Clinical communication — Kliniese mededeling

Spinal spondylosis and acute intervertebral disc prolapse in a European brown bear (*Ursus arctos arctos*)

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ABSTRACT

A 22-year-old male European brown bear (*Ursus arctos arctos*) was presented to the Onderstepoort Veterinary Academic Hospital after an acute onset of hind limb paralysis 4 days earlier. Previous radiographs revealed marked degenerative joint disease of the stifles, tarsi and digits. The clinical findings were consistent with acute disc prolapse. Lateral radiographs of the entire vertebral column were made as well as ventrodorsal pelvic radiographs. The latter were within normal limits. The vertebral column revealed multiple lesions consistent with chronic and acute disc herniations. Lateral compression of the caudal lumbar nerve roots could not be ruled out. Owing to multiple significant findings of the vertebral column and the poor prognosis for full recovery after surgery, the bear was euthanased. The diagnosis of an acute disc prolapse and multiple chronic disc herniations was confirmed on necropsy.

Key words: brown bear, disc disease, disc herniation, radiography, *Ursus arctos arctos,* zoo animal.

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INTRODUCTION

The European brown bear *(Ursus arctos arctos)* originates from Eurasia and is a commonly kept zoo animal. They have been reported to reach 47 years of age in captivity, and can weigh up to 780 kg[6].

Intervertebral disc disease is a common disease in dogs and effects all breeds, with over-representation of the chondrodystrophic breeds[12,15]. It has only been sporadically reported in the cat[2,4,10,15] while in other domestic species, such as the horse, intervertebral disc disease has been only rarely reported[13]. In carnivorous zoo animals, only a few articles could be found concerning degenerative spinal disease[3,5,7,9] and only 1 disc prolapse has been described in the Ursidae[11].

This clinical communication describes radiographic findings consistent with multiple chronic and 1 acute intervertebral disc prolapse in a brown bear.

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CASE HISTORY

Six days prior to presentation at the Onderstepoort Veterinary Academic Hospital (OVAH), a 22-year-old male European brown bear belonging to the Johannesburg Zoo suffered acute onset bilateral hind limb paresis. This bear had been born in the Johannesburg Zoo and was hand-raised by keepers. The animal had been treated, for suspected hind limb stiffness and suspected osteoarthritis of the hip and stifle joints, with chondroitin and glucosamine (Proflex Complex, AST Sport Science, Golden, CO, USA) for the previous 6 months. After this treatment, the hind limb stiffness appeared to improve. The bear had not previously displayed any sign of proprioceptive deficits.

Radiographs of the the left and right tarsus, stifle and digits were taken under anaesthesia and findings were consistent with marked degenerative bony changes of all the above joints. Spinal and pelvic radiographs could not be taken with the machine available. Blood was taken from the jugular vein at the same time and submitted for haematology and biochemistry. No significant abnormalities were detected.

The animal was initially treated with procaine and benzathine penicillin (Lentrex, Merial South Africa, Halfway House) (3000 mg i/m) (for a possible infectious cause and because he had been darted) as well as phenylbutazone (Phenix 20 %, Vibac RSA, Halfway House, South Africa) (3 g i/m). The bear was started on 5-day-course of oral phenylbutazone (Equipalazone, Kyron Veterinary Laboratories, Benrose, South Africa) (3 g SID). It recovered uneventfully from anaesthesia, but the next day showed proprioceptive deficits, using only the forelimbs and dragging the hind limbs. Arrangements were then made to undertake further diagnostic tests.

Six days after the initial acute onset, the animal was presented at the OVAH for radiography of the spine. The bear's weight was estimated at 500 kg and was anaesthetised with detomidine (Domesedan, Novartis SA, Isando, South Africa) (15 mg i/m) and ketamine (Ketamine Powder, Kyron Veterinary Laboratories, Benrose) (900 mg i/m) by remote injection. It was intubated with a 16 mm endotracheal tube. An intravenous line was placed and lactated Ringers solution (Intramed Ringer lactate solution, Fresenius Kabi, Midrand, South Africa) administered throughout the procedure (10 ℓ i/v). The animal was given a total of 20 mg detomidine i/v and 1450 mg ketamine i/v as supplemental dose for the duration of the 4-hour procedure. It was maintained on isoflurane (Isofor, Safeline Pharmaceuticals, Wadeville Johannesburg, South Africa) inhalation anaesthesia during radiography.

RADIOLOGICAL EXAMINATION AND FINDINGS

A high-output rotating anode fixed X-ray apparatus (Polydoros 100, Siemens A.G., Erlangen, Germany), fast speed rare earth screens (Trimax T16, 3M, Milan, Italy) with compatible films and a focused 12:1 grid were used. The speed of this system was 600. The source-to-image distance was 115 cm. Exposures used were 105/133 kVp and 63/80 mAs for the cervical spine, 133 kVp and 180 mAs for the thoracic spine, and 133 kVp and 160 mAs for the lumbar spine.

Radiographic examination was performed as described in the horse for spinal radiographs[13]. The brown bear had 7 cervical, 15 thoracic and 6 lumbar vertebrae. The disc space of C7–T1 was narrowed and revealed marked sclerosis of the corresponding endplates (Fig. 1). The T1–2 disc space was wedge-shaped (Fig. 1). Varying degrees of spondylosis were present between C7–T4, and multiple other mid-thoracic sites, T13–14 and T15–L2. Marked ventral spondylosis was present between L1 and L2, with a slightly narrowed disc space (Fig. 2). A mineralised disc could be seen at the markedly narrowed L3–4 disc space (Fig. 3). The disc space of L4–5 was markedly narrowed and in addition to the superimposed transverse process there appeared to be some early mineralisation of this disc (Fig. 3). The disc space of L5–6 was also narrowed with marked spondylosis (Fig. 3). Marked spondylosis (both ventral and lateral) of L6–S1 with endplate sclerosis could also be seen (Fig. 3).

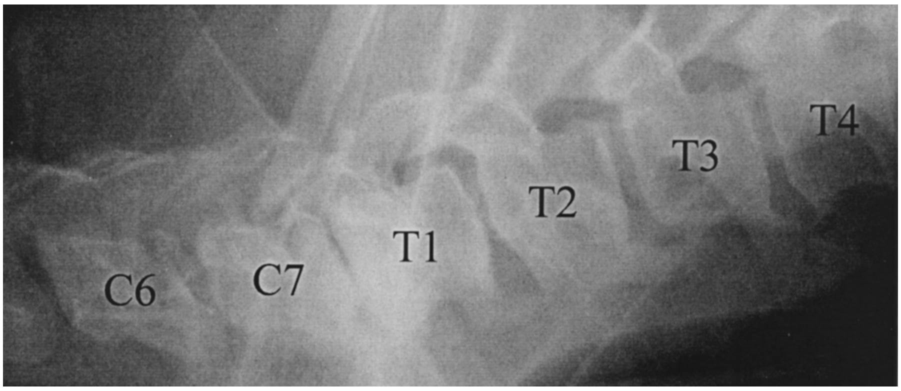

Fig. 1: **Left-to-right lateral recumbent survey radiograph of the caudal cervical and cranial thoracic spine of a 22-year-old male brown bear presented with acute onset of bilateral hind limb paralysis. Note the marked narrowing of the C7–T1 disc space with marked sclerosis of the corresponding endplates. The T1–2 disc space is also wedge-shaped, with C6–T4 revealing varying degrees of ventral spondylosis.**

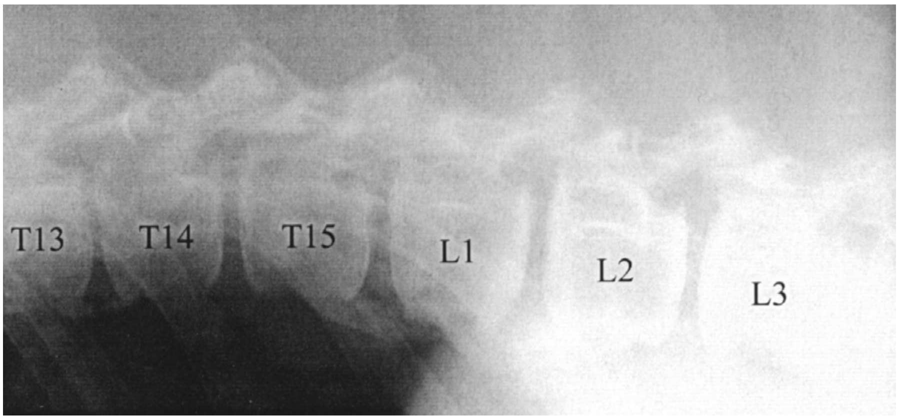

Fig. 2: **Left-to-right lateral recumbent survey radiograph of the caudal thoracic and cranial lumbar spine of the same animal as in Fig. 1. Note the extensive degree of ventral spondylosis of T13–14 and T15–L2. The disc space of L1–2 is narrowed and marked ventral spondylosis is present.**

Radiographic findings were consistent with multiple chronic disc herniations (C7–T1, T1–2, L1–2, L5–6 and L6–S1) and a suspected acute disc prolapse of either L3–4 or L4–5. In addition, there was marked ventral spondylosis at C7–T1, multiple thoracic vertebrae, L1–2, L5–6 and L6–S1 as a result of the abovementioned chronic disc protrusions and degenerative idiopathic changes. Ventral spondylosis of L6–S1 needed further investigation to rule out lumbosacral instability. The same applied for its lateral component to rule out nerve root compression. A lumbar myelogram was recommended to evaluate the multiple sites of suspected disc herniations more effectively.

Owing to the presence of multiple significant lesions of the vertebral column in combination with advanced and multiple degenerative spinal and joint disease, the acute onset, duration of clinical signs (6 days) and the weight of the animal, the prognosis for full recovery after surgery was considered poor and the bear was euthanased.

NECROPSY FINDINGS

Necropsy revealed extensive ventral spondylosis of C7–T4, T11–13, T13–14, T15–L2, L5–6 and L6–S1. At T11–13, T15–L2 and L6–S1 the bony reaction also involved the lateral aspects of the vertebral bodies. There was loss of disc space and narrowing of the disc space at C7–T4, T11–13 and L3–4. Along the length of the lumbar canal there was extensive haemorrhage into the epidural space, with compression of the cord. The L4/5 disc space was empty, with disc material present within the overlying blood clot in the spinal canal. Histological examination revealed masses of calcified disc material mixed with blood within the epidural space. Pigments associated with the breakdown of erythrocytes were beginning to appear in the blood clots.

DISCUSSION

Intervertebral disc disease and spondylosis are common findings in companion animals. Whereas intervertebral disc

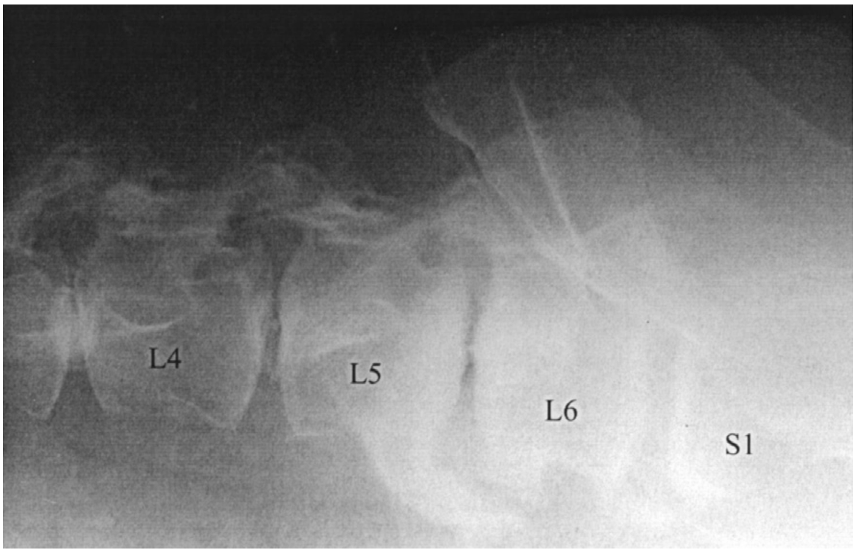

Fig. 3: **Left-to-right lateral recumbent survey radiograph of the caudal lumbar and cranial sacral spine of the same animal as in Figs 1 and 2. The L3–6 disc spaces are narrowed. A mineralised disc is clearly visible at the L3–4 disc space. An ill-defined mineral opacity can be seen faintly superimposed over the transverse processes at L4–5 disc space. There is also marked L5–S1 ventral spondylosis with sclerosis of the corresponding endplates.**

disease requires treatment (either medically or surgically), spondylosis in most locations is a common incidental finding in middle-aged dogs, with males being more predisposed[14]. Spondylosis in the caudal cervical spine and the lumbosacral junction may be associated with, but is not diagnostic of, cervical and lumbosacral instability[14]. Confirmation of instability requires further investigation. This also applies to the present case.

In companion animals, intervertebral disc disease affects mainly dogs. There are numerous reports on this disease complex[12,15], with certain chondrodystrophic breeds predisposed to particular types and locations. In domestic cats it has only been sporadically reported[2,4,10,15]. However, captive large felids present with degenerative spinal disease more frequently[5,7,9]. Interestingly, no reports could be found on degenerative spinal disease in captive canids.

Only a limited number of reports on bears with degenerative spinal disease could be found[3,9]. Spinal decompression in a black bear (*Ursus americanus*) was performed successfully after intervertebral disc herniation, even though the animal recovered slowly[11]. No neurological deficits were present 1 year later[11]. The onset in the black bear was acute, it weighed only 127 kg and only 1 narrowed disc space at T10/11 was present on survey radiographs, consistent with a radiographic diagnosis of disc protrusion.

Even though there are radiographic signs suggestive of disc protrusion on survey radiographs, such as a narrowed disc space, pointed appearance of mineralised disc material, mineralised disc material within the vertebral canal, and the vacuum phenomenon, these are not considered to be accurate enough to attempt targeted surgical treatment for intervertebral disc protrusion without myelography[8]. Accuracy of determining sites of intervertebral disc protrusions using only survey radiographs ranged from 51–61 % in one study[8], and all observers had a low accuracy of identification of 2nd intervertebral disc protrusion. The most useful radiographic sign, narrowed intervertebral space, only had moderate sensitivity (range 64–69 %) and moderate predictive value (range 63–71 %)[8]. Hence, for a definite diagnosis and confirmation of the site for surgery in the present patient, a myelogram would have had to be performed, especially since multiple sites were suggestive of acute and chronic disc protrusions. This was considered, but for a lumbar myelogram, a spinal needle of at least 20 cm would have been required due to the extensive fat layer in the region of access. Thus, an ultrasound-guided lumbar myelogram was recommended. Alternatively, a cervical myelogram could have been attempted. Even though this would have required a 15-cm-long spinal needle, this approach is easily and commonly performed in the horse for evaluation of cervical lesions[13]. For the contrast medium to eventually reach the lumbar area would have been time-consuming, and it would have been questionable if enough pressure could have been built up to outline the pathological area. The contrast medium column may have stopped prior to the lesion, as is often the case when performing cervical myelograms in the Dachshund with larger (often acute) caudal thoracic or lumbar lesions (W M Wagner, pers. obs., 2004). In horses, a 2nd spinal needle can be placed at the lumbosacral area to ease the flow of contrast medium caudally, and in this case, a lumbar myelogram could have been done as well.

There have been multiple clinical reports concerning the prognosis of intervertebral disc herniations determined from treatment results linked with the rate of onset, the duration of clinical signs and the degree of neurological deficits[1,12]. The prognosis is also affected by the weight of the animal, with small individuals having a tendency to recover better use of their affected limbs. Since this brown bear had an acute onset with persistence of signs for 6 days prior to diagnosis, an estimated body weight of about 500 kg, and multiple sites of suspected intervertebral disc herniations as well as concurrent advanced osteoarthritis of multiple joints, a poor prognosis for successful recovery after surgery was given, and the bear was euthanased.

Interesting was the extensive and exuberant amount of spondylosis with a marked lateral component to it. The could be effect of captivity, lack of exercise and nutrition; however, no other bear from the Johannesburg Zoo living under the same circumstances has been reported with similar clinical signs or disease.

CONCLUSION

This article records a case of an acute and multiple sites of chronic disc herniations in a European brown bear, with marked and extensive degenerative spinal and joint changes. It emphasises that a similar radiographic diagnostic approach as in companion animals has to be applied for spinal radiography. However, this requires a high-output X-ray machine. Furthermore, that for confirmation of a disc prolapse (diagnosis, significance and site/s) a myelogram is definitely required.

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