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SHORT REPORT

Life on Horseback: Palaeopathology of Two Scythian Skeletons from Alexandropol, Ukraine

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ABSTRACT In 2006, two skeletons were analysed that were previously excavated from the periphery of a Scythian burial mound, near the village of Alexandropol in southern Ukraine. Dated to ca. 325 BC, both remains are male. The first is that of a youth in his late teens who exhibits indications of biological stress and degenerative changes to the spine in the form of a Schmorl's node. The second is a middle- aged individual with extensive healed lesions due to trauma to the right humerus and clavicle with associated bony changes of the elbow and spine. Stable isotope analyses indicate a diet based on C3 plants. Their skeletons suggest a rigorous life on horseback. Both may have served as sacrificial victims. Historical records document the strangulation of attendants and their placement around the periphery of royal burial mounds. Grave goods suggest that both were warriors, although the youth lacks the traumatic injuries exhibited by the older male. The individuals from Alexandropol may have served a Scythian king in life and in death. Copyright © 2008 John Wiley & Sons, Ltd.

Key words: palaeopathology; horseback riding; Schmorl's nodes; Scythian; spinal degeneration

Introduction

Around 325 BC, one of the last of the Royal Scythian burial mounds (kurhans or kurgans) was being used for the interment of royal leaders and their attendants. Alexandropol, located in southern Ukraine, is one of many kurhans that dot the landscape along the lower Dnipro River (Figure 1). They represent the remnants of a culture whose demise still invokes more questions than answers. The Greeks considered them 'barbarians', applying the term to any alien culture that did not speak Greek (Rolle, 1989; Hall, 1989; Ascherson, 1995). Since the Scythians were not a literate people and made their living on pasturing and warfare, many still use the term today.

The Scythians inhabited the steppes of Europe and Asia and flourished on the Black Sea in the Dnipro area during the 5^{th} and 4^{th} centuries BC (Cernenko, 1983; Reeder, 1999). Known for their semi-nomadic lifestyle spent on horseback and in wagons, their burials reflect the importance of their horses. Horses have been recovered from royal burials, decorated in ornamental bridles, and were even embalmed as part of the 40-day-long celebrations following the death of important rulers (Rolle, 1989). The leather bridles fitted

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Figure 1. Map showing the distribution of Scythian kurhans in the study region (Aruz *et al.*, 2000: Figure 75). This figure is available in colour online at www.interscience.wiley.com/journal/oa.

around the horses' muzzles. They were equipped with an iron bit of the snaffle type and adorned with medallion-like ornaments called phalerae. They were often decorated with scenes from myth or daily life (Reeder, 1999). Horses were not only prized possessions but also utilised for their meat. Large numbers of butchered horse remains have been recovered in association with remains of wild boar and stags, believed to be part of ritual funeral feasts (Rolle, 1989).

The two individuals described in this article were not of the royal class. They were located on the periphery of the mound, probably buried as attendants to royalty whose remains were unearthed in the 1860s during excavations that cut through the central part of the mound. Today, the American-Ukrainian Scythian Kurhan Project (AUSKP) is trying to reconstruct the history of this mound and answer some of the intriguing questions concerning the end of a people described by Herodotos in the 5th century BC as a rich, royal, military culture (Marincola, 1996). Burial 1 was discovered in 2004, and Burial 2 in 2005. The remains were brought back to Alexandropol in 2006 to be analysed by Wentz. The remains had previously been analysed and reported by A. Kozak, a Ukrainian researcher, but reports were not available in English. De Grummond has since translated the reports for the purpose of this research. The present report is one of few available in English documenting the people from this region and period.

Materials

Burial 1

Burial 1 consists of approximately 50% of the skeleton of a young male. Although the majority of long bones are represented, none are complete and most consist of approximately half of the element. The remains are highly eroded, preventing substantial metric analyses. The face and

Figure 2. Proximal ulnae from Burial 1 showing bilateral asymmetry; anterior and medial views. This figure is available in colour online at www.interscience.wiley.com/journal/oa.

mandible display both gracile and robust features (all analyses based on standards from Buikstra & Ubelaker, 1994), although the glabella and mental eminence are rugose, indicating a probable male. The pelvic indices (greater sciatic notch, ventral arc, subpubic concavity, and ischiopubic ramus ridge) are ambiguous. This is most likely due to the immaturity of the skeleton (probably late teens as estimated from dental eruption and degree of attrition). The third molars have not erupted and are not in their crypts (possible agenesis). There is minimal wear on the occlusal surfaces of the teeth. Extensive taphonomic damage prohibits estimations of epiphyseal closure. The extremities are well developed, and there is asymmetry of the proximal shaft diameters, general robusticity,

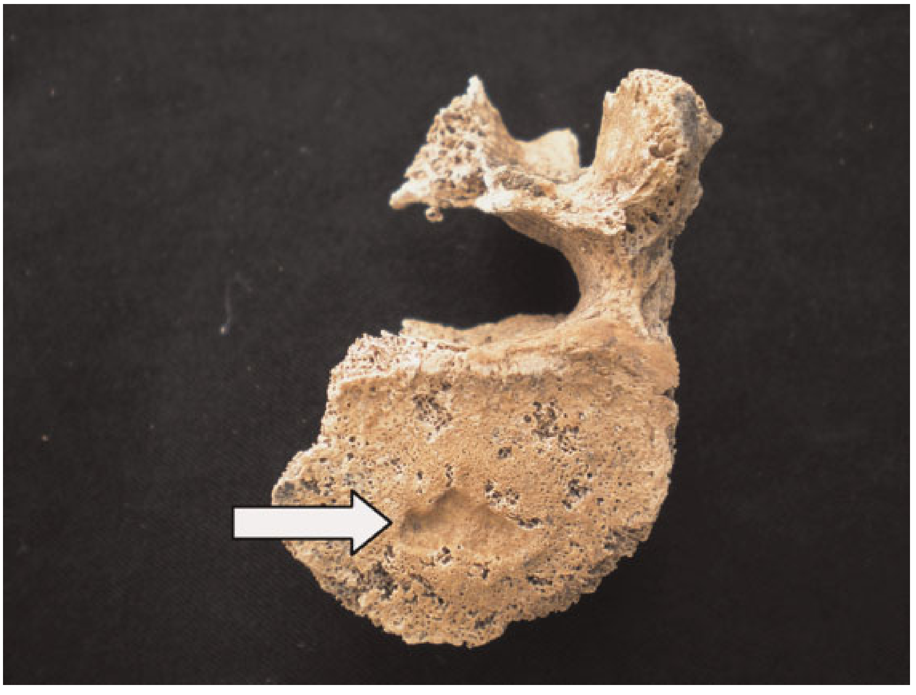

Figure 3. Schmorl's node on lumbar vertebra from Burial 1. This figure is available in colour online at www.interscience.wiley.com/journal/oa.

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Table 1. Skeletal and dental metrics from Burial 1

Element/side	Metric	Measurement (in mm)
Right tibia	A/P at nutrient foramen	33.16
Right tibia	M/L at nutrient foramen	25.09
Patella	Length	40.55
PM^1	Mesial/distal	6.62
PM^1	Buccal/lingual	9.28
PM^1	Crown height	5.45
M_2 (right)	Mesial/distal	9.88
M_2 (right)	Buccal/lingual	8.92
M_2 (right)	Crown height	5.45

and muscle attachment sites between the right and left ulnae. The right ulna is much more robust than the left, which could be attributed to use of the bow and arrow during life (Figure 2). There is an erosive lesion on the superior surface of one of the lumbar vertebrae that appears to be a Schmorl's node (Figure 3). The cranium lacks cribra orbitalia or porotic hyperostosis, although two incisors display linear enamel hypoplasias (teeth crumbled on examination; number of defects not obtained). Limited metrics were obtainable from two teeth due to the extreme fragility of dental remains. No skeletal fractures are noted. Metrics were obtained on the tibia, patella, one premolar (side unknown) and one molar (Table 1). There is a small area (1×2 cm) of hyperporosity above the left orbit, referred to as 'orange peel appearance' by Kozak, who attributed it to exposure to cold weather (Figure 4). Both skeletons display this condition. There is a remnant of a metopic suture, also displayed by both skeletons.

Burial 2

Burial 2 consists of approximately 30% of the skeleton of an adult male, based on facial/cranial morphology. The individual is approximately 40–50 years of age based on degenerative changes to the joints and vertebrae, dental attrition, and significant closure of ectocranial and palatine sutures. Elements of the right upper extremity are present but incomplete. The lower extremities consist of incomplete tibia and only a few bones from the feet. The remainder of the skeleton is highly fragmented. The cranium is highly fragmented and only a portion of the frontal bone

Figure 4. Hyperporosity above orbits from Burial 1; the same condition is noted in Burial 2. This figure is available in colour online at www.interscience.wiley.com/journal/oa.

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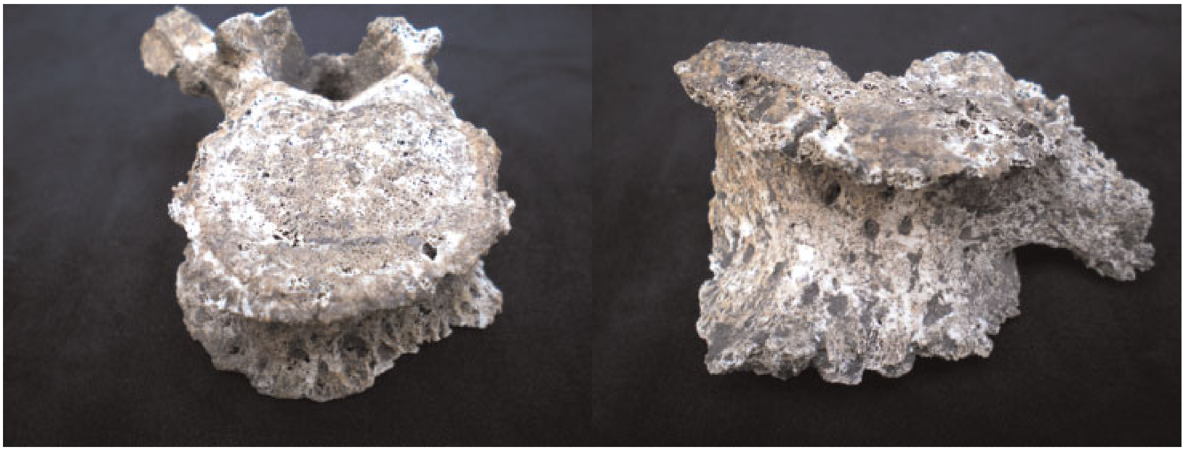

Figure 5. Osteophytic lipping to lumbar vertebra from Burial 2. This figure is available in colour online at www.interscience.wiley.com/journal/oa.

is intact. There is a small area (1 × 3 cm) of hyperporosity over the right orbit. There is the remnant of a metopic suture just above the nasal bones. The face and cranium exhibit both gracile and robust characteristics. Ectocranial suture (at bregma) exhibits significant closure and the anterior median palatine suture is completely fused.

There are eight intact vertebral bodies (four lumbar and four thoracic, not enumerated due to taphonomic damage). All lumbar vertebrae exhibit moderate osteophytic lipping of the anterior bodies. One lumbar and one thoracic vertebrae exhibit Schmorl's nodes and 'parrot-beak' lipping (Figure 5). Two thoracic vertebrae are completely fused (Figure 6). The vertebral condyles of the sacrum also exhibit degenerative changes to their articular surfaces with associated osteophytic lipping.

There is significant trauma to the right upper extremity (radius, ulna and humerus). There is a healed mid-shaft fracture of the right clavicle. There is a healed and displaced fracture to the surgical neck of the humerus with associated shortening of the shaft (Figure 7). The head of the humerus has been medially rotated and driven into the shaft, with significant cortical remodelling to the periphery of the proximal shaft. There are associated bony changes of the elbow joint with degenerative changes to the distal condyles of the humerus (Figure 8). There is significant flattening and lipping of the coronoid process of the ulna. The olecranon process has been broken off *post mortem* but the remnant exhibits marginal lipping. The radial head also exhibits flattening and marginal lipping. Although the joint is not ankylosed, it may have been held in a flexed position in life based on patterns of articulation among the affected joint surfaces. Eleven hand phalanges and one carpal bone were recovered, which are normal in appearance. Metrics were obtained from both tibia and the left radius (Table 2).

Life on horseback

A world traveller and doctor during the second half of the 5th century BC described the Scythians

Figure 6. Fused thoracic vertebrae from Burial 2. This figure is available in colour online at www.interscience.wiley.com/journal/oa.

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Figure 7. Extensive remodelling of a healed humeral fracture from Burial 2. This figure is available in colour online at www.interscience.wiley.com/journal/oa.

as 'small, plagued with arthritis, with swelling of the vertebrae and hip problems associated with their life on horseback' (Rolle, 1980). Changes in skeletal morphology associated with horseback riding have been noted in several studies (Angel, 1982; Reinhard *et al.*, 1994; Scott & Willey, 1997). The degenerative changes to the spine from Burial 2 are consistent with horseback riding, and similar changes have been documented in historic populations in which horseback riding was the primary means of transportation (Scott & Willey, 1997). The Scythians owed much of their prowess in hunting and in battle to the superb skill with which they handled their mounts, spending many hours schooling their animals (Rice, 1957). These skills were probably obtained at an early age. Therefore, degenerative changes of the spine probably began at an earlier age than in non-riding individuals.

Table 2. Skeletal metrics from Burial 2

Element/side	Metric	Measurement (in mm)
Tibia, left	A/P at nutrient foramen	39.01
Tibia, left	M/L at nutrient foramen	27.09
Tibia, left	A/P at tibial tuberosity	56.09
Tibia, right	A/P at nutrient foramen	38.17
Tibia, right	M/L at nutrient foramen	27.52
Tibia, right	A/P at tibial tuberosity	56.29
Radius, left	A/P at deltoid tuberosity	17.56
Radius, left	M/L at deltoid tuberosity	18.21

Although Burial 1 is a young individual, the appearance of a Schmorl's node could be early evidence of changes in the lumbar spine due to frequent riding. Schmorl's nodes in modern populations have been associated with trauma-related injuries in young male athletes (Walters & Coumas, 1991; Yochum *et al.*, 1994) and identified as occupational markers associated with carrying heavy loads (Wilczak & Kennedy, 1998). They have also been associated with congenital defects of the dorsal plate and medical conditions such as hyperparathyroidism, osteomalacia, infection and neoplasm (Yochum *et al.*, 1994). Burial 1 does not exhibit signs of osteomalacia (such as bowing of long bones or metaphyseal expansion) but taphonomic damage to the majority of the cortical surfaces complicates the assessment of other medical conditions such as infection.

To investigate the incidence of Schmorl's nodes in young individuals from an archaeological population, a survey was conducted of the remains from Windover (8BR246), a 7000-year-old Archaic population from eastern central Florida (Doran, 2002). Horses as game animals have been documented in association with pre-Archaic populations in North America. Protein residue analysis of Clovis points from south-western Alberta, Canada, indicates utilisation of horses (*Equus conversidens*) for meat prior to extinction of this animal from the continent at around 10,000 BP (Kooyman *et al.*, 2001). There is no evidence of horses (for consumption or means of transportation) at the Windover site, but the population consists of a large number of subadults (approximately 52% of the total population) and preservation is exceptional, enabling an assessment of Schmorl's node frequencies in young individuals.

A total of 358 vertebrae were examined. Thirty-one subadults (between the ages of 2 and 18) and seven young males (between the ages of 19 and 30) were surveyed based on the availability of at least one thoracic or lumbar vertebra with superior and inferior aspects of vertebral bodies intact (Figure 9). Young adult females were

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Figure 8. Bony changes to the elbow joint secondary to traumatic injury in Burial 2. This figure is available in colour online at www.interscience.wiley.com/journal/oa.

excluded from the survey since the remains from Alexandropol appear to be male. Of the 38 individuals assessed, only two (5%) exhibited Schmorl's nodes: a ten-year-old with an early-stage node on the inferior surface of the fifth lumbar vertebral body, and a 23-year-old male with five nodes (a node on the inferior surface of the 10th thoracic vertebral body; a node on the superior and inferior surfaces of the 11th thoracic vertebral body; and a node on the superior and inferior surfaces of the first lumbar vertebral body). Comparative analyses from archaeological populations associated with riding would help elucidate the frequencies of Schmorl's nodes in young people habituated to horseback riding. According to studies of modern populations, the prevalence of Schmorl's nodes in the spines of elderly persons is reported to be far lower than in young persons (Hamanishi *et al.*, 1994), and they are directly associated with traumatic injury to the spine (Pfirrmann & Resnick, 2001).

Life on horseback had other associated risks. Burial 2 exhibits injuries that appear to be consistent with a fall from a moderate height (perhaps from a horse) that fractured the right clavicle and shaft of the right humerus, damaging the elbow joint. All injuries exhibit similar degrees of healing and remodelling. The only left-sided upper extremity long bone is the radius, which is normal. The tibiae from Burial 2 also exhibit asymmetrical changes possibly related to riding. The posterior aspect of the right tibia has greater development of the interosseus crest than the left, indicating habitual movement involving the right lower extremity. This asymmetry could have resulted from the repeated motion involved in mounting or dismounting a horse. Angel (1982) noted high frequencies of calcaneal fractures associated with frequent dismounting from horseback; therefore, it is logical to assume other skeletal changes would accompany such habitual movement.

The asymmetry noted in the right ulna from Burial 1 could be caused from the use of the bow and arrow. There are many artistic representations of the use of the bow and arrow among the Scythians, which were carried in one large quiver called a gorytos (Cernenko, 1983; Rolle, 1989). The gorytos was worn slung from the belt at the left hip and arrows were shot over the left side of the body (Rice, 1957). Thus, the right arm would have been used to draw back the bow before launching. Additional weapons included swords, daggers, celts, axes and lances, all of which are wielded. Like riding, these skills were probably taught at a young age and could account for asymmetrical muscular development of the arms. Cernenko (1983) noted that bows and arrows accompanied Scythians from cradle to grave, with arrowheads found in burials of kings and commoners alike. Pearson & Lieberman (2004) reported that rates of new bone growth, as well as rates of bone turnover, increase in cases where bone is placed under mechanical strain prior to sexual maturity. Frequent warfare would also have promoted traumatic injuries. Almost the whole of the adult population of Scythia, including large numbers of the women, fought on campaign, with the majority of men serving as cavalry (Cernenko, 1983).

Table 3. Carbon and oxygen isotopic signatures taken from dental enamel from Burials 1, 2 and 3

Name	$\delta^{13}C_{PDB}$	$\delta^{13}C$ std dev.	$\delta^{18}O_{PDB}$	$\delta^{18}O$ std dev.
R-B1	−12.2	0.03	−4.5	0.03
R-B2	−12.2	0.02	−4.6	0.02
R-B3	−10.4	0.07	−5.7	0.09

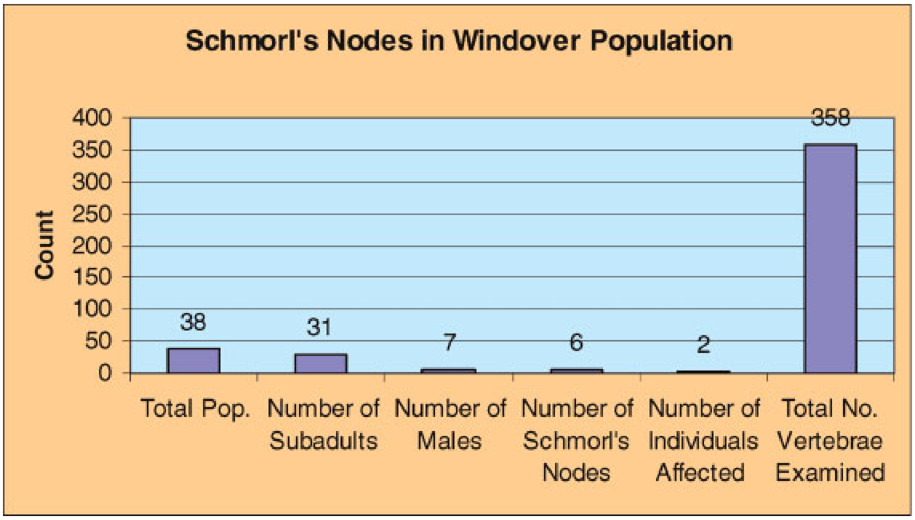

Figure 9. Incidence of Schmorl's nodes among the Archaic population of Windover (8BR246). This figure is available in colour online at www.interscience.wiley.com/journal/oa.

Aside from warfare, horseback-riding enabled the Scythians to hunt local game, such as elk, bison and wild hare. They also utilised edible roots, bulbs and fruit that grew naturally throughout the region (Rice, 1957). Their diet is reflected in stable isotope analyses conducted by Wentz on dental enamel from Burials 1 and 2 that show a diet composed primarily of C3 plants. Results of $\delta^{13}C$ and $\delta^{18}O$ values are provided in Table 3. Analyses were also conducted on dental material from a third skeleton that was excavated late in the season (skeleton not analysed) from the periphery of the mound, revealing similar $\delta^{13}C$ values (Table 3). Oxygen values are similar for Burials 1, 2 and 3, reflecting cultural, temporal and/or geographical continuity among those interred around the periphery of the mound.

Conclusion

This report provides one of the few documented analyses in the English literature on Scythian remains. A literature search of the *American Journal of Physical Anthropology* and the *International Journal of Osteoarchaeology* produced only four references pertaining to remains from this period or region (Murphy *et al.*, 1998 (*IJO*); Ubelaker & Ildiko, 1998 (*IJO*); Ricault *et al.*, 2004 (*AJPA*); and Blau & Yagodin, 2005 (*AJPA*)).

The end of the 2006 field season produced two additional skeletons from Alexandropol (Burial 3, mentioned above, and an additional skeleton). A return to Ukraine to include these skeletons in our analyses is in the planning stages, based on availability of funding. DNA analyses of Burials 1, 2 and 3 are currently underway to shed light on kinship and migration patterns. This analysis provides a framework on which to continue research on the life and health of the Scythians.

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