Intra-articular lipomatous lesion in the stifle in a dog

Intra-articulair lipomateus letsel in het kniegewricht bij een hond

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ABSTRACT

A seven-year-old, female Labrador retriever was presented with chronic and intermittent left hindlimb lameness, deteriorating over the previous three weeks. Radiographs showed an avoid mass with a fat opacity, at the craniomedial aspect of the left distal femur, with craniomedial displacement of the patella and marked degenerative joint disease. Computed tomography (CT) scans revealed an ovoid, well-defined, mildly heterogeneous, non-enhancing, septated fat attenuating mass (-70HU). On ultrasound (US), the mass had smooth regular margins and was slightly hyperechoic to adjacent muscles with a mildly heterogeneous aspect. Cytology revealed well-differentiated adipocytes. The findings were consistent with intra-articular lipomatous lesion, most likely a true intra-articular lipoma.

SAMENVATTING

Een zeven jaar oude, vrouwelijke labrador retriever werd aangeboden voor chronische en intermitterende mankheid aan de linkerachterpoot, die sinds drie weken aan het verergeren was. Röntgenfoto's toonden een eivormige massa met vetopaciteit op het craniomediale aspect van de linker distale femur, met craniomediale verplaatsing van de patella en uitgesproken degeneratieve veranderingen. Computertomografisch onderzoek toonde een eivormige, goed gedefinieerde, licht heterogene, niet-contrastopnemende, septate, vetattenuerende massa (-70HU). Op echografie had de massa gladde marges en een licht heterogeen echogeen aspect. Het cytologisch onderzoek toonde goed gedifferentieerde adipocyten. De bevindingen kwamen overeen met een intra-articulair lipomateus letsel, hoogstwaarschijnlijk een echt intra-articulair lipoom.

Signalment, history and clinical findings

A seven-year-old, female Labrador retriever was presented at the Veterinary University Hospital of Liège (Belgium) with left chronic intermittent hindlimb lameness, worsening over the last weeks. No history of trauma was reported by the owners.

General physical examination revealed no abnormalities. No lameness was noticed during orthopedic examination. Both right and left stifles were thickened (left more than right) with a positive right cranial 'tibial drawer test', indicating joint instability. Based on clinical examination, the suspected diagnosis was chronic bilateral cranial cruciate ligament disease.

Imaging findings, diagnosis and outcome

Mediolateral and craniocaudal radiographs of both stifle joints were taken (DigiVeX FP, Medex Loncin S.A., Belgium).

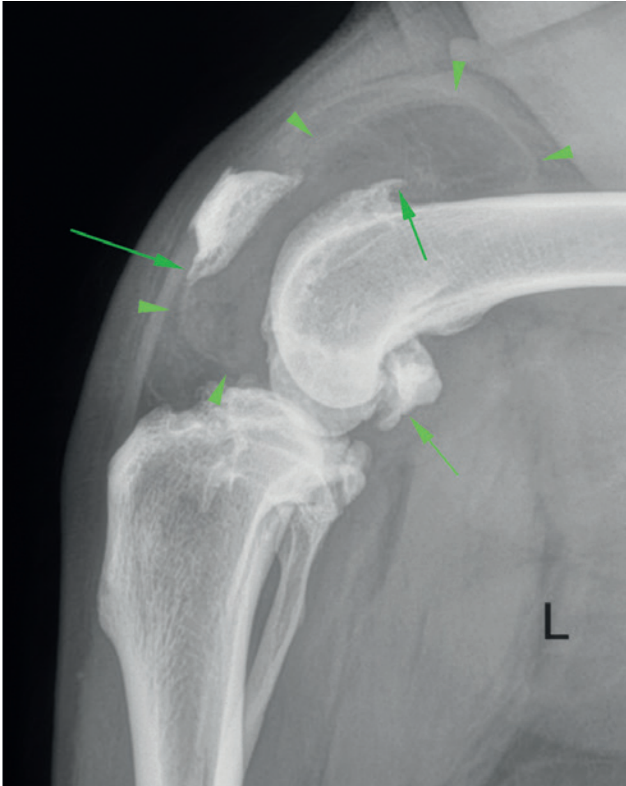

Figure 1. Lateral radiograph of the left stifle showing a well-defined fat opacity visible cranial to the distal femur and displacing the patella cranially (arrowheads). Multiple degenerative changes of the joint are also visible (arrows).

Bilaterally, the tibial plateau was mildly cranially displaced compared to the femoral condyles. There was mild (right side) and moderate to severe rough and irregular (left side) remodeling of the joint surfaces characterized by osteophytes on the tibial plateau, both tibial condyles, the femoral trochlea, the patella and both fabellae; and there was a small smooth enthesophyte on the distal patella.

On the right stifle, an intra-articular soft tissue opacity, displacing cranially and distally the patellar fat pad, was observed, consistent with joint effusion.

In contrast, on the left stifle, an ovoid, well-defined, heterogeneous mass (approximately 6.3cm in length and 1.8cm wide) was observed. The mass predominantly consisted of fat opacity but with a minor soft tissue component. It was positioned between the femoral trochlea and the patella, creating a mass effect and displacing the patella craniomedially (Figure 1).

These findings were consistent with an intra-articular mass in the left femoro-patellar-tibial joint.

A pre- and postcontrast computed tomographic (CT) examination (Somatom 16 slices, Siemens, Erangen, Germany) of the stifles was performed in order to better evaluate the mass and its margins for future surgery. Acquisition parameters were 120kVp, 92mA, 0.75mm slice thickness with bone (Br60s) and soft tissue (Br40s) reconstructions. Postcontrast images were acquired one minute after the manual intravenous injection of 2mL/kg of iodinated contrast medium (Iohexol, Omnipaque 300®, General Electric Healthcare, Diegem, Belgium, 300 mg of I/mL). The CT examination confirmed the radiographic findings of a well-defined, ovoid, mildly heterogeneous mass (6.9cm long, 4.3cm wide, 3cm high), mainly of fat attenuation (-70HU), with a few soft-tissue attenuating components. This mass was located cranial and slightly medial to the left femur and tibia, occupying the left femoro-tibio-patellar joint and displacing the patella cranially and medially (Figure 2). Proximally and distally, the mass was well delineated by a thin hyperattenuating line of soft-tissue attenuation (+/-33HU), interpreted as the capsule, which was in contact with the patellar ligament and was thicker on its caudal aspect. The mass extended proximally to the distal third of the femoral diaphysis and distally to the tibial plateau. These findings were consistent with an intra-articular lipoma/liposarcoma of the left stifle, with associated subluxation of the left patella. Bilaterally, marked peri-articular osteophytosis/enthesophytosis was observed as described on the radiographic

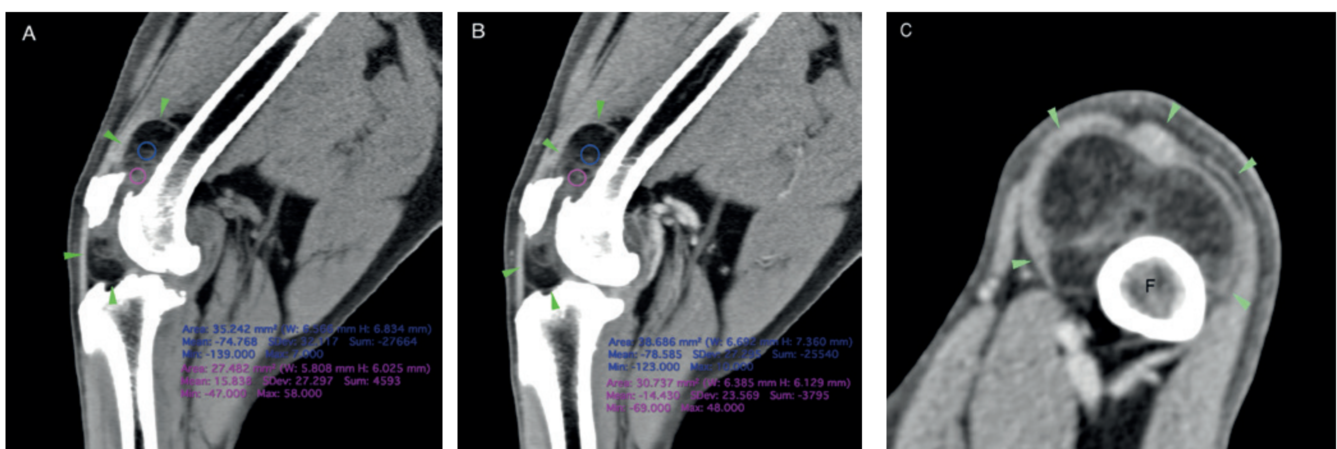

Figure 2. (A) Precontrast reformatted sagittal, (B) postcontrast reformatted sagittal and (C) transverse CT images of the left stifle (soft tissue filter) showing a large fat attenuating mass cranial to the distal femur (arrowheads. (A) and (B) emphasize the lack of enhancement, regions of interest (circles) were placed on the mass. F = femur.

images consistent with bilateral degenerative joint disease. Mild bilateral and symmetrical enlargement of popliteal lymph nodes was observed, most likely consistent with reactional hyperplasia.

An ultrasound (Aloka Alpha10 unit, Tokyo, Japan, 7.5-10 MHz linear transducer) of the left stifle was performed in order to obtain US-guided fine-needle aspirations (FNA) of the mass, avoiding sampling the patellar fat pad. A homogeneous to mildly heterogeneous, echoic mass was visualized in the cranial and medial aspect of the left stifle joint, as described in both radiography and CT (Figure 3). The borders of the mass were mainly smooth and well delineated with some areas where the margins were less sharp or mildly ill-delineated. The lateral and medial aspects of the femoral trochlea and the tibial plateau showed very irregular bone margins. US-guided FNAs of the mass were performed with no complications.

Unstained slides appeared with glistening droplets. After May-Grünwald Giemsa staining, the samples were examined. May-Grünwald Giemsa is a methanolic Romanowsky stain considered as the gold standard in veterinary cytology. The aspirates were hypocellular, with a single cluster of large cells containing small and compressed nuclei, offset peripherally by a large, optically empty vacuole suggestive of lipid content. These cells were identified as well-differentiated adipocytes, consistent with lipoma or accidental aspiration of fat (Figure 4).

Because of the cytological and imaging findings, an intra-articular lipoma/liposarcoma was suspected**.** A surgical excision of the mass was proposed but was refused by the owners. Therefore, histopathology was not available to confirm this hypothesis. The dog received chondroprotectors. No imaging follow-up, nor orthopedic examination were performed. After six months, no lameness was observed in the dog by the owners and no external growth or mass was visible. Although histopathology was not available, resolution of the clinical signs and the absence of an external growth or mass were suggestive of a benign lesion. In this case, magnetic resonance imaging (MRI) was not performed, but based on the examinations performed in this case and on the human literature, intra-articular lipoma was the most likely diagnosis.

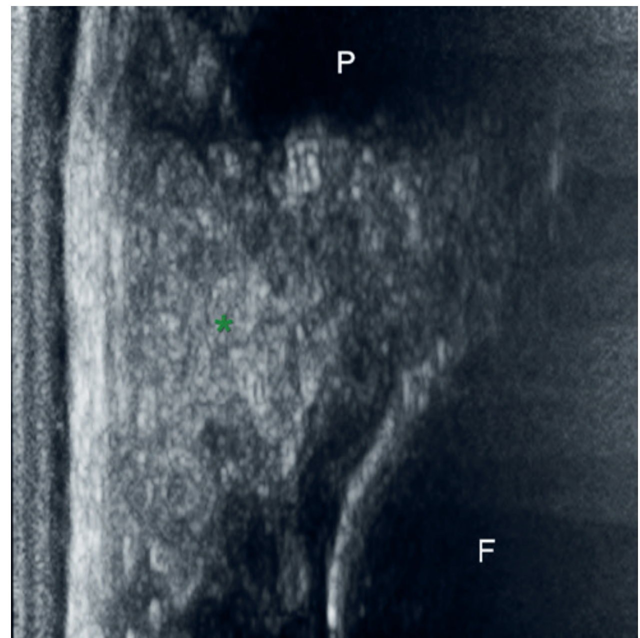

Figure 3. Ultrasonography image of the left stifle showing an echoic mass (asterix). F = femur; T = tibia.

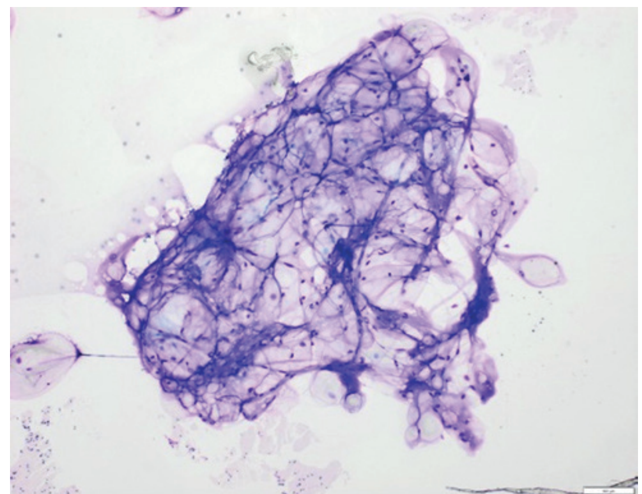

Figure 4. Fine-needle aspirate of the mass showing well-differentiated adipocytes. Objective x10 (May-Grünwald Giemsa). Note that some contaminants are seen on the picture (red blood cells and on the external sides, bacteria or, less likely Malassezia yeast).

DISCUSSION

Based on the imaging findings, the differential diagnosis for the adipose intra-articular mass included intra-articular lipoma/liposarcoma, infiltrative lipoma, Hoffa's disease, lipoma arborescens and pigmented villonodular synovitis.

In humans, the final diagnosis of an intra-articular lipomatous lesion is based on MRI (Dalla Rosa, 2019; Temponi et al., 2017; Tsifountoudis, 2017; Roemer, 2016; Ho Kwon et al., 2014; Larbi et al., 2014). True lipoma is considered to have smooth, well-defined margins, while a nodular 'finger-like' appearance is considered pathognomonic of lipoma arborescens. In human medicine, lipoma arborescens is a rare intra-articular, benign lesion characterized by the replacement of the subsynovial tissue by mature fat cells, giving rise to a villous synovial proliferation of fatty tissue. This lesion can be associated with joint effusion, synovial cyst and bone erosion (Dalla Rosa, 2019; Bankaogla, 2017; Howe et al., 2013; Sheldon et al., 2005; Learch and Braaton, 2000) and has been more often reported in the knee with an unilateral localization (Garnaoui, 2018; Tsifountoudis, 2017; Howe et al., 2013). On US examination, its typical

aspect is a hyperechoic synovium-based mass, similar to the adjacent subcutaneous fat, with multiple finger-like globular and villous fronds extending from the base of the mass. CT findings in case of lipoma arborescens include a synovial mass of fat attenuation (Sanamandra, 2014; Martin et al., 1998). MRI can demonstrate a high signal intensity in T1-weighted and T2-weighted sequences. (Dalla Rosa, 2019; Tsifountoudis, 2017). Even if osteoarthritis was reported in the present case, the mass described had a smooth appearance on both US and CT, making the diagnosis of lipoma arborescens less likely.

Hoffa's disease is described in human medicine as an intrinsic disease of the infrapatellar fat pad, characterized by acute or chronic inflammation (Roemer, 2016; Larbi et al., 2014; Ghate et al., 2012). However, unlike intra-articular lipoma, it is rarely found in the suprapatellar bursa or intercondylar region (Dalla Rosa, 2019). On radiographs, lesions are normally not visible. In more chronic cases however, peri-articular calcification can be detected (Larbi et al., 2014). Because of the location and extension of the mass and because no evidence of inflammation was detected with cytology, Hoffa's disease was considered less likely in the present case.

Pigmented villonodular synovitis is a benign proliferating disorder of the synovial membrane, one of the four subtypes of tenosynovial giant cell tumors (Falster, 2017). It can be locally aggressive, affecting the joints, tendon sheaths and bursa (Ho Kwon et al., 2014; Tyler et al., 2006). Even if rare, it is the most common intra-articular benign tumor-like lesion described in humans. It is generally monoarticular, and the knee is the most involved joint (Temponi et al., 2017; Ho Kwon, 2014). Radiographs are usually unremarkable, but 9% to 25% of the patients show extrinsic erosion of the bones, with well-defined sclerotic margins (Temponi et al., 2017; Ho Kwon et al., 2014). MRI findings include hyperplastic synovium with nodular or diffuse proliferations that have low signals on T2-weighted and T1-weighted images. A large joint effusion may also be present (Dalla Rosa, 2019; Turkucar et al., 2019; Karami et al., 2018; Willimon et al., 2018). In the dog presented in this study, no bone erosion was detected, in contrary, there was a marked peri-articular new-bone production.

In veterinary medicine, in the current WHO classification of mesenchymal skin and soft tissue tumors of domestic animals, only three benign forms of tumors of the adipose tissue are recognized, represented by lipoma, infiltrative lipoma and angiolipoma; and one malignant form, represented by liposarcoma (Spoldi et al., 2016; Hendrick; 1998).

Infiltrative lipomas are locally aggressive with infiltration of the surrounding normal muscle and fibrous tissue, but they do not metastasize. On radiographs, there is consistently an area of fat-related radiolucency, typical of a lipomatous mass (McEntee and Thrall, 2001). On CT, infiltrative lipomas appear irregular in shape as they infiltrate in between the adjacent tissue but remain homogeneous with prevalent fat attenuation (Spoldi et al., 2017). In the dog of the present case, the mass appeared well defined, regular in shape and without evidence of muscle or fibrous tissue infiltration on CT.

Liposarcomas are uncommon malignant fatty tumors in dogs that typically arise from subcutaneous sites and can occur at axial or appendicular locations (Fuerst et al., 2017). On CT, liposarcomas frequently exhibit a mixed fat to soft-tissue attenuation, are heterogeneous and should contrast enhance in dogs. These findings are similar to the findings in human studies (Fuerst et al., 2017; Spoldi et al., 2017; Gaskin et al., 2004). Presence of mineralizations within the mass and regional lymphadenopathy are commonly found with liposarcomas (Spoldi et al., 2017). In humans, liposarcoma appears as a large lesion of low fatty component with thick septae, accompanied by non-lipomatous soft tissue on MRI examination (Dalla Rosa, 2019).

In addition, in human studies, liposarcomas have been classified into subtypes based on cellular morphology. Well-differentiated liposarcomas are predominantly fat attenuating. In veterinary medicine however, liposarcomas are not clearly classified and the different histological appearances do not correlate with differences in biological behavior (Fuerst et al., 2017; Spoldi et al., 2017). In this case report, fat attenuation was prevalent with no evidence of contrast enhancement. The diagnosis of the lipomatous lesion in this case tended to be an intra-articular lipoma, but without a histopathological analysis of the mass, a liposarcoma could not be ruled out.

Intra-articular true lipoma is defined as a solitary round or ovoid mass of fat tissue contained in a thin fibrous capsule and without synovial changes (Bankaogla, 2017; Poorteman, 2015; Hsiu and Wu, 2013). Initially, intra-articular lipoma can be difficult to diagnose, especially when small. On radiography, it appears as an area of well-defined radiolucency (Dalla Rosa, 2019). On CT, lipomas generally appear as well-defined homogenous lesions. Benign lipomas have a homogeneous low attenuation on CT, with measurements between -65 and -120 HU (Bankaogla, 2017). On MRI, it manifests as a high intense signal in T1-weighted and T2-weighted sequences, which is analogous to the signal intensity of the subcutaneous fatty tissue. However, lipoma can also appear with non-specific characteristics on MRI, such as a fluid signal intensity, which is thought to be related to mucoid degeneration (Dalla Rosa, 2019).

In contrast to liposarcoma or infiltrative lipoma, lipomas are round to oval in shape, with well-defined margins and relatively homogeneous fat attenuation. However, the presence of small hyperattenuating components (linear or irregular conglomerates) may be visualized in lipomas (Spoldi et al., 2017). These findings are more consistent with the ones in the pres-

ent case. An intra-articular lipoma is a rare condition in human medicine, with only a few cases reported in the literature. It more frequently affects the knee joint (Dalla Rosa, 2019; Hsiu and Wu, 2013), and it is typically a solitary polyp-like mass, round to oval with a short stalk connecting to the joint capsule (Hsiu and Wu, 2013).

Lipomas, infiltrative lipomas and liposarcomas are well described in the veterinary literature, but rarely in an intra-articular location. To the authors' knowledge, this is the third case described in the literature of an intra-articular adipose mass in the stifle. In the first case described by Orekhova and Schwarz (2021), radiography of the stifle joint revealed soft tissue swelling with effacement of the infrapatellar fat pad. Ultrasonography showed a joint cavity filled with a large amount of anechoic fluid and diffuse hyperechoic, oval-shaped tissue originating from the joint capsule. CT scan was not performed in that case.

The second case showed medial distension of the joint capsule by soft tissue opacity on radiographs (Scavelli and Goh, 2024). No other imaging examination was conducted. The key difference with the current case is the true fat opacity of the mass within the joint, rather than joint distension caused by a soft tissue opacity with infrapatellar fat effacement.

In human medicine, MRI has a fundamental role in detecting these intra-articular lesions. Unfortunately, when the dog was presented at the University Hospital, MRI was not available on-site. However, the main adipose nature of the mass, which was confirmed by cytologic examination, was correctly identified with CT. Sampling of the patellar fat pad was considered unlikely because of the use of US-guidance. The radiographic and CT findings described a few soft tissue septae within the mass, making the distinction between lipoma and liposarcoma difficult. The lack of histological evaluation of the mass represents the major limitation of this study. This would have been of use in better defining the lesion and confirming the benign nature of it.

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Uit het verleden

Nieskruidwortel in het scrotum: een paardenmiddel

Toen de pest in Lyon woedde, paste een monnik een wel zeer drastische paardenremedie op zichzelf toe. Hij doorboorde zijn scrotum en stak een stukje nieskruidwortel in de wonde, zoals men bij paarden placht te doen. Op die manier mocht hij zijn mannelijke attributen als gevrijwaard van de pest beschouwen.

Bronnen

Montanus T. (Thomas vanden Berghe, 1669). Over de pest in Brugge. Vertaald in *Montanus Tijdingen*, 2008.

Over de toepassing van de sterk irriterende nieskruidwortel (*Helleborus*) als 'etterdracht' om ontsteking op te wekken en 'het kwaad uit te drijven' (cf. VDT, 2015, jg. 84, p. 101).