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Ruptures of the common calcaneal tendon

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The common calcaneal tendon (CCT) is the convergence of 3 distinct musculotendinous units at the calcaneus: the gastrocnemius tendon (GT), the superficial digital flexor tendon (SDFT), and the common tendons of the biceps femoris, gracilis, and semitendinosus muscles (1–3). The major component of the CCT is the GT of insertion. The gastrocnemius muscle originates as both lateral and medial heads on the caudal aspect of the lateral and medial femoral condyles, then spans the stifle joint before inserting on the calcaneus and acting as the major extensor of the hock (1–4). The common tendons of the gracilis, biceps femoris, and semitendinosus muscles have relatively minor insertions on the calcaneus. The superficial digital flexor muscle originates with the lateral head of the gastrocnemius muscle, courses between the heads of the gastrocnemius muscle, forms the SDFT, which passes medial to the GT before fanning out and becoming superficial to the GT at the calcaneus. Within its retinaculum at this point, the SDFT passes over the calcaneus and inserts on the plantar aspect of the phlanges (1,3).

Tendon rupture is usually associated with an acute traumatic episode: either an impact injury resulting in avulsion of the tendon from the calcaneus or direct sharp trauma to some part of the musculotendinous unit (2,3). A subset of CCT injuries, however, are degenerative in nature (2). Derangement of CCT function may arise in young dogs that develop an avulsion fracture of the proximal calcaneus (3).

Common calcaeal tendon injuries may be partial or complete, and may involve any combination of the 3 tendons that make up the CCT. Most commonly, the entire CCT is disrupted, producing a plantigrade stance and an inability to support weight-bearing. Alternatively, the GT may be disrupted with the SDFT unaffected. This produces a partially plantigrade stance, as the SDFT prevents full hyperflexion of the hock. In addition, the digits will be flexed in a "claw-like" manner, since the intact SDFT is stretched with weight-bearing (2,3). Although much less common, some patients avulse one or both heads of the gastrocnemius muscle from their origin on the caudal aspect of the distal portion of the femur producing similar clinical signs.

Clinical signs associated with CCT rupture will vary depending on the acuteness of the problem. Most dogs will exhibit an acute nonweight-bearing lameness with swelling in the tendon as it approaches the calcaneus. If no obvious penetrating laceration is present, careful palpation may reveal the disruption in the tendon at, or proximal to, the calcaneus. If the dog is not presented at the time of acute injury or the problem is chronic, the swelling may be absent, although fibrous thickening of the tendon will be apparent. Although these patients are lame, they usually have recommended weight-bearing and may show some degree of plantigrade stance, depending on whether the disruption of the CCT is partial or complete.

While acute laceration of the tendon can occur in any animal, degenerative tendon tears are most common in middle-aged, active, large breed dogs with Labradors, Dobermans, and German shepherds being most common (2). Bilateral ruptures may occur in cases of severe trauma or as a feature of degenerative tendon pathology. The pathogenesis of degenerative cases of CTT rupture has not been well-described. Whether this represents the product of long-term "wear and tear" in particularly active dogs or the expression of a genetic factor, as is the case in degeneration of the cranial cruciate ligament, is unclear. In humans, an association with the use of fluoroquinolones or the chronic use of nonsteroidal anti-inflammatory drugs has been described (3). In dogs, an association with obesity, diabetes, or Cushing's disease has been noted (2).

Chronic calcaneal tendonitis is characterized by thickening of the distal portion of the CCT and varying degrees of lameness. There may be increased flexion of the digits and pain on extension of the digits (2). Radiographs will demonstrate thickening of the distal portion of the CCT and roughening or mineralized densities at the proximal border of the calcaneus. These densities represent small avulsions of the GT of insertion and associated dystrophic mineralization. The condition may be bilateral and may lead to eventual complete tendon rupture. Rest and nonsteroidal anti-inflammatory therapy are indicated in chronic common calcaneal tendonitis. Enforced rest by immobilization of the hock may be indicated in some cases (2).

Diagnosis of CCT rupture can usually be made based on history and physical examination; however, radiographs can be helpful with partial ruptures or degenerative tendonitis. Thickening of the tendon and avulsed, mineralized fragments may be noted in the area of the calcaneal attachment (2,3).

Ultrasonographs are commonly used to diagnose CCT rupture in humans and they have recently become a more common diagnostic modality for diagnosis of this condition in animals (3,5).

Repair of CCT rupture demands surgical intervention to reestablish tendon integrity. In acute cases, this involves suturing each component of the CCT individually. In chronic cases, there may be extensive fibrous tissue to debride and it may be impossible to separate individual tendon components. It is imperative that the ends of the tendon be debrided back to normal tissue and that the tuber calcus has all fibrous tissue removed from the tendon insertion point. If primary apposition of torn tendon ends can be accomplished, this should be done with locking

loop or three-loop pulley sutures. The latter has been shown to decrease the tendency for gap formation at the anastomosis site (6). If the tendon has avulsed from the tuber calcis then medial and lateral bone tunnels are drilled from proximal to distal in the calcaneus to facilitate passage of the sutures. If debridement or trauma has left a significant gap in the CCT such that primary anastomosis is not possible, the defect may be bridged by an autograft or tendon transposition. Transposition of the peroneus brevis and longus (4), or the deep digital flexor tendon (3) from the calcaneus to the free end of the ruptured CCT can serve to bridge the gap. Alternatively, a free fascia lata graft can be used or can reinforce the transposed tendons (4,7).

Immobilizing the hock in extension helps to take some of the pressure off the repair, especially during the early phase of healing. This can be accomplished with a full cast or cranial half cast (4,8). Alternatively, a screw can be placed from the plantar aspect of the calcaneus into the tibia proximal to the hock joint (2,3). This technique usually requires some additional external coaptation in large dogs. Immobilization of the hock with a transarticular external skeletal fixator offers great strength and the ability to treat injured or healing soft tissues. Perhaps most importantly, it allows avoidance of soft tissue irritation that is nearly inevitable with external coaptation (2,3). Support and immobilization of the hock has been advocated for a period of 3–10 wk (2–4,8); however, the trend in humans and animals is towards earlier controlled movement of the hock (3,4,8). In humans, passive range of motion exercises have been advocated as early as 72 h postoperatively, while in animals, experimental data suggest that limited movement involving the surgically repaired CCT can begin at the end of the stage of fibroplasia, at 14–21 d (3,4,8). Early motion of the hock joint lessens stiffness and chondromalacia within the joint; however, the challenge with veterinary patients is to control the stress on the repair. This can be accomplished by removing a bivalve or cranial half cast for physiotherapy sessions or by temporarily loosening external skeletal fixator clamps to facilitate physiotherapy. Alternatively, a "happy medium" might be achieved by maintaining rigid fixation for 4 wk in all cases, then substituting a less rigid device, such as a Robert Jones bandage, for an additional 3 wk in cases where an autograft or transposed tendon is being protected (8).

The prognosis for return to function is generally very good in cases of CCT rupture repairs, especially where primary apposition of tendon ends or tendon and calcaneus can be achieved (2).

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