International Journal of Paleopathology 14 (2016) 31–35

Contents lists available at ScienceDirect

International Journal of Paleopathology

journal homepage: www.elsevier.com/locate/ijpp

Spavin in red deer: A case study from the Early Neolithic Blagotin, Serbia

Jelena Bulatović[a,*], Nemanja Marković[b], Oliver Stevanović[c], Darko Marinković[d], Ivana Stojanović[b], Nikola Krstić[d]

[a] Laboratory for Bioarchaeology, Department of Archaeology, Faculty of Philosophy, University of Belgrade, Čika Ljubina 18-20, 11000 Belgrade, Serbia
[b] Institute of Archaeology, Kneza Mihaila 35/IV, 11000 Belgrade, Serbia
[c] PI Veterinary Institute of Republic Srpska "Dr. Vaso Butozan", Branka Radičevića 18, 78000 Banja Luka, Bosnia and Herzegovina
[d] Faculty of Veterinary Medicine, University of Belgrade, Bulevar Oslobođenja 18, 11000 Belgrade, Serbia

ARTICLE INFO

Article history:
Received 24 December 2015
Received in revised form 21 April 2016
Accepted 27 April 2016

Keywords:
Red deer
Tarsal joint disease
Spavin
Early Neolithic
Blagotin
Serbia

ABSTRACT

Pathological modifications are rarely observed in the remains of wild animals from archaeological sites. We present one such specific, pathological change – a case of spavin in a red deer specimen from the Early Neolithic site of Blagotin, in central Serbia. The left tarsal joint presented proliferative new bone formation, which was analyzed macroscopically, then subjected to X-ray and computed tomography (CT) imaging. We assume that the initial degenerative changes in this red deer tarsal joint were probably caused by ageing, although the environment may have likely contributed to the progression of the disorder. Spavin usually results in stiffness of the joints and in lameness, perhaps contributing in the animal's capture by Neolithic hunters. This case is important in that it demonstrates that spavin is not necessarily a consequence of riding or traction work.

1. Introduction

The earliest Neolithic in the central Balkans is represented by Starčevo culture, part of the Starčevo-Kőrös-Criş cultural complex (c. 6300–5200 BCE). The vast majority of the Starčevo sites are small, short-term occupations, mostly single-layered and characterized by the presence of large pits, whose function is still debatable (e.g. Bogdanović, 1988; Greenfield and Jongsma-Greenfield, 2014). Starčevo communities, the earliest agricultural communities in the region, also practiced farming and animal breeding. Hunting was an important activity (Bökönyi, 1970, 1984; Clason, 1980).

In this paper, we present a case of spavin in red deer from the Early Neolithic site of Blagotin, in central Serbia. The site is located 26 km northeast from the present-day town of Trstenik, and approximately 180 km south of Belgrade. The first small-scale excavation of the site was conducted in 1985 (Tomić, 1988), followed by several systematic excavation campaigns between 1989 and 2002 (Greenfield, 1995; Nikolić and Zečević, 2001; Radoman, 1995; Redžić and Zečević, 1995; Stanković, 1992a,b; Stanković and Leković, 1993; Stanković and Redžić, 1996a,b; Stanković and Runić, 1990; Stanković et al., 1997). The site covers 6 ha, and presents a cultural layer around 0.8–1.1 m depth (Greenfield, 1995; Nikolić and Zečević, 2001; Radoman, 1995); however, only 300 m^2 of the site has been excavated (Nikolić and Zečević, 2001; 4). It is a multi-layered site, which was initially inhabited during the Early Neolithic (end of the VIIth and beginning of the VIth millennium BCE). It was reoccupied in the Early Eneolithic, the Early Bronze Age and the Early Iron Age (Nikolić and Zečević, 2001).

Nine pit features have been partially or completely excavated in the central part of the Early Neolithic settlement at Blagotin. They were arranged in a circular pattern, around the largest central pit feature (10 × 8 m), which according to the excavator was a shrine (Nikolić and Zečević, 2001; Stanković and Leković, 1993; Whittle et al., 2002). Other pit features were smaller, approximately around 4 × 5 m. All pit features are ellipse or trapezoid in shape (Nikolić and Zečević, 2001), and they are more or less contemporaneous (Greenfield and Jongsma-Greenfield, 2014, 25). The Early Neolithic settlement of Blagotin has been radiocarbon dated: OxA-8608: 6440–6230 cal. BCE, OxA-8609: 6230–6020 cal. BCE, and OxA-8760: 6220–5990 cal. BCE (Whittle et al., 2002).

The economy of the Early Neolithic population at Blagotin was based on animal husbandry, while hunting, fishing and gathering played a minor role in subsistence (Greenfield and Jongsma-

* Corresponding author.
E-mail address: jelena.bulatovic@f.bg.ac.rs (J. Bulatović).

http://dx.doi.org/10.1016/j.ijpp.2016.04.006
1879-9817/

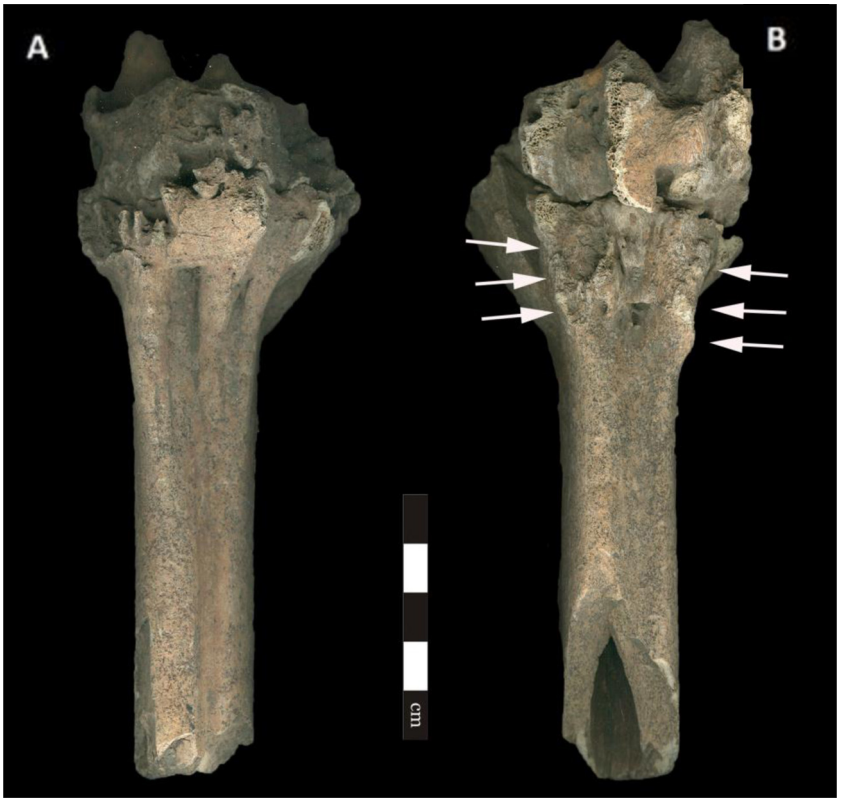

Fig. 1. Red deer tarsal joint with ankylosis; arrows show syndemosphytes.

Greenfield, 2014). As of yet, only faunal material from the 1989 to 1994 campaigns has been published, but the data already identifies the Blagotin faunal assemblage as one of the largest in the region, with 8.729 specimens identified to a genus or species taxonomic level (NISP) (Greenfield and Jongsma-Greenfield, 2014). The vast majority of remains belong to domestic animals (91.7%). The most abundant taxa are caprines (59%), followed by domestic cattle (31%); other domestic animals are present in very small numbers. Few remains from wild species were registered (8.3%). The most common wild species are red deer (3%) and roe deer (2%). Most of the deer, aurochs and boar were adults, thus exhibiting classic hunted age profiles (Greenfield and Jongsma-Greenfield, 2014).

2. Material and methods

The red deer tarsal joint analyzed in this paper consists of the left os centroquartale and proximal part of the metatarsal bone. It was found during the 1995 excavation's season in the tenth spit of the trench BLRc, which was dated to the Early Neolithic based on stylistic-typological characteristics of pottery found within the spit. The specimens are well preserved without any gnawing, weathering and butchering marks.

The specimen was first inspected macroscopically. X-ray analyses of bones with pathomorphological changes were carried out using a X-ray apparatus Siemens Selenos 400 (55 kV, 16 mA s). Computed tomography (CT) imaging of the specimen was performed with a Siemens Somatom AR. STAR scanner (slice thickness 1 mm, 110 kV, 63 mA s).

3. Results

Based on size and morphology, this specimen analyzed belonged to an adult red deer. Proliferative new bone formation was macroscopically observed in the dorsal and plantar surfaces of the os centroquartale, as well as in the proximal parts of the metatarsal bone. Exostoses of the tarsal joint differ in size and intensity. Nodular and well-formed proliferative lesions, osteophytes with large longitudinal syndesmophytes, were observed in the margins of the joint capsule and in ligamentous insertions. These changes were visible on the plantar surface of the proximal part of the metatarsal bone. The joint showed signs of incomplete ankylosis, with new bone formation and zones of articular surface deformation (Fig. 1).

Results of the analysis X-ray and CT scan showed massive flaky periostal proliferations (*periostitis ossificans chronica*), localized in the dorsal and plantar surfaces of the os centroquartale, as well as in the proximal parts of the metatarsal bone (Fig. 2). The intensity of these changes varied from initial signs of periostitis up to formed osteophytes, syndesmophytes and spur shaped, joint-bridging exostoses, particularly well developed near the ligament insertions and joint capsule (Fig. 3). These manifestations were proliferative and were characteristic of a chronic deformative inflammation or chronic arthropathy. Marked narrowing of the interarticular spaces and double contouring between the second and third row of the tarsal bones, as well as the fusion of the corresponding articular surfaces with proximal metatarsal epiphyses were noted, indicating the degenerative component of the pathologic process (Fig. 4). All these abnormal changes were indicative of a chronic deformative inflammation of the tarsal joint, common in ungulates and usually referred to as spavin (*arthropathia deformans et ankylopoetica tarsi*).

4. Discussion and conclusion

Degenerative osteoarthritis in tarsal joints is well-known in cattle and horses (Axelsson et al., 2001; Bartosiewicz et al., 1997; Bartosiewicz, 2013; Baxter, 2011; Björnsdóttir et al., 2003; Schebitz, 1965; Schebitz and Wilkens, 1967). This change is often attributed to overwork (Baker and Brothwell, 1980; Bartosiewicz et al., 1997;