Stifle synovial cyst in a Labrador Retriever with concurrent cranial cruciate ligament deficiency

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Summary
A seven-year-old Labrador Retriever dog was presented with the complaint of chronic left hindlimb lameness. A diagnosis of partial rupture of the left cranial cruciate ligament with concurrent cranio-medial synovial cyst formation was made. This cystic structure was assumed to be communicating with the stifle joint. There was no evidence of a meniscal tear, but superficial fibrillation of the axial border was present. Surgical excision of the cyst with concurrent treatment of the cranial cruciate ligament deficiency by tibial tuberosity advancement was performed with a successful outcome. Whilst commonly encountered in humans, synovial cysts are uncommon in dogs. To the authors’ knowledge, this is the first reported case of synovial cyst formation in the stifle of a dog.

Introduction
Soft tissue synovial cysts are commonly documented in the human literature but are rarely reported in domestic animals. The majority of references to synovial cysts in dogs pertain to extradural cysts affecting the spinal column, however appendicular soft tissue cysts have been reported in cats and dogs in relation to the elbow, carpal, metacarpal, interphalangeal or tibiotarsal joints (1–6). Knee joint synovial cysts in humans, commonly referred to as popliteal or Baker’s cysts, may be incidental findings but are frequently related to intra-articular pathologies, especially meniscal tears (7, 8).

To the authors’ knowledge, synovial cyst formation relating to the canine stifle has not been previously reported. This case report describes the clinical features, diagnosis and management of a synovial cyst, which was assumed to be communicating with the caudal compartment of a stifle joint, with concurrent partial cranial cruciate ligament trauma and superficial fibrillation of the medial meniscus.

Case report
A seven-year-old female spayed Labrador Retriever was presented with the complaint of a three month history of acute onset non-progressive left pelvic limb lameness. Administration of firocoxib8 (5 mg/kg PO once daily for 14 days) as prescribed by the referring veterinarian had improved, but not resolved, the lameness. The owner also reported the presence of a firm swelling on the medial aspect of the same stifle joint, which had appeared since the onset of lameness and increased in size since that time.

Clinical examination revealed a moderate weight-bearing lameness, with signs of mild pain elicited upon firm palpation and extension of the left stifle. There was evidence of mild thigh muscle atrophy. A unilateral medial buttress formation and stifle effusion were palpable. Both a positive cranial tibial thrust and a positive cranial drawer sign could be elicited in the left stifle, the latter more pronounced in stifle flexion. These findings were consistent with a partial tear of the cranial cruciate ligament. A firm swelling approximately 2.5 cm in diameter was palpable on the medial aspect of the left stifle, adjacent to, but distinct from the medial collateral ligament. Fine needle aspiration of the mass produced a fluid grossly consistent in appearance with joint fluid. The remainder of the examination was unremarkable.

Radiographic examination revealed signs of a moderate stifle effusion, more pronounced caudally than cranially, and medial soft tissue swelling consistent with medial buttress formation (Fig. 1). There was evidence of minor stifle osteoarthritis, with osteophyte formation on the femoral trochlear ridges. A soft tissue opacity was visible on the medial aspect of the joint, adjacent to the femoral condyles, in a position consistent with the palpable location of the cyst. Ultrasonography of the mass revealed a fluid filled structure incompletely divided by a septum.

The patient was premedicated with methadoneb (0.3 mg/kg IM) and acepromazine maleatec (0.02 mg/kg IM). General anaesthesia was induced using thiopentone4 (15 mg/kg IV) and maintained with inhalational anaesthesia using 1.5–2.0% isoflurane4 in 100% O2. An epidural nerve block was performed at the lumbo-sacral...

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junction employing morphine (0.1 mg/kg) and bupivicaine (1 mg/kg).

A standard cranio-medial approach to the stifle joint was performed. A fluid filled mass, approximately 2.5 cm x 1.5 cm in diameter, was identified on the medial aspect of the left stifle at the level of the femoral condyles, emerging from just cranial to the caudal belly of sartorius muscle (Fig. 2).

The mass was incised and approximately 3 ml of clear, yellow, tenacious fluid, grossly consistent with joint fluid, was evacuated. Exploration showed the mass to be partially divided by a septum and to have a single patent sinus, approximately 1.5 mm in diameter.

A standard medial parapatellar arthrotomy was performed, incising the joint capsule cranial to the sinus. The cranio-medial band of the cranial cruciate ligament was completely torn; the caudo-lateral band was stretched and moderately fibrillated. The caudal cruciate ligament was normal. The medial meniscus had subtle fibrillation of its axial border, but was otherwise normal with no tears. The lateral meniscus was normal. The joint was debrided of all remnants of the cranial cruciate ligament. The medial meniscus was neither excised nor released.

The mass was excised by sharply dissecting around its base, and a length of suture material was passed into the sinus. Whilst the suture was easily inserted, it could not be visualised either in the cranial compartment of the stifle joint or directly communicating with either meniscus. It was therefore presumed to be entering the caudo-medial compartment of the stifle. A routine tibial tuberosity advancement procedure was performed (9). The sinus opening was closed by the placement of a single suture. Closure was otherwise routine, with a soft-padded dressing applied to the limb for 36 hours postoperatively.

Postoperative analgesia was provided with 0.2 mg/kg methadone intramuscularly every four hours from eight to 24 hours postoperatively and then 0.02 mg/kg buprenorphine subcutaneously every eight hours for a further 24 hours. The patient also received 5 mg/kg firocoxib orally once daily for 10 days.

Histopathological examination of a sample of the mass wall revealed a fibrotic capsule, significantly thicker than the true joint capsule, with reactive hyperplastic synovium with papillary synovial projections into the cyst lumen (Fig. 3A). Multifocal infiltrates of haemosiderophages in the connective tissue, indicative of significant past haemorrhage (Fig. 3B), were present. These findings were consistent with chronic haemorrhagic synovitis.

Eight days postoperatively, the patient was moderately lame on the affected limb, but with no evidence of cyst recurrence. The patient presented seven months postoperatively with a sudden onset of moderate lameness of the affected limb. There was no evidence of recurrence of the cyst, but a mild pain response was elicited when the stifle joint was manipulated. The lameness resolved with the administration of 5 mg/kg firocoxib orally once daily for seven days. At telephone follow-up performed 15 months postoperatively, the owners reported that the dog appeared to be well, and that they had not observed any signs of lameness or increased swelling on the medial side of the stifle joint.

Discussion

True synovial cysts are found attached to the walls of synovial joints, bursae or tendon sheaths, and by definition have a synovial lining. They can be either intra-articular or extra-articular. Intra-articular cysts usually develop within the joint space, while extra-articular cysts arise outside the joint capsule. The pathogenesis of synovial cysts is not fully understood, but it is believed that they may be due to the accumulation of synovial fluid within a pre-existing synovial cavity or within a pre-existing bursa.

In this case, the synovial cyst was located on the medial aspect of the left stifle, emerging from just cranial to the caudal belly of sartorius muscle. The mass was incised and approximately 3 ml of clear, yellow, tenacious fluid, grossly consistent with joint fluid, was evacuated. Exploration showed the mass to be partially divided by a septum and to have a single patent sinus, approximately 1.5 mm in diameter. The mass was excised by sharply dissecting around its base, and a length of suture material was passed into the sinus. Whilst the suture was easily inserted, it could not be visualised either in the cranial compartment of the stifle joint or directly communicating with either meniscus. It was therefore presumed to be entering the caudo-medial compartment of the stifle.

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ovial lining. This synovial lining distinguishes them from synovial ganglions, which lack this lining and do not communicate with the joint space (10). True cysts may or may not communicate with the joint space (11).

In humans, the terms popliteal or Baker’s cyst are often used to describe knee joint cysts, but these technically refer to a specific type involving the gastrocnemius-semimembranosus bursa (12). In theory, any of the bursae around the human knee may be affected, but this site is the most commonly affected (13). In our reported case, the protrusion was further proximocranial, emerging cranial to the sartorius muscle. Whilst the bursa associated with vastus medialis is a potential source of a medial synovial cyst, the precise location made this unlikely in this case.

Synovial cysts in humans have been reported to cause various clinical signs including compressive neuropathies and generalised limb pain or, in cases of rupture, pseudothrombophlebitis, mirroring deep vein thrombosis (14–17). It could not be determined if the cyst in this case was truly symptomatic due to the concurrent cruciate ligament disease.

Whilst advanced diagnostic imaging techniques such as computed tomography and magnetic resonance imaging are useful, sonography is the method of choice for diagnosing human popliteal cysts (13). In this case, ultrasound confirmed a cystic structure apparently communicating with the stifle joint. Surgical exploration was elected although preoperative arthrography may have clarified the precise course of the communication with the stifle. The passage of suture material through the sinus did not reveal the precise route, but the communication was assumed to be with the caudal compartment due to the lack of visualisation of the material in the cranial compartment or adjacent to the menisci. Further exploration was not performed in order to limit surgical morbidity.

The aetiology of synovial cysts is unclear, but in human adults an underlying intra-articular pathology is usually present, including various arthritides (18, 19). However, there is a strong correlation between knee joint cysts and caudal meniscal tears (7, 20, 21). Three potential mechanisms have been proposed for the pathogenic origins of cysts in humans: 1) joint capsule herniation due to increased intra-articular pressure, 2) bursal distension by fluid originating in a diseased joint with communication between the joint and the bursa, and 3) accumulation of fluid in a non-communicating bursa (22). Thirty to 50% of human popliteal cysts reportedly communicate directly with the knee joint (13). Any cause of increased synovial fluid production and subsequent elevation in intra-articular pressure may therefore result in synovial cyst formation, particularly if there is a defect in the joint capsule.

In this case there was a partial tear of the cranial cruciate ligament with a significant stifle effusion but only minor degenerative changes in the joint. A meniscal tear was not identified intraoperatively; rather, minor fibrillation was present, which may indicate low-level direct trauma. While tears may lie undetected, the thorough intra-operative examination and continued improvement of the patient postoperatively made it unlikely for a meniscal tear to have been present (23). The moderate lameness seven months postoperatively may feasibly have related to a late meniscal tear, but the lameness resolved with conservative treatment and further investigations were not performed (24).

Given the histopathological findings, particularly the presence of haemosideropenic synovial projections into the cyst lumen joint space (arrow). There are occasional scattered mononuclear inflammatory cells present in the synovium. B) The thickened fibrotic cyst capsule with a focal aggregate of macrophages containing brown haemosiderin pigment (arrow). (Scale bar = 100 μm).

References
A. D. Franklin et al.: Stifle synovial cyst with concurrent cranial cruciate ligament injury