

THE 2006 WĀDĪ ABŪ KHASHĀRIF AND WĀDĪ AL-MUDAYFI'ĀT CEMETERY EXCAVATIONS

Megan A. Perry, Abdel Halim al-Shiyab and Hani Falahat

Introduction

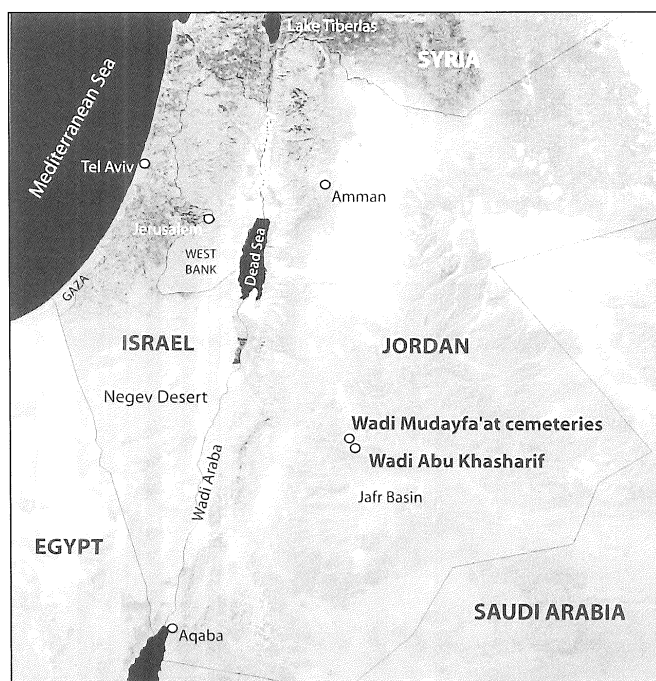
In 2005 and 2006, five burials were excavated by the Department of Antiquities (DoA) at four sites in between al-Ḥusayniyya and al-Jafr in southern Jordan (Fig. 1). The sites are located approximately 30 kilometers southeast of al-Ḥusayniyya along the road to al-Jafr. In January, 2006, three burials were excavated from sites MDA, MDB, and MDC (MDA Burial 2, MDB Burial 1, and MDC Burial 1), all located along Wādī al-Mudayfi'āt ca. 4km to the north of the main road. At the same time, a fourth burial was recovered from a cemetery located along Wādī Abū Khashārif (WAKA Burial 1), ca. 4km to the southwest of the main road. In addition, a fifth burial had been excavated from cemetery MDA (MDA Burial 1) in 2005. This burial was transported to Yarmouk University, and was subse-

quently seized by the police; therefore we were not able to analyze this individual. Another possible site along Wādī Abū Khashārif, WAKB, was also excavated but no burials were recovered. Two burials, MDB Burial 1 and MDC Burial 1, date to the second to fourth century AD based on ^{14}C analysis; because of material, cultural and other mortuary similarities between the burials, we presume that all recovered burials date to approximately the 2nd to 4th century AD as well. This preliminary report outlines the archaeological and bioanthropological results and expectations for future analyses based on preservation of these individuals.

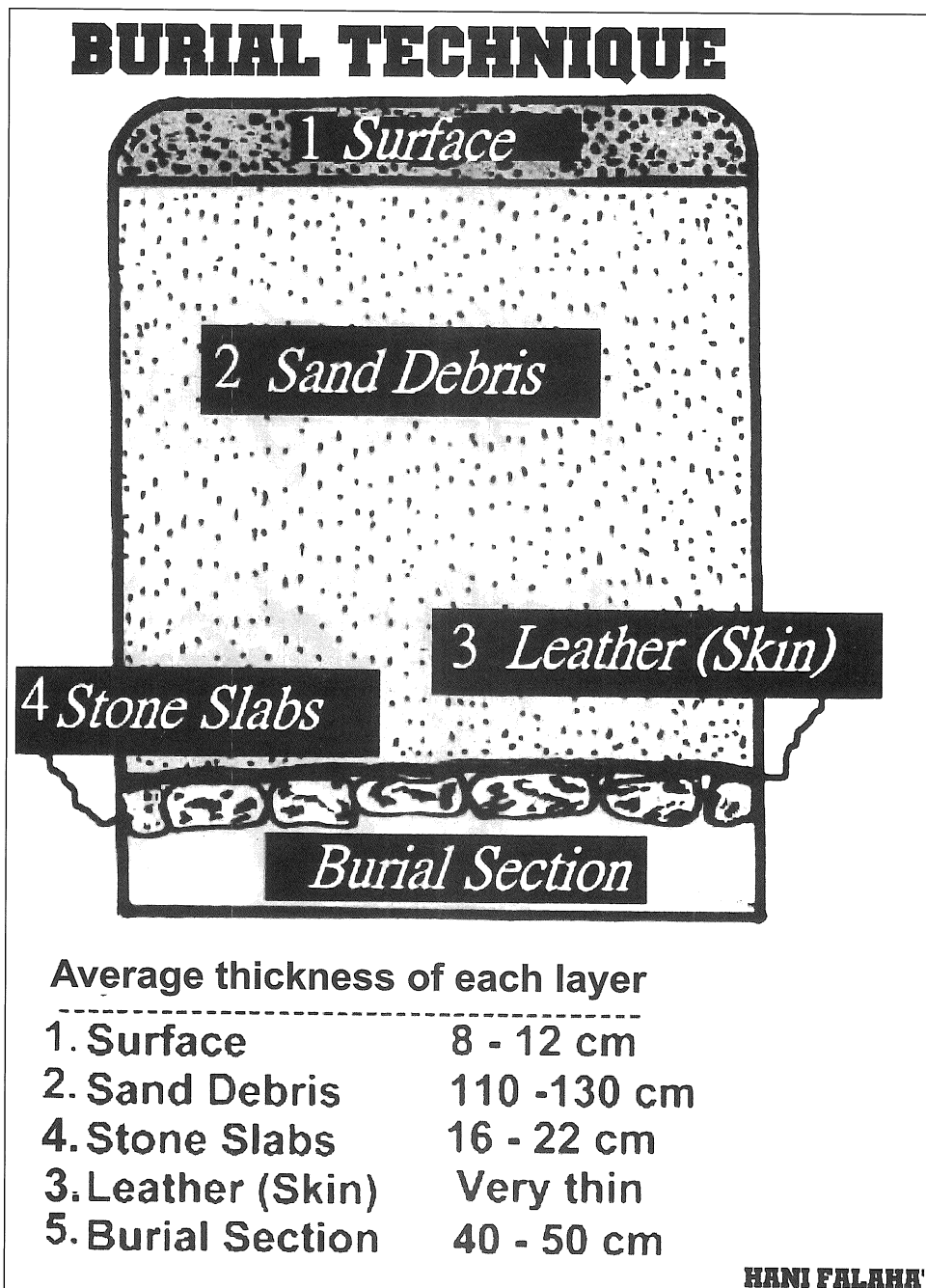
Site Descriptions

The four cemeteries MDA, MDB, MDC, and WAKA, and site WAKB, are located on small banks located alongside the main channels of wadis al-Mudayfi'āt and Abū Khashārif. No habitation site associated with the graves has been discovered, although a quarry site was noted ca. 3.5km from the two Wādī Abū Khashārif sites. Five possible burial features at Wādī Abū Khashārif B were explored by the DoA. These features consisted of circles of differing dimensions, each with a rectangular feature in the middle (Fig. 2), that turned out to have been used for feeding animals and are of an unknown date. Furthermore, no ceramics or other artifacts could be seen on the surface to indicate any ancient human activity, with the exception of bones and textile fragments occasionally scattered across the surface due to recent robbing activity. The cemeteries therefore probably served as seasonal burial locations for regional nomads.

These burials originally had been marked by an ovoid circle of stones, however ca. 10-12cm of gravel and sand has been deposited over the



1. Location of the Wādī al-Mudayfi'āt and Wādī Abū Khashārif cemeteries.

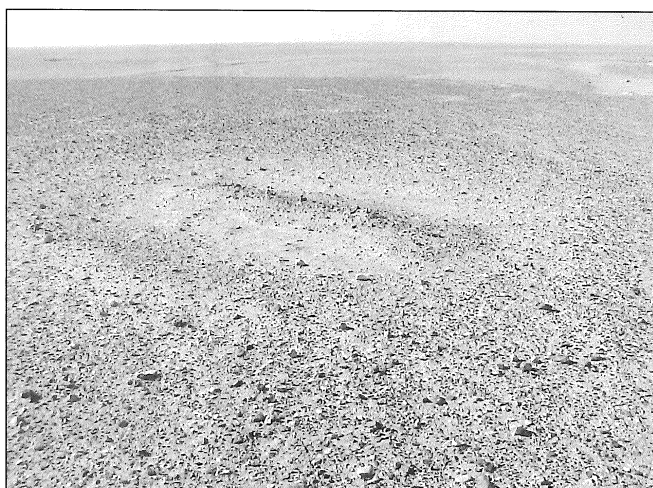


2. Circular features in WAKB (photo by Hani Falahat).

surface marker since the cemeteries had gone out of use (Fig. 3). There remains no obvious feature on the surface to mark the location of these graves; therefore the total number of graves in each cemetery cannot be estimated. Tomb robbers have excavated from 10 to 12 pits within each cemetery area, only some of which appear to have revealed ancient graves (Fig. 4). Informants at Wādī Abū Khashārīf noted that five individuals had been previously been removed from the tombs there. The five also were excavated from tombs with varied amounts of disturbance. The DoA additionally excavated another



3. Schematic drawing of burial shaft (drawn by Hani Falahat).



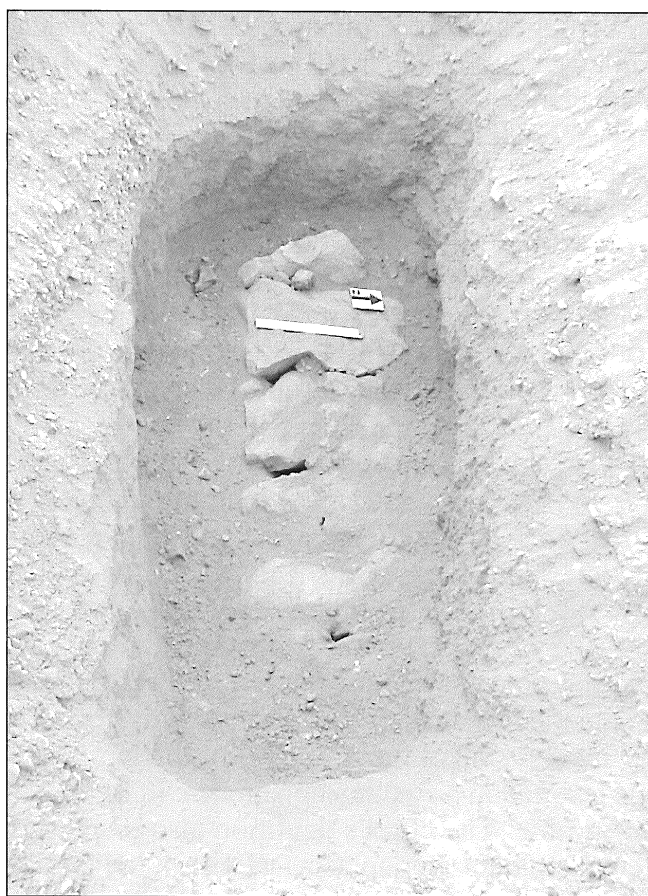
4. Site MDA showing robbed pits (photo by Hani Falahat).

80cm long pit at Wādī Abū Khashārif A that did not contain a tomb or burial. Geophysical techniques could be employed in the future to possibly locate undisturbed tombs in the area.

Burial Descriptions

The four burials from the Wādī al-Mudayfi‘āt area and one burial from Wādī Abū Khashārif share many similarities in internment style. The burials generally were located at the bottom of a 1.6-2.0m ovoid shaft excavated into the alluvial, fluvial, and colluvial gravel and sand comprising the wadi banks. These single, primary burials have varied orientations, but primarily were aligned east to west. The bodies were placed on their right side within the tomb, with their legs slightly flexed. All of the bodies had been wrapped in wool and linen textiles and in some cases encased in decorated and stitched leather “shrouds”. Approximately 40-50cm above the bottom of the shaft, a small ledge was left to hold the irregularly-cut chert capstones placed over the grave (Fig. 5). Evidence from many graves suggests that these capstones were covered with an additional sheet of leather, over which the sandy pit fill was dumped to close off the grave.

The disturbed and robbed nature of the burials makes assessing the range of artifacts originally in the graves difficult. Excepting the textiles and leather products, only one burial from Wādī Abū Khashārif (WAKA burial 1) contained grave goods in the form of personal jewelry. Beads supposedly also had been recovered in MDA burial 1. Specific artifacts and results



5. Capstones over MDB burial 1 (photo by Hani Falahat).

of skeletal analyses are discussed for each burial below.

MDA Burial 1

The only items remaining from this N-S oriented burial excavated in 2005 include pieces of woven textile and a number of fragments of scalp with ca. 2-3cm long dark brown hair discovered within the textile fragments. A number of ca. 25cm long strands of dark hair apparently were found on the surface adjacent to the robbed grave that contained MDA burial 1, but likely was not associated with this individual. One witness reported that some beads had been recovered previously from this tomb.

MDA Burial 2

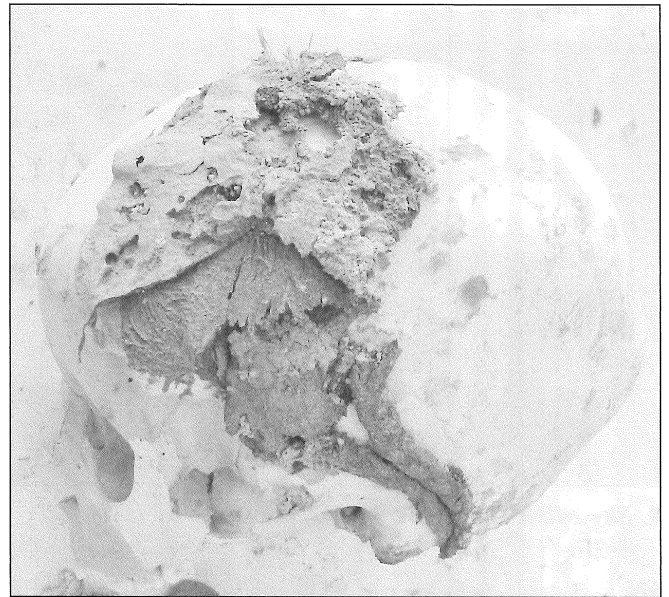
The second grave explored from site MDA contained the body of a single individual, relatively undisturbed despite the tomb’s robbed nature. The body was oriented E-W, lying on its right side with its head to the west and facing south. This burial was of a young individual approximately 7 years old (\pm 24 months) based

on dental eruption, formation of primary ossification centers and epiphyseal union, and long bone length. The skeleton was well-preserved and contained mummified soft tissue adhering to the legs, ribs, fingers, a few thoracic and lumbar vertebrae, the pelvic bones, and the right arm. A majority of the skeletal remains were recovered except for many unfused long bone epiphyses, portions of the hands and feet, the 10th thoracic and 5th lumbar vertebrae, the 1st and 12th right ribs, the sternum, both clavicaulae, the right scapula, and right patella.

The child displayed some evidence of active infection and intermittent childhood stress. Small areas of periosteal infection were noted in the internal surface of the right ilium, the posterior side of the left tibial middle diaphysis, the distal ½ of the medial and posterior left fibula, and the proximal 2/3 of the left and right ulnae on the medial surface. The periosteal reaction on the medial side of the distal 1/3 of the left fibula has resulted in a swollen appearance in its posterior profile. The child's dentition also displayed dental enamel hypoplasias (DEHs) indicating exposure to physiological stress during dental enamel growth. DEHs on the central left and right mandibular incisors, the right mandibular M₁, and mandibular deciduous m₂ suggests the individual suffered from intermittent stress between 2-6 years of age, essentially the years before his or her death.

In addition to the skeletal remains, a small patch of scalp (9cm x 9cm) and short (ca. 3cm) dark hair were found attached to the anterior portion of the left parietal and posterior portion of the left side of the frontal bone (**Fig. 6**). A few pieces of the leather body shroud remained on top of the hair. Another piece of scalp (3cm x 3cm) was attached at the left speno-temporal-frontal junction. This smaller piece contained two attached braids ca. 5.5cm long and ca. 0.8cm wide that curved posteriorly behind the external auditory meatus to the posterior portion of the left mastoid. These braids probably originally had been tucked behind the left ear. The excavation photos indicate that more scalp and hair was attached to the skull but had detached during removal and transport of the skull.

A number of leather and textile fragments also were recovered with the body and from on top of the capstones. Two different types of tex-



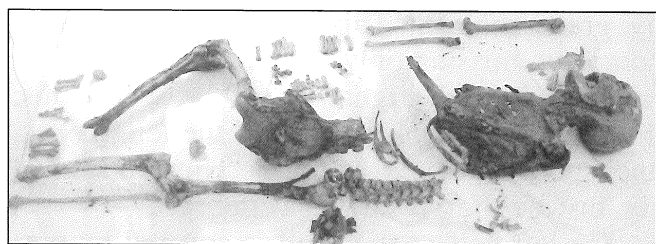
6. Hair and leather with MDA burial 2 (photo by Megan Perry).

tiles were observed, one colored, finely woven cloth with a plaid or checked pattern, and another made from cream-colored, finely woven wool. The leather appeared to be made from pieces stitched together with leather laces.

MDB Burial 1

This individual was discovered laying on his right side facing south within an E-W oriented tomb. This burial contained the best preserved individual in the sample. The cranial and pelvic morphology indicate that this individual was a male, possibly 50+ years old at the time of death based on cranial suture closure. Mummified soft tissue covers a large portion of the body including the skull, the entire left thorax, the right thorax superior to Rib 4, the left upper and lower arm, the lower four lumbar vertebrae, the pelvic girdle, and the left upper and lower leg (**Fig. 7**). Small patches of mummified tissue additionally cover the anterior side of the right femoral diaphysis, the distal surface of the right femur, and the proximal one-third of the right tibial diaphysis. The soft tissue preserved the flexed position of the individual's elbows, hips, and knees at the time of burial. The pelvic girdle and thorax however were largely empty of internal organs. The esophagus could be seen extending into the thorax cavity. Most of the surviving soft tissue appeared to be skin, ligaments, and tendons.

Overlying the soft tissue in many areas were two layers of woven textiles. The inner lay-



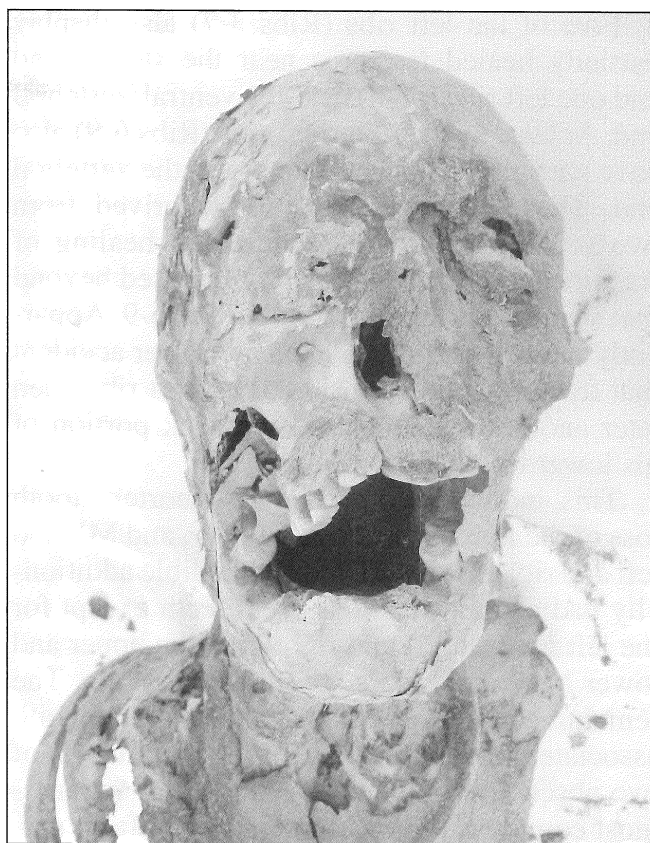
7. MDB burial 1 (photo by Megan Perry).

er consisted of cloth made from fine-woven, cream-colored woolen threads, and the outer layer of more coarsely woven woolen cloth. The only decoration observed on the cloth was a ca. 3.3cm dark band across the piece adhering to the man's face (**Fig. 8**). The burial also had been encased in a leather shroud, of which small pieces were found scattered in the fill surrounding the body. A leather sheet also was discovered lying on top of the capstones above the burial, although this was partially disturbed due to robbing activity. No other grave goods were discovered in the grave.

This individual also had hair still attached to mummified tissue on the skull, pelvic area, and upper legs. A large portion of the scalp contained short (ca. 2.5cm), light-colored hair. Portions of a ca. 1.5cm long beard extend from below the external auditory meati on the left and right sides of the skull down across the mandibular rami and underneath the chin. Removal of the textile fragment over the face also revealed a moustache and other facial features such as eyelids, eyelashes, and the nose (**Fig. 9**). The facial and scalp hair appears to be discolored yellow by the surrounding soil but originally was white due to old age. In the pelvic region and along the upper thighs small amounts of 0.8cm long,



8. Textile over face of MDB burial 1 (photo by Megan Perry).



9. Close-up of MDB burial 1 (photo by Megan Perry).

dark hair could also be seen and are likely the remains of pubic and body hair.

This individual suffered from extensive joint degeneration, including osteoarthritis over most of the body's synovial joints, and extensive vertebral osteophytosis and vertebral disk pathologies (Schmorl's nodes). This is not surprising given his advanced age. More prominent osteoarthritis (sharp ridge with extensive spicule formation) was noted in the left shoulder, elbow, hip, and knee joints (the right side could not be observed due to soft tissue preservation) and the joints of the right and left hands and feet. Less prominent joint degeneration was noted in the left and right wrist and ankle. The synovial joints between the vertebrae similarly display extensive osteoarthritis, particularly between the lumbar and lower thoracic vertebrae. These vertebrae additionally have extensive osteophyte formation in the form of curved spicules on the superior and inferior margins of the vertebral body. Similar levels of degeneration may exist on the right side of the body and within the articulated vertebrae; the presence of soft tissue, however, hinders observation of these joint surfaces.

Five of the left ribs (Ribs 3-7) also display partially healed fractures near the sternal end and one left rib (Rib 8) near the ventral/vertebral end. At least four of the right ribs (Ribs 6-9) also have partially healed fractures near the vertebral end. These fractures apparently derived from two separate trauma episodes. The healing of fractures in left Ribs 3-7 had progressed beyond that seen in left Rib 8 and right Ribs 6-9. Apparently then this individual had an earlier accident that fractured the front side of his left ribs, then later another that fractured the back portion of his lower left and right ribs.

This individual also had antemortem tooth loss of the maxillary left PM¹, PM², and M¹, and left and right M² and M³. The mandible additionally had antemortem loss of all teeth except for the left M¹ and left and right M². The upper and lower M³s likely were absent congenitally. The remaining dentition was worn substantially with associated alveolar resorption and formation of two abscesses. The dental enamel was worn almost completely from the occlusal surface, particularly the lateral incisors, canines, and first premolars of the maxillary teeth. This extensive wear had exposed in many cases the root canal, resulting in the formation of abscesses above the right maxillary I¹, PM³, and M¹.

Radiographic analysis of the articulated portion of the body covered by soft tissue did not identify any further pathologies or anomalies besides confirming the fractures of the right 8th and 9th ribs. No endo- and ecto-parasites or insect remains were noted on this body.

The left and right tali and right calcaneus used for ¹⁴C analysis. The results of this analysis confirmed that this individual died between 81-358AD [95.4% (2σ) calibrated age ranges, relative area under probability distribution 0.978 (Reimer *et al.* 2004)].

MDC Burial 1

The individual contained in this burial was a 25-29 year-old based on pubic symphyseal and auricular surface morphology. The pelvic and cranial morphology did not clearly identify the sex of this individual, but it is possibly a female based on the femoral head diameter and ischio-pubic index \ (France 1998). The skeleton of this individual is well preserved although some elements recently were broken due to disturbance

by grave robbers. This skeleton is relatively complete, missing only the left and right patellae, portions of the right os coxa, the twelfth ribs, distal and proximal portions of the long bones, and some hand and foot bones. This female had six, instead of five, lumbar vertebrae.

The left half of the skull is covered by preserved scalp tissue and ca. 35.0cm long black wavy hair (**Fig. 10**). Only a small piece of dark, finely woven textile was recovered with this burial. No leather fragments were recovered with the body.

This woman had extensive pathological lesions in her cervical, thoracic, and lumbar vertebrae, minor periostitis, some evidence for degeneration of the vertebral disks, and cavities and DEHs in the dentition. First, the anterior, right, and left portions of the cervical, thoracic, and lumbar vertebral bodies displayed resorptive lesions averaging 1-3mm in diameter. Radiographic assessment of these vertebrae identified possible lesions within the vertebral body itself. These lesions seem to be most involved in the 5th through 12th thoracic vertebrae. Potentially associated with these vertebral lesions is slight porosity on the inferior portion of the right ribs along the costal groove toward the dorsal side of the sternal end. Differential diagnosis of these pathologies will help determine the cause of this condition.



10. MDC burial 1 (photo by Megan Perry).

This individual additionally displayed other vertebral pathologies in the form of Schmorl's nodes on the 12th thoracic and 1st, 3rd, and 4th lumbar vertebrae. Furthermore she had a small area of periostitis on the posterior side of the right distal tibia. DEHs observed in this individual's dentition suggest she suffered repeatedly from stress between 2 to 6.5 years of age. Small areas of dental calculus additionally covered most of her permanent dentition, and she had interstitial and cervical caries on her maxillary left I¹.

The left and right tali and calcanei were used for ¹⁴C analysis. This analysis confirmed that this individual died between 71-433 CAL A.D. [95.4% (2σ), relative area under probability distribution 0.998 (Reimer *et al.* 2004)].

WAKA Burial 1

This burial, as the others, had been disturbed before being excavated by the DoA. A modern plastic bag was discovered within the grave fill 90cm below the surface, and the bones had been pushed to the eastern end of the tomb. This burial contained a completely skeletonized individual, approximately 16-18 years old according to epiphyseal union and dental development. The cranium of this individual was missing, probably stolen by individuals who recently disturbed the grave, although a few permanent teeth were recovered. Otherwise this skeleton generally was well-preserved, missing a few cervical and thoracic vertebrae, ribs, long bone epiphyses, and hand and foot bones. Similar to MDC Burial 1, this adolescent had a congenital transitional anomaly between the thoracic and lumbar vertebrae. Many of the skeletal elements, particularly long bones such as the right ulna, radius, and humerus, had purple discoloration, possibly from dye used in textiles that wrapped the burial.

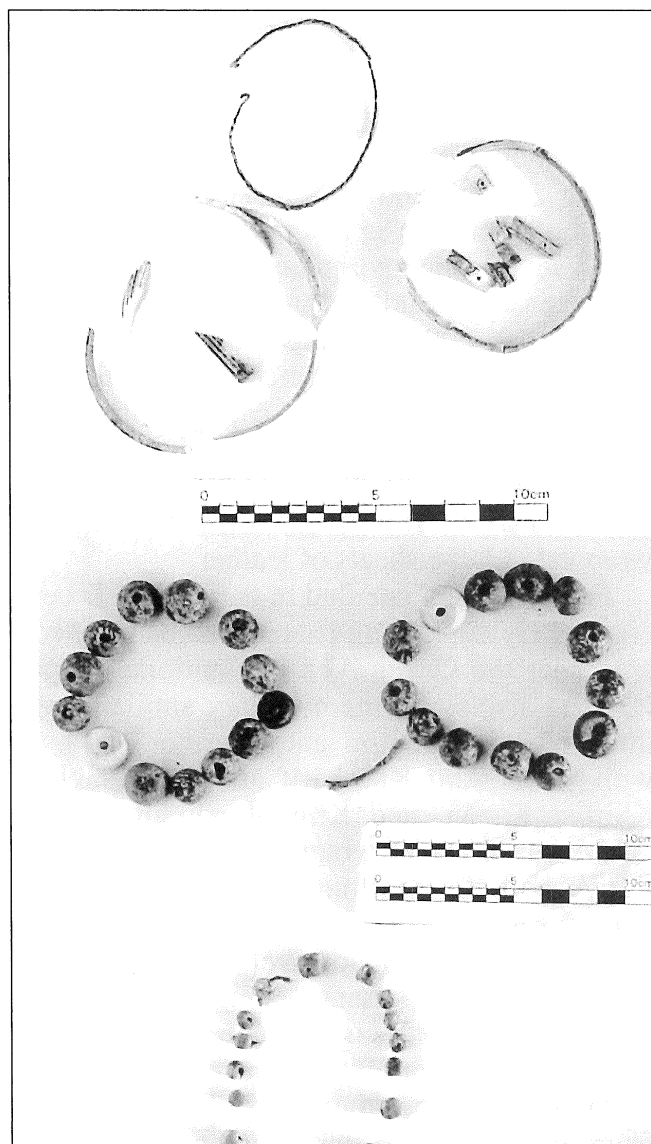
This burial had evidence of abnormal bone loss in the vertebrae and ribs similar to MDC Burial 1 and DEHs indicating childhood stress. Here lesions in the vertebrae were concentrated particularly in T1-T5. These vertebral pathologies may have been associated with porosity on the ribs that ran along the costal groove similar to ribs from MDC Burial 1. DEHs from this adolescent suggest that he or she suffered intermittently from physiological stress in between 2 and 5 years of age. The central and lateral maxillary incisors additionally displayed interesting verti-

cal microabrasions, possibly from diet or use of the incisors for processing certain materials.

A few textile and leather fragments also were preserved in the grave. Two carved bone or ivory bracelets ca. 1cm wide with a diameter of ca. 6cm were recovered with this individual, along with a hooked bronze bracelet or anklet and a number of green glass beads measuring 0.25-1.00cm (**Fig. 11**). The outer surface of the bone/ ivory bracelets have two carved lines running along the top and the bottom of the bracelet edge, in between which are small circular designs.

Discussion

Only a few examples of ancient burials from Jordan containing naturally mummified human



11. Artifacts recovered from WAKA burial 1 (photos by Hani Falahat).

soft tissue have been recovered and studied. The closest parallel for these tombs come from the 2nd-4th century Khirbat Qazone (Khirbat Kazūn) cemetery excavated in 1996, 1997, and 2004 (Fujii 1998, 1999, 2000, 2001). Many graves from the site contained well-preserved burials wrapped in textiles and leather, similar to the burials from Wādī Abū Khashārif and Wādī al-Mudayfi'āt. Some individuals from Kazūn additionally had preserved soft tissue and hair. The Kazūn cemetery contained three primary tomb styles — a simple shaft tomb cut into the soil covered with limestone capstones lying horizontally directly on top of the tomb, similar to these four burials, mudbrick capstones placed at an angle over the grave, or a pit grave covered with burial fill but no capstones (Politis and Granger-Taylor 2003: 107; Politis *et al.* 2005). The Kazūn graves however sometimes contained more than one individual, one notable departure from the Wādī Abū Khashārif and Wādī al-Mudayfi'āt burials.

The 2nd-4th and 6th-7th century AD north and south cemeteries from Khirbat adh-Dhariḥ also resemble the internment style seen at wadis Abū Khashārif and al-Mudayfi'āt (Fujii 1998, 1999, 2000, 2001). Tombs C2 in the southern cemetery and the northern cemetery tombs are simple cist tombs lined and capped with rough-cut limestone slabs. Some tombs contained more than one individual, similar to those from Khirbat Kazūn. The bodies often were interred wrapped in large sheets of leather.

Furthermore a late 2nd to early 3rd AD cemetery likely containing pastoral nomads discovered near the Queen Alia International Airport (QAIA) displays some mortuary similarities to these burials (Ibrahim and Gordon 1987). As with wadis Abū Khashārif and al-Mudayfi'āt, Khirbat Kazūn, and Khirbat adh-Dhariḥ, the QAIA burials were wrapped in large sheets of leather and placed in unlined pits and covered with capstones. The artifact assemblage from the QAIA cemetery however is much broader than the burials presented here, although this may reflect the effects of tomb robbing rather than actual mortuary variation.

Many tombs postdating the 3rd century AD from southern or eastern Jordan suggest that this burial repertoire remained unchanged until at least the 6th century AD. Graves from 3rd-4th

century Bir Madhkūr (Perry 2007), 4th century Wādī Faynān (Findlater *et al.* 1998), and mid-5th century Aila (Perry 2002) all have simple graves with little mortuary architecture beyond a stone or mudbrick-lined cist tomb and/or capstones and few grave goods.

The textiles and leather are currently undergoing analysis and will provide more information on the date of these burials and the use of these materials in a mortuary context. The objects discovered with the one burial from Wādī Abū Khashārif resemble those discovered from other Nabataean, Roman, and Byzantine burials in Jordan. The bone/ivory bracelets likely are the most unique item. Very similar examples have been discovered at Khirbat adh-Dhariḥ in tomb C2 D, although the exact date of this Nabataean, Roman, or Byzantine tomb is unknown (Lenoble *et al.* 2001: 137).

As noted earlier, the lack of associated habitation sites suggests that these cemeteries are associated with a nomadic population who seasonally buried their dead at these locations. The closest documented site is Late Neolithic through Bronze Age Qā' Abū Ṭulayḥa West, ca. 8-10km away (Fujii 1998, 1999, 2000, 2001). The closest contemporary site seems to be the 2nd-early 6th century AD Roman *castellum* of Da'jāniyya, ca. 28km to the west of the cemeteries (Godwin 2006; Parker 1986). No evidence from these burials however ties these individuals to the nearby Roman military presence. The nomads buried in the QAIA cemetery, for example, were thought to have been involved in patrolling the *limes Arabicus* (Ibrahim and Gordon 1987). Presuming that the Wādī al-Mudayfi'āt and Wādī Abū Khashārif cemeteries were associated with seasonal camps, these camps are not in as close proximity to the fort such as the nomads in the QAIA cemetery are to Zizyā (Ibrahim and Gordon 1987; Parker 1986; Perry 2002).

Conclusions and Potential for Future Analyses

The extremely well-preserved nature of these burials indicates that they can elucidate the health and quality of life, migration patterns, diet, and culture of nomadic individuals in Jordan. MDA Burial 2, MDB Burial 1, and MDC Burial 1 all contain preserved soft tissue and hair that can be used for isotopic analyses of

diet, migration, and burial period in addition to ancient DNA analysis. It appears however that viscerae and coprolites have not been preserved in any of these individuals. The disturbed nature of these burials also suggests that recovered insects and pollen may be modern contaminants instead of ancient indicators of the environment, climate, and season. Other contaminants such as cigarette smoke or recent fungal growth may also inhibit chemical analyses of these bodies. The recovery of undamaged and uncontaminated burials through further excavation of these cemeteries is encouraged.

Acknowledgements

The authors would like to thank Fawwaz al-Khraysheh, Director-General of the Department of Antiquities of Jordan, and Pierre and Patricia Bikai, former directors of the American Center of Oriental Research (ACOR), for facilitating and supporting this research. Funding and logistical support were provided by the Department of Antiquities, ACOR, East Carolina University, Yarmouk University, and the Joukowsky Family Foundation. Christopher Tuttle, Eric Nordgren, Ken Nystrom, Hero Granger-Taylor, and Dino Politis provided helpful information on conservation and analysis. Dr. Adnan Ishaq assisted with the radiographic analysis.

Megan A. Perry
Department of Anthropology
East Carolina University
Greenville, NC 27858 USA
perrym@ecu.edu

Abdel Halim al-Shiyab
Faculty of Archaeology and Anthropology
Yarmouk University
Irbid – Jordan
shiyab10@hotmail.com

Hani Falahat
Department of Antiquities
Ma'an District
Ma'an – Jordan
hani_petra@yahoo.com

Bibliography

al-Muheisen, Z. and Villeneuve, F.
2005 Archaeological Research at Khirbat adh-Dharih.

- ADAJ 49: 489-499.
- Findlater, G., el-Najjar, M., al-Shiyab, A.H., O'Hea, M. and Easthaugh, E.
1998 The Wadi Faynan Project: The South Cemetery Excavation, Jordan 1996: A Preliminary Report. *Levant* 30: 69-83.
- France, D.
1998 Observational and Metric Analysis of Sex in the Skeleton. Pp. 163-186 in K. J. Reichs (ed.), *Forensic Osteology: Advances in the Identification of Human Remains*. 2nd Edition. Springfield, IL: Charles C. Thomas Publishers.
- Fujii, S.
1998 Qa' Abu Tulayha West: An Interim Report of the 1997 Season. *ADAJ* 42: 123-140.
1999 Qa' Abu Tulayha West: An Interim Report of the 1998 Season. *ADAJ* 43: 69-89.
2000 Qa' Abu Tulayha West: An Interim Report of the 1999 Season. *ADAJ* 44: 149-171.
2001 Qa' Abu Tulayha West, 2000. An Interim Report of the Fourth Season. *ADAJ* 45: 19-37.
- Godwin, V.L.
2006 The Castellum of Da'janiya (Area T). Pp. 275-287 in S. T. Parker (ed.), *The Roman Frontier in Central Jordan*. Washington, DC: Dumbarton Oaks.
- Ibrahim, M.M. and Gordon, R.L.
1987 *A Cemetery at Queen Alia International Airport*. Wiesbaden: Harrassowitz.
- Lenoble, P., al-Muheisen, Z. and Villeneuve, F.
2001 Fouilles de Khirbet edh-Dharih (Jordanie) I. Le cimetière au sud du Wadi Sharheh. *Syria* 78: 89-151.
- Parker, S.T.
1986 *Romans and Saracens: A History of the Arabian Frontier*. ASOR Dissertation Series No. 6. Winona Lake, IN: Eisenbrauns.
- Perry, M.A.
2002 *Health, Labor, and Political Economy: A Bioarchaeological Analysis of Three Communities in Provincia Arabia*. Ph.D. Dissertation, University of New Mexico.
2007 A Preliminary Report on the Cemeteries of Bir Madhkur. *BASOR* 346: 79-93.
- Politis, K.D.
1998 Rescue Excavations in the Nabataean Cemetery at Khirbat Qazone 1996-1997. *ADAJ* 42: 611-613.
- Politis, K.D. and Granger-Taylor, H.
2003 Nabataeans on the Dead Sea Littoral. Pp. 106-108 in G. Markoe (ed.), *Petra Rediscovered: Lost City of the Nabataeans*. New York: Harry N. Abrams.
- Politis, K.D., Kelly, A.M. and Usman, L.
2005 Survey and Excavations at Khirbat Kazun 2004.

ADAJ 49: 327-337.

Reimer, P.J., Baillie, M.G.L., Bard, E., Bayliss, A., Beck, J.W., Bertrand, C.J.H., Blackwell, P.G., Buck, C.E., Burr, G.S., Cutler, K.B., Damon, P.E., Edwards, R.L., Fairbanks, R.G., Friedrich, M., Guilderson, T.P., Hogg, A.G., Hughen, K.A., Kromer, B., McCormac, G., Manning, S., Ramsey, C.B., Reimer, R.W., Remmele, S., Southon, J.R., Stuiver, M., Talamo, S., Taylor, F.W., van der Plicht, J. and Weyhenmeyer, C.E.

2004 INTCAL04 terrestrial radiocarbon age calibration, 0-26 cal kyr bp. *Radiocarbon* 46: 1029-1058.

Villeneuve, F. and al-Muheisen, Z.

2003 Dharih and Tannur: Sanctuaries of Central Nabataea. Pp. 83-100 in G. Markoe (ed.), *Petra Rediscovered: Lost City of the Nabataeans*. New York: Harry Abrams.