INTRODUCTION

The superficial digital flexor muscle originates from the lateral supracondylar tuberosity of the femur and is covered proximally by the gastrocnemius muscle.1 Its tendinous distal insertion, the superficial digital flexor tendon (SDFT), runs together with the gastrocnemius tendon, winding round it to become medial and caudal to this tendon.1 Distally, the SDFT broadens on the tuber calcanei, forming an extensive “calcaneal cap” kept in place by a medial and a lateral retinaculum.1 The tendon then divides into four parts which run on the plantar surface of the metatarsophalangeal joint to insert on the middle phalanges of digits II, III, IV and V.1,2 At the calcaneal tuberosity, the SDFT is separated from the gastrocnemius tendon and the calcaneus by a synovial bursa,3 or bursa tendinis calcanei,1 which extends proximally and distally to the tuberosity.2 Laxation of the SDFT is reported to be an orthopaedic condition that occurs infrequently in dogs.2

According to the literature, the incidence of luxation of the SDFT is higher in Shetland sheepdogs and in Collies.4 Indeed, a study carried out in 2002 by S. Solanti et al. indicated that in Shetland sheepdogs luxation of the SDFT is transmitted as an autosomal recessive condition. No sex- or age-related predisposition has been described.

The aetiology is unknown, but some predisposing factors have been recognised: obesity, repeated microtrauma, excessive physical activity, torsional forces and skeletal malformations,6 such as hypoplasia of the medial or lateral process of the tuber calcanei.2 The clinical findings almost always include inflammation of the bursa tendinis calcanei, secondary to damage to the lateral or medial insertion of the tendon.4,8,7,9 Lateral luxation of the SDFT is more frequent, presumably because the lateral insertion of the tendon into the calcaneus is stronger and more pronounced than the laxer, medial insertion.2,6,8,9

Luxation of the superficial digital flexor tendon (SDFT) is an infrequent orthopaedic condition in dogs. A case of SDFT luxation is herein reported in a 2-year old bitch, crossbred with a Shetland sheepdog.

The dog was referred for severe, left hind limb lameness. Physical examination revealed a painful swelling located at the calcaneal tuber, related to ectasia of the bursa tendinis calcanei. Lateral SDFT luxation was observed on flexion of the hock. No other orthopaedic pathologies were identified either in the affected limb or in the contralateral limb.

The SDFT luxation was treated surgically by securing the tendon with a non-absorbable suture using simple interrupted stitches. The limb was then immobilised in plaster for 3 weeks and, after removal, the tendon was found to be stable with no signs of bursitis. Upon examination 6 weeks after surgery, no lameness was detected and no signs of relapse were noted.

Keywords - Luxation, superficial digital flexor tendon, bursa tendinis calcanei, dog.
In 2010, M. Gatineau reported that intermittent luxation or subluxation of the SDFT could lead to longitudinal tears in the tendon, which could severely compromise the mechanical function of the tendon.

**CASE REPORT**

Lea, a 2-year old, spayed bitch, a crossbred Shetland sheepdog weighing 40 kg, was brought for examination because of intermittent lameness of the left hind limb which had started 3 weeks earlier, following a run in the park. The patient was initially treated with an anti-inflammatory drug, Meloxicam (Loxicom®, Vetoquinol) (0.1 mg/kg) for 7 days, which reduced the severity of the lameness, without achieving complete remission of the symptoms. The dog was therefore referred to a specialist for assessment.

The orthopaedic examination revealed a grade 2 lameness (on a scale from 0 to 4) of the left hind limb. On inspection an evident swelling was present at the calcaneal tuberosity of the hock, which, on deep digital palpation, was tender and of soft elastic consistency. With flexion of the hock the SDFT luxated laterally; with extension of the joint it returned to its correct position (Fig. 1). No other orthopaedic abnormalities were found either in the affected limb or in the contralateral one.

Planto-dorsal and medio-lateral X-rays of the hock were taken. These showed hypoplasia of the lateral process of the calcaneal tuberosity in the symptomatic limb as well as in the contralateral one (Fig. 2).

With the agreement of the owner, surgical stabilisation of the SDFT was performed. The patient was pre-medicated with Medetomidine (Sedastart®, Esteve) (10 µg/kg) and Methadone hydrochloride (Semfortan®, Dechra) (0.5 mg/Kg); anaes-

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Luxation of the SDFT is an uncommon orthopaedic condition in dogs, although its incidence is higher among Shetland sheepdogs. The luxation is more frequently lateral and a calcaneal bursitis is almost always present.

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Figure 1 - On the left, the SDFT (black arrow) can be seen in its site along the anatomical axis of the pelvic limb (red arrow), during extension of the hock. On the right it can be seen that the SDFT luxates laterally during flexion of the hock.

Figure 2 - The red arrow points to the lateral process of the calcaneal tuberosity, which is hypoplastic compared to the medial process.
Theesia was induced with Propofol (Proposure®, Meri-
al) (1 mg/kg) and maintained with inhalation of isoflu-
rane gas. An antibiotic was administered pre-operatively
(Cefazoline®, Teva) (22 mg/kg) and the left hind limb
was prepared for surgery and positioned in extension
on the operating table with the dog in sternal recum-
bency. The skin was incised caudally and medially to the
calcaneus, starting just proximal to the calcaneal
tuberosity and continuing distally along the medial mar-
gin of the calcaneus (Fig. 3). The subtenodinous synovial
bursa was considerably distended and the medial reti-
naculum was torn. It was confirmed that the SDFT lux-
ated during flexion of the tarsus and returned to its place
during extension (Fig. 3).

The bursa tendinis calcanei was incised and a large
amount of synovial fluid emerged. The medial part of
the synovial bursa and of the medial retinaculum in ex-
cess was then removed. The free margin of the medi-
al retinaculum was juxtaposed and sutured to the me-
dial margin of the SDFT with non-absorbable size 0
polyamide monofilament (Seralon®, Serag Wiessner), us-
ing simple, interrupted stitches. The skin was closed in
layers with a simple uninterrupted suture with 2-0 ab-
sorbable monofilament (Serasynth®, Serag Wiessner) (Fig.
4). A plaster cast was then applied for 3 weeks and
Carprofen (Dolagis®, Ati) (4 mg/kg) and amoxicillin +
clavulanic acid (Synulox®, Pfizer) (12.5 mg/kg) were pre-
scribed for 7 days. At the follow-up examination, 4 weeks
after the intervention, the tendon appeared stable dur-
ing flexion-extension movements of the hock and the
swelling at the site of the retrocalcaneal bursa had dis-
appeared. However, a mild, grade 1 limp, was still pres-
cent, which was managed successfully with a second cy-
cle of anti-inflammatory therapy.

Three months after surgery, the dog was no longer lame
and the tendon was perfectly in place.

DISCUSSION

Luxation of the SDFT is described as an uncommon clin-
ical finding in the dog. The differential diagnoses include
all the causes of lameness of the hind limb, with par-
ticular attention to orthopaedic conditions of the tar-
sus such as laceration of the calcaneal tendon, fractures
of the calcaneus and neoplasms, which careful clinical
examination and radiography can easily exclude.

The literature consulted describes a higher incidence of
SDFT in Shetland sheepdogs. The patient examined
was a cross with a Shetland sheepdog, thus concordant
with the descriptions in the literature of hereditary fac-
tors in this breed.

Obesity is reported as another predisposing factor for
SDFT. The patient was indeed overweight; this could
have overloaded the hind limbs and subjected the su-
perficial flexor tendons to high stress, facilitating in-
fammation of the calcaneal bursa and of the medial reti-
naculum.

Since the medial retinaculum is less developed than the
lateral one, its fibres can be weakened and overextend-
ed, with a resulting inability to perform its function of
The SDFT luxates during flexion of the hock and returns to its place spontaneously during extension. It is important to highlight that this flexion-extension manoeuvre of the hock must be performed with the knee extended; in fact, as well known, the knee is a “bracing keystone” of the pelvic limb. With the knee in extension, the tension necessary for the tendon to luxate can be reached.

In agreement with the literature, medical treatment was ineffective in that it alleviated the pain and improved the degree of lameness, but it did not lead to a complete disappearance of either symptoms or the luxation. The SDFT was therefore stabilised surgically using simple interrupted stitches made of non-absorbable material.

Although hypoplasia of the lateral process of the calcaneal tuberosity was present, the surgical correction of the bone surface was not performed. This choice was made on the basis of the lack of data in the literature regarding the efficacy of an osseous intervention and, in contrast, in view of the known efficacy of fixing the tendon only with a suture.

We believe that ultrasonography would be useful to identify the presence of micro-lacerations in the SDFT, which could be present in patients without being clinically apparent.

**CONCLUSIONS**

Although luxation of the SDFT is an uncommon orthopaedic disorder it should be included among the differential diagnoses of tarsal lameness in the dog. One important clinical finding in the diagnostic workup is the eventual presence of calcaneal bursitis. The tendon luxation test is to be performed with the knee extended since extension and flexion of the whole limb do not create the necessary tension to make the tendon dislocate and the diagnosis could, therefore, be missed. The efficacy of surgical treatment and the inefficacy of solely medical treatment were confirmed. Surgical fixation using non-absorbable sutures, followed by immobilisation with a cast, is an effective therapeutic approach.

In the future it would be interesting to study lesions of the SDFT in more depth by means of ultrasonography, particularly for microlesions that cannot be identified with other diagnostic investigations.
KEY POINTS

- Breed predisposition in Shetland sheepdogs and their cross-breed.
- Inflammation of the bursa tendinis calcanei almost always present.
- Lateral luxation of the SDFT is more frequent.
- Confirmed effectiveness of surgical treatment.

REFERENCES