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Case Report

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Aggressive osteoblastoma of the cervical vertebrae in a Turkish Angora cat

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Abstract: Aggressive osteoblastoma is a type of bone tumor rarely reported in veterinary literature. Osteoblastoma may be misdiagnosed as an osteosarcoma, which is a well-understood malignant bone tumor. Owing to poor prognosis, animals diagnosed with osteosarcoma are not always treated. In the present case, we diagnosed the tumor as aggressive osteoblastoma on the basis of macroscopic, microscopic, radiographic, and immunohistologic findings. The patient was treated via resections of the osteoblastoma and lived without metastasis for 3 years. This is the first reported case of aggressive feline osteoblastoma of the cervical vertebrae and will be useful for diagnosing and managing aggressive osteoblastoma.

Key words: Feline, bone tumor, aggressive osteoblastoma, osteosarcoma, immunohistology

1. Introduction

Osteoblastoma is a rare bone-forming neoplasm that accounts for approximately 1% of all bone tumors in human medicine (1). In veterinary medicine, osteoblastoma has only been reported in the hedgehog and pony species (2,3).

The characteristics of osteoblastoma in small animals are not well known because there are so few reported cases. Osteoblastoma generally occurs at a young age (1), and frequent sites include the vertebral column, sacrum, and long bones (1,4,5). Common sites of spinal osteoblastoma are the vertebral pedicles, vertebral laminas, transverse processes, and spinous processes (6).

Definitive diagnosis of osteoblastoma is not possible by radiography (1), but computed tomography (CT) or magnetic resonance imaging (MRI) can still be used to distinguish between osteoblastoma and osteosarcoma (1,5). CT and MRI can help diagnosis by estimating the size of tumor and its relationship with adjacent tissue. The soft-tissue component of osteosarcoma is distinctly visible in a CT or MRI scan. Osteosarcoma tends to extend into the soft tissue, but osteoblastoma rarely extends into the soft tissue and does not metastasize (1,4,5).

Variants of osteoblastoma have recently been reported, including tumors that invade the adjacent tissue. This aggressive type of osteoblastoma needs to be distinguished from low-grade osteosarcoma because the property of invasiveness is common to both. It was reported that osteocalcin is a marker of osteoblast differentiation (7). Negative COX-2 staining is an indicator of low-grade osteosarcoma while positive COX-2 staining indicates aggressive osteoblastoma (7).

Osteosarcoma is a malignant bone tumor and has poor prognosis. For this reason, many cats with osteosarcoma are euthanized to avoid deterioration of the cat's quality of life. In this study, we examined a tumor on the basis of macroscopic, microscopic, radiographic, CT, MRI, and immunohistologic findings. On the basis of the examination results, we diagnosed the tumor as aggressive osteoblastoma.

Resection surgery of this nonmetastatic bone tumor improved the cat's quality of life for 3 years.

This case of aggressive osteoblastoma in the cervical vertebrae of a 7-year-old Turkish Angora cat is the first report of aggressive feline osteoblastoma. This report will be useful for diagnosing and managing aggressive osteoblastoma.

2. Case history

A 7-year-old castrated male Turkish Angora cat was referred to the Veterinary Teaching Hospital of Konkuk University (Korea) with a 3-month history of right-forelimb monoparesis. The patient showed neurological deficits in the right forelimb, except for digital deep-pain perception, and could not ambulate normally. Blood cell count, serum biochemistry, and electrolyte results were within the reference ranges.

Radiography showed bony proliferation at the ventral margin and lateral transverse region of the vertebral bodies

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of C3–C5 (Figure 1). The C2–C4 intervertebral disk spaces were narrowed, and the spinous processes of the C3–C5 vertebrae were poorly defined and had irregular shapes. The tumor was 2.5 × 1.5 cm in size. A CT scan showed an irregularly shaped mass with hyperattenuation at the C3–C4 vertebral level in the transverse images (Figure 2). In addition, the mass compressed the spinal cord at the C3–C4 level by approximately 50% from the right side, and there was bony lysis on the right side of C3–C4 in the pedicle and lamina regions. The MRI showed an irregularly shaped mass at the C3–C4 vertebral level, which showed hypointensity on the T2-weighted image and isointensity on the T1-weighted image (Figure 3). The MRI revealed that approximately 50% of the spinal cord at this level was compressed by the mass. The mass was enhanced on T1-contrast images. Surgical resection was performed at the Veterinary Teaching Hospital of Konkuk University. A dorsal approach hemilaminectomy was performed via the removal of the right dorsal lamina, right pedicle, and the articular facet of the C3–C4. Ideal primary treatment would be complete removal of the mass, but it was difficult to perform complete ablation because the tumor was near the spinal cord and complete removal of the mass would have caused anatomical instability of the cervical vertebrae. Hemilaminectomy was performed in order to improve neurological signs

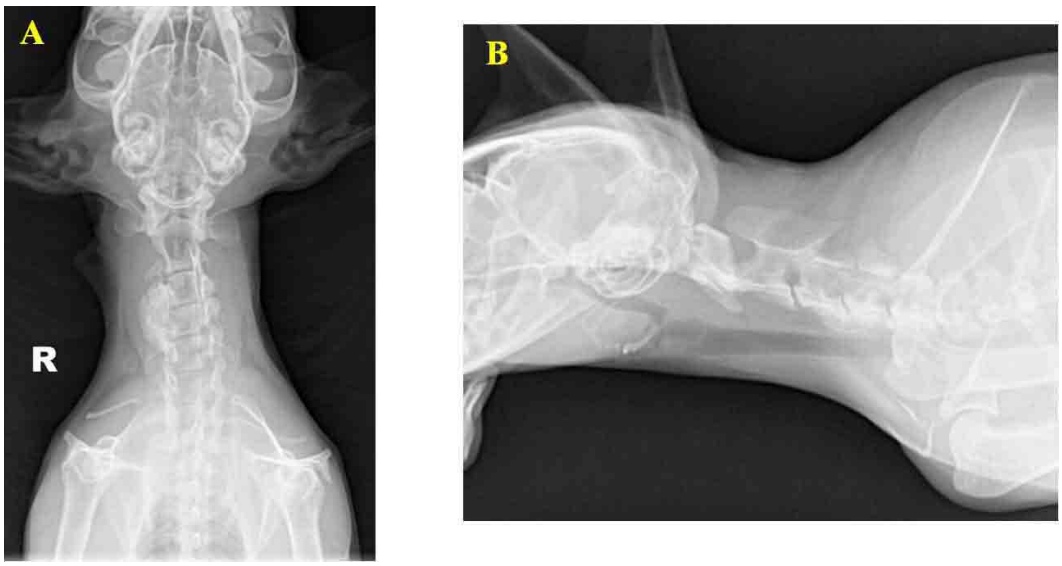

Figure 1. Osteoblastoma of the C3–C4 vertebrae: A) VD view on a digital X-ray; the size is 2.5 × 1.5 cm. B) Lateral view on a digital X-ray.

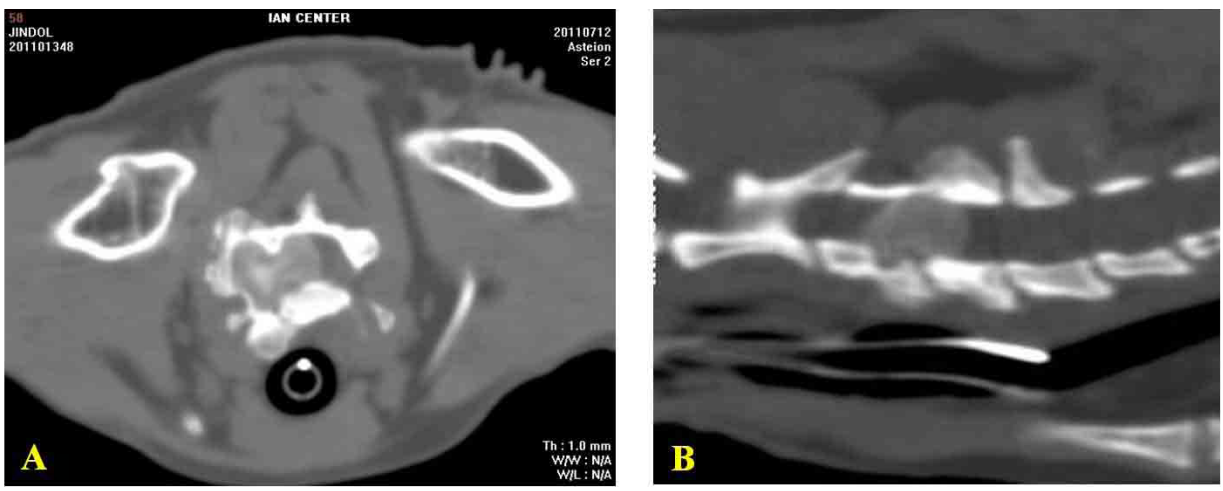

Figure 2. Lateral variation of bone tissue by osteoblastoma (computed tomography). Hyperattenuation at the C3–C4 vertebral level: A) Precontrast VD view. B) Precontrast lateral view. Bone lysis and tissue infiltration by tumor.

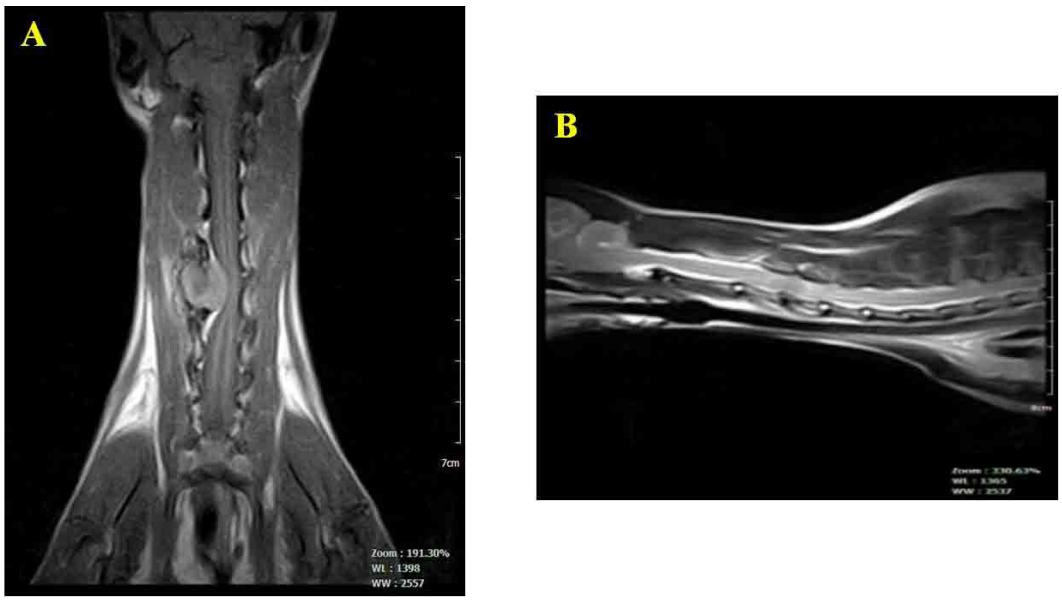

Figure 3. MR images of osteoblastoma. Compression of spinal cord by tumor: A) Dorsal view; postcontrast T1-enhanced image of venous plexus. Isointensity at the C3–C4 vertebral level. B) Lateral view; median section of postcontrast hypointensity T2-enhanced image.

and symptoms. Histological examination of the resected mass revealed it to be hypercellular and composed of proliferative fibrovascular tissue with abundant giant cells and osteoclasts; mineralized osteoid formation was observed with hematoxylin and eosin staining (Figure 4). The osteocalcin staining showed osteoblast differentiation (Figure 5). The tumor was diagnosed as a benign bone-forming neoplasm that had invaded the adjacent tissue. Differentiation between aggressive osteoblastoma and low-grade osteosarcoma was necessary. Immunohistologic analysis with COX-2 staining showed that the tumor was not a low-grade osteosarcoma (Figure 6), and it was thus diagnosed as aggressive osteoblastoma.

After the surgery, the patient was fitted with a neck brace and Elizabethan collar and hospitalized at the Veterinary Teaching Hospital of Konkuk University. One week postoperatively, clinical symptoms had improved, which included alleviation of the symptoms of right-forelimb monoparesis. One month later, the patient displayed normal gait and the ability to jump.

However, a mass was found again in the C3–C5 vertebrae 2 years after the operation. The patient had a history of anorexia and a reluctance to jump. Although the MRI revealed severe spinal cord compression, no abnormalities were detected in the gait or during neurological examinations. No metastasis was found in any organs, and surgery was performed to resect the tumor regrowth. One year following the second surgery, the cat showed forelimb lameness, and severe spinal-cord compression was revealed in the MR images. Three days after the third tumor-resection surgery, the patient died of postoperative complications.

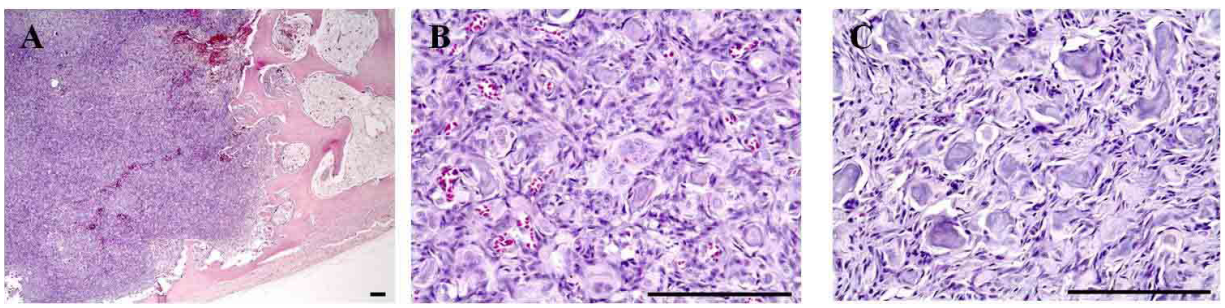

Figure 4. Hematoxylin and eosin staining. Bar = 120 µm. There is proliferative fibrovascular tissue with many giant cells, osteoclasts, and mineralized osteoid formation (A: H&E, 40×; B and C: H&E, 400×).

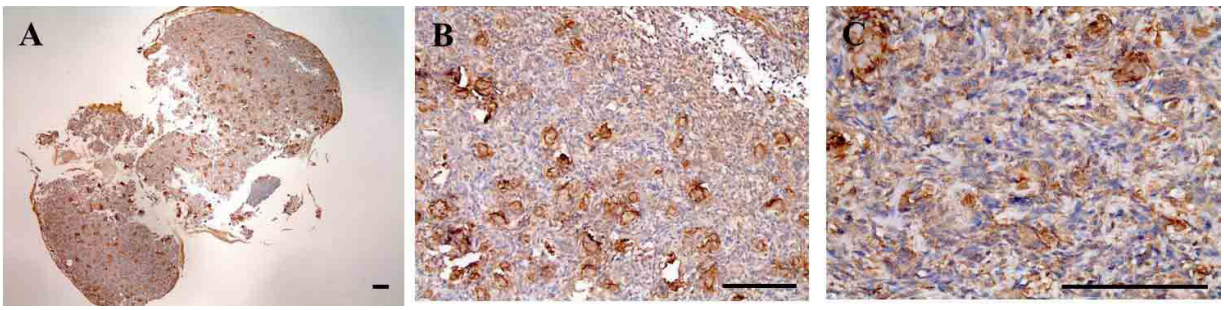

Figure 5. Osteocalcin staining. Bar = 120 µm. There is moderate positive staining of COX-2 in the cytoplasm of tumor cells (A: COX-2, 40×; B: COX-2, 200×; C: COX-2, 400×).

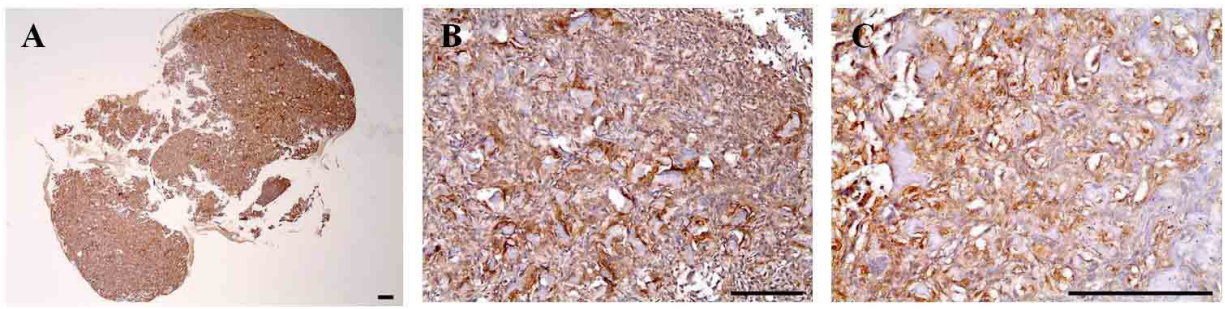

Figure 6. Cyclooxygenase-2 staining. Bar = 120 µm. There is moderate positive staining of COX-2 in the cytoplasm of tumor cells (A: COX-2, 40×; B: COX-2, 200×; C: COX-2, 400×).

3. Results and discussion

Conventional osteoblastoma is benign and differs from osteosarcoma, which tends to infiltrate into the adjacent tissue, but it has been reported that some variants of osteoblastoma have invasive characteristics (7,8). Aggressive osteoblastoma tends to extend into tissue adjacent to the tumor and recurs but does not metastasize (1). It is challenging to distinguish between aggressive osteoblastoma and low-grade osteosarcoma because of the similar histological characteristics of their invasive structures (9). Recently, application of osteocalcin and COX-2 staining has enabled distinction between aggressive osteoblastoma and low-grade osteosarcoma. Positive osteocalcin staining was found in tumor cells of all osteosarcomas and osteoblastomas. Negative COX-2 staining may be a useful indicator of low-grade osteosarcoma, and aggressive osteoblastoma displays positive COX-2 staining (7). This case was examined using hematoxylin and eosin staining, osteocalcin, COX-2 staining, radiography, CT, and MRI. The tumor was diagnosed as aggressive osteoblastoma. Primary treatment of osteoblastoma is complete resection of the tumor (6,10,11). Osteoblastoma has a high recurrence rate, and complete surgical resection is difficult (11). In this case, resection surgery of this nonmetastatic osteoblastoma improved the clinical symptoms, which included alleviation of the symptoms of right-forelimb monoparesis for 3 years. This is the first reported case of aggressive feline osteoblastoma of the cervical vertebrae. This report will be useful for diagnosing and treating aggressive osteoblastoma.

Acknowledgment

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