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CASE REPORT

Companion or pet animals

Isolated medial meniscal tear in a domestic shorthaired cat

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Abstract

This case report describes the presentation, diagnostic imaging, management and outcome of a cat with an isolated meniscal tear. A 4-year-old, male, neutered, European shorthair cat was presented with a left hindlimb lameness. The left stifle joint was painful on manipulation, effusion was present and no primary cause such as cruciate ligament disease, stifle disruption or patellar luxation could be detected. The suspicion of a knee sprain was raised, and conservative therapy was performed without improvement of the lameness during the following weeks. Therefore, magnetic resonance imaging was recommended, which revealed a medial meniscal injury with no primary cause present. Therapy consisted of partial meniscectomy via arthrotomy. The lameness improved postoperatively, and in long-term follow-up a mildly progressive osteoarthritis developed.

BACKGROUND

Pathologies of the stifle joint are a common cause for lameness in cats. Underlying diseases include cranial cruciate ligament rupture, stifle disruption and patellar luxation.[1] In rare cases, osteochondrosis dissecans (OCD) can be found.[2] Cruciate ligament disease is a well-known condition in feline stifles. Given that a history of trauma is not always reported, the exact aetiology of cranial cruciate ligament insufficiency remains unclear in a proportion of patients. Recent studies suggest that the pathophysiology of cranial cruciate ligament insufficiency in cats could be similar to that of cranial cruciate ligament disease in dogs.[3] Cruciate ligament disease in cats primarily affects the cranial cruciate ligament, as is common in dogs.[4] Affected cats show marked lameness, pain, joint effusion and a positive cranial drawer test.[1] Secondary meniscal tears often occur, with a reported incidence of up to 67%. Studies report an incidence up to 67%,[5] and in some patients an audible click is noticed during examination.[6] Although the medial meniscus is damaged more often than the lateral meniscus, lesions of both or isolated lesions of the lateral meniscus have also been reported to occur.[5] Traumatic injuries can lead to stifle disruption, which can include severe stifle instability and disruption of the tibiofemoral joint.[1] In most cases, rupture of both cruciate ligaments, the medial collateral ligament, as well as meniscal damage are present.[7] OCD is rarely reported in conjunction with meniscal damage in cats.[2] Meniscal tears in cats have been reported to occur concurrently to the above-described pathologies, and also alongside patellar luxation.[8] To the authors' knowledge, an isolated meniscal tear has not yet been reported in cats. The condition has been rarely reported in dogs.[8,9]

The menisci are two semilunar fibrocartilaginous structures between the articular surfaces of femur and tibia.[10,11] They contribute to joint congruence, are part of load transmission and impact absorption processes, reduce biomechanical stress and contribute towards stifle stability.[9,12,13] Menisci are also important for lubrication of the stifle joint and prevention of synovial impingement.[10,11]

Meniscal tears can be suspected in clinical examination, but further investigations are necessary for a definitive diagnosis. Meniscal integrity can be investigated via non-invasive diagnostic modalities such as magnetic resonance imaging (MRI), or surgically via arthrotomy or arthroscopy.[14] Classification of meniscal lesions addresses the appearance, location, shape and extent.[15] The literature describes vertical longitudinal tears between tibial and femoral surface, including displaced bucket handle tears, oblique or flap tears, radial tears, horizontal or horizontal cleavage tears, complex and degenerative tears.[16] For therapy of meniscal injuries, the location and kind of the tear is essential.[15] Reported treatment options for meniscal disease in dogs include partial or total meniscectomy, surgical repair or conservative treatment with or without injection of platelet-rich plasma (PRP).[9,13] However, meniscal repair is not reported in cats.

To the best of our knowledge, isolated meniscal injuries have not previously been reported in cats. The authors aim with this report to describe for the first time the presentation, diagnostic imaging findings, management and outcome for a cat with an isolated meniscal tear.

CASE PRESENTATION

A 4-year-old, male, neutered, European shorthair cat, weighting 5.5 kg, was presented at the Ludwig-Maximilians-University for left hindlimb lameness. The patient had been previously healthy. A trauma was not observed, and the patient was an indoor cat. The owners had already began administering a non-steroidal anti-inflammatory (NSAID) at the time of presentation, and reported that the lameness would resolve with an NSAID but recur as soon as these were stopped.

INVESTIGATIONS

The general examination was unremarkable. The cat was excited and showed no lameness during the initial examination, but the owner reported ongoing lameness at home. The orthopaedic examination revealed a painful left stifle with joint effusion. Cranial drawer and tibial compression tests were suspected to be subjectively mildly positive on manipulation of the left stifle. In retrospect, the laxity detected was considered normal for a feline stifle. No evidence of mediolateral instability was found to suggest the presence of concurrent collateral ligament damage. No abnormalities of patellar tracking were found. Finally, medial buttress was not present. Besides, no abnormalities were found during orthopaedic examination. Bloodwork revealed no abnormalities. Diagnostic imaging including orthogonal radiographs of both stifle joints showed the presence of increased soft tissue opacity at the level of the left stifle joint (Figure 1). The suspicion of a stifle sprain was raised, and conservative therapy, consisting of activity restriction and the use of non-steroidal pain killers, was performed. The lameness did not improve with conservative therapy, and the cat re-presented 8 weeks later for a follow-up examination and further diagnostic imaging.

The findings of the orthopaedic examination were equivalent to the initial presentation, but additionally a presumed meniscal click was present. Follow-up radiographs revealed incipient osteoarthritic changes.

Additional diagnostics included examination of the stifle under anaesthesia and an MRI scan. The stifle joint was stable during examination, but effusion was present and a click noise audible. A 1.5 T MRI (Magnetom Symphony, Siemens Medizintechnik/Healthineers) and a knee coil were used to perform the examination. The scan included one transverse T1-weighted sequence, sagittal and dorsal proton density (fat suppression) sequences and a transverse T2-weighted constructive interference steady-state sequence. MRI findings demonstrated a slight stifle joint effusion. The cruciate ligaments could not be evaluated in detail because of the small body size of the patient, and therefore there was limited picture quality. As far as the cruciate ligaments could be visualised, they seemed inconspicuous. The caudal horn of the medial meniscus presented with a lateral contour loss and a diffuse hyperintense signal (Figure 2). The lateral meniscus appeared unremarkable. All bony structures were unremarkable. Due to the MRI findings, the suspicion of an isolated injury of the caudal horn of the medial meniscus was raised.

LEARNING POINTS/TAKE-HOME MESSAGES

- Meniscal injuries may be diagnosed by magnetic resonance imaging, arthroscopy or exploratory arthrotomy.
- Meniscal disease mainly occurs secondary to cranial cruciate ligament rupture or stifle disruption, but on rare occasion isolated meniscal tears can occur.
- Treatment for meniscal tears most commonly involved surgical removal of the affected portion of the meniscus. Meniscal disease will lead to degenerative long-term joint disease.

DIFFERENTIAL DIAGNOSIS

The case reported presented with a hindlimb lameness, and a painful stifle joint with joint effusion. Cranial drawer test was negative for instability on examination under sedation. A meniscal click was not present initially, but one was palpable at the time of the second examination. Possible underlying diseases include cranial cruciate ligament rupture, stifle disruption, patellar luxation and in rare cases OCD.

In this case, based on the MRI findings, the primary differential diagnosis was an isolated medial meniscal injury, followed by cranial cruciate ligament disease.

TREATMENT

The patient underwent general inhalation anaesthesia with dexmedetomidine (2 μg/kg), ketamine (2 mg/kg), methadone (0.2 mg/kg) and isoflurane for surgery. The affected pelvic limb was aseptically prepared. A lateral parapatellar arthrotomy was performed. Inspection of the femoro-tibio-patellar joint revealed intact cranial and caudal cruciate ligaments and an intact lateral meniscus. The medial meniscus showed a transverse tear, and the caudal horn was detached. Resection of the defective portion of the medial meniscus was completed. The joint was irrigated with saline. The incision was routinely closed.

OUTCOME AND FOLLOW-UP

The patient was discharged with the postoperative prescription of cefazolin (25 mg/kg twice daily for 5 days) and meloxicam (0.1 mg/kg for 7–10 days) orally. The owner was instructed to restrict the cat's activity through cage rest for 4 weeks. On a follow-up conducted by phone interview 4 months postoperatively, the owner reported that the cat still showed mild lameness. Physiotherapy was recommended accordingly.

The follow-up examination 1 year postoperatively revealed a lameness (grade 1/4) of the left hindlimb, mild muscle atrophy of the affected limb, a full range of motion and stable stifle joint. The left stifle joint effusion was slightly increased. The owner reported the cat showed no clear sign of chronic pain. The radiographs were repeated, and a mild progression

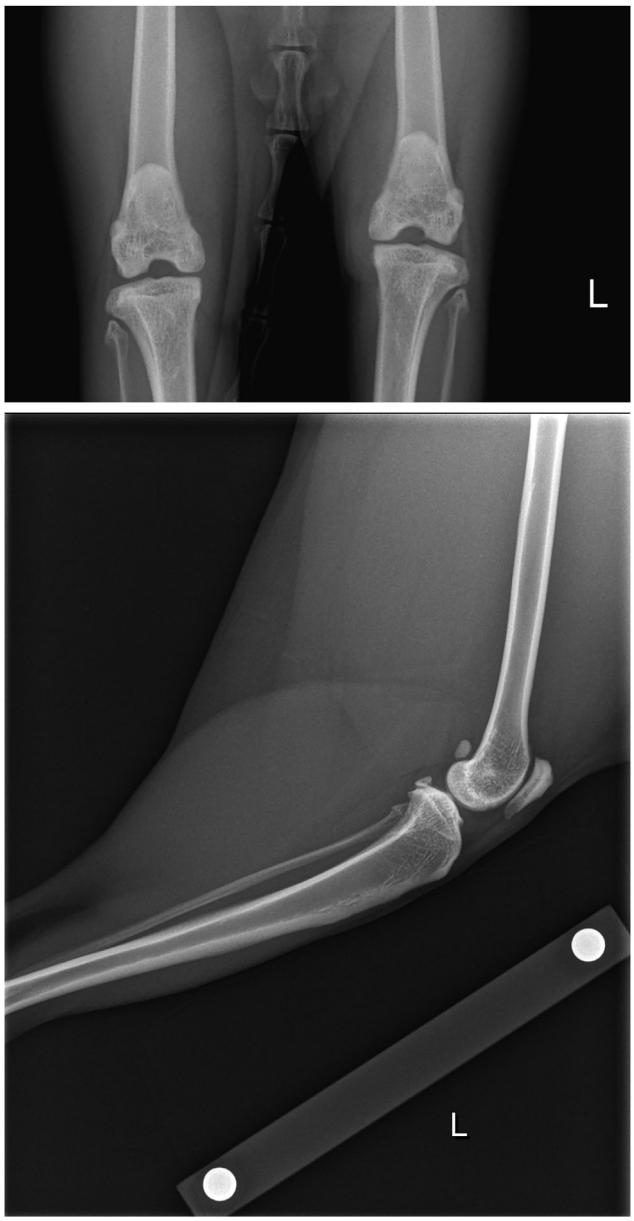

FIGURE 1 Orthogonal radiographs of the left stifle joint: note the enlarged joint capsule shadow.

of degenerative osteoarthritic signs was present. To further evaluate the existence of chronic pain conditions, the owner was asked to answer a pain score questionnaire consisting of 15 Likert-style questions. The questionnaire used was based on an existing publication in feline orthopaedics.[17] Answers were given numeric values from 1 to 5. A score of 62/75 points was achieved. The results demonstrate that the cat showed mildly reduced playing and mildly reduced jumping activity.

DISCUSSION

The presented case shows that isolated meniscal disease should also be considered as primary stifle joint disease in cats in rare occasions.

The existing literature reflects that primary meniscal disease is a rare disease in dogs.[11,18] To the authors' knowledge, this is the first report of an isolated medial meniscal injury in a cat.

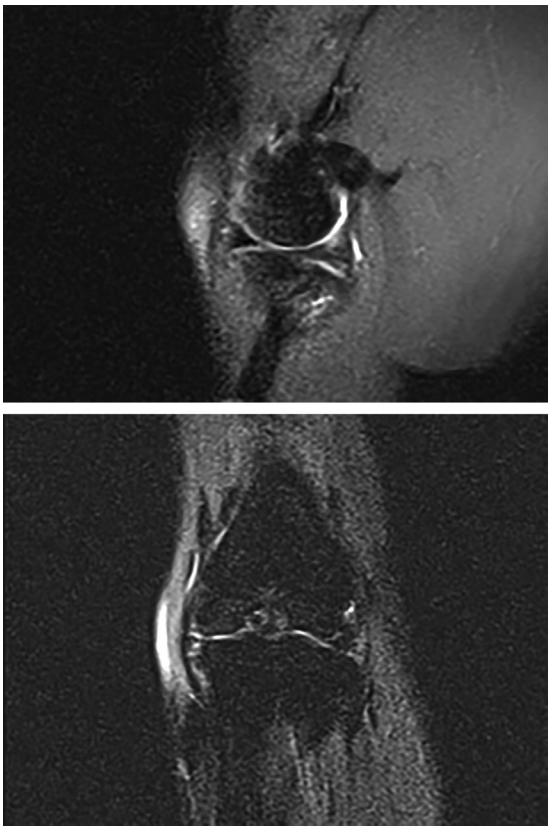

FIGURE 2 Magnetic resonance imaging of the left stifle joint: note a lateral contour loss and a diffuse hyperintense signal of the caudal horn of the medial meniscus.

Meniscal damage can occur when the stifle joint is moved in a combined flexion-rotation or extension-rotation during weight bearing. If an excessive degree of force is applied during extension of the stifle joint, this can result in a degree of injury of the cranial portion of the medial meniscus. Similarly, if a degree of excessive force is applied during stifle flexion, damage to the caudal pole of the medial meniscus can occur. Abnormal internal rotation of the joint during weight bearing usually results in tearing of the medial meniscus.[19] An unwitnessed trauma is considered the most likely aetiology in this case, given the pathophysiology of isolated meniscal tears in people and in dogs. Diagnosis of meniscal disease is done by orthopaedic examination, diagnostic imaging and direct visualisation of the menisci via arthroscopy or arthrotomy.

The examination of affected stifle joints may demonstrate a meniscal click that is known to be a specific, but not sensitive, sign of a damaged meniscus, moving between the femoral condyle and tibia.[13,20] The presence of an audible click is more often found with bucket-handle tears than with other tear morphologies.[21] The examination of the presented patient revealed pain, joint effusion and a positive meniscal click, which lead to suspicion of stifle joint and meniscal disease. As a result, further investigations were considered to be indicated.

Among diagnostic imaging modalities, MRI is the most sensitive for detection of meniscal disease.[20] In dogs, there are contradictory studies regarding the sensitivity of MRI for detection of meniscal tears. One older study states a high sensitivity/specificity for detection of meniscal damage of 93%/88% for the medial and 79%/95% for the lateral meniscus.[20] A study by Böttcher et al. revealed that low-field MRI was of low diagnostic value for detection of meniscal

disease compared to arthroscopy.[22] A recent report shows that MRI can be used for detection of cruciate ligament rupture in cats. The quality of feline stifle MRI scans can be improved using a small suitable coil and increasing the number of averages. A scan of both stifle joints at the same time may be used for a comparative examination.[14]

Arthroscopy is reportedly the most sensitive and specific diagnostic method for detection of meniscal pathology in dogs.[23] Although stifle arthroscopy has been described in the cat,[2] the technique was also found to lead to more iatrogenic articular cartilage damage in a cadaveric study when compared to arthrotomy, as a means of exploration of the stifle joint in dogs.[24] An exploratory arthrotomy is considered to be an equally valid approach, especially when accompanied by meniscal probing, with potentially less inherent iatrogenic articular cartilage damage. In the case presented here, MRI was successful in diagnosing an isolated meniscal injury, and therefore may serve as an alternative to surgical exploration of the stifle joint. Further studies are required to compare MRI and surgical exploration of the stifle as diagnostic tools in cats before firm recommendations can be made about MRI's suitability as an imaging modality in these cases.

For treatment of meniscal tears, location, kind of lesion and species are considered. Possible ways of treatment in dogs are partial or total meniscectomy, surgical repair or conservative treatment with or without injection of PRP.[9,13] Surgical repair of a meniscal lesion in a cat, with the instrumentation currently available, would be prohibitive due to patient and meniscal size. As a result, the authors opted for a partial medial meniscectomy as a form of treatment for the medial meniscal tear encountered.

The prognosis for dogs with meniscal injuries has been reported to be guarded,[25] and performance of a meniscectomy has been documented to lead to progression of stifle osteoarthritis in affected patients.[26,27] Further studies are required to evaluate the prognosis in cats.

The data collected may suggest that similarly to what has been observed in people and dogs, meniscal damage treated with subsequent partial meniscectomy may not allow for restoration of full function postoperatively. Larger case series would be needed to investigate this preliminary assumption further. The presented case revealed markedly reduced playing and mildly reduced jumping behaviour, but the overall score of 83% would suggest that the cat maintained an acceptable quality of life with subtle restrictions. As the questionnaire used is not validated, a more precise evaluation and pain scoring could eventually have been achieved by using a validated one.

In summary, an isolated meniscal injury should be considered a differential diagnosis in feline stifle joint disease. MRI may represent a useful diagnostic tool, but further investigations are needed to identify the most efficient technique.

AUTHOR CONTRIBUTIONS

The first author planned and conducted this study under supervision of the senior, who also reviewed the manuscript before submission.

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CONFLICT OF INTEREST STATEMENT

The authors declare they have no conflicts of interest.

ETHICS STATEMENT

There is no ethical issue associated with this manuscript, because the presented data were obtained during routine treatment in the cat. The cat was not involved in any kind of animal experiment. According to competent authorities, this kind of research does not require ethics approval or general approval with respect to German law.

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MULTIPLE-CHOICE QUESTION

What is the most sensitive diagnostic imaging modality to diagnose meniscal disease in cats?

POSSIBLE ANSWERS TO MULTIPLE-CHOICE QUESTION

a) radiographically visible mineralisation between femur and tibia
b) ultrasound examination
c) MRI scan
d) CT scan

CORRECT ANSWER

c) MRI scan.

An MRI scan is the most sensitive diagnostic imaging technique to detect meniscal tears in cats. Improved quality may be achieved by using a high-field MRI and a suitable small coil.