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A CASE OF MULTIPLE MYELOMA AND CONGENITAL ANOMALIES OF AN EARLY ISLAMIC SKELETON FROM TELL ABU AL-KHARAZ, JORDAN

ABSTRACT: The female skeletal remains that were recovered at the site of Tell Abu al-Kharaz in 2014 in Jordan Valley suffered the diseases of multiple myeloma, congenital anomalies and osteoarthritis. She died at an age of about 25–29 years old. Although the remains were found next to an Iron Age structure, the burial type and body position probably suggest an Islamic date. Palaeopathologically, multiple myeloma and secondary cancer (metastatic), such as breast cancer in the case of women, are often difficult to distinguish. However, the female skeleton of this study shows no new bone formation surrounding the perforations, which means that secondary cancer is unlikely to be the cause. This also excludes syphilis as a possible diagnosis.

KEY WORDS: Multiple myeloma – Tell Abu al-Kharaz – Jordan Valley

INTRODUCTION

During the field season of 2014, the Swedish archaeological team at the site of Tell Abu al-Kharaz in the Jordan Valley – directed by Peter Fischer – accidently recovered a human skeleton beside an Iron Age wall, where the legs were positioned during the internment under a recent wall. The area where the skeleton was recovered is an Iron Age area with some walls from recent periods on top. This actually indicates an age younger than the Iron Age and suggested by the director of the excavation to be from the Islamic period (Fischer 2014: personal communication). The body was laid on the right side with the head facing Qibla (south in Jordan), a typical Islamic burial (*Figure 2*). Excavations around the burial revealed no further burials, which is unusual and probably signifies the lower social status of the individual (Al-Shorman 2007). The site was first occupied during the Early Bronze Age and continued throughout the Middle/Late Bronze Ages and the Iron Age (Fischer 2013). Further excavations at the site have not revealed burials but dwelling structures. As

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the site was densely occupied during the various phases of the Iron Age (Fischer 2013), the cemetery might have been located outside the settlement area. The 2014 season aimed to investigate the area around the geographical center of the city.

MATERIALS AND METHODS

The study comprised one skeleton that was recovered from the archaeological site of Tell Abu al-Kharaz in Jordan Valley (*Figure 1*). According to the director of the excavation, the skeleton is dated to the Islamic period and most probably Abbasid (Fischer 2014: Personal communication). The skeleton was found buried under an Iron Age structure on its right side (east-west) and facing south signifying an Islamic burial practice (*Figure 2*). Upon recovery, the bones were in a very poor preservation condition, fragile with longitudinal cracks and bleached. The preservation condition indicates a shallow burial and prolonged exposure to the sun. The skeleton was transferred to the physical anthropology labs at Yarmouk University for bioarchaeological analysis. Visual examination and radiography were used to extract the data concerning demographic variables and paleopathological lesions. These methods were carried out according to the standards by Buikstra and Ubelaker (1994).

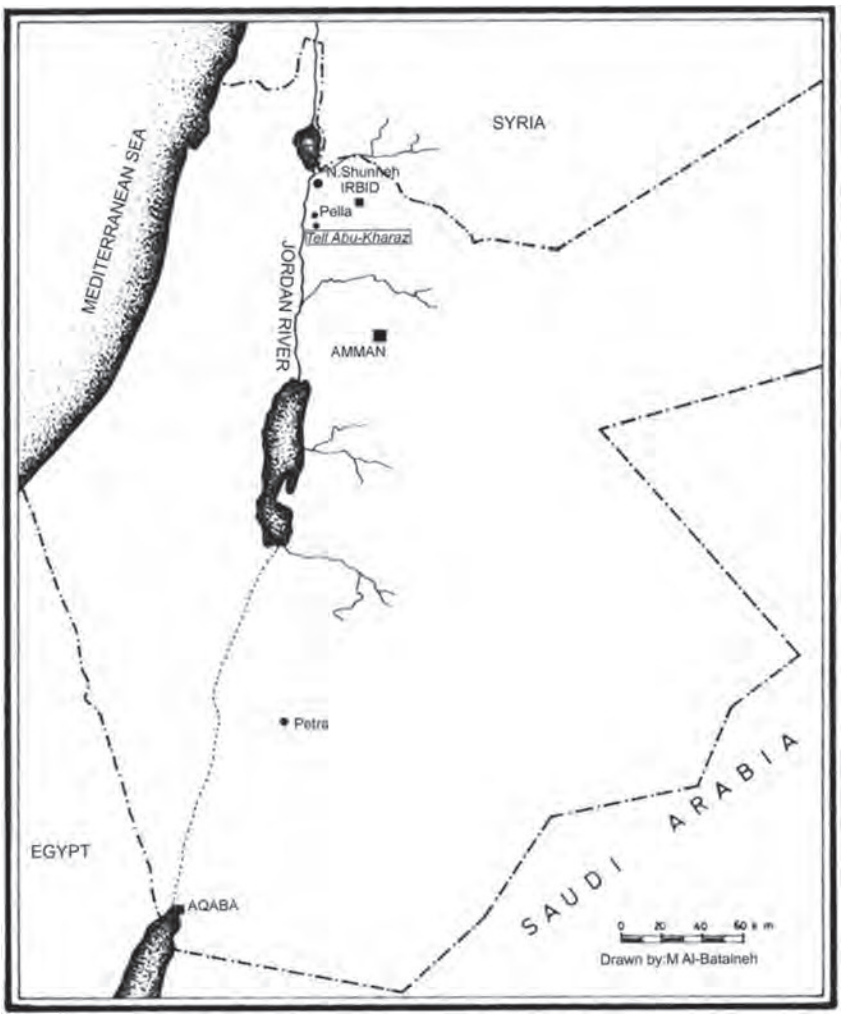

FIGURE 1. The map of Jordan showing the site of Tell Abu al-Kharaz in the Jordan Valley. Mapped by Muwafaq Al-Bataineh.

FIGURE 2. The burial showing internment. Photographed by P. Fischer.

RESULTS AND DISCUSSION

The examination of the os coxae, skull and mandible indicates female sex. The age at death was estimated using the auricular surface, long bones epiphyseal union, and dental attrition. Based on the previous criteria, age is estimated to be in the late twenties (*Table 1*).

The visual examination of the skeleton revealed many pathological lesions. These lesions are listed with their location and possible diagnosis (*Table 2*).

The results show that the individual endured the severity of congenital anomalies in the skull, sternum and pelvis. Beside sternal asymmetry, osteoarthritis of the costal notches was prominent and manifested by new bone formation and pitting (*Figure 3*). The exostosis anterior to the foramen magnum was probably congenital as being regular in shape and smooth (not an inflammatory reaction) (*Figure 4*). This lesion would have restricted right rotation of the head.

The osteophytosis and vertebral body degeneration triggered the formation of Schmorl's nodes (*Figure 5*). The asymmetry of the sacrum also must have altered the body posture and gate, which usually impairs daily activity pattern.

The skull shows multiple perforations in the frontal, parietals, temporals and maxillas typical of multiple myeloma (*Figure 6*). Multiple myeloma is a cancer of plasma cells which accumulates in bone marrow. It is difficult in palaeopathological diagnosis to differentiate between myelomatous perforations in the skull and perforations of secondary cancer (Cattaneo *et al.* 1994). For example, the Egyptian skull (2686–2345 BC) that was diagnosed as cancer of the

TABLE 1. Age estimation of the skeleton.

Bone	Feature	Age in years
Os coxa (auricular surface)	No porosity and no apical activity (Buikstra, Ubelaker, 1994)	25–29
Clavicle	The surface of the facet is smooth without a rim (Steele, Bramblett, 1988)	26–30
Third molar	Fully erupted (Steele, Bramblett, 1988)	>18

TABLE 2. The pathological lesions of the skeleton and their probable diagnosis.

Pathological lesion	**Location**	**Probable diagnosis**
Mild osteophytosis	Lumbar vertebra (L 6)	Osteoarthritis
Mild osteophytosis	Thoracic vertebrae (T 10)	Osteoarthritis
Mild osteophytosis	Cervical vertebrae (C6)	Osteoarthritis
Schmorl's node	Lumbar vertebra(L 6)	Osteoarthritis
Left lower first molar	Premortem loss	Caries
Cartilage ossification	Trachea	Hypercalcemia
Bone resorption	Ossified trachea	Multiple Myeloma
Asymmetry	Sternum	Congenital
Asymmetry	Sacrum	Congenital
Exostosis and pitting	Rt. and Lt. clavicular notch	Osteoarthritis
Exostosis	Anterior to foramen magnum	Congenital
New bone formation and pitting	5th Lt costal notch	Osteoarthritis
New bone formation and pitting	4th Lt costal notch	Osteoarthritis
New bone formation and pitting	3rd Rt. Costal notch	Osteoarthritis
New bone formation and pitting	5th Rt. Costal notch	Osteoarthritis
Cracks	Vault	Postmortem sun exposure
Holes	Frontal (1 Lt.), parietal (2 Rt. and 2 Lt.), temporal (2 Rt.) and maxilla (2 Rt.)	Multiple myeloma
Abnormal bone fusion	Sagittal suture	Congenital craniostenosis
Wear	Anterior and posterior teeth	Dental wear
Cut marks	Left parietal	Anthropogenic (during excavation)

nasopharynx has a number of secondary vault perforations (Wells 1963). However, in multiple myeloma, the lesions are sharply defined holes typically 5 to 20 mm in diameter and often penetrate both tables in the skull (Aufderheide, Rodiguez-Martin 1998). The malignant plasma cells inhibit local osteoblastic activity at the site of the lytic focus, so sclerotic margins do not occur in most cases (Mulligan 2000). Myelomatous perforations are round and small, but individual large lesions, particularly the primary lesion, do occur and small lesions can become confluent, often showing scalloped margins as in the case of the right parietal perforation (*Figure 7*). In metastatic carcinoma, even if it is predominately lytic, some of the lesions usually show osteoblastic response in association with at least some of the lesions (Marcsik *et al.* 2002, Ortner 2003). Multiple myeloma frequently involves the glenoid fossa of the scapula and the lateral portion of the clavicle, and disseminates into the radius and the ulna (Schinz *et al.* 1951–1952).

In multiple myeloma, the multiple and clearly destructive nature of skull perforations distinguishes them from the perforations of chronic infections such as venereal syphilis and from the perforations of trauma (Robert and Manchester 2007); the lesions often have scalloped margins (Mulligan 2000: 127) with localized lytic loci in the diploë that can be seen using radiographs (*Figure 8*) (Molnar *et al.* 2009). Based on the scalloped margins of the perforations,

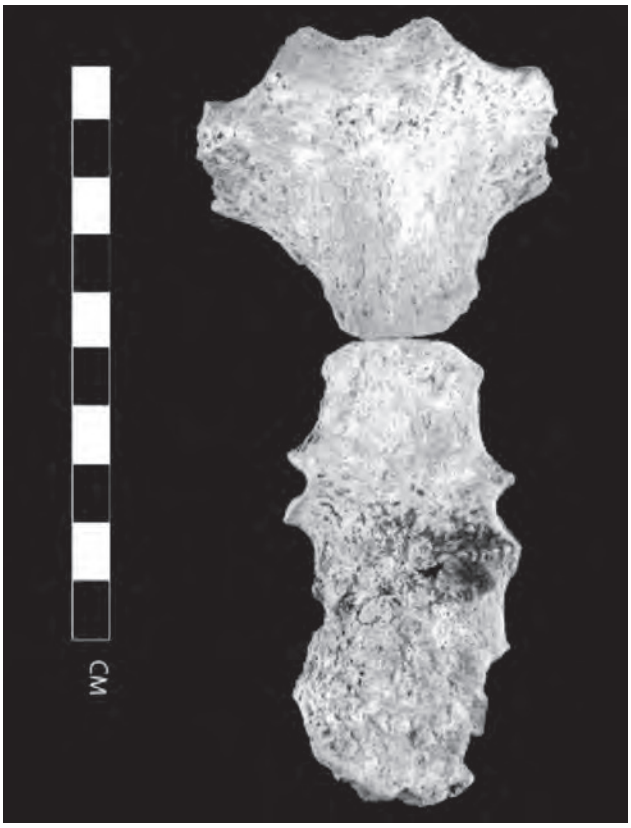

FIGURE 3. Asymmetric corpus sterni and osteoarthritic evidence. Photographed by H. Deebajeh.

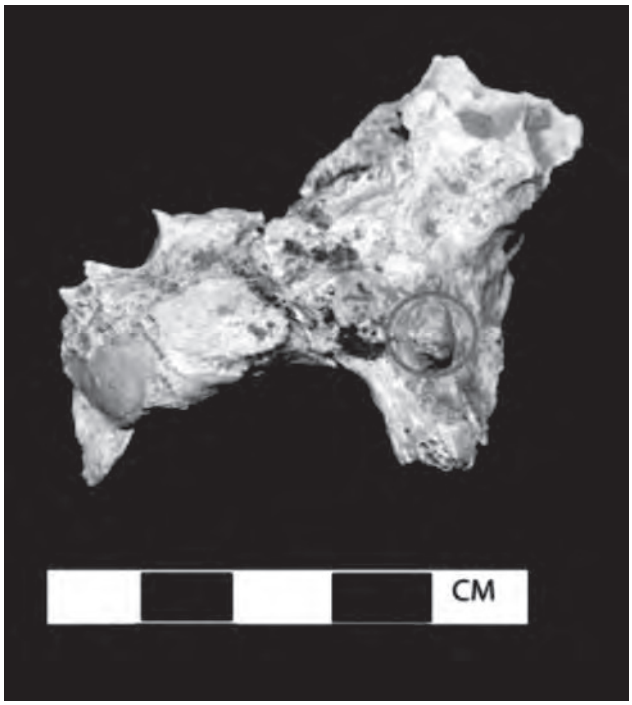

FIGURE 4. Exostosis anterior to the foramen magnum. Photographed by H. Deebajeh.

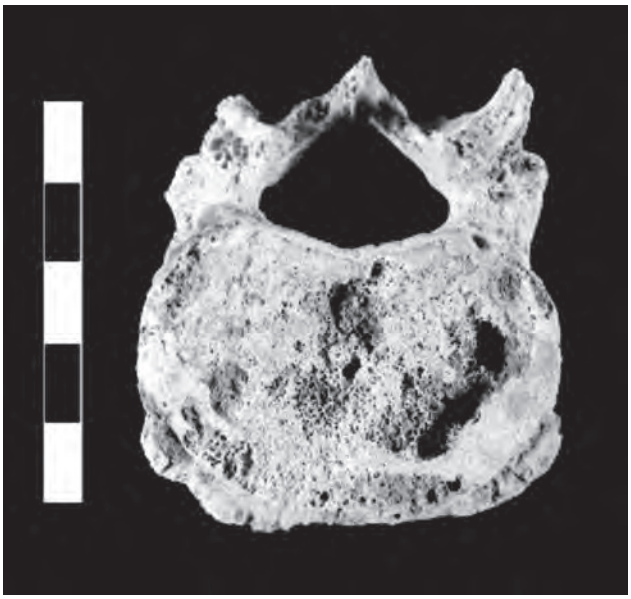

FIGURE 5. Lumbar osteophytosis and vertebral body degeneration. Photographed by H. Deebajeh.

FIGURE 6. Lateral view of the skull showing the multiple perforations in the right parietal and mastoid process. Photographed by P. Fischer.

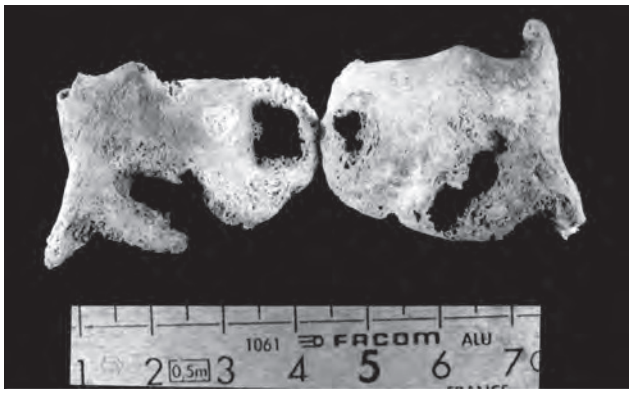

FIGURE 7. The myelomatous perforations of the ossified trachea. Photographed by H. Deebajeh.

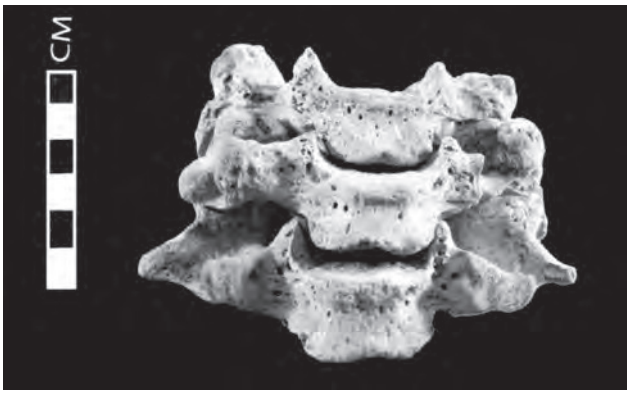

FIGURE 8. The porotic cervical vertebrae. Photographed by H. Deebajeh.

osteoblastic response, penetration and shape, the skull is diagnosed as having multiple myeloma. The vertebrae also shows lesions typical of multiple myeloma and the most evident lesions throughout the skeleton were ossified trachea as shown in figure 9 below. Hypercalcemia is usually encountered in multiple myeloma, which explains the ossification of the trachea (Raab *et al.* 2009).

The teeth exhibited gross dental wear and dental caries, which were attributed to the consumption of hard food items, rich carbohydrate diet, and poor oral hygiene. The lower canines show clear linear enamel hypoplasia reflecting childhood stress.

CONCLUSION

The woman of this study was born with bone anomalies in the head, pelvis, and chest that certainly created improper posture and gate. She lived suffering from the diseases of cancer and congenital anomaly. Trodden sharp knife put an end to her misery. Even after death, she did not receive a decent burial but a humble place in an abandoned area of a vanished society. This probably questions either her social status or the people's fear of her diseases.

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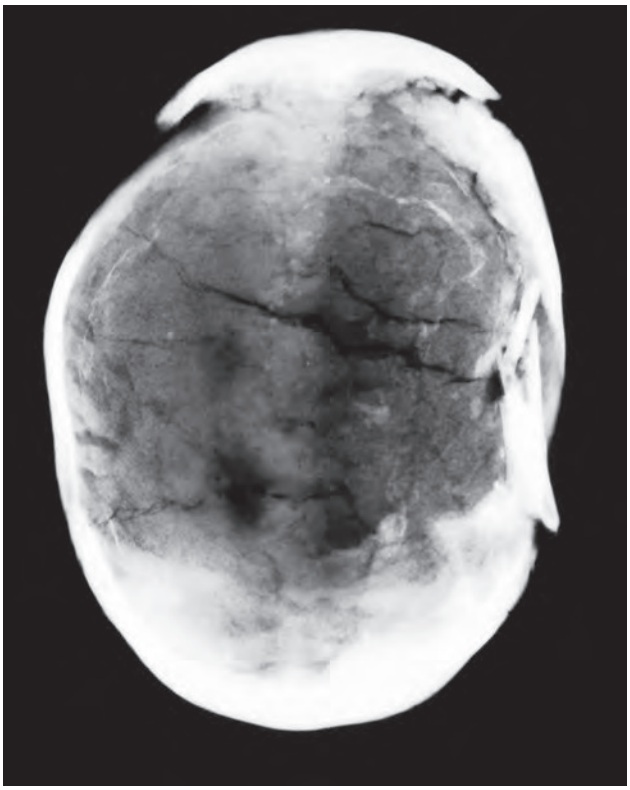

FIGURE 9. Radiograph – additional lytic loci localized in the diploe.

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