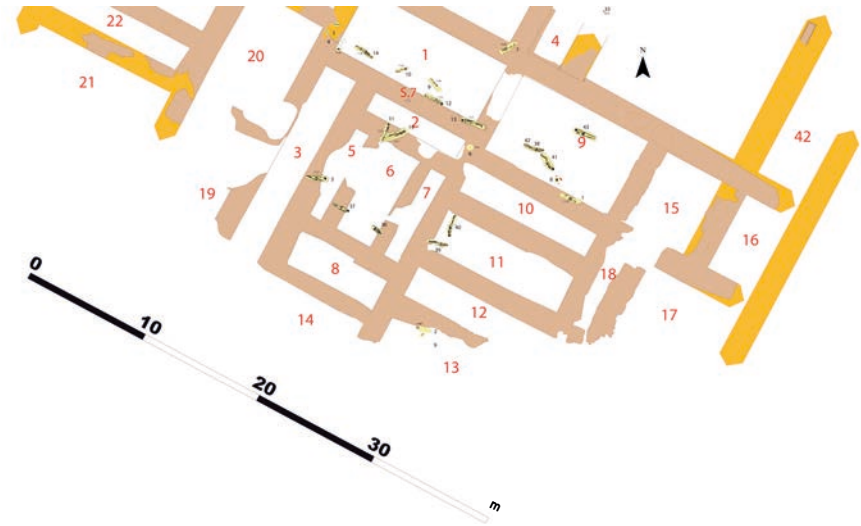

Figure 4. Muweis, Palace A, General position of graves, central sector (© 2011 -Louvre-Mission archéologique de Mouweis-Marc Maillot).

The Christian rite seems not to be predominantly represented since about half of the skulls are orientated toward the east (for 15 individuals, Figures 6 and 7). West, south and north orientations are observed, and six individuals were not identifiable (about 20%). However, Lebedev and Reshetova (2017) underline that for Medieval cemeteries the orientation could be somewhat erratic.

This disparity is rather intriguing and relates to the numerous different positions of the individuals in the graves. Several different positions were observed

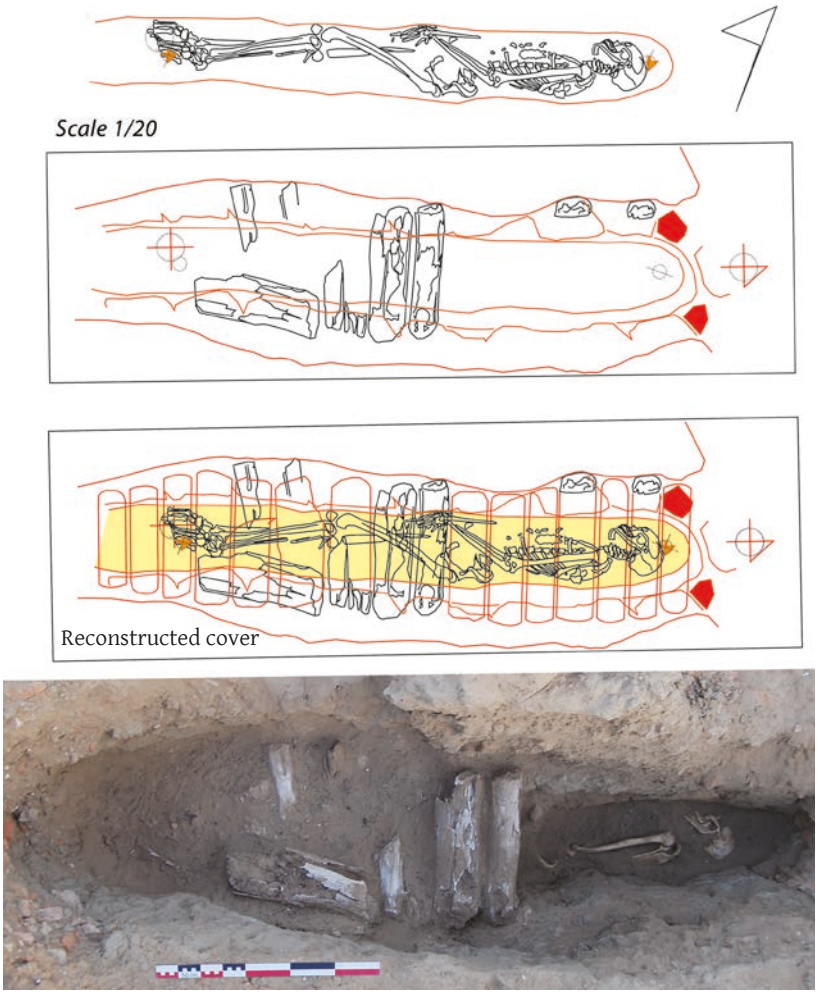

Figure 5. Muweis, Palace A, Grave Fo15 (© 2009 -Louvre-Mission archéologique de Mouweis-Marc Maillot).

for the individuals. Indeed, despite the restrained observability of field information, data collected show that individuals were mostly lying in a supine position but also in a right or left lateral position, or with flexed lower limbs. This heterogeneity and diversity in positions, despite a predominance of individuals in the supine position, is frequent in Medieval Sudanese necropoles (Adams *et al.* 1999, 9-10; Edwards 1998, 213-215). The position of the body as well as the type of the grave shaft was probably very much a matter of individual preference (Adams *et al.* 1999, 45).

Other archaeothanatological observations can be made for most of the individuals, such as type of body decomposition (found mostly as a filled space rather than in a void). The digging, burial of the bodies and the shroud preserved the bones in a coherent orientation after soft tissue decomposition. However, the sediment filled the space quickly, which kept part of the pieces unstably balanced while avoiding migration or collapse of the anatomical segments. These observations suggest the use of a perishable material, such as a shroud, to contain the body. This raises questions on differential funerary treatment, or different qualities of fabric used to contain the body. The fact that the bodies of all the individuals found in the graves that contained traces of shroud decomposed in a mixed space supports this hypothesis. Elements of different type of shroud (resonated, double layer, thick or thin) were found in seven graves. Traces of mat have been also observed (underneath the body) in two other graves (Fo3 and 13).

Furthermore, the distribution of the burial pits highlights the existence of different concentrations of graves: the central, south and north-eastern parts of the palace. Indeed, the northwest corner contained 11 graves over approximately 115m² (i.e. one grave every 10.5m²), while the southeast corner had 21 graves over approximately 110m² (i.e. one grave every 5m²). Rooms 1 and 2 (c. 44m²) alone contained 11 graves (i.e. one grave every 4m²). The 38 tombs discovered during the excavation over the total surface area of the palace, suggest a density of one grave every 14m². The northwest and southeast parts are the best preserved areas of the ruined palace. The only overlapping burials (Room 2: Fo11 and Fo15) and the only tomb with funerary architecture (Fo15) were found between those areas of concentration. It should also be noted that Room 2 corresponds to the highest point of the kom formed by the ruin of the palace (alt. asl 372.32m (Maillot 2016)).

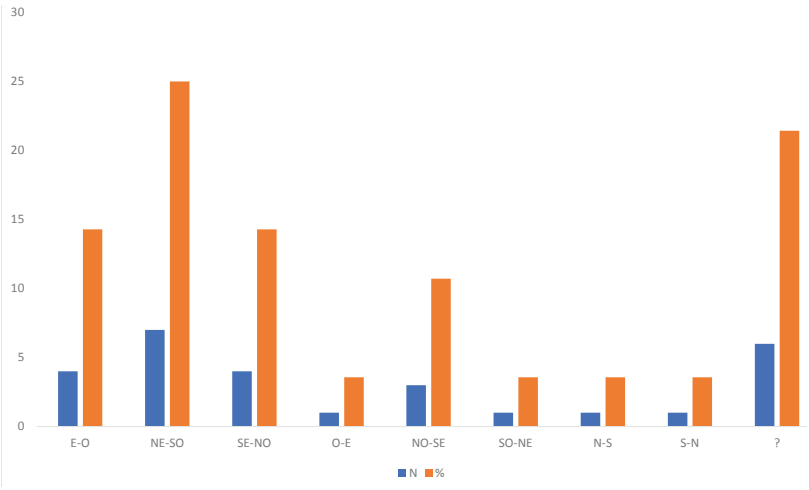

Figure 6. Distribution of individuals, orientation within the graves on the necropolis.

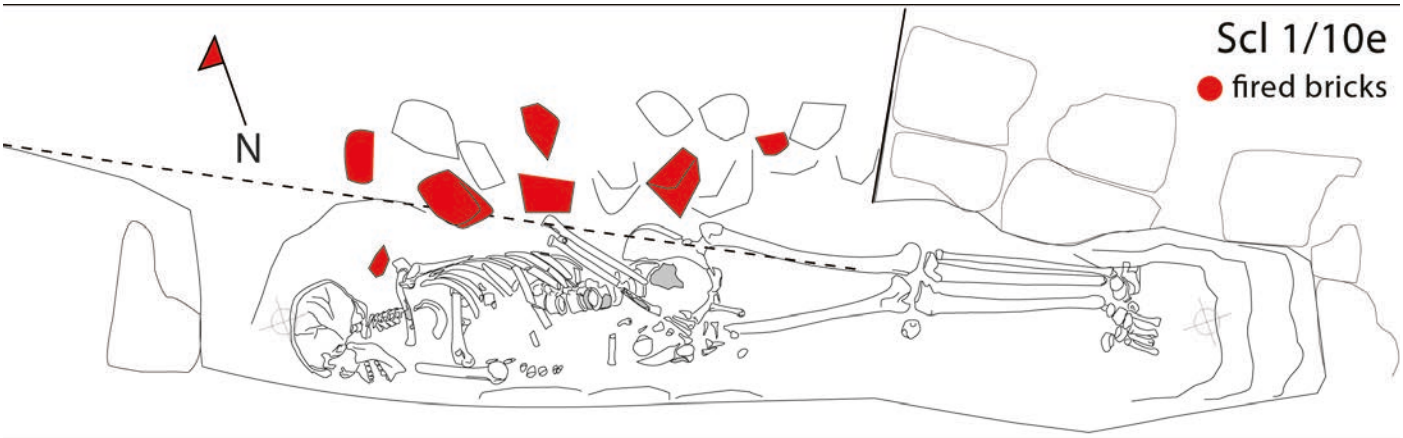

Figure 7. Muweis, Palace A, Grave Fo13, with fired bricks (© 2009 -Louvre-Mission archéologique de Mouweis-Marc Maillot).

However, we cannot evoke funerary architecture or grave goods to explain the distribution of tombs. Neither can we support the existence of a polarity exercised by the only tomb with architecture, and consequently the hypothesis of a concentration of tombs focused on the centre of the palace. This interpretation regarding the distribution of tombs could also be influenced by the destruction of the remains at the northwest, southwest and southeast extremities of the palace. Those parts had been largely destroyed by a large *khor* running from the top of the mound and by farming activities (Maillot 2016), thus, only two thirds of the palace were accessible to the excavation.

The topography of the kom with its highest point corresponding to Room 2 (i.e. between the two areas of burial density) could suggest a concentration and diffusion effect of the tombs progressively moving outward from the centre. The funerary occupation and organisation would appear to be an opportunistic reuse of the area that could have focused initially on the highest point, before dispersing over time. Another further explanation for this grave distribution could be anthropological, thus, a hypothesis of funerary selection (according to social status, age-at-death, state, sex etc.) was the basis of the palaeobiological study.

Skeletons: Palaeobiological information

The sample represents 28 anatomically connected individuals that were exhaustively studied. Individuals are mainly adults (24 adults, 4 juveniles) and there were two partial individuals (1 adult Fo1B and 1 immature Fo38I) found in a secondary position. The total number of individuals is about 32. Cortical bone observability was quite good for half of the sample, whereas dental remains were poorly preserved (no preserved teeth for 13 of the 30 individuals in the sample). 60% of the subjects are incomplete or partial (12 complete subjects out of a total of 30). In this regard, not all biological parameters are known (Figure 8). Indeed, age could not be estimated for 25% of the subjects and no sexual diagnosis was possible for 40% of the sample.[3] Juveniles cover all demographic age groups except the neonate. The Mature age group is more representative for adults, but age could not be precise for seven adult individuals and because of the small sample size, extrapolations were limited. Interpretations are even more limited by the fact that sex could only be determined for 12 individuals.

For the sub-group of individuals buried in the central part of the palace, no predominance according to age or sex could be identified, even though subadult individuals and young adults are the most represented (Fo11, Fo12, Fo14 and Fo15). Because of the small sample size, it can only be assumed that the individuals in that central group could be biologically related. A family unit or a small apparently homogenous population are two valid hypotheses to explain this group. The size of the sample from Muweis and the number of observable skulls do not allow extrapolation at a larger scale (i.e. in terms of funerary recruitment or homogeneity of the buried population). Indeed, osteometric[4]

[3] The methods applied for this study are regularly and classically used for various anthropological studies. Estimation of age for each of these adults was determined by the bony structure of the auricular surface and pubic symphysis (Lovejoy et al. 1985; Schmitt 2005). Age at death of immature and subadult skeletons was determined by calcification and eruption of the dental material, ossification patterns of epiphyses and long bone length (Scheuer and Black 2000; White and Folkens 2000). Osteometric criteria and morphological criteria proposed by Bruzek 2002; Bruzek *et al.* 2017; Murail *et al.* 2005, have been used for the assessment of sex.

[4] The overall osteometric data for adults used the classification of Buikstra and Ubelaker 1994. Stature estimation was determined for adults with available complete long bones and the formulae proposed by Raxter *et al.* 2008.

Age range / Sex	-	Female	Male	Unknown	Total
1-4 yrs	1				1
5-9 yrs	3				3
15-19 yrs	1			1	2
Adult Young		4	2		6
Adult Mature		2	4	4	10
Adult old		2			2
Adult unknown				8	8
Total	5	8	6	12	32

Figure 8. Age and sex distribution of the Muweis necropolis individuals.

data is scarce with only eight craniums measurable. The use of other estimations based on discrete traits[5] is also difficult because of their insufficient number and because of a lack of reliable sexual diagnoses (eight unknown sex adults, *c.* 25% of the sample).

The study of paleopathological lesions[6] could be one of the elements describing this funeral recruitment. Concerning dental health status, unfortunately the study was not extremely informative as very few teeth were observable. Indeed, *post-mortem* tooth loss was frequent and dental enamel was extensively destroyed through rapid 'weathering' (Boulestin 1998). Only 12 subjects (nine adults and three juveniles) presented relevant, but common lesions: dental plaque, caries, and important dental wear. Six subjects out of the nine in the central group showed dental lesions, some of which are the most remarkable of the whole series. Indeed, dental caries disease is marked by a peri-apical abscess observed in Fo11, and Fo15 showed the only case of enamel hypoplasia completing the observations of stress markers on bone.

The general health status was also approachable. We observed osteological alterations on 26 individuals (eight from the centre and 18 from the rest on the necropolis) which led to significant diagnostics (Figure 9). A total of 98 lesions of different types were recorded. The majority of them were integrated as part of the diagnoses. These are grouped in a 'palaeopathological' profile (Ardagna 2004) of the population, according to their advancement or their nosologic group (Figure 9).

Despite the presence of uncertain diagnoses due to preservation state or because of a lack of specificity for some of the lesions, significant diagnoses were made, which illustrate the remarkable palaeopathological significance of this sample. The predominance of degenerative anomalies (such as osteoarthrosis of the spine) is observed, but only six individuals showed multiple signs of osteoarthrosis. This could be explained by the preservation state or the low number of elderly adults in the sample. 21% of the lesions correspond to 'markers of occupational stress (MOS)' including microtraumatic lesions, posture or enthesopathies (Dutour 1986; Capasso *et al.* 1999; Vilotte 2006). A closer study of the individuals buried in the center of the palace shows that these individuals share these markers like the rest of the sample. Concerning the frequent stress marker, mostly aspecific signs such as cribraorbitalia or porous hyperostisis of the skull were observed within the normal ranges of observation in the osteoarchaeological series (Ortner 2003). A case of diaphyseal bowing of both tibia (F09, incomplete 1-4 yr individual) associated with acute angulation of the femoral neck, metaphysar swelling and porous remodeling (on both tibia and distal femur) could suggest the presence of a generalised metabolic syndrome link to nutritional deficiency such as rickets (Lewis 2018; Brickley *et al.* 2008). Even if their frequencies are extremely anecdotal, the other significant

[5] The study and recording of discrete traits followed classical and recent guidelines (Hauser and Di Stephano 1989; Verna *et al.* 2013; Verna 2014; and Voisin 2012). Stature estimation was determined for adults with available complete long bones using the formulae proposed by Raxter *et al.* (2008). Heritability of discrete traits is extremely variable (Sjovold 1984), and even extremely low for particular traits. Moreover, the influence of age, sex, and other environmental or population factors modulate the relevance of these observations, and restrain the role of discrete traits to descriptive biological elements.

[6] The palaeopathological study is based on exhaustive and macroscopic analyses of bones. For adult individuals each diagnosis was performed with criteria, interpretation and terminology of Aufderheide and Rodridez-Martin 1998; Ortner 2003; Waldron 2009; Lewis 2018; and Roberts 2018.

Lesion / Nosology	No. of lesions (periphery)	No. of lesions (centre)	No. of lesions total
OA C1-C2	2	-	2
OA cervical	7	2	9
OA thoracic	10	3	13
OA lumbar	4	3	7
Total Arthrosis (spine)	23 (36%)	8 (22%)	31 (31%)
OA shoulder	4	1	5
OA upper limb	1	-	1
OA hand	1	-	1
OA hip	1	-	1
OA lower limb	2	-	2
Total Arthrosis (appendicular)	9 (14%)	1 (3%)	10 (10%)
Total arthrosis	32 (50%)	9 (25%)	41 (42%)
MOS upper limb	3	2	5
MOS spine	-	1	1
MOS scapular gridle	-	1	1
MOS pelvic gridle	3	2	5
MOS lower limb	6	2	8
MOS feet	1	-	1
Total MOS	13 (20%)	8 (22%)	21 (21%)
Congenital abnormality spine	6	1	7
Congenital abnormality rib	1	-	1
Total congenital anomaly	7 (11%)	1 (3%)	8 (8%)
Fracture MT 5 droit	-	1	1
Fracture shoulder	-	1	1
Alvusion fracture spine	1	-	1
Fracture upper limb	2	-	2
Fracture lower limb	1	-	1
Total fracture	4 (6%)	2 (5%)	6 (6%)
Total Specific infection	-	3 (8%)	3 (3%)
Total Signs of non-specific infection	3 (5%)	1 (3%)	4 (4%)
Total Stress marker	2 (3%)	9 (25%)	11 (11%)
Total Fracture tarsal or MOS ?	2 (3%)	2 (5%)	4 (4%)
total	**63**	**35**	**98**

Figure 9. Summary of the information obtained through the palaeopathological study of the individuals. OA for osteoarthritis, specific infection designs from known origin such as tuberculosis, leprosy, treponematosis, brucellosis or fungal infection (Ortner 2003; Roberts 2018), non-specific infection when the infection causing microorganism is unknown (periostitis, osteomyelitis), MOS for marker of occupational stress, congenital anomaly designs lesions such as L5 sacralization, developmental defect (spina bifida occulta) or segmentation failure (Roberts 2018).

paleopathological lesions concern infection. They enabled the identification of two cases of spondylodiscitis which can been associated with a tuberculous infection and a convincing case of leprosy (Ardagna and Maillot, in press). The latter (Fo13 mature female; Figures 7, 10 and 11) presents extremely specific and convincing facial lesions including resorption of the anterior nasal spine, bilateral and symmetrical resorption and remodelling of the edges of the nasal aperture, inflammatory reaction of the alveolar bone near the maxillary central incisors. The surfaces of the edges of the nasal notch are smooth and most likely thickened following cortical bone re-modelling. We can also note the rough appearance around the anterior nasal spine (Figure 10).

These facial lesions are compatible with the typical rhinomaxillary syndrome of leprosy as described in the literature (Ortner 2003). In addition, many destructive and possibly disabling lesions involving hand and feet phalanges such as concentric resorption, and erosive lesions with an acro-osteolysis pattern, were observed (Figure 11). The skeletal distribution of alterations of the individual from Grave 13 are consistent with a diagnosis of a lepromatous form of leprosy. If we analyse the spatial distribution of palaeopathological information, the central group is not spared from disease. It includes two probable cases of tuberculosis, a woman who suffered from leprosy, a child presenting signs of metabolic disease, most of the aspecific stress marker and an another young woman with signs of early arthrosis.

Discussion

The Muweis necropolis was isolated without any visible link to a church, as is the case for most Christian Nubian cemeteries, especially during the Early Christian period (AD 600-850) (Adams *et al.* 1999). There are a few other rare examples of funerary reuse, which could be described as opportunistic, of the ruins of a Meroitic palace. Indeed, the necropolis at Muweis shares similarities with the site of Wad ben Naga, where the inside, periphery and walls of the Meroitic palace were also disturbed by Medieval burials (Maillot 2017). On the site of Abu Erteila large disturbances were visible within the Meroitic temple (Fantusati *et al.* 2015), where the same types of Medieval grave were dug through the temple wall. Burial typology is also uniform (oblong grave pit) and the bodies were in a variable orientation but mostly in a supine position and without any grave goods (Fantusati *et al.* 2015; Baldi 2015). Some burials showed remains of matting and textiles, which could be fragments of shroud (Baldi 2015). The Medieval graves (*c.* 17, Fantusati *et al.* 2015) also suggest areas of concentration towards the walls of the former palace (Fantusati *et al.* 2015). These three sites are associated with small-scale funerary occupations that are difficult to characterise from both archaeological and anthropological points of view. Indeed, the osteological sample from the Muweis necropolis was rather restrained, and access to palaeobiological data was complicated due to the lack of discriminative anatomical elements, such as the *oscoxae*, but the review of anthropological information highlighted significant particularities for this sample.

In this context, palaeobiological information remains difficult to interpret. Spatial repartition according to age and sex shows no particularity. The low representation of older adults is difficult to interpret as such, mainly because of the small sample size. However, a sort of pivotal point composed of a female individual, a male individual and three juveniles is found along a leveled wall of the palace (Room 1 and 2 northeast-southwest orientation). In the same way, Fo15's burial (the most complex and the most sophisticated) is related to a young male subject who overlaps a female individual of comparable age.

This configuration could point to biological proximity (as parental grouping) or social grouping but it remains hypothetical. The paleopathological profile shows significant differences between the central grouping and the rest of the sample. One of the most significant results of the palaeobiological analysis is the leprosy case (Grave Fo13) found in the central burial group. Although the presence of this infection in that particular region is known (Ortner 2003), palaeopathological cases remain particularly scarce.

Leprosy, which was present in ancient Egypt, could have been introduced during commercial trade with inland African regions, such as Nubia, during the reign of Ramses II (*c.* 1300 BC) (Lechat 2009). However, as compared to Europe, palaeopathological evidence of leprosy is extremely rare in ancient Egypt, Nubia and the Near East (Dols 1979; Dzierzykray-Rogalski 1980; Molto 2002). The individual in grave Fo13 contributes to this paucity of information relative to leprosy in ancient Nubia and Egypt.

Six individuals (4 adults and 2 juveniles) present one or several stress markers (20% of the total sample) and most

Figure 10. Muweis, Palace A, Grave Fo13 (mature female) with a) anterior view of the rhinomaxillary region, b) detail of the nasal aperture and nasal bones showing resorption, including of the anterior nasal spine (white arrow), c) lateral view of the cranium (© 2009, Louvre-Mission archéologique de Mouweis -Yann Ardagna).

Figure 11. Muweis, Palace A, Grave Fo13 (mature female) with dorsal (A) and palmar (B) view of the preserved phalanges of the left foot showing concentric diaphyseal destructive remodelling, fusion, distal resorption and truncation of the 1st, 2nd and 5th toe phalanges (© 2009 -Louvre-Mission archéologique de Mouweis-Yann Ardagna).

come from the central grouping. Moreover, it seems that 15 individuals (6 from the center and 9 from the periphery) present one or several activity markers, which corresponds to 50% of the total sample. These two elements (with the necessary caution in relation to the low specificity of such markers) imply harsh and difficult living conditions (dietary deficiencies, chronic infections, hard labour), typically characteristic of past populations; however, they are in accordance with Wood's *et al.* (1992) osteological paradox '*better health makes worse skeletons*'. This result implies a strong immune system allowing individuals to resist living hazards with, nevertheless, osteological traces of these events in the bone. The central group covers the largest number of pathological individuals. Parental ties remain the main and most probable hypothesis to describe the grouping of these burials, with not only a central role in the funerary space but also a preferred and even privileged burial sector. This suggests differences in social status and the absence of segregation (at least in death) of pathological subjects.

In medieval Europe, the segregation of people with leprosy is frequently reported in palaeopathological and historic literature (Lynnerup and Boldsen 2012). However, recent bioarchaeological observations show that behaviour towards leprosy in medieval European societies could be more varied than systematic exclusion (Roffey and Tucker 2012; Lee and Manchester 2008). Indeed, several European medieval occurrences show that people who experienced leprosy were not subjected to funerary exclusion (Baker and Bolhofner 2014; Likovsky *et al.* 2006; Lunt 2011; Taylor *et al.* 2000). Insights concerning leprosy and behaviour toward the disease in Nubia or Egypt are very rare in anthropological and palaeopathological literature. Sudan's neighbouring countries were, contrary to Europe, more tolerant and an accepting attitude was prevalent in Medieval Islamic societies of the Near East (Dols 1979; Zias 2002). According to Dols (1979) Arabic medieval medicine does not recommend isolation of people with leprosy. Medieval Ethiopian society seems to be more tolerant than Europe, especially during the early Medieval period (Pankhurst 1984). No segregation was found for the Muweis necropolis either. This suggests that funerary recruitment based on social (and/or family) status of the entire palatial center transcends disease through death. The segregation of leprosy sufferers does not necessarily imply a systematic comparable funerary treatment. Bodies did not typically leave the original community and were even brought back to be buried. In the reporting of other medieval cases of leprosy in Sudan (Møller-Christensen and Hugues 1966; Smith 1910; Stone *et al.* 2009; Molto 2002; Macke and Macke-Ribet 1994), there is no mention of the exclusion of affected individuals. For the Egyptian cases from the Ptolemaic period in Dakhleh, it was suggested that 'the oasis was used as a deportation place for the leprosy-ill belonging to the ruling

class' (Dzierzykray-Rogalski 1980, 73). This kind of behaviour cannot be suggested for the Muweis case, although the hypothesis that the individual had a privileged social status while also suffering from leprosy can be retained. This behaviour has already been observed in other sites, most notably during the Byzantine Empire, where this affliction was frequently present and active from the 4th to the 6th century AD (Karamou *et al.* 2012).

Aside from the fact that the only tomb with complex architecture is centrally located at the highest point of the *kôm*, we have no clear arguments suggesting that the central area of the Muweis necropolis was dedicated to individuals with a particular status, but if this hypothesis was argued disease did not seem to be an issue. In comparison with the site of Abu Ertelia, Lebedev and Reshetova (2017) point out the existence of complex social structures for these small Medieval ensembles. It is therefore difficult at this stage to propose further inferences concerning the social status of Muweis individuals.

Again, these are only hypotheses generated by comparisons with other behaviours seen elsewhere toward the disease. Indeed, as we have pointed out, there is no obvious and clear archaeological argument on the necropolis of Muweis (grave goods, burial architecture etc.) that can support the funerary dynamic of a concentration from the centre moving to the periphery. The example of Abu Erteila also shows 'excavated burials concentrated in the central and most elevated part of the mound within the limits of Meroitic structures' (Lebedev and Reshetova 2017, 173) with no other hypothesis than the opportunistic reuse of palace walls (see also Maillot in this issue). Like the palaeobiological parameters, the presence of leprosy, described in other Egyptian or Nubian sites from other periods, only provides very indirect arguments concerning differences in social status. However, the funerary re-use of ruins, which have formed a mound after abandonment, seems to be a Medieval custom in the Meroe/Shendi region, which has been attested by different archeological excavations. This custom needs to be further investigated at other sites and incorporate a larger sample size.

Conclusion

Concerning the Muweis necropolis, other archaeological and anthropological investigations could confirm this recruitment mode and characterise this small population even more. If the size of the sample and missing anthropological and archaeological data did not enable larger extrapolations, the Muweis osteoarchaeological sample remains largely informative. All observations highlighted the abundance and potential of information that can be obtained from this collection.

Like the sites of Abu Erteila and Wad ben Naga, it seems that the Muweis site does not contain any complex architectural elements found in other Post-Meroitic and Medieval cemeteries in the Kingdom of Alwa such as for example, the tumili, cairns or burial chambers of Gabati (Edwards 1998, 69). However, variations in the orientation or position of the individuals, as encountered in medieval times at Soba or Gabati (Welsby 2002, 49), is noticed. The marginal aspect of the Muweis site could be heightened by the difficulty in extending anthropological comparisons to other sites in the region (such as Gabati or Soba) that do not share an opportunistic reuse of a kom. Furthermore, some skeletal samples from other sites have not yet been extensively studied (Vollner 2016, 19) and are associated with a large temporal span.

The presence of leprosy in Muweis, a disease rarely attested in medieval Nubia, hypothetically could be related to the complex structure of a local medieval community. It has already been mentioned that the cemetery of Abu Ertelia may have incorporated a sedentary population and wanderers or travellers (Lebedev and Reshetova 2017). Like the sites of Abu Erteila and Wad ben Naga, Muweis is in a marginal position between the Medieval kingdoms of Makuria and Alwa (Lebedev and Reshetova 2017). Comparisons with other sites is complicated by this marginal position and by the Muweis osteoarchaeological sample size.

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