The use of a stifle flexion device to manage avulsion of the lateral head of the gastrocnemius muscle in a cat

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Summary
This report describes the diagnosis and treatment of a traumatic avulsion of the lateral head of the gastrocnemius muscle in a three-and-a-half-year-old male neutered Domestic Shorthaired cat. Surgical repair was achieved using a modified three-loop pulley suture pattern passed through a suture anchor inserted at the point of origin of the tendon and around the fabella. A stifle flexion device was utilised during the postoperative period to protect the repair. Follow-up at five months showed a return to normal function. This is the first report of avulsion of the lateral head of the gastrocnemius in a cat.

Introduction
The Achilles’ mechanism includes the gastrocnemius muscle and tendons, the superficial digital flexor muscle and tendon, and the conjoined tendon of the biceps femoris, semitendinosus and gracilis muscles. Clinical presentation of its disruption is usually that of a weight-bearing lameness with varying degrees of hyperflexion or collapse of the hock (1–3).

In cats and dogs, injuries of the common calcaneal tendon are more common than injuries to the tendons of origin (4, 6). There are few reports describing the management of gastrocnemius tendon of origin injuries in dogs (7–16). To the authors’ knowledge this injury has not been reported in the cat.

The aim of this report is to describe the clinical features, surgical treatment and outcome of avulsion of the lateral head of the gastrocnemius muscle in a cat.

Case report
A three-and-a-half-year-old, male neutered Domestic Shorthaired cat was presented with a seven-day history of left pelvic limb lameness. The lameness had been acute in onset whilst the cat was roaming outside of the home.

On examination the cat showed a left-sided plantigrade stance with moderate external rotation of the distal limb. The toes were in an extended position. There was full range-of-motion of the hock and the stifle, with signs of mild discomfort on palpation of the caudolateral aspect of the stifle. Although the hock could be fully flexed with the stifle maintained in extension, the common calcaneal tendon was intact. There was no flexion of the digits during this manoeuvre.

Mediolateral (Fig. 1) and caudocranial (Fig. 2) radiographic views of the left stifle and tibia showed distal displacement of the lateral fabella.

Surgery
The cat was premedicated with acepromazine (0.02 mg/kg, IM) and methadone (0.2 mg/kg, IM). Induction of anaesthesia was achieved with propofol (given intravenously to effect, approximately 6 mg/kg) and maintained with sevofluorane (2.5–3.5%) in oxygen. As well as the methadone, pre-emptive analgesia included intravenous meloxicam (0.1 mg/kg) and an epidural injection of preservative-free morphine (0.2 mg/kg). Intravenous cefuroxime (20 mg/kg) was administered 30 minutes before skin incision and after 90 minutes. Avulsion of the tendon of the lateral head of the gastrocnemius muscle was confirmed via a standard caudalateral approach to the stifle (17). A 4 mm suture anchor, 6 mm long, was inserted at the point of origin of the tendon. A modified three-loop pulley suture pattern utilising 3.5...
was continued intravenously every six hours for the first 24 hours after surgery. The cat was discharged the day after the surgical procedure and was cage-rested for six weeks. Medication with meloxicam (0.05 mg/kg orally, once daily) was continued for seven days.

On examination three weeks postoperatively, the flexion device was intact. It was being well tolerated by the cat and there was no discharge from the incisions. The stability of the repair, tested under sedation, was maintained. The middle nylon loop was replaced with a longer one, achieving a maximum extension of the stifle of about 70 degrees in order to allow a wider range-of-motion of the stifle and increased tension on the Achilles’ mechanism.

On examination six weeks postoperatively, there was no lameness or collapse of the hock on the affected limb. The flexion device was preventing full stifle extension but was allowing a normal gait. There were no loop-related complications. Examination under sedation revealed that the tension on the left gastrocnemius was similar to that on the right, with an angle of extension of both hocks of 120 degrees with the stifles fully extended. Radiographs showed an unchanged position of the lateral fabella in comparison with the immediate postoperative radiographs (Fig. 5). The flexion device was removed and the cat was discharged with instructions for cage rest with periods of supervised exercise for three weeks followed by three weeks of restriction to the house.

At 12 weeks postoperatively, the owner reported the cat to be comfortable and to be walking without lameness or collapse of the hock. The cat was able to jump up onto furniture without hesitation, and it was allowed full activity outdoors.

On examination five months after surgery, the cat did not demonstrate any signs of lameness. Range-of-motion of the left stifle and hock were normal. There was mild thickening of the lateral tendon of origin of the gastrocnemius muscle and no signs of pain could be elicited on palpation.

Discussion

The gastrocnemius muscle is divided into a lateral and medial head. Each tendon of origin has a sesamoid bone, the lateral and the medial fabellae. In contrast to the dog, in a high percentage of cats the medial fabella is not mineralized and is therefore not always recognizable radiographically (19). The lateral and medial heads of the gastroc-
nemius muscle arise on the lateral and medial supracondylar tuberosities of the femur respectively. The two heads of the gastrocnemius muscle fuse with each other to form a broad tendon that tapers distally and inserts on the tuber calcanei (20–22). Being a biarticular muscle it spans both the stifle and the hock joints, and thus has a complex function. Its actions are extension of the tarsal joint and, to a lesser extent, flexion of the stifle. Because of the anatomical constraints associated with the points of origin and insertion, concurrent extension of the stifle joint and flexion of the tarsocural joint is not possible without rupture of the gastrocnemius muscle-tendon unit.

Variation in the position of the fabellae in the dog has been reported. West Highland White Terriers appear to have a high prevalence of an abnormal mediiodistal location of the medial fabella, although it is considered an incidental finding and not related to a pathological displacement (23).

Traumatic displacement of the fabellae is rare in dogs and only a few cases have been reported (7–16). Surgical repair of the avulsed tendon has been performed in most cases. Most commonly the fabella was retained using orthopaedic wire passed through a bone tunnel prepared in the femoral supracondylar tuberosity and around the fabella, with the repair being protected postoperatively by maintaining the hock in extension via external coaptation (7, 9, 12, 14, 15). In two of these cases the orthopaedic wire failed (12, 14). Other methods for retaining the displaced fabella that have been used in dogs include a screw and spiked washer and a bone anchor (11, 13). Other strategies to maintain the hock in an extended position and thus protect the repair have included transarticular external skeletal fixation and a calcaneo-tibial screw and external coaptation (8, 14).

In the case we report here, the avulsed head of the gastrocnemius muscle was reattached close to the anatomical origin using a bone anchor (24). Polydioxanone was chosen as a suture material due to its reliability in tendon repair (6). A modified three-loop pulley suture was used for surgical repair since this tendon suture has been shown to be superior to a locking loop suture in preventing gap formation during tensile loading of reattached canine gastrocnemius tendons (18).

Immobilisation of the hock will not completely immobilize the gastrocnemius muscle because it also crosses the stifle and is active during much of the stance phase (26). A recent study in dogs did not find a significant difference in maximum gastrocnemius tendon strain with fixator-immobilized and non-immobilized tarsal joints (27). Although optimum tendon healing requires some degree of strain along the length of the tendon to stimulate maturation of the scar and longitudinal orientation of the collagen fibres, the authors stated that immobilization of the hock had no effect on maximum strain in a weight-bearing situation (27). However, in that study the hocks were fixed at a weight-bearing angle rather than in full extension, which would have protected the tendons further.

Immobilisation of a joint leads to degeneration and thinning of the articular cartilage, changes that become obvious as early as one week after immobilization in a rat model (28). These changes are initially mostly due to loss of water content from the cartilage rather than damage to the extracellular matrix. They may be due to a lack of mechanical stress or a lack of joint fluid production or circulation during immobilization and are generally considered reversible for up to around six weeks of immobilization, although the cartilage remains susceptible to trauma for some time after remobilization.

In the cat described in this report, the tendon repair was protected with a flexion
device. The use of such a device has been reported once before in a young dog with a quadriceps contracture (29). For the cat reported here, the device allowed full range-of-motion of the hock with a controlled extension of the stifle. Initially the maximum extension of the stifle was set to about 55 degrees which allowed full flexion of the hock only during full flexion of the stifle. The device permitted weight-bearing and joint motion soon after surgery thus avoiding the potential problems associated with joint. Furthermore, the device was readily adjustable such that the tension across the repair could be increased during the healing period. The device was tolerated exceptionally well during the postoperative period. Although other methods to protect gastrocnemius tendon of origin repairs have been successfully used in dogs, we considered the flexion device used in this case to be preferable to external coaptation, with no need for repeated bandage changes and without the risk of bandage-related injuries (30, 31). Compared to tibio-tarsal transarticular external fixation, the flexion device avoids the need for specific orthopaedic expertise or instrumentation other than a drill and the flexion device was applied much quicker than a fixator frame and physiotherapy. J Small Anim Pract 2009; 50: 236–240.

Conflict of interest
None declared.

References


