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Subcutaneous Fibrosarcoma in the Occipital Region with Nuchal Crest Adhesion in a 5-month-old Dog

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Abstract : A 5-month-old castrated male Bichon Frisé was presented with a subcutaneous mass on the occipital region. Anisocytosis, anisokaryosis, and binucleation were observed on the cytology, and the suspected diagnosis was sarcoma. There were no metastatic lesions on radiography or computed tomography. Surgical resection was performed and fibrosarcoma was diagnosed by histopathology and immunohistochemistry. This is a very rare case of a spontaneously occurring subcutaneous fibrosarcoma in a small breed puppy.

***Key words* :** anti-proliferating cell nuclear antigen, fibrosarcoma, immunohistochemistry, puppy, vimentin.

Introduction

Canine fibrosarcomas (FSAs) are categorized in the heterogenous group of malignant tumors and classified as soft tissue sarcomas (STSs) owing to the similarities in their biological features (1). The incidence of FSA is reported as at least 6% of canine cutaneous and subcutaneous tumors, and at least 35%-45% of all STSs (6). Although surgical resection is recommended, these tumors tend to recur with a relatively low metastatic rate (7). The metastatic rate has been reported as 17% and the recurrence rate as low to moderate, ranging from 7%-30% (2). Studies of cutaneous and subcutaneous FSA mainly occurred in middle to older-aged male dogs and no gender or breed predispositions are known to exist (6). However, according to retrospective studies, it normally appears in larger breeds, especially in Golden Retrievers and Dobermans (6). The incidence of STSs in puppies are reported to be rare (3). This is a very rare case of a spontaneously occurring subcutaneous FSA in a small breed puppy.

Case

A 5-month-old castrated male Bichon Frisé presented to Helix Animal Medical Center (HAMC, Korea) for evaluation of a subcutaneous mass on the dorsal cervical region. The tumor was found approximately 1 month prior to the visit date, and adhesion to the nuchal crest was discovered during surgical resection in a local hospital.

On physical examination, the tumor size measured as approximately 2 × 2 × 2.5 cm and, a portion was found to be firmly fixed to the skull. Fluid was revealed around the tumor with fluctuation. Blood test results were in normal ranges. On radiography, the tumor was found with soft tissue density, but no signs of osteolysis were evident adjacent to the mass. There were no signs of metastasis. On computed tomography (CT), post-contrast soft tissue sagittal-level images revealed the mass located subcutaneously in the occipital region and situated on the parietal bone (Fig 1). No changes were observed on the bones associated with the subcutaneous mass. The lymph nodes, including the submandibular and retropharyngeal lymph node, were presented without any abnormalities, and no signs of metastasis to other organs were identified.

For cytologic assessment, fine needle aspiration (FNA) was performed. Numerous spindle cells with oval to fusiform morphology and ovoid to elongated nuclei were observed. The nucleo-cytoplasmic ratio relatively high and vacuolation was observed. The cells exhibited moderate anisocytosis and anisokaryosis, and binucleated cells were observed. Based on the cytological features, the diagnosis was suspected as sarcoma.

Based on the examinations, surgical resection of the tumor with wide margins was performed. The tumor including the surrounding skin, subcutaneous, and muscle tissues was resected. A pseudocapsule was observed on the superficial part of tumor and the deep part of the tumor was adhered firmly to the nuchal crest. After flushing with saline, the subcutaneous and skin tissues were closed routinely.

On gross inspection, a white, firm mass with indistinct margins and diffuse dark areas on the cut surface were observed (Fig 2A). The resected mass was sent to Konkuk University for histopathologic examination. The neoplastic sample was stained with hematoxylin and eosin (H&E) and

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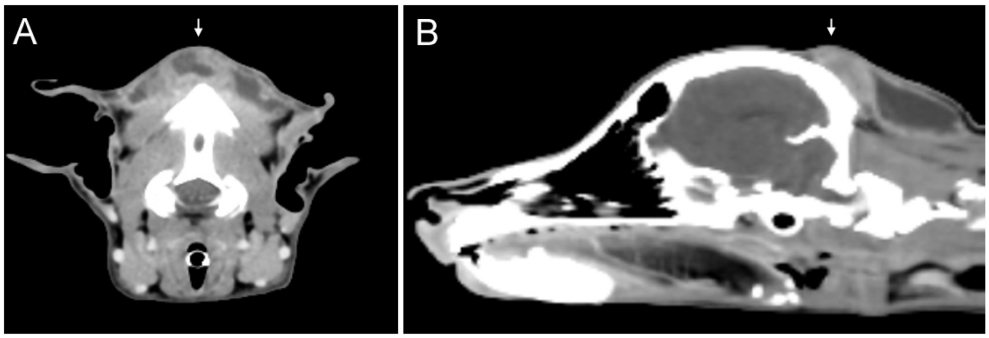

Fig 1. Post contrast computed tomographic images. Arrow indicates the mass with an internal mixed form of fluid and lumps of soft tissue. (A = transverse image, B = sagittal image).

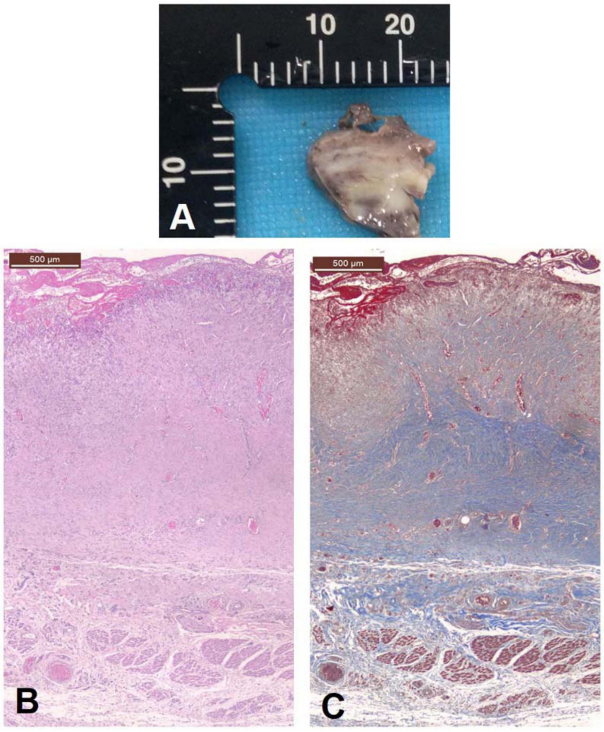

Fig 2. Gross and histopathological findings of the occipital region. The occipital sample was moderately firm on palpation and composed of heterogenous brown and whitish-to-cream colored tissues (A). The most of the samples were replaced by eosinophilic tissues that extended to the deeper muscular layer (B). Neoplastic lesion was positive for trichrome (C).

Masson's trichrome staining. Immunochemistry was also performed using the primary antibodies which were mouse monoclonal anti-vimentin (Dakocytomation, Glostrup, Denmark, 1:100) and mouse monoclonal anti-proliferating cell nuclear antigen (PCNA, Santa Cruz Biotechnology, CA, USA, 1:200).

On microscopic examination, the tumor composed mainly of eosinophilic proliferative lesions with invasion into the muscle tissue (Fig 2B). Blood vessels were observed within the neoplastic lesion. Invasive proliferation of fibrotic tissue and muscle bundle atrophy was identified and the margins between the tumor and surrounding tissues were indistinct. Masson's trichrome results revealed blue staining of fibroblasts producing collagen stoma (Fig 2C). At higher magnification, the tumor cells had larger nuclei than normal fibroblasts, and contained multiple nucleoli with overall coarse chromatin. Most of the tumor cells showed moderate to severe nuclear pleomorphism including anisokaryosis, polymorpho-nuclei, and polychromasia (Fig 3A and B). Immunohistochemically, the neoplastic cells were positive for PCNA (Fig 3C) and vimentin (Fig 3D). Based on the above histopathological findings, a diagnosis of histologic grade II FSA was made (6).

Two months post-surgery, a subcutaneous nodule in the shoulder region was revealed and the tumor was surgically resected at a local hospital. The biopsy results revealed chronic panniculitis. One year following the second mass resection, no signs of FSA recurrence have been found.

Discussion

FSA is a malignant tumor derived from mesenchymal cells or fibroblasts (1). The primary sites are reported to be the extremities and oral cavity (6); however, it can occur in any part of the body (8,10). Since this tumor aggressively infiltrates into adjacent tissues, it tends to be locally invasive (1). Although the main site of metastasis is the lung, there have been reports of metastasis to the liver, bone, and brain (1). Metastatic potential varies according to the STS grading system; less than 10% of grade I, approximately 20% of grade II, and 50% of grade III tumors metastasize (7).

Although STSs are known to rarely occur in juveniles, there have been reports documenting STSs in canine species younger than 1 year old (3,8). In addition, there were studies including evidence of a cutaneous or subcutaneous FSA in a 4-month-old retriever puppy in 1967 and a poorly differentiated sarcoma in a 7-month-old Italian hound in 2008 (3). Interestingly, another case study has been reported in which the location of the FSA was nearly identical in a 4-month-old retriever (5). This study is noteworthy in that case reports of cutaneous and subcutaneous FSA in canine species younger than 1 year old is rare, and the occipital region is a novel primary region compared to the 3 cases described above (5). Further retrospective analyses of juvenile FSAs will be needed from large, multicenter data.

Extensive surgical resection in cases of STSs without metastasis is generally acknowledged as the best choice of

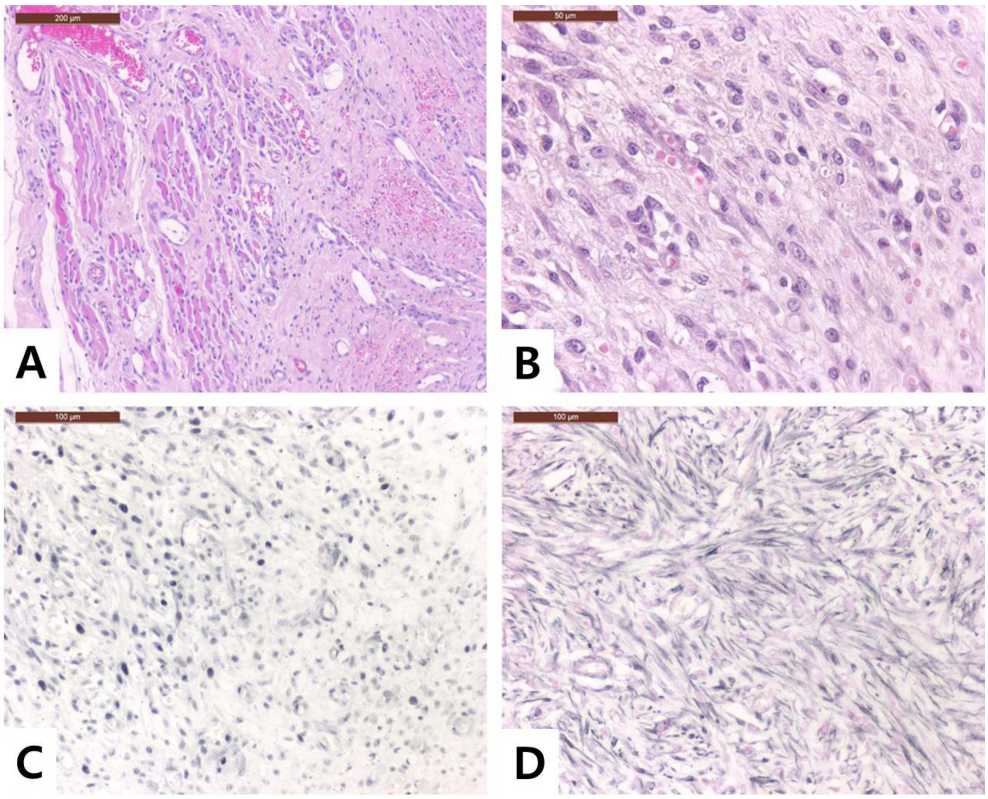

Fig 3. Histopathologic investigation of neoplastic lesion. Neoplastic lesions invaded the muscle layer and resulted in muscle bundle dissociation and atrophy. Numerous congestive blood vessels were also seen (A). Most of the tumor cells possessed multiple nucleoli within the round, ovoid to elongated, nucleus (B). (hematoxylin-eosin, A; bars = 200 μm, B; bars = 50 μm) Immunohistochemistry revealed that tumor cells showed a strong positive reaction for PCNA (C) and vimentin (D). (C-D = immunohistochemistry, bars = 100 μm).

treatment for long-term survival (1,7). Grade I and II cutaneous FSA are also known to have a low probability of metastasis, and receiving aggressive and complete surgical excision is reported to have a similar prognosis as those patients that received concurrent radiotherapy (7). In the report by Kim *et al*., a second surgery was required owing to recurrence of tumor; bone was resected since synechiae to the periosteum were identified (5). The effect of locally applied cisplatin is unknown, but no recurrence was reported for 6 months following the procedure (5). In the case presented herein, a malignant sarcoma was diagnosed from the FNA results, and the sarcoma was maximally resected to include the bone with synechiae. Absence of recurrence for a year was observed. A good prognosis from early, proactive, and broad extent of surgical resection could be expected in young age patients with FSA in the cranial region.

An association of vaccines with FSA occurrence in feline species is well-established (4). There is also a recent report of vaccine-associated FSA in canine species (11). Although the case presented herein has a history of vaccination, the tumor occurred in a place considerably far from the scapular region, which is the routine site of injection. Additionally, excluding the mild infiltration of neutrophil in the hemorrhagic region, the lymphocytic aggregation commonly seen in vaccine induced sarcoma was not revealed (11). Thus, the vaccination history is concluded to have no association with the tumor in this case. Moreover, although chronic inflammation or granuloma rarely develop into FSA, pathologic findings such as hyperemia, hemorrhage, and minor inflammation were not observed (9) and the possibility as a secondary occurrence should be low. Fibrosarcoma rarely metastasize distantly, and since no tumor were found in other parts of the body, this case was diagnosed as a primary FSA.

In summary, a spontaneous subcutaneous FSA, which occurred in the occipital region in a 5-month-old small breed puppy, was surgically resected extensively and was confirmed without recurrence for a year. For investigation of the cause and affected regions of juvenile fibrosarcoma, further cases and researches are necessary.

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