



Case Study

Paleopathological changes in an early iron age horse skeleton from the Central Balkans (Serbia)[☆]



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ABSTRACT

During a rescue archeological excavation in 2012 at the site of Ranutovac-Meanište near Vranje, southern Serbia, remains of an Early Iron Age (Hallstatt B-C) settlement were revealed. In one of the settlement pits a complete horse skeleton was discovered. The skeleton belongs to a mare, aged 4–5 years at death. In this paper, paleopathological changes in the horse skeleton are described and analyzed using macroscopic, radiographic and scanning electron microscopy techniques to interpret the possible use of the animal. Potential biting damage is observed in the lower second premolars (P₂) and mandibular diastema. Several pathologies are recorded in thoracic (T₁₀₋₁₇) and lumbar vertebrae (L₁). Paleopathological changes in forelimbs are restricted to the lower leg bones. Bone changes in the hind-limbs, beside the metatarsals and the first phalanges, are also observed in the right femur, right calcaneum and both tibiae. These paleopathological changes were caused by chronic inflammation of ligaments as a consequence of the intensive exploitation of the animal, most likely riding. This paper is one of the first publications of animal paleopathology in Serbia and the first identified example of coxofemoral osteochondrosis in horse in the paleopathological literature.

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1. Introduction

In human history, no other domestic animal has played such a direct role in accelerating social processes and political developments as the horse; it has been central to the rise and fall of empires and the conquest of entire continents (Bowling and Ruvinsky, 2000). Given its importance, equine studies are well developed and scholars from various disciplines are working to achieve better understanding of different aspects of horse evolution, its domestication and relationships with humans. Horse paleopathology has been used to answer crucial questions concerning when, where and how the horse was domesticated (Anthony and Brown, 2000, 2011; Anthony, 2007; Bendrey, 2007a; Brown and Anthony, 1998; Levine et al., 2000, 2005; Levine, 1999, 2005; Outram et al., 2009). Paleopathological studies are also reliable in detecting changes in strategies of horse management through time (Antikas, 2008; Bartosiewicz and Bartosiewicz, 2002; Daugnora and Thomas, 2005; Janeczek et al., 2012).

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In this paper the results of the paleopathological analysis of a complete horse skeleton from the Early Iron Age site of Ranutovac-Meanište in southern Serbia are presented. Using an interdisciplinary approach, the use of the horse, as well as the causes and processes of diseases are described and reconstructed. This is one of the first works in the field of animal paleopathology in present-day Serbia. This is unsurprising given that the discipline has recently started to develop in this region (Marković, 2013; Marković and Bulatović, 2013; Marković et al., 2014a, 2014b, in press).

2. Archeological context

Ranutovac (Fig. 1) is located near Vranje, about 50 km north of the border of Serbia and the Former Yugoslav Republic of Macedonia. The site of Meanište, situated on the eastern periphery of Ranutovac, was investigated in spring 2012, as part of systematic rescue excavations of the sites endangered by the construction of the Belgrade-Skopje highway.¹ The site is located on the left terrace of the South Morava River, from which it is currently situated about 600 m away. The excavations revealed a necropolis with

¹ The research was conducted by the Institute of Archaeology in Belgrade during April–July 2012.



Fig. 1. Map of Serbia (Central Balkans) with location of the site of Ranutovac.

cremations dating from the Early Bronze Age (late third–early second millennium BC) (Bulatović, 2013), and the periphery of an Early Iron Age (the first half of the first millennium BC) settlement.

Feature 41 in which a horse skeleton was discovered consists of two pits: the southern, oval in shape (length of 2.2 m and width of 1.8 m, the relative depth from the excavation surface approximately 0.7 m) and northern approximately circular in shape with a diameter of 1.7 m (baseline) to 2.1 m (bottom of the pit), with a relative depth of 1.8 m. The pits were filled with fragments of daub and charcoal, as well as fragments of pottery, while a flake of chipped stone and a terracotta coil were found in the southern pit. The horse skeleton was laid in the northern pit about one meter deep in the dark loose soil with daub pieces. The horse was buried on its left side on an east–west axis with limbs extended and head bent toward the chest (Fig. 2). The flattened bottom of the pit was situated about 0.7 m below the horse skeleton. The fill of the pit below the horse skeleton contained the same materials as the fill above. A pit dwelling with storage pits (*butroi*) around it, approximately from the same period, was found about 10 m north–east of Feature 41.

The pit fill is broadly dated to the Early Iron Age, based on stylistic-typological characteristics of pottery finds. The shapes and decorations of vessels from Feature 41 means that they can be attributed to the indigenous culture that developed under the influence of late stage Gava-Belegiš II culture (a regional variant of the Unrenfelder cultural complex) and the somewhat younger Kalakača culture from the southern part of the Great Hungarian Plain. This indigenous cultural group in the South Morava valley is determined to the period Hallstatt B–C according to Central European periodization (Bulatović, 2009). Wheel-thrown Greek painted pottery, which has been found in some burials at the site, indicates



Fig. 2. Horse skeleton in situ (photo: A. Bulatović).

the continuous life of the settlement throughout the entire Early Iron Age until the sixth/fifth century BC.

3. Materials and methods

Analysis of the complete horse skeleton discovered in the pit was undertaken macroscopically. Sex identification was achieved using the morphology of the pelvis (Sisson and Grossman, 1975), although account was also taken of the presence of small vestigial canines. The age of the animal was estimated according to lower incisor wear (Cornevin and Lesbre, 1894). Withers height was calculated after Johnstone (2004). The enamel exposure on the anterior edge of the lower second premolars and changes to the diastema of mandible are interpreted as possible damage caused by biting, following Bendrey (2007a). The pathology observed in the spine was classified according to Bartosiewicz and Bartosiewicz (2002). The ossification of the interosseous ligaments between the metapodials was quantified using the scoring system of Bendrey (2007b).

Lower second premolars (P_2) were extracted from the mandibles and examined under a Scanning Electron Microscope (SEM). They were selected to examine narrow bands of enamel exposed on the anterior surface of the teeth. Scanning was undertaken in the Laboratory for Scanning Electron Microscopy (SEMLAB) at the Faculty of Mining and Geology, Belgrade University, Serbia. A JEOL JSM-6610LV Scanning Electron Microscope and EDS detector (model: X-Max Large Area Analytical Silicon Drift connected with INCAEnergy 350 Microanalysis System) were used in the analysis. The SEM was used in variable pressure mode, with a chamber pressure of 50 Pa, using nitrogen as a chamber gas. Operating conditions were: 20 kV, probe current setting 10 nA, working distance 10 mm. The chemical analysis was undertaken using internal standards with total normalized to 100% (Table 1).

X-ray analyses of the pathologically modified femur were carried using a Giertch EX9025 V camera on Scanx14 phosphorescent plates and Protec 35 × 43 flexible plates. The applied exposure was 50 kV and 6–8 mA.

4. Results

The horse skeleton is well preserved. Evidence of slaughter and butchery were not observed. The absence of gnawing and weathering marks indicate that the horse was buried shortly after death.

The skeleton belongs to a mare based on the shape of the pelvis and the presence of small vestigial canines. The sciatic arch (*arcus ischiadicus*) is slightly expressed which is characteristic for mares

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