The pathological changes in the hind limb of a horse from the Roman Period

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ABSTRACT: During the archaeological excavation of a multicultural settlement at the Nitra-Chrenova site (southwestern Slovakia) an assemblage of animal bone remains was revealed. In one of the settlement features dated to the Roman period a complete horse skeleton was discovered. An investigation was carried out in the hind limb of the horse's skeleton involving macroscopic and radiographic analysis. Exostoses were observed on the tibia, talus, calcaneus, tarsal and metatarsal bones. The articular surfaces were destroyed. The anatomical structure of the talus, calcaneus and tarsal bones was not visible due to new bone formation. Additionally, osteomyelitis was observed in the talus, calcaneus and tarsal bones. It is suggested that the pathological changes developed during the septic inflammation process as a consequence of the complicated wound of the tarsal region or the tarsal joint perforating trauma.

Keywords: archaeozoology; palaeopathology; horse; Roman Period; septic arthritis

Palaeopathological analyses of animal remains, in contrast to reports of human palaeopathology in the human medical journals, are in the veterinary scientific literature extremely rare. Palaeopathological investigations are very important for the history of diseases, medicine and veterinary history, ethnography and history of religions (Lachowicz and Wyrost, 1977; Fabis, 1997, 2004, 2005; Rooney, 1997; Ikram and Iskander, 2002; Kloos, 2002; Onar et al., 2002; Driesch et al., 2004; Davies et al., 2005; Chroszcz et al., 2006; Zedda et al., 2006; Zapata and Alcaraz, 2007; Dzierzecka et al., 2008; Lublyanowics, 2008) Sometimes palaeopathology can shed light on great historical mysteries, such as the deaths of the pharaohs Seqenenre Taa II and Tutankhamen (Berge and Goot, 2002; Boyer et al., 2003). Investigations on cat mummies in Bubasteion revised the current knowledge about cats and the Bast goodness cult. The majority of cats were very young and the cause of their death was strangulation. They were sacrificed by priests during special religious ceremonies (Zivie and Lichtenberg, 2005). The analysis of the hind limb from a horse's skeleton is described in this paper. The skeleton originates from the southwestern part of Slovakia and has been dated to the Roman Period. Our investigations were focused on the tibia, talus, calcaneus, tarsal and metatarsal bones.

MATERIAL AND METHODS

The building of a new Shell petrol station in Nitra resulted in a rescue archaeological excavation that was carried out by the Archaeological Institute of the Slovak Academy of Sciences (Brezinova et al., 2003). During the field work in 1996 settlements dating from the Neolithic Period up to the Modern Age were explored. The horse skeleton investigated in this article originates from a settlement dated to the Roman Period. This constituted of a pit 7 with a regular circular ground plan with a diameter of

140 cm narrowing down close to its bottom and with a depth of 85 cm. At a depth of 40–50 cm the horse skeleton in anatomical order was discovered. It seems that the carcass of the animal had been tossed into the pit, without any sign of careful placing. The fill under the skeleton was compact and revealed 19 fragments of pottery, clay spindle whorl, fragments of construction material and animal bone fragments belonging to cattle and pig (Brezinova et al., 2003). The finding was originally identified during the archaeozoological analyses of animal bone assemblage from the site (Fabis, 2003). According to this investigation, some elements of the horse skeleton were missing. A complete vertebral column was preserved, while the skull was heavily damaged and except for the mandibles it was not possible to reconstruct and study its morphology. The skeleton of the limbs was preserved also partially. The horse was a male and died at the advanced age of 10 or more years. According to Vitt's methodology its withers height was 141 cm (Vitt, 1952). On the basis of the eroded surface of the second lower premolars and pathological changes observed on the ventral ridge of the mandible (chronical periostitis caused by permanent irritation by the tight halter) we suppose that the animal had been used as a riding horse. Distinctive proliferative changes of the vertebral column, located on the last thoracal and most of the lumbar vertebras which eventuated in bridging osteofytes support our assumption. The variety of pathological changes in this animal was enriched further by complicated ankylosis of the tarsal articulation and proliferative changes on adjacent bones. These are the pathological changes discussed within this article in more detail. New analysis of the affected hind limb was done on two levels. A detailed macroscopic analysis was carried out. In addition to that, an X-ray investigation was made using the digital radiographic PROSCAN CR-system 35 with CONAXX software. The radiographic apparatus 10040 HF Orange was used with the parameters 2,5 mAs i 50 kV. The radiographs were interpreted with the digital software Promis. Photographic documentation was also carried out.

RESULTS

In the tibia, advanced exostoses, located in the corpus and in the first third of a distal part of the bone, were observed. Similar changes were also located in the articular surface. On the radiograph, shadows, signifying periosteal activity and new bone formation, were observed. The changes had proliferative character (Figure 1 and 4).

All tarsal bones were fused together *(ankylosis)*. The surfaces of the bones were not visible due to extensive, irregular new bone formations. No anatomical structures of the bones could be identified, because of the pathological changes. In the radiograph, an advanced periosteal reaction was visible. The inner bone structure had signs of irregular rebuilding. A blurred picture of the bone trabecular structure was observed (Figure 2 and 3).

In the third metatarsus bone the pathology was located in the proximal diaphysis of the bone. The articular surfaces of the bone were invisible due to new bone formation. The exostoses were highly advanced, and were limited not only to the third

Figure 1. Tarsus of the horse (lateral aspect)

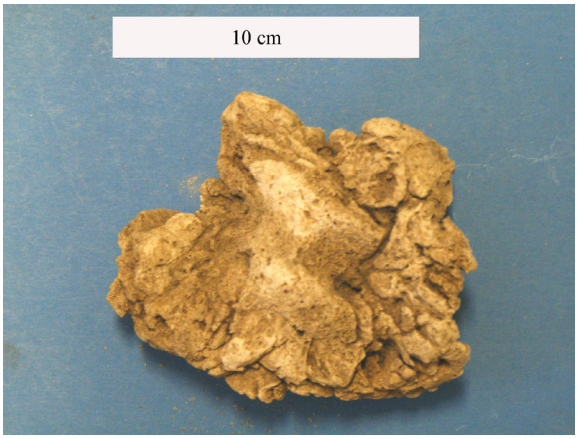

Figure 2. Deformed tarsal bones (proximal aspect)

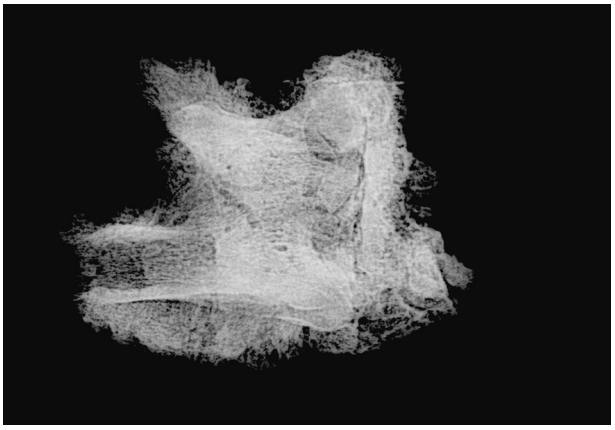

Figure 3. Radiograph of the tarsal bones (posterior-anterior projection)

Figure 4. Radiograph of the tibia (posterior-anterior projection)

metatarsal bone, but occurred also in the second and fourth metatarsals. The X-ray picture was similar to the tibia and exostoses were observed on the cortex of the bones. Changes inside the medullar cavity structure were not visible (Figure 1).

DISCUSSION

There are only a few publications regarding pathologies in equines found archaeological excavations. A case of a complicated fracture with subsequent *osteomyelitis* in a horse limb was reported by Antikas (2008) while changes such as fractures, *periostitis purulenta*, *osteophytosis*, *ankylosis* were described by Rooney (1997). Kobryn (1987) investigated horses from the Middle Ages and concluded that fractures are the most common pathologies. Dzierzecka et al. (2008) documented several conditions such as *arthropathia deformans, ankylosis* of the tarsal joint *(arthropathia ankylopoetica)* in horses from the Middle Ages. Various examples of healed bones fractures, exostoses and pathological changes in the vertebral column were described by Ambros and Mueller (1980) in horses from Slovakia and Czech Republic found within the graves of Slavs and Avars. Miklikova (2008) described *periostitis* of the metapodium and a possible case of tuberculoid changes on the ribs of horses from an early medieval settlement situated in south-western Slovakia. The changes observed by Bendrey (2008) in horses from the Vaibles farm in England were located on the ribs, the pelvis and the vertebras. In his opinion, these changes suggest *Mycobacterium bovis* or *Brucella abortus* infection. An identification of *tuberculosis* or *brucellosis* has implications in terms of exposure of the horse to diseases and possible horse breeding, as it is thought that both diseases occur principally through contact with cattle (Brendrey, 2008). It would mean that the farmers from the studied region had also been in contact with zoonoses.

The typical bone reaction *(periostitis)* on an inflammatory process is presented in this paper. The lyses of the bone, characteristic for bone *neoplasia*, were not observed in this case. Bone tumours such as *osteosarcoma* or *osteochondroma* are very rare in horses (Busch et al., 2007). In the investigated animal the changes were very advanced and were located in the large area. Tarsal joint ankylosis occurred also; therefore, we can assume a long-running process. The most advanced changes were located in the talus and other tarsal bones, where the pathological process occurred inside of the bones *(osteomyelitis)*. Advanced changes were also seen in the proximal part of the third metatarsal bone and the distal part of the tibia. This clinical picture suggests a pyo-inflammatory process caused by a complicated injury of the tarsal region, or a trauma penetrating the tarsal joint directly (Brusie et al., 1992; Schneider et al., 1992). Gramm-positive bacteria have been described to the most common infectious agent in adult horses (Schneider et al., 1992). Meijer et al. (2000) described both Gramm-positive and Gramm-negative and also a mixed population of bacteria within septic arthritis after perforating trauma. The pathological changes affected the tarsal joint and its nearest surroundings. The infectious diseases process started probably in the tarsal joint and spread along the attached

bones and tissues *(per continuitatem)*. Certainly, pain, joint area effusion, edemas and strong lameness were present. Advanced changes occurred also in the articular surfaces of the tarsal joint which was immobilized. The clinical status of the animal excluded the riding possibility. Injuries of the locomotion apparatus in the horses are very common. If the wound in the joint region or the joint trauma is not quickly healed a pyo-inflammatory process can develop. Hyland (2003) argues that locomotion apparatus injuries were the major problems in horses in ancient times. Even today, when veterinary medicine is very advanced, the treatment of purulent arthritis *(arthritis purulenta)* is a serious and complicated medical problem (Meijer, 2000; Mattson et al., 2004; Richardson, 2008). Our information about animal healing techniques within "barbarian" tribes such the Germani or Teutons (in older literature) is not sufficient and in fact, we have to base our knowledge on the Roman military veterinarian Apsyrtos. His writings on the tarsus region phlegmon *(phlegmona)* treatment are known (Amann, 1983). If the horse had been treated in order to restore health, the observed pathological changes proved that treatment was unsuccessful, causing the health status of the animal to deteriorate. The disease process had been long-running in character and the horse could not have been used for riding any more. This means that the animal had been under the owner's care for a long time due to the hope of successful treatment. Finally, the horse from the Germanic settlement in Nitra either died or had to be put down by its owner or another person.

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Received: 2009–10–09
Accepted after corrections: 2010–07–29

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