Magnetic resonance imaging of a sacral bone with telangiectatic osteosarcoma in a dog: a case report

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ABSTRACT: A canine patient with osteosarcoma of the sacrum was subjected to low-field magnetic resonance imaging with the following sequences: FSE, SE, 3D HYCE, X BONE, Fast STIR, GE STIR and Gradient Echo. Due to the size and location of the tumour, surgery was not performed, and the patient was euthanized. A histopathological analysis of the tumour revealed telangiectatic osteosarcoma.

Keywords: MRI; osteosarcoma; dog; spine

Magnetic resonance imaging, in particular techniques that rely on machines with low magnetic field strength, is an increasingly popular diagnostic method. Magnetic resonance scanners with field strengths of up to 0.5 T are used mainly in examinations of the central nervous system and the osteoarticular system in dogs, cats and horses. Low-field scanners support quick diagnosis of pathological changes affecting the above anatomical systems. In this study, MRI examination had raised the suspicion of sacrum osteosarcoma in a canine patient, which was later confirmed by the results of a histopathological analysis of the tumour.

Case description

A male dog of the Cane Corso breed, aged nine years, with a body weight of 42 kg, was referred to the clinic with symptoms of ataxia, loss of appetite, decreased activity levels, sleepiness and painful bowel movement. The patient had undergone a two-week course of treatment with tramadol hydrochloride 3 mg/kg b.w., administered SC every six hours (Tramadol 50 mg/ml, Grunenthal, Germany), and butorphanol 0.2 mg/kg b.w., administered SC every 12 h (Morphasol 4 mg/ml, Animedica, Germany). When pressure was applied to the area of the sacral and caudal vertebrae, it produced a painful sensation. A per-rectal examination revealed the presence of a hard tissue mass in the sacral area. The patient was referred for an MRI scan.

The MRI examination was performed with the use of a low-field scanner with a field strength of 0.25 T (Vet Grande, Esaota, Italy). The lumbosacral section was scanned in sagittal, transverse and dorsal planes, to produce T1- and T2-weighted images with the use of the following sequences: FSE, SE, 3D HYCE, X BONE, Fast STIR, GE STIR and Gradient Echo. The examination revealed a hyperintensive signal area with an irregular contour, measuring 52/41 mm, in the Fast STIR sequence (Figure 1), infiltration of the left sciatic nerve in the 3D HYCE

Figure 1. Hyperintensive signal area with an irregular contour around the sacral bone in the Fast STIR sequence

Figure 2. Tissue mass infiltration of the left sciatic nerve in the 3D HYCE sequence

Figure 3. Infiltration of sacral vertebral bodies in the X BONE sequence

sequence (Figure 2), and infiltration of sacral vertebral bodies in the X BONE sequence (Figure 3).

An initial diagnosis of neoplastic changes in the sacral area with a suspicion of osteosarcoma was made based on the results of the MRI exam. In view of the results of the scan and the fact that the patient had experienced severe pain, the owner decided to euthanize the dog.

The body was subjected to anatomopathological and histopathological analyses. A post-mortem examination revealed a tumour, 15 cm long and 7 cm wide, with a soft consistency and uneven surface, infiltrating surrounding tissues and the left sciatic nerve, in the body of the first and second sacral vertebrae. The tumour section showed numerous blood-filled cysts. The structure of the sacrum was completely damaged at the site of the tumour growth. Variably-sized metastatic tumours of soft consistency, containing blood-filled cysts, were observed in the lungs. The presence of hyperplastic tumours was noted in the spleen. Sacral and mediastinal lymph nodes were enlarged and congested. The examination also revealed left and right ventricular distension, congestion and dystrophy of the liver and kidneys, and bladder distension.

During necropsy, samples of the sacral tumour, the sacrum, lung, liver, spleen and lymph nodes were taken for histopathological examination. Tissue samples were routinely fixed in 10% buffered formalin, embedded in paraffin, sectioned at 4 µm and stained with haematoxylin and eosin. The sacrum was decalcified in formic and hydrochloric acids in an electric field. Histopathologically, the tumour that destroyed the ventral part of the sacrum (Figure 4) was composed of many variably-sized blood-filled spaces lined by malignant cells with numerous mitotic figures (Figure 5). Malignant osteoblasts were spindle-shaped to round, with hyperchromatic, pleomorphic nuclei and a variable number of visible nucleoli. In the cavities, osteoclast-like multinucleated giant cells, some bizarre, were observed. The production of osteoid around the cavities was observed. In the stroma of the tumour, macrophages with foamy cytoplasm, inflammatory cells, melanocytes and proliferation of the stromal fibroblasts and capillaries were noted. There were also places of massive necrosis of tumour cells. The tumour was diagnosed as a telangiectatic osteosarcoma. In the lung, metastatic tumours with structure similar to the primary tumour, characterised by small and large blood-filled cysts lined by sarcoma cells and necrotic areas, were observed (Figure 6). Sarcoma cells were spindle-shaped to round, with hyperchromatic, pleomorphic nuclei. Some cells were large, binucleated, with visible nucleoli. Congestion and alveolar emphysema were also noted. In the spleen and lymph node osteosarcoma cells, activation of lymphoid follicles and hemosiderosis were observed. There were no osteosarcoma cells in the liver.

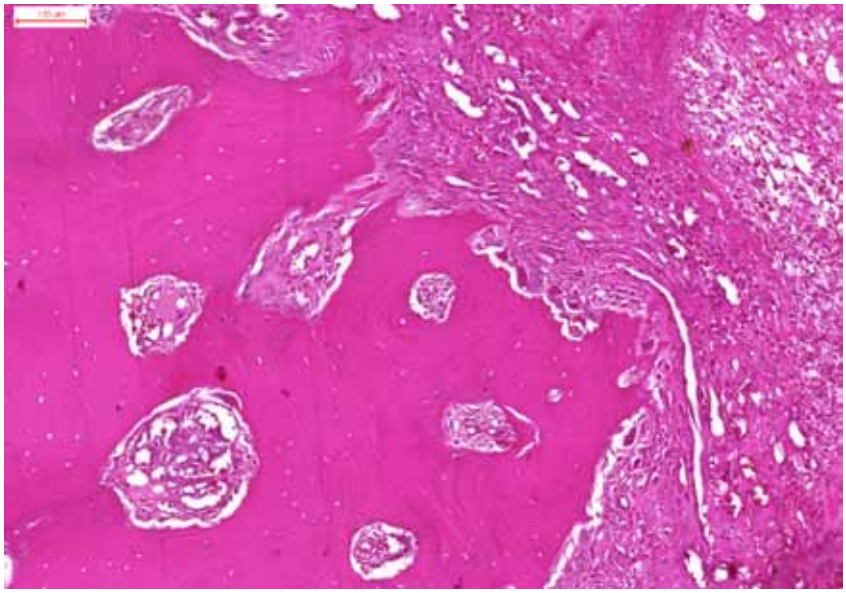

Figure 4. Histopathological view of osteosarcoma of the ventral part of the sacrum

DISCUSSION AND CONCLUSIONS

The aim of this study was to compare magnetic resonance images produced by various sequences with histopathological images of a sacral osteosarcoma in a dog. Most magnetic resonance images revealed extensive hyperintensive signal areas, which corresponded to histopathological images characterised by many variably-sized blood-filled areas. Spinal cord infiltration, which may accompany malignant tumours, was not observed in the discussed case. The tumour metastasised to remote parenchymal organs. Spinal osteosarcoma has been described in canine and feline patients (Okuda et al. 2009; Kang et al. 2010), but it is a rare condition that accounts for only around 3% of spinal tumours (Theodorou et al. 2008). In the literature, osteosarcoma has been described to localise mostly to the lumbar and cervical spine (Bagley 2010) but the described neoplasm may affect all spinal levels. There is no information about osteosarcoma in the sacral bone with such metastasis as described here. According to Theodorou et al. (2008), magnetic resonance imaging supports the detection of primary malignant spinal tumours such as Ewing's sarcoma, chordoma, osteosarcoma, lymphoma and plasmacytoma.

The results of our study indicate that low-field magnetic resonance imaging is an effective technique for diagnosing sacral osteosarcomas in canine

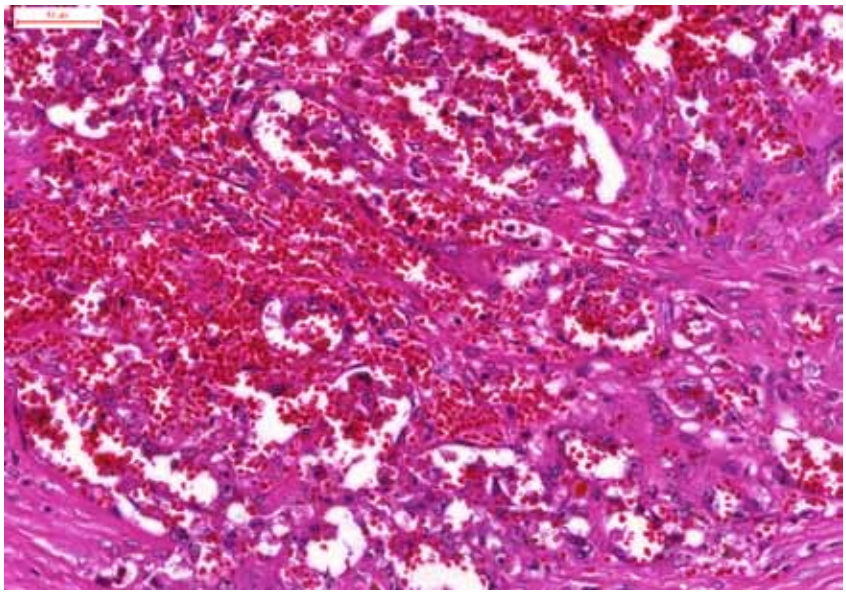

Figure 5. Histopathological view of the examined osteosarcoma of the sacral bone composed of many variably-sized blood-filled spaces lined by malignant cells with numerous mitotic figures

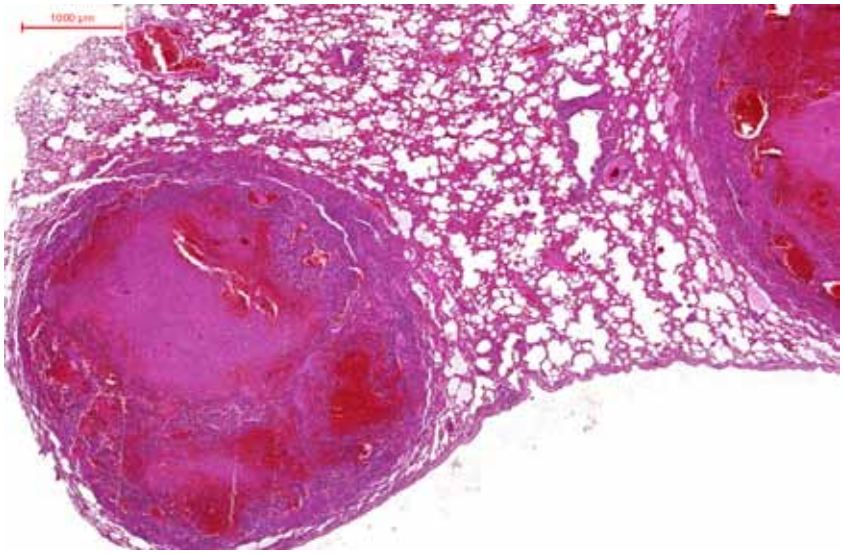

Figure 6. Histopathological view of metastatic changes in lungs with structure similar to the primary tumour, characterized by small and large blood-filled cysts lined by sarcoma cells and necrotic areas

patients. MRI scans supported the determination of tumour size and dimensions, and they were useful in assisting the dog's owner to decide on a further course of action.

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