SUBCUTANEOUS MASS OVER THE CRANIODORSAL ASPECT OF THE LEFT SCAPULA IN A CAT

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Signalment:
A 9-year-old, neutered male, domestic short hair cat

History:
This patient was presented to the Queen Mother Hospital for Animals, Oncology Service, Royal Veterinary College, UK, for investigation of a rapidly growing subcutaneous mass near left scapula. According to the referring vet the mass had been present for a month and the cat had been vaccinated against FeLV and rabies.

Physical examination:
On presentation the cat was bright alert and responsive. His vital parameters were within normal limits. A mass was present subcutaneously over the craniodorsal aspect of the left scapula. It was freely mobile and did not appear attached to underlying tissues. The mass was firm and lobulated in texture but non-painful. It measured 3.6 cm x 1.2 cm. Peripheral lymph nodes were within normal limits. Thoracic auscultation and abdominal palpation were normal. The cat had a body weight of 3.9 kg and a body condition score of 4/9.

Diagnostic procedures:
Haematology: Lymphocytes mildly decreased at 0.82x10^9/l (RI 1.5 - 7x 10^9/l).
Serum biochemistry: Mild increase in CK at 576 U/l (RI 52 - 506 U/l).
Rest within normal limits.

CT scan: Thorax: Subcutaneous mass between skin and left supraspinatus muscle. Mass has low attenuation (22HU) in pre-contrast images and accumulates contrast mainly around its periphery. Adjacent muscle and bone do not appear to be invaded. No enlarged nodes identified.

Fine needle aspirates from the subcutaneous lesions were performed and submitted for evaluation (*Images 1 – 4*).

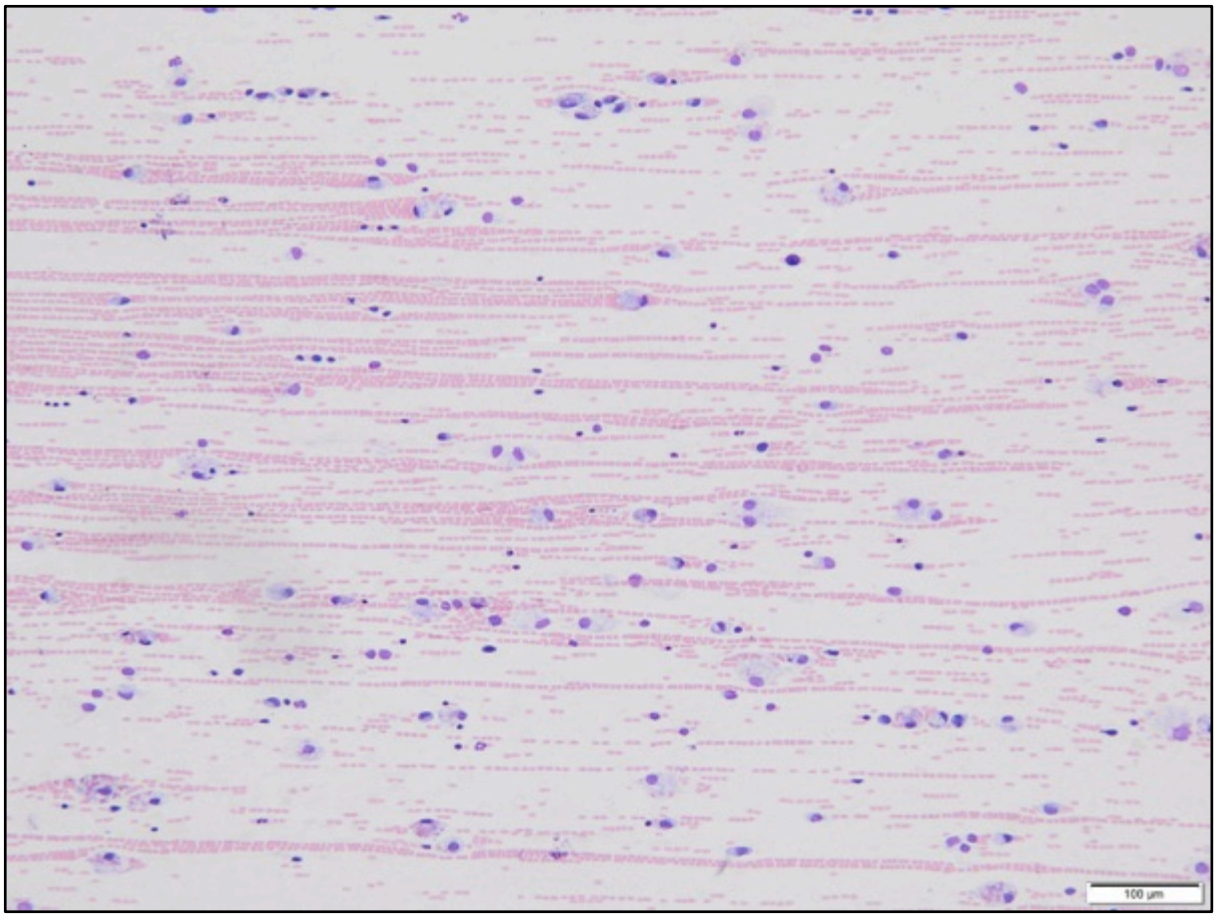

Image 1. FNA smear from a subcutaneous mass over the craniodorsal aspect of the left scapula in a cat (10x objective, modified Wright's stain).

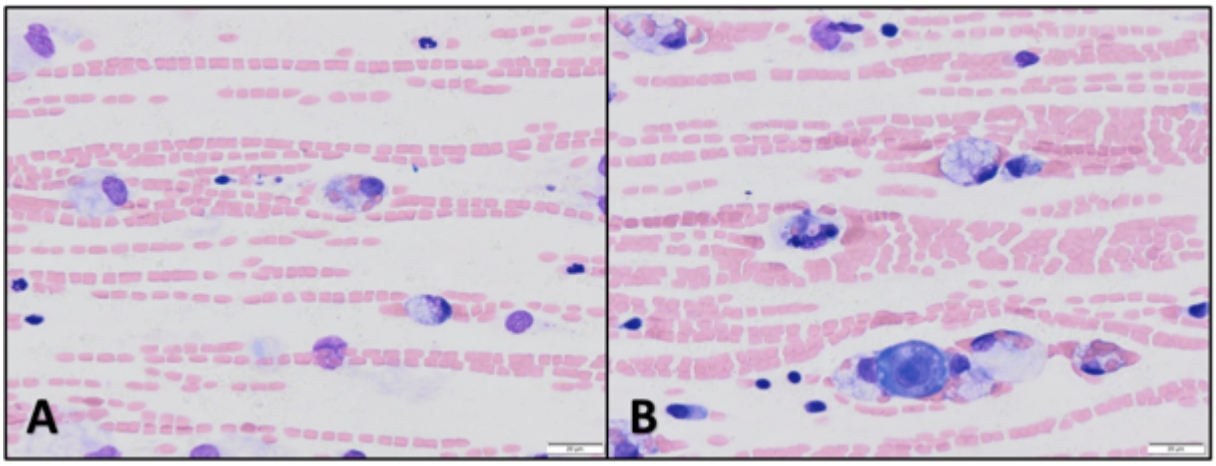

Image 2. FNA smear from a subcutaneous mass over the craniodorsal aspect of the left scapula in a cat (50x oil objective, modified Wright's stain).

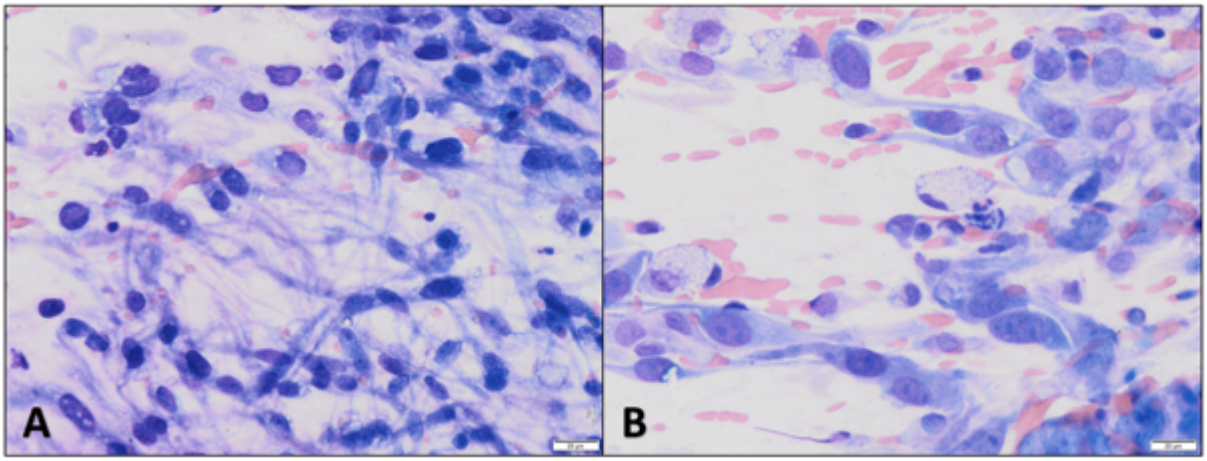

Image 3. FNA smear from a subcutaneous mass over the craniodorsal aspect of the left scapula in a cat (50x oil objective, modified Wright's stain).

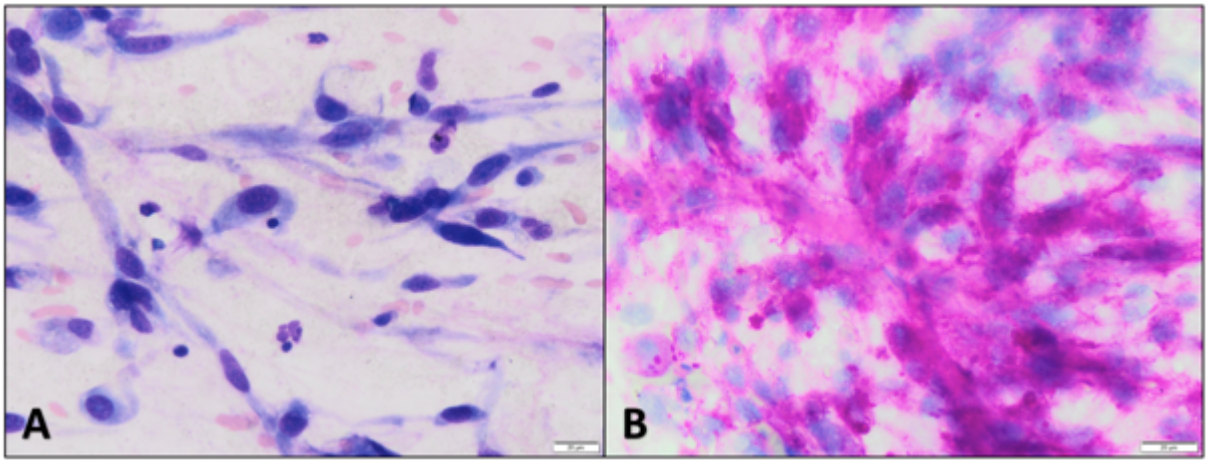

Image 4. FNA smear from a subcutaneous mass over the craniodorsal aspect of the left scapula in a cat.

A. 50x oil objective, modified Wright's stain
B. 50x oil objective, PAS stain

Question:
Based on clinical presentation and the cytology findings, what would be your main differential diagnoses?

Cytologic description:
The smears from the subcutaneous lesion (*images 1-4*) have high nucleated cellularity, moderate numbers of erythrocytes and occasional lysed cells on a background with high amounts of viscous-appearing pale pink extracellular matrix. Cells often appear in windrowing formation. There are multiple population of cells present, mostly mixed together.

1. High numbers of oval to occasionally plump spindle cells are present individually or in loose aggregates. They have a round to oval nucleus, prominent nucleoli, coarse chromatin and low amounts of variably basophilic cytoplasm which is occasionally vacuolated and rarely contains small pink granules. Purple extracellular matrix material is seen woven between the cells. Criteria of malignancy included: Marked anisocytosis and anisokaryosis (nuclei averaging15-30 um), frequent macrokaryosis (~50um+), occasional binucleation and rare multinucleation (up to 7 nuclei per cell) with intracellular anisokaryosis, nuclear moulding and prominent multiple nucleoli that did vary in number (up to 4) and shape (oval to angular) even within the same cell. Mitotic figures are frequently noted, including aberrant figures.
2. Low to moderate numbers of macrophages are present and are commonly highly vacuolated and frequently perform erythrophagia. Also, giant macrophages and siderophages are rarely noted.
3. Low numbers of small lymphocytes and plasma cells admixed with the pleomorphic spindle cells.
4. Low numbers on non-degenerate neutrophils (in haemic proportions) and rare eosinophils are also noted.

Cytologic interpretation:
Consistent with sarcoma
Evidence of prior haemorrhage with macrophagic inflammation
Evidence of mild lymphoplasmacytic inflammation

Additional findings:
Based on the cytology findings surgical excision of the mass was performed with wide, 4cm, surgical margins around the sarcoma. Two thirds of the scapula were removed.

Histopathology description:
Arising within the superficial subcutis is a relatively well demarcated, unencapsulated, lobulated, expansile loosely cellular neoplasm (*image 5*). Neoplastic cells form vague streams, are small and polygonal to spindloid with distinct cell borders separated by a sparse fibrovascular stroma and wide clear spaces. Neoplastic cells contain a moderate amount of eosinophilic cytoplasm and nuclei are small, ovoid and hyperchromatic with a variably prominent single nucleolus. There is moderate anisocytosis and anisokaryosis and 7 mitoses are counted in 10 (400x) high power fields (*image 5 inset*). The neoplasm is surrounded and, to a lesser extent, infiltrated by large numbers of lymphocytes, plasma cells and occasional clusters of foamy macrophages. The neoplasm extends to the deep soft tissue margin (that would overly the scapula) but not within a minimum of 2cm from the lateral tissue margin.

Also, within the subcutis, is a focal aggregate of large round cells which have a blue-grey appearing, finely granular cytoplasm (macrophages containing vaccine adjuvant) (*image 6-A*) and small numbers of adjacent lymphocytes and plasma cells.
Additional Alcian blue and PAS stains were performed with the myxoid extracellular material staining Alcian blue positive (*image 6-B*).

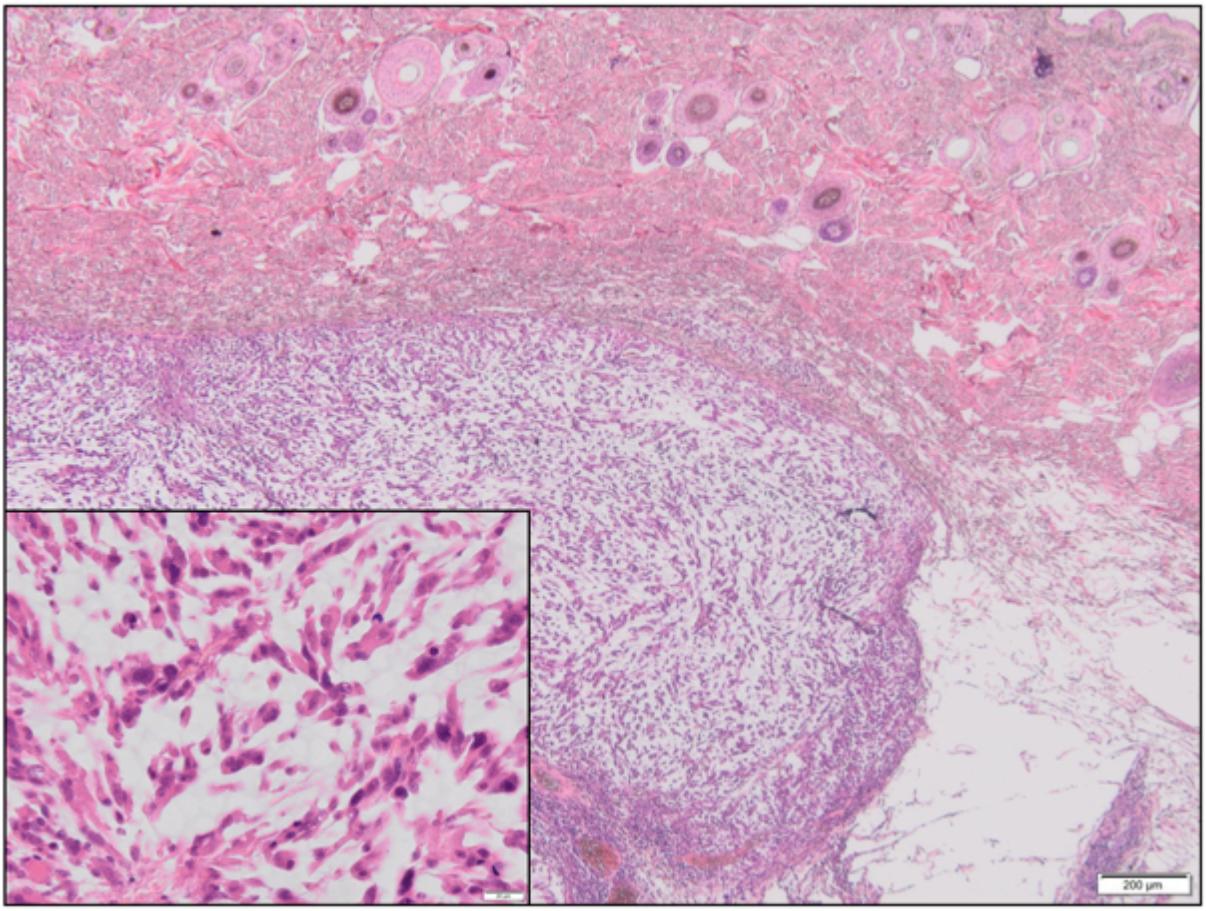

Image 5. Feline injection-site myxosarcoma, H&E stain (4x objective, inset 40x oil objective)

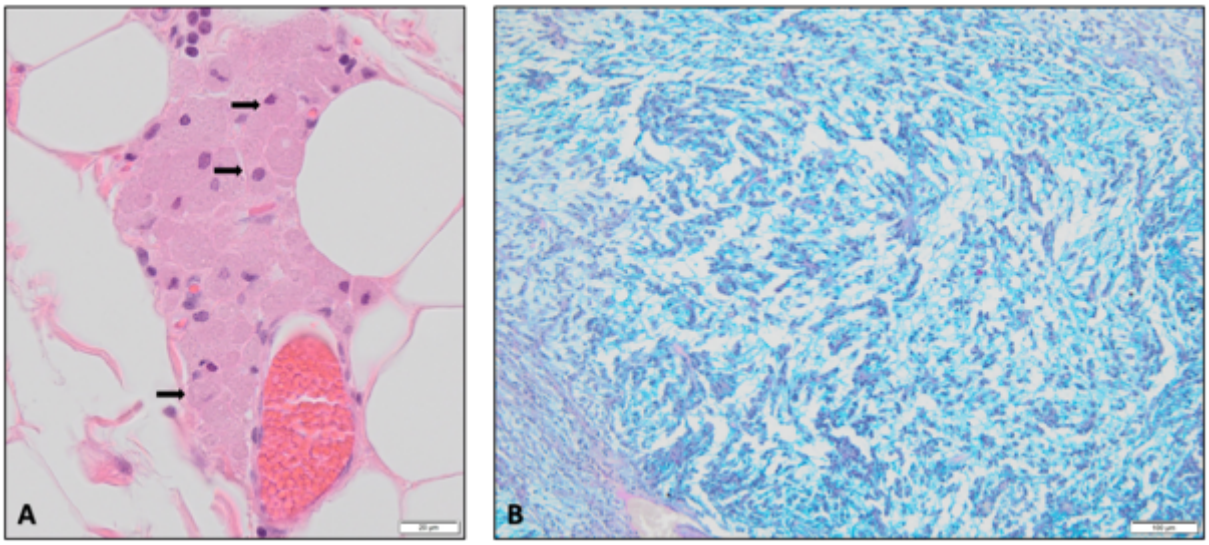

Image 6. Feline injection-site myxosarcoma

A. Macrophages containing vaccine adjuvant (arrows) 40x oil objective, H&E stain
B. Alcian blue and PAS stains, 10x objective

Histopathology interpretation:
Subcutaneous myxosarcoma with adjuvant containing macrophages

Examination of the submitted subcutaneous mass identifies a sarcoma which is formed by small spindloid cells within an abundant loosely arranged stroma, most consistent with a myxosarcoma. The presence of associated macrophages in multiple sections, often appearing to contain adjuvant type material is a feature observed in vaccine-associated sarcomas.

Final diagnosis:
Feline injection-site myxosarcoma

Treatment and follow up:
Post-operative recovery was excellent and the cat was discharged 4 days post-surgery. Follow up CT scan 3 months later

Answers to questons:

> The cytological interpretation was challenging due to the presence of multiple cell populations admixed with inflammatory cells. Top differential diagnosis based on FNA smears was a sarcoma including myxosarcoma, fibromyxosarcoma and fibrosarcoma. A reactive process could not be entirely ruled out.

Discussion:

In face of the location of a malignant mesenchymal population with mixed inflammation and macrophages containing foreign material (supposed adjuvant) a diagnosis of feline injection-site sarcoma (FISS) was established (1). Even though the mass was not tested for feline sarcoma virus (FeSV) or feline leukaemia virus (FeLV) this cat was regularly vaccinated for FeLV and at nine years of age would be considered a typical age for a post-vaccinal sarcoma to develop (2).

Feline injection-site sarcomas are consider the most significant adverse effects following vaccination due to their aggressiveness and recurrence following surgical excision (1, 3). Commonly FISS are fibrosarcomas, but other sarcomas have been described including osterosarcomas, chondrosarcomas, rhabdomyosarcomas, malignant fibrous histiocytomas and myofibroblastic sarcomas (1). Myxosarcomas and fibromyxosarcomas are sporadically reported as FISS (4, 5) and are considered rare neoplasms in cats (6).

The cytological interpretation from this case was challenging due to the presence of multiple cells populations admixed with inflammatory cells. An initial diagnosis of sarcoma with macrophagic and lymphocytic inflammation was made. Still a reactive process could not be ruled out entirely even though it appeared less likely. Lymphocytic inflammation is frequently reported in histology of FISS, typically T lymphocytes, in addition to the macrophagic inflammation with the presence of foreign material within the macrophages (supposed adjuvant) (1). The frequent erythrophagia noted reflects previous sampling of the mass by the referring vet.

The presence of abundant extracellular matrix is the most interesting feature of this case. Fibrosarcomas can produced mucin, but only in small amounts, making this sarcoma with abundant myxoid extracellular material a myxosarcoma. This was confirmed by the histological assessment including the Alcian blue positivity. Alcian blue did not stain the cytology smears, although this should have been feasible (7). However PAS positivity of the material was noted. Soft tissue sarcomas may have a mix of different proteoglycans and glycosaminoglycans (8) and this apparent discordant result could reflect this mix of material. Further studies would be needed to clarify. Most studies group together all FISS despite fibrosarcomas being over-represented, thus no specific information regarding the outcome, metastasis and recurrence rate are available for vaccine associated myxosarcomas specifically. In this case complete excision with clean margins was achieved and 4 months post-operatively, no clinical recurrence has been reported.

Acknowledgements:
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