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<p>TITLE OF CASE</p> <p>UNUSUAL PRESENTATION OF BILATERAL STIFLE OSTEOCHONDRITIS DISSECANANS IN TWO LABRADOR RETRIEVERS</p>
<p>SUMMARY</p> <p>There are few published reports of Computed Tomography (CT) findings for the diagnosis of stifle osteochondritis dissecans (OCD) in the dog. This report describes the radiographic and MDCT (multi- detector computed tomography) findings of two cases with bilateral stifle osteochondrosis (OC) and OCD lesions. In both cases, radiographs did not provide a complete picture of the pathology and CT was needed for a definitive diagnosis. In case 1, CT showed bilateral defects on the caudomedial part of the lateral femoral condyles with joint mice within the cranial right stifle joint. In case 2, CT showed large bilateral joint mice within the intercondylar fossa originating from the medial aspect of the lateral femoral condyles as well as a defect on the right medial femoral condyle. MDCT provided an accurate diagnosis in both these cases and facilitated surgical planning.</p>

BACKGROUND

Osteochondrosis (OC) is a disruption of endochondral ossification that involves the articular cartilage and underlying bone (Ytrehus et al. 2007). In osteochondritis dissecans (OCD), cracks and fissures are formed in areas of necrotic cartilage, which can extend towards the articular cartilage creating a cartilage flap or loose body (*joint mouse*) (Ytrehus et al. 2007). The stifle can be a diagnostic challenge because of its complex anatomy (Marino and Loughin 2010). Where radiographs fail to identify an OC or OCD lesion in the stifle, multi-detector computed tomography (MDCT) is a useful imaging modality to evaluate for occult intra-articular or subchondral bone changes (Samii et al. 2011).

The aim of this manuscript was to describe the radiographic and CT findings of two cases with bilateral OC and OCD lesions in an unusual location of the distal femur, with emphasis on the use of MDCT to produce an accurate diagnosis and to facilitate surgical planning in cases where radiographs do not provide a complete picture of the problem.

CASE PRESENTATION

Case 1

Signalment, history and clinical findings

An 8-month-old female entire Labrador retriever dog was referred for evaluation of bilateral hind limb lameness of six weeks duration. Conservative treatment with rest and non-steroidal anti-inflammatories (meloxicam 0.2mg/kg once daily, Boehringer Ingelheim, UK) had improved the lameness initially, however, when exercise was re-introduced, the lameness re-appeared.

Although the problem was bilateral, the owner had noticed that it was more evident in the left hind limb. Orthopaedic examination revealed bilateral stifle effusion and very mild bilateral joint instability. Both hind limbs showed a hyper-extended posture. The rest of the clinical and orthopaedic examination was unremarkable.

Imaging description

Radiographs of the stifles and hips taken by the referring veterinarian revealed bilateral changes of the stifles. There was evidence of moderate to severe bilateral joint effusion, mild bilateral osteoarthritis and presence of bilateral calcified intra-articular bodies located cranially to the femoral condyles. No obvious evidence of flattening or subchondral bone sclerosis of the femoral condyles was noted at this stage (Figure 1). At this point the main differentials included bilateral partial cranial cruciate rupture with bony avulsion or bilateral stifle OCD, given the age and clinical presentation of the dog.

To further characterize the initial findings, and given that radiography and the orthopaedic examination were not sufficiently comprehensive for reaching a definitive diagnosis, a CT examination of both stifles was performed. The patient was anaesthetised and placed in sternal recumbency with the hind limbs in a semi-extended position and the long axis parallel to the scanning table. Images were acquired as a helical run with a 16-slice system (Aquilion 16, Toshiba America Medical Systems, Tustin, CA). Slice thickness was 0.5 mm. Bone [Window level (WL) 1000, Window width (WW) 3500] and soft tissue (WL 35, WW 350) algorithms were acquired and reviewed by a certifying radiologist using a dedicated 3D workstation (Osirix, Pixmeo, Geneva, Switzerland).

The CT revealed marked bilateral hypoattenuating joint effusion (20-30 HU) and mild periarticular osteophytosis. There was a bilaterally irregular surface of the medial aspect of the very caudal part of the lateral femoral condyles outlining a circular hypoattenuating defect within the subchondral bone. The surfaces of both femoral intercondylar fossae were also irregular. At least two, 1mm, bone-density fragments (joint mice) were visible within the cranial aspect of the right stifle joint, cranially to the lateral femoral condyle (Figure 2). There were also several small

(at least 3 x 1mm) fragments cranial to the medial femoral condyle and in the caudal aspect of the joint, caudal to the lateral femoral condyle (at least 3 x 1mm). In the left stifle there were fewer joint mice, with one large fragment (3.2 x 3.6mm) located cranial to the lateral femoral condyle and a further fragment (2.2 x 2.3mm) within the caudal aspect of the joint, caudal to the lateral femoral condyle.

Diagnosis/outcome

Following the CT scan a diagnosis of bilateral OCD of the medial aspect of the most caudal part of the lateral femoral condyle was made. The intra-articular bodies were thought to represent subchondral bone fragments originating from the lesion itself. This was unusual as the fragments migrated a long distance from the site of origin through the intercondylar fossa and were lodged in the area where the cranial cruciate ligaments originate, becoming a potential source of damage to the ligaments themselves.

Surgical treatment was advised for this patient. An arthroscopically assisted abrasion arthroplasty, bilaterally staged, was performed with the aim to aid resurfacing of the defects with fibrous cartilage. The left stifle was operated on first. A large lesion of approximately 3x3x2 mm, which appeared bi-parted in a vertical direction, was visualised in a location consistent with what was seen on the CT images. The lesion was debrided down to viable subchondral bone and the bony fragments flushed out of the joint. A similar procedure was repeated for the right stifle three weeks later.

The patient recovered well and was discharged 48 hours later with analgesia (meloxicam 0.2mg/kg once daily, Boehringer Ingelheim, UK) and joint supplements (glucosamine and chondroitin, VetPlus, UK). Exercise restriction was recommended with cage rest and short toilet

lead walks only for the following 6 weeks. Afterwards, a progressive program of controlled lead exercise with hydrotherapy was encouraged.

The dog recovered well from both procedures, with occasional lameness and some fibrous reaction around the surgical sites detected at the three-week post-operative check. Follow-up radiographs 7 months after the surgery showed moderate bilateral effusion and mild bilateral osteophytosis. The patient was re-evaluated by the referring veterinarian 9 months post-operatively, where no clinical evidence of stifle effusion or lameness was detected. The owner reported that the patient occasionally would become stiff and very slightly lame after long exercise, but that the dog was otherwise well.

Case 2

Signalment, history and clinical findings

A 5-month-old female entire Labrador was referred for evaluation of left hind limb lameness of approximately 3 weeks duration. The dog had initially presented to the referring veterinarian with an acute non-weight bearing lameness on the left hind limb 3 weeks previously. Conservative treatment with rest and non-steroidal anti-inflammatories (Carprofen 2mg/kg twice daily for 5 days, Zoetis, UK) had markedly improved the lameness but the dog remained stiff on rising and the lameness worsened after exercise. On orthopaedic examination at the referral hospital the dog was moderately lame on the left hind limb, stifle palpation elicited a pain response and revealed marked bilateral joint effusion. Crepitus was also palpated in the left stifle.

Imaging

Radiographs of the stifles, taken by the referring veterinarian were reviewed at the time of examination at the referral hospital. They showed moderate bilateral stifle effusion and mild

flattening of the right medial femoral condyle (Figure 3). No radiographic changes suggestive of intra-articular bodies were noted on the radiographs.

As for case 1, to further describe the radiographic findings, a CT scan of both stifles was performed using the same protocol as previously described.

Changes were almost bilaterally symmetrical revealing a moderate amount of hypoattenuating joint effusion (average 25 HU) and several joint mice at the level of the intercondylar fossae [3 x 1.5 mm on the right, and slightly larger ones on the left (4 x 2mm)] originating from the medial aspect of the lateral femoral condyles. Two of the mentioned bodies on each stifle were still attached to the underlying bone. The surface of the medial aspect of both lateral femoral condyles was irregular with the presence of moderate subchondral sclerosis of the underlying bone (Figures 4 and 5). There was a small defect (3mm length) on the articular surface of the right medial femoral condyle with regional subchondral sclerosis (Figure 5).

Diagnosis/outcome

A diagnosis of bilateral stifle OCD involving the medial aspect of the lateral femoral condyles, and OC of the articular surface of right medial femoral condyle was made.

The patient was anaesthetised and a left stifle arthrotomy was performed to remove the bone fragments, carry out abrasion arthroplasty and osteostixis to encourage fibrocartilage repair. The dog recovered well from surgery and was discharged the following day with analgesia (tramadol 2mg/kg twice daily, Bristol Laboratories Ltd, UK and carprofen 2mg/kg twice daily, Zoetis, UK) and antibiotics (cephalexin 15mg/kg twice daily, Virbac, UK). The dog received 4 weeks of cage rest followed by a further 4 weeks of gradually increasing exercise. Long-term, it was advised

that the dog was subjected to steady, moderate exercise as well as maintain a lean bodyweight and receive joint supplements (glucosamine and chondroitin, VetPlus, UK).

Re-check 6 months after presentation at the referral hospital, revealed no lameness with improved muscle mass in both hind limbs and minimal stifle effusion but pain persisted at full extension of the right stifle. At this point an arthrotomy on the right stifle was performed, which revealed a partial cranial cruciate ligament tear and healing of the medial condylar lesion with fibrocartilage. A small fragment was removed from the lateral femoral condyle as well. The dog recovered well after this procedure.

At clinical examination for routine vaccination 3 years post surgery it was noted that the dog had some hind limb muscle atrophy and she was referred for physiotherapy.

DISCUSSION

OCD of the stifle joint is an infrequently reported cause of lameness in young, large breed dogs (Robins 1970, Denny and Gibbs 1980, Alexander et al. 1981, Montgomery et al. 1989, Langley-Hobbs 2001).

The most common localisation of OCD in the stifle is the articular surface (medial aspect) of the lateral femoral condyle (Alexander et al. 1981, Olsson 1987, Montgomery et al. 1989, Langley-Hobbs 2001, Cavanaugh et al. 2007). There are two previous reports of stifle OCD presenting CT features (Cavanaugh et al. 2007, Kulendra et al. 2008). One describes a unilateral OCD-like lesion located on the medial aspect of the medial femoral condyle in a cross-breed dog with a large osseous fragment within the intercondylar fossa (Kulendra et al. 2008). The second publication reports a Boxer with a unilateral OCD lesion on the medial aspect of the lateral femoral condyle at the level of the intercondylar fossa (Cavanaugh et al. 2007). In both cases, the lesion was unilateral. Moreover, the radiographs were highly suggestive of an OCD lesion and the CT appearance was not described in detail.

In our cases, only CT imaging enabled us to diagnose with certainty OCD lesions in an uncommon location, and to plan and tailor adequate surgical treatment for them. The radiographic findings were compatible, but not definitive for the presence of an OCD lesion, and further imaging studies were needed in order to reach the diagnosis. It is possible that taking oblique views might have helped in depicting the actual defect at the level of the femoral condyle. CT to evaluate the intercondylar fossa of canine stifles can be easily obtained and is more reliable when compared with conventional radiographs, which is what we found in our two cases (Fitch et al. 1996, Lewis et al. 2008). This may be because it avoids osseous and/or soft tissue superimposition (Fitch et al. 1996). The use of multiplanar reconstructions (MPR) and volume rendered images (VR) in these cases was very helpful both for diagnostic purposes and to show

the precise location of the lesions to help with the surgical approach. In addition to plain CT scans, CT-arthrography could have been used to look for evidence of intra-articular ligamentous abnormalities; however, arthroscopic evaluation and direct inspection were selected for this purpose in these cases.

The prognosis in OCD cases is variable and depends on several factors, such as the chronicity of the lesion and the degree of degenerative joint disease present at the time of the treatment (Bertrand et al. 1997). Surgical treatment involves removal of the cartilage flap via arthroscopy or arthrotomy and, traditionally, debridement with the aim to stimulate the development of fibrous cartilage (Bertrand et al. 1997, Harari 1998). More recently, the application of an osteochondral autograft as a potential superior method of resurfacing has been introduced to veterinary surgery (Cook et al. 2008, Palierne et al. 2010).

LEARNING POINTS/TAKE HOME MESSAGES

In summary, these two cases show unusual localisations of bilateral stifle OCD. They support the importance of cross-sectional imaging techniques like MDCT for determining the exact location and appearance of an OCD lesion in order to optimise planning for surgery. With modern MDCT scanners, anatomical volumes can be acquired with isotropic resolution along any plane, making the interpretation of normal anatomy and pathology much easier with the use of MPRs and VR reconstructed images (Bertolini and Prokop 2011). In these cases CT was superior to radiography, which underestimated the extent of the stifle OCD lesions.

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FIGURE/VIDEO CAPTIONS

Figure 1

Medio-lateral (**a**) and caudo-cranial (**b**) radiographs of the right stifle and medio-lateral (**c**) and caudo-cranial (**d**) radiographs of the left stifle of case 1 at the time of the initial presentation.

There is evidence of bilateral joint effusion with loss of the normal patellar fat pad and caudal displacement of the fascial planes and mild new bone formation on the distal pole of the patella, in the femoral ridges and fabellae consistent with mild periarticular osteophytosis. There are bilateral mineralised articular bodies (black arrows). Lateral is to the right of the image.

Figure 2

CT reconstructions [transverse (**a**), sagittal (**b**) and dorsal (**c**)] of the right stifle at the level of the lesion in bone algorithm of case 1.

The lateral condyle has an irregular border with sclerosis of the subchondral bone on its caudo-medial aspect in both transverse and dorsal sections (arrows) (**a, c**). A circular defect is evident at the level of the subchondral bone in the sagittal plane (arrow) (**b**). Small calcified bodies are visible cranial to the intercondylar fossa (star) (**a**). Lateral is to the right of the image.

Figure 3

Medio-lateral (**a**) and caudo-cranial (**b**) radiographs of the right stifle.

There is evidence of joint effusion with loss of the normal patellar fat pad and caudal displacement of the fascial planes. There is also flattening of the medial femoral condyle (black circle). Lateral is to the right of the image.

Figure 4

CT reconstructions [transverse (**a**), sagittal (**b**) and 3D volume rendering (**c**)] of the left stifle in bone algorithm of case 2. There is marked subchondral bone sclerosis (black arrowheads) of the lateral femoral condyle, irregular margin of the medial aspect of the lateral femoral condyle and presence of articular joint mice (black arrows). Lateral is to the right of the image.

Figure 5

CT reconstructions [transverse (**a**), dorsal (**b**) and 3D volume rendering (**c**)] of the right stifle in bone algorithm of case 2.

Image **a** and **c** show an irregular margin of the medial aspect of the lateral femoral condyle, sclerosis of the subchondral bone (black arrows) and the presence of joint mice (black arrow head). There is flattening of the articular surface of the medial femoral condyle with sclerosis of the underlying bone (black circle) (**b**). Lateral is to the right of the image.

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