Spondyloarthropathy in a captive female brown bear (*Ursus arctos*)

ABSTRACT

Spondyloarthropathy is a form of arthritis that affects spine, especially sacroiliac joint leading to the severe, chronic pain and over time, can cause complete fusion of the sacroiliac (SI) joint. The present report describes a case of spondyloarthropathy in a captive female brown bear (*Ursus arctos*) from Sarajevo zoo, Bosnia and Herzegovina. Morphological inspection and radiograph of the macerated sacral and coxal bone specimen was performed. Both examinations showed complete bilateral symmetrical fusion of the sacral and coxal bone with syndesmophyte formation. Animals residing in zoos are kept under specific conditions which lead to inactivity and possible mobility problems caused by some sort of spondyloarthropathy.

Keywords: Spondyloarthropathy, sacroiliac joint, zoo animal

Introduction

The group of seronegative spondyloarthropathy includes ankylosing spondylitis, Reiter's syndrome, psoriatic arthritis and the arthritic conditions associated with inflammatory bowel disease (McEwen et al., 1971). These conditions are characterized with the production of the bony outgrowths called syndesmophytes, which replace inner ligaments and joint capsule leading to the complete ossification and fusion of the spine and iliac region (Kompanje et al., 2000). The syndesmophytes often form at the cranioventral margin of the wing of the sacrum and adjoining aspect of the ilium (Gembardt, 1974). The other symptoms of spondyloarthropathy are fusion of the vertebral bodies, nonmarginal syndesmophytes and zygapophyseal joint fusion (Rothschild and Woods, 1989). The exact cause of the spondyloarthropathy is yet unknown, but it's believed that genetic and environmental factors both play a role. Some previous bacterial infection (*Salmonella*, *Shigella* and *Yersinia*) can serve as a trigger of the inflammatory response (Granfors et al., 1988). Spondyloarthropathy has been documented in bears (Kompanje et al., 2000; Rothschild et al., 1993) and in various animals like large cats (Rothschild et al., 1998), gorillas (Rothschild and Woods, 1989) and primates (Rothschild and Rothschild, 1996).

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Case Report

Nedžad Hadžiomerović[1a]
Rizah Avdić[1b]
Senad Kovačević[2c]
Faruk Tandir[1d]
Pamela Bejdić[1e]

[1]. Department of anatomy and histology with embryology, Veterinary faculty, University of Sarajevo, Bosnia and Herzegovina
[2]. 4th year student, Veterinary faculty, University of Sarajevo, Bosnia and Herzegovina
[a]ORCİD 0000-0002-3155-1011
[b]ORCİD 0000-0002-6874-444X
[c]ORCİD 0000-0001-5127-7198
[d]ORCİD 0000-0001-9184-592X
[e]ORCİD 0000-0002-4938-6333

Correspondence
Dr. sc. Nedžad Hadžiomerović
Department of Anatomy and Histology with Embryology, Veterinary Faculty, University of Sarajevo, Bosnia and Herzegovina
E-mail: nedzad.hadziomerovic@vfs.unsa.ba
Zmaja od Bosne 90, 71000 Sarajevo, tel.: ++387(0) 33 729 137

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The brown bear possesses a plantigrade support like humans, and consequently some anatomical features of the spine and hind limb are present (Spataru and Spataru, 2008). The sacroiliac joint (SI) is synovial joint formed by the auricular surfaces from sacral bone and wings of ilium. These surfaces are extended to the whole dorsal half of the ilium covered with cartilage. The joint is supported by the three ligaments (intraarticular, dorsal and ventral sacroiliac), which are quite short but very strong ligaments (Konig and Liebich, 2009).

The bodies and processes of the five sacral vertebrae fuse in the adult and form sacrum. The first sacral vertebra is larger than others and forms a base of the sacral bone. The spinous processes at the dorsal surface are short and lateral from these processes dorsal surface bears four pairs of dorsal sacral foramina (*foramina sacralia dorsalia*). The first pair of openings is large, while the other remains quite small. The lateral parts of the sacrum or wings of the sacrum (*ala ossis sacri*) have large, rough auricular surface which articulate with the same surface on the ilium to form sacroiliac joint (SI) (Konig and Liebich, 2009).

The present report describes a case of spondyloarthropathy in captive female brown bear from "Pionirska dolina" zoo from Sarajevo, Bosnia and Herzegovina.

CASE HISTORY

A female brown bear named "Sanja", died at the age of 30 in her sleep in February 2018 at the Sarajevo zoo. She had arrived in 2002 from Zagreb. The autopsy was performed the day after her death at the Veterinary Faculty University of Sarajevo. The exact cause of the death was *Clostridium* infection. In the days before its death, the bear didn't show signs of any disorder and had normal eating habits. Some difficulties with moving were reported during the months of March and April in the last five years of the bear's life, but after April, condition and moving became normal.

Upon autopsy animal was skinned of, muscles were removed; bones were macerated and freed from fat in the macerator and devices for defatting the bones. Some parts of skeleton show pathological changes, like thoracic and sacral part of vertebral column. The bones of the limbs show signs of osteoarthrosis with erosive changes and osteophyte formation. The radiograph was performed on the coxal and sacral bones from the dorsal and ventral projection.

The SI joint is low motion joint and combination of synovial joint and sacroiliac ligaments. Production of bony outgrowths called syndesmophytes which replace ligaments of the SI joint leads to the ossification and complete fusion of the joint. The radiograph shows bilateral symmetrical fusion of SI joint which is one of the main symptom of the spondyloarthropathy. At the ventral aspect large auricular surfaces can be seen and fusion line between them (Figure 1-A). The dorsal aspect shows incorrect fusion line between sacrum and ilium bone (Figure 1-B). The thoracic and lumbar part of the spine showed large nonmarginal syndesmophytes, especially on the ventral part of the vertebral body. There were also sings of the calcification of the vertebral discs. The signs of the erosion were located on the cranial and caudal parts of the vertebral body (*caput vertebrae*).

The ventral aspect of the macerated bone shows fusion line on the left side while right side has no line (Figure 2-A). The syndesmophytes were found around the base of the sacrum. There were no signs of new bone formation near the SI joint. The articulation with last lumbar and first coccygeal vertebra was normal. Zygapophysial joint was also normal with small amount of syndesmophytes around. On

the dorsal side the fusion was complete on both sides with no signs that joint was ever present there (Figure 2-B).

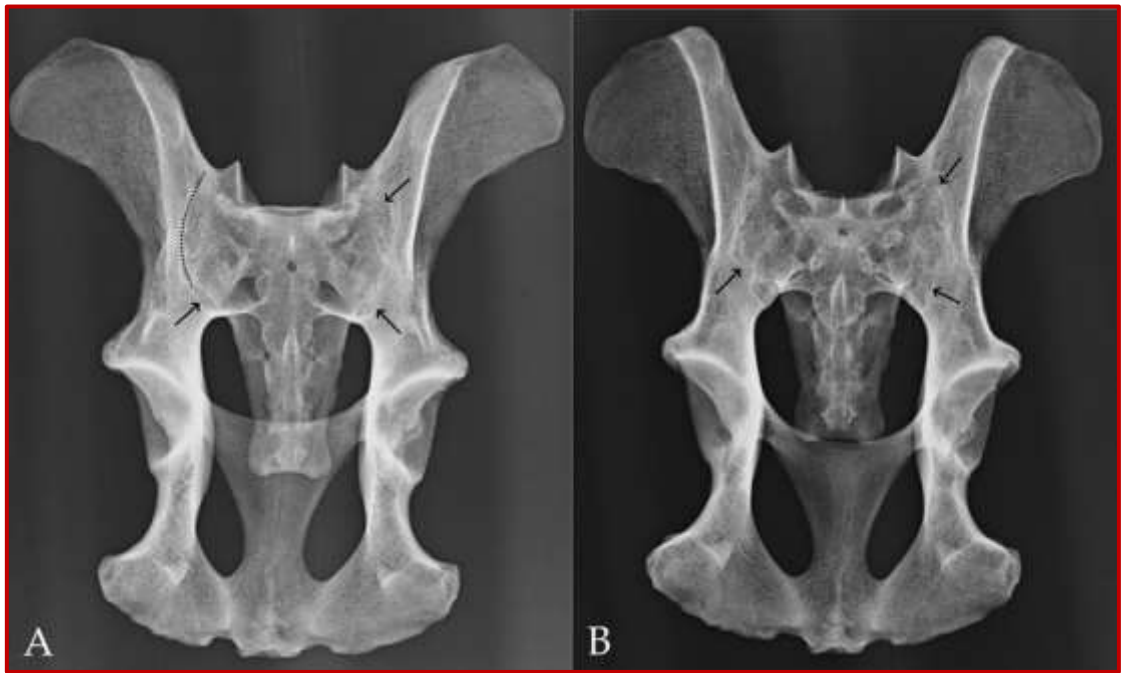

Figure 1. Radiograph of the pelvis and sacrum. A. Ventral projection. B. Dorsal projection. Arrows indicate fusion line between auricular surfaces of the sacrum and ilium.

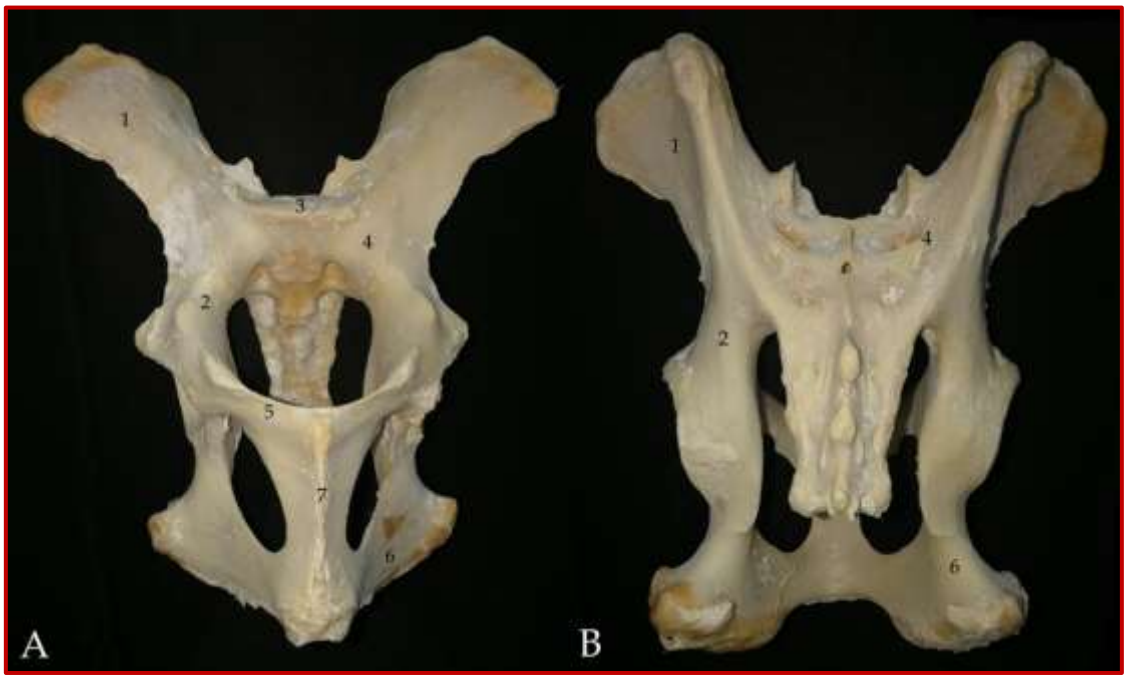

Figure 2. Pelvis and sacrum. A. Ventral projection. B. Dorsal projection
1. Ala ossis ilium; 2. Corpus ossis ilium; 3. Basis ossis sacri; 4. Ala sacralis; 5. Os pubis; 6. Os ischii; 7. Symphysis pelvina

DISCUSSION

Spondyloarthropathy is a group of inflammatory rheumatic disease associated with joint disease of the vertebral column. This group includes several conditions, like reactive arthritis, psoriatic arthritis, arthritis associated with inflammatory bowel disease and ankylosing spondylitis. All of these conditions were previously described in

Ursidae (Rothschild et al., 1993; Kompanje et al., 2000). The symptom that we focused in this case was the presence of bilateral symmetrical sacroiliac fusion and syndesmophyte formation. This finding was documented in other cases of spondyloarthropathy in bears (Kompanje et al., 2000). According to Spataru and Spataru (2008), the sacroiliac joint in bear has extended auricular surfaces to the whole dorsal half of the ilium with short and very strong sacroiliac ligaments. This anatomical feature allows some limited bipedalism which is often used in case of fighting, feeding, etc. Spondyloarthropathy was found in 86% of 243 adult bear skeleton with different symptoms: calcification of the annulus fibrosus, forming syndesmophytes, zygapophysial joint fusion and sacroiliac joint fusion (Rothschild et al., 1993). The spondyloarthropathy was found in 3,7% of 386 large cats, independent of free-ranging or zoological park environment (Rothschild et al., 1998). Arthritis has been diagnosed in the 20% of gorillas, and frequencies in the two populations were not significantly different between free-ranging and zoo population (Rothschild and Woods, 1989).

According to Grandia et al. (2001) captive bears have more spare time than their wild counterparts, which leads to unnatural behavior patterns such as inactivity or stereotypic behavior. The insufficient space in zoo (about 300 square meters) and ages of the bear can be the factors associated with the spondyloarthropathy.

Conflicts of interest

The authors declare that there is no conflict of interest.

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