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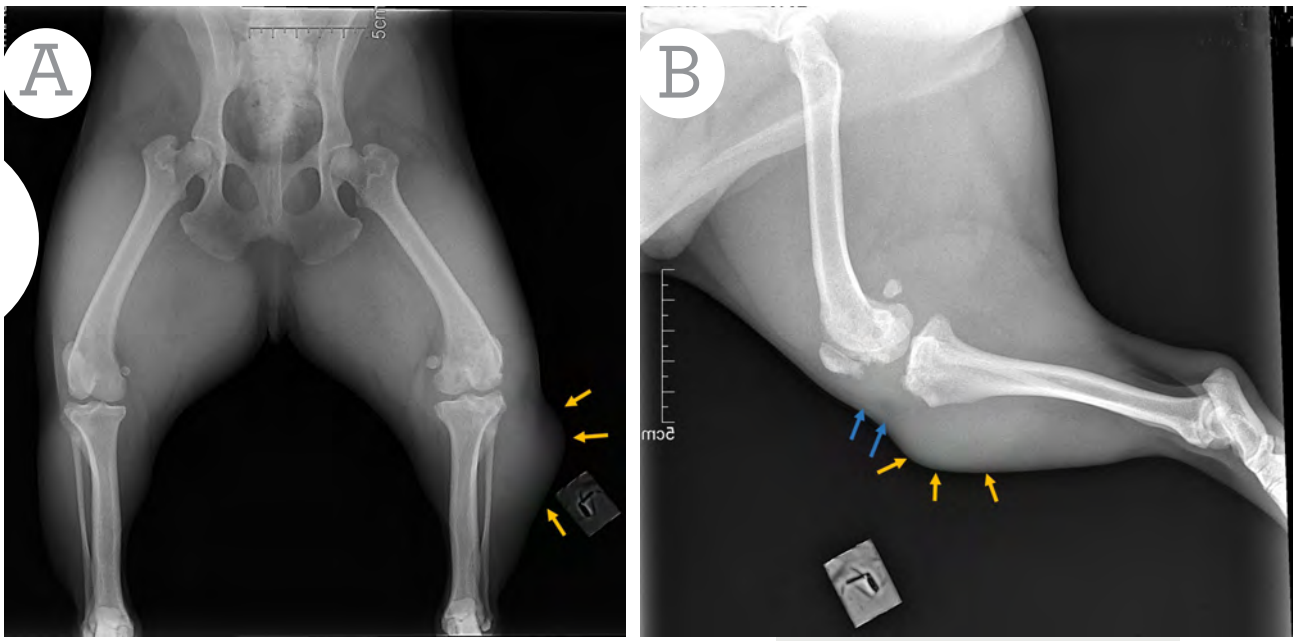

FIGURE 1A: Dorsoventral and **B.** left lateral radiographs. Perichondral osteophytes and enthesophytes are visible on the distal femur, distal patella and proximal tibia. The stifle joint has moderate to marked intracapsular soft-tissue swelling that displaces the infrapatellar fat pad cranially (blue arrows). A golf-ball-sized swelling with soft-tissue opacity is present distal to the stifle joint (yellow arrows). Radiographs courtesy of Sophie Dunn, Te Aroha Veterinary Services.

Lameness in a young French Bulldog: *what's your diagnosis?*

SVS Laboratories pathologist **Lisa Schmidt** discusses a case of increasing lameness in a dog and differential diagnoses

HISTORY

A two-and-a-half-year-old male neutered French Bulldog initially presented with a one-week history of left-hindlimb lameness and a two-day history of a golf-ball-sized swelling lateral to the tibial crest and distal to the tibiofemoral joint. There was no history of trauma and the dog was not pyrexic. Radiographs, cytology and histology were undertaken to determine the underlying nature of the lesion.

CLINICAL AND GROSS FINDINGS

Radiographs (Figure 1) showed osteoarthritic changes characterised by osteophytes and enthesophytes that were visible on the distal femur, distal patella and proximal tibia. In addition, there was marked intracapsular swelling and the golf-ball-sized mass had a soft-tissue opacity. On physical examination the dog lacked cranial drawer signs (ie, the cruciate ligaments were intact). The lesion was aspirated, and viscous, synovial-like fluid was collected.

The turbid, red fluid had a total protein and nucleated cell count of 38g/dL (reference range <25g/dL) and 1.5 x 109/L (reference range: 0–2 x 109/L), respectively. A direct smear and Cytospin preparation were examined microscopically. Cytologically (Figure 2), the fluid had a pale pink amorphous to granular background containing a predominance of monocytoid cells (>90%) with fewer polymorphonuclear cells (<10%). The monocytoid cells were presumed to be a mix of macrophages and synoviocytes. A diagnosis of mild mononuclear inflammation was made, which was consistent with the reported radiographic degenerative and osteoarthritic changes. Since the primary lesion was described as a mass, additional diagnostics were recommended (eg, biopsy, repeat radiographs).

The dog's lameness continued to progress. Surgical exploration was elected and tissue biopsies were collected. Biopsies and the initial surgery showed that the lesion had infiltrated from the

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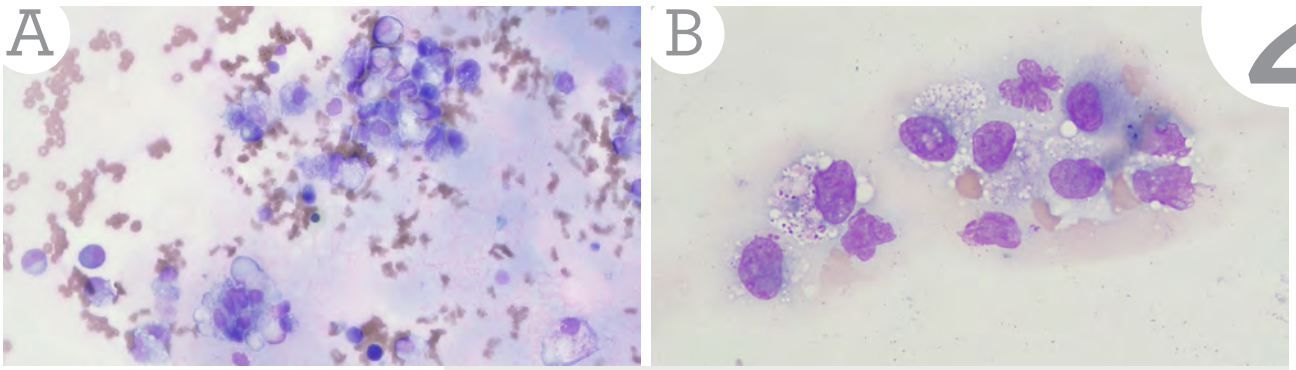


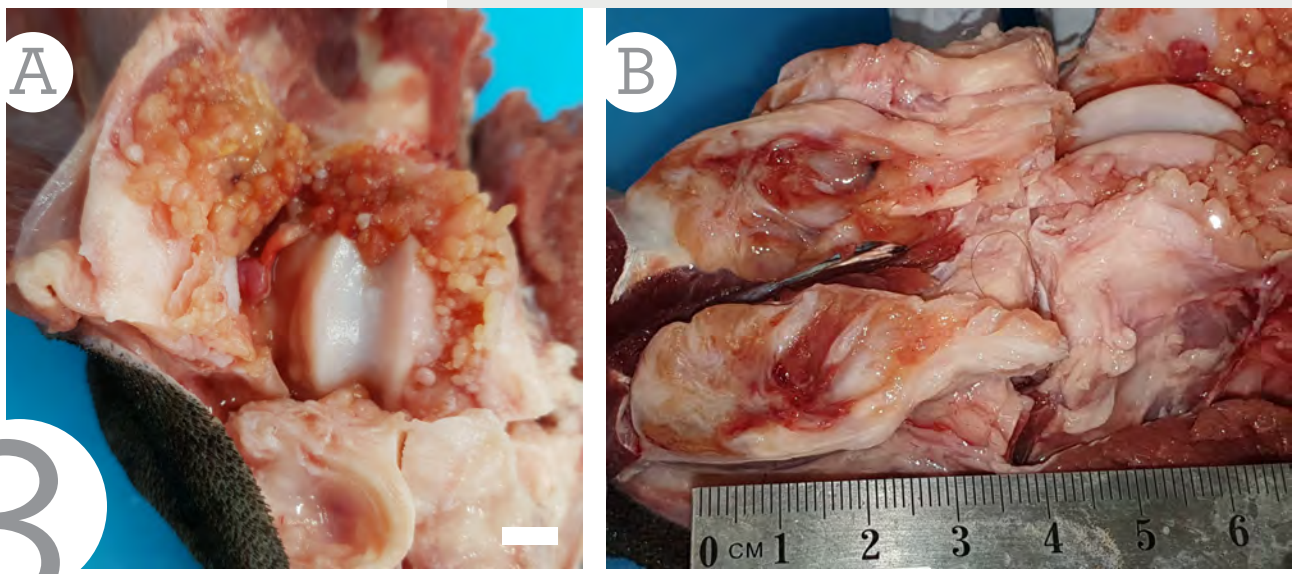
FIGURE 2: Cytology. **A.** Low magnification and **B.** higher magnification showing mostly vacuolated monocytoid cells (consistent with macrophages and/or synoviocytes) on a pale pink amorphous to granular background admixed with erythrocytes and rare neutrophils.

joint capsule distally along fascial planes into adjacent muscle and tendons. Based on these findings, the affected limb was amputated and submitted to the laboratory. The skin and tibiofemoral joint capsule were incised exposing the nodular neoplasm that extended distally from the cranial tibia, forming a firm tan lesion (Figure 3). Part of the lesion extending along the cranial tibia (Figure 3b) was presumed to be fibrous connective tissue secondary to the earlier surgical biopsy.

Mass lesions of the joints include benign and malignant tumours and non-neoplastic tumour-like lesions (Craig et al., 2016; 2017). Malignant tumours include histiocytic sarcoma, synovial cell sarcoma (if such a tumour exists) and other sarcomas (Craig et al., 2002; 2010; 2016; 2017). Currently, the term synovial cell sarcoma is thought to be a misnomer, as the cell of origin is unknown and not the synovial cell as previously thought (Monti et al., 2018). Benign tumours include synovial myxoma, synovial haemangioma, periarticular fibroma and giant cell tumour of the tendon sheath. Periarticular fibroma is an uncommon tumour of dogs that is seen more commonly surrounding the carpal joint and less frequently affecting the tarsal joint. Giant cell tumours of the tendon sheath are rare tumours that occur in the distal limbs of cats. Finally, non-neoplastic lesions include synovial chondromatosis, synovial cysts, vascular hamartomas, synovial pad proliferation and calcinosis circumscripta (Craig et al., 2016; 2017).

Based on the radiographs, cytology and gross findings, what are your top differential diagnoses?

FIGURE 3: Amputated limb with an intra-articular nodular neoplasm. **A.** Femoral-tibial (knee) joint with exposure of the distal femoral condyles and reflection of the patella and joint capsule to expose a nodular neoplasm. Bar = 10mm. **B.** Incision through the fascia overlying the tibial diaphysis showing a tan, yellow and red myxomatous tumour invading into muscle and tendon, and admixed with fibrous connective tissue.



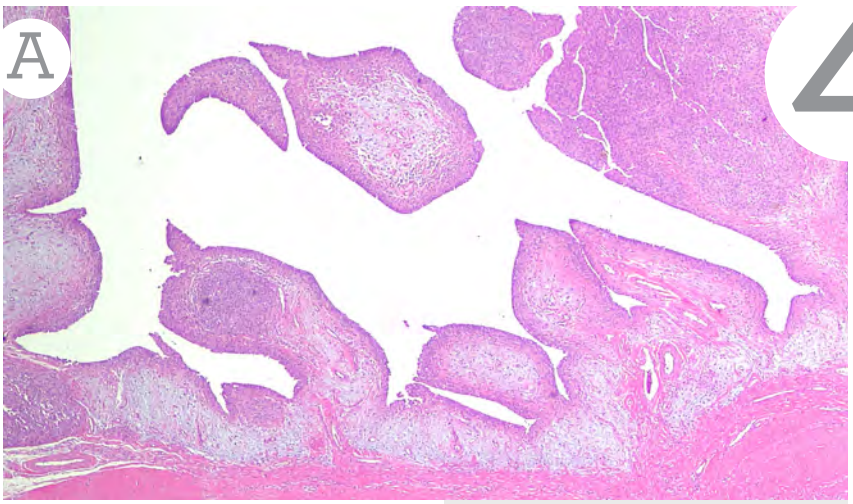


FIGURE 4: Histopathology of the intra-articular nodular neoplasm. **A.** Low magnification (2x objective) showing the nodular nature of the lesion and areas of abundant myxomatous matrix (pale blue-grey areas). **B.** Higher magnification with areas of high and low cellularity. Nodules are composed of synoviocytes, spindle cells, myxomatous matrix and low numbers of scattered inflammatory cells.

HISTOPATHOLOGIC FINDINGS

The initial biopsy and tissues from the amputated limb revealed neoplastic nodules that were covered by a hyperplastic synovium with foci of high and low cellularity. Areas of low density were composed of stellate to spindloid cells that had indistinct cell margins and oval nuclei with hyperchromatic chromatin. The cells were separated by an abundant myxomatous stroma that occasionally contained scattered foamy macrophages and hemosiderophages. In more densely cellular areas, neoplastic cells were larger and had small to moderate quantities of eosinophilic cytoplasm with occasional clear vacuoles. The nuclei were predominantly oval, up to 20 x 15 microns, and had finely stippled basophilic chromatin and frequently a single nucleolus. Cells were supported by a scant fibrovascular stroma. Regardless of cellularity, mitoses were infrequent and binucleated and multinucleated cells were not seen.

MORPHOLOGIC DIAGNOSIS

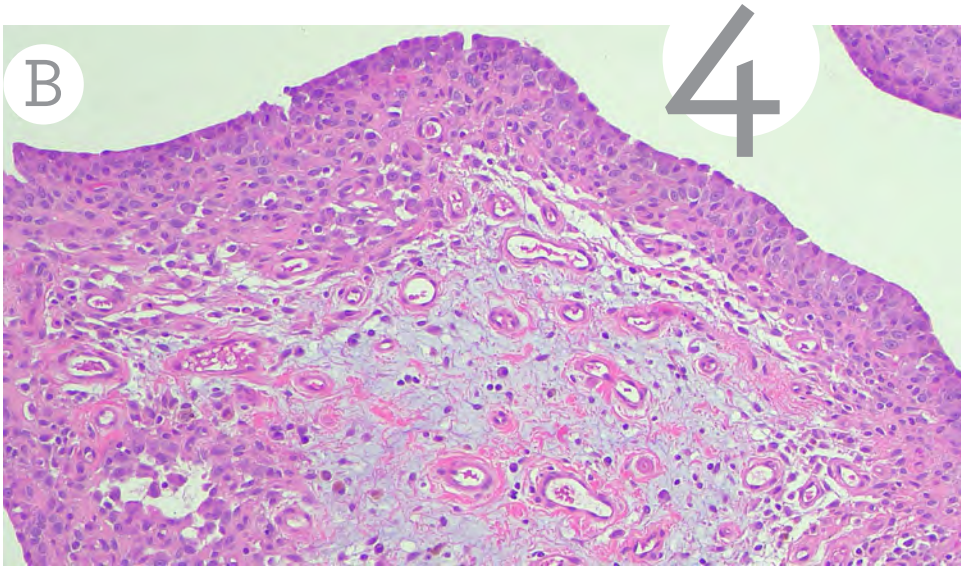
Synovial myxoma with local invasion.

COMMENT

Given the list of tumours and tumour-like joint lesions, the top three differential diagnoses for this case, based on the nodular gross appearance, would be histiocytic sarcoma, synovial myxoma and synovial chondromatosis. Had bony lysis been seen radiographically, the top differential diagnoses would have been histiocytic sarcoma, synovial myxoma and synovial cell sarcoma (Craig et al., 2002; 2010; 2016; 2017). It is not possible to differentiate between histiocytic sarcoma, synovial myxoma and synovial cell sarcoma radiographically (Craig et al., 2010; 2017). Nonetheless, it is important always to submit radiographs with musculoskeletal biopsies (both fine needle aspirates and tissue biopsies).

Synovial myxomas are the second most common articular neoplasm after histiocytic sarcoma (Craig et al., 2016). While they are considered benign because they do not tend to metastasise, they can be highly invasive (Craig et al., 2002; Izawa et al., 2012), as is seen in this case. Synovial myxomas are typically seen in large breed dogs between two and 14 years of age (mean age at presentation 8.5 years) and Doberman Pinschers and Labrador Retrievers are over-represented (Craig et al., 2010; 2017). They occur in a single joint, most commonly in the stifle or digit. These tumours often produce viscous fluid.

Clinically, these lesions are slow growing and dogs may present with lameness (with or without joint swelling) that has been present for weeks to



years (a mean of six months) (Craig et al., 2017). Radiographically, most dogs have soft-tissue swelling and periarticular osteophytes, and up to 20% of dogs have bony lysis (Craig et al., 2010; 2017). Grossly, the lesions consist of soft, white, translucent nodules and pockets of viscous fluid. Nodules can line the entire surface of the joint capsule. In some cases nodules and viscous fluid can extend outside the joint capsule and into adjacent bones and muscle, as seen in this case (Craig et al., 2017; Izawa et al., 2012). Cases without bony lysis or extension outside the joint capsule can be treated with synovectomy, which is curative in 90% of cases. Limb amputation is required for lesions that infiltrate along fascial planes. Survival times are often long, even with incomplete surgical excision.

SUMMARY

Differentiating between nodular neoplasms grossly may not always be possible.

In general, synovial myxomas have a more nodular appearance than histiocytic sarcomas and the nodules are softer than those seen with synovial chondromatosis. There is a significant difference in biologic behaviour and prognosis, especially between histiocytic sarcomas and synovial myxomas; consequently it is important to confirm the diagnosis by histology prior to treatment.

Histologically, the myxomatous stroma is considered a distinguishing feature of synovial myxomas that is not seen in histiocytic sarcoma, synovial cell sarcoma or synovial chondromatosis. VS

REFERENCES:

Craig LE, Ditmer KE, Thompson KG. Bones and joints. In: Maxie MG (ed). *Jubb, Kennedy & Palmer's Pathology of Domestic Animals*, Volume I, 6th Edtn. Pp 159–62. Elsevier, Philadelphia, 2016

Craig LE, Krimer PM, Cooley AJ. Canine synovial myxoma: 39 cases. *Veterinary Pathology* 47(5), 931–6, 2010

Craig LE, Julian ME, Ferracone JD. The diagnosis and prognosis of synovial tumors in dogs: 35 cases. *Veterinary Pathology* 39(1), 66–7, 2002

Craig LE, Thompson KG. Tumors of joints. In: Meuten DJ (ed). *Tumors in Domestic Animals, 5th Edtn*. Pp 337–50. John Wiley and Sons, Ames, Iowa, 2017

Izawa T, Tanaka M, Aoki M, Ohashi F, Yamate J, Kuwamura M. Incidental synovial myxoma with extensive intermuscular infiltration in a dog. *The Journal of Veterinary Medical Science* 74(12), 1631–3, 2012

Monti P, Barnes D, Adrian AM, Rasotto R. Synovial cell sarcoma in a dog: A misnomer-Cytologic logic and histologic findings and review of the literature. *Veterinary Clinical Pathology* 47(2), 181–5, 2018