Achilles Tendon Injuries and Treatment

A relatively common injury in larger breed dogs is damage to the Achilles tendon (common calcanean tendon) complex. This article is a brief discussion of the anatomy, injury types, and treatments of the Achilles.

Anatomy: The Achilles tendon consists of three independent portions which have an attachment to the tuber calcanei on the calcaneus bone.

The bulk of the tendon is made-up of the common tendon of the gastrocnemius muscles and inserts onto the proximal end of the tuber calcanei.

The tendon of the superficial digital flexor muscle is the next largest part. The tendon winds medially around the gastrocnemius tendon to lie on its caudal surface. On the tuber calcanei it broadens to form a cap, which is attached to the bone by way of collateral ligaments (retinacular). It travels over the tuber calcanei and separates to insert on P2 of the individual digits. These attachments are important, as the anatomy here explains the characteristic stance of a dog presenting with the Type 2c and 3 injury below.

The third portion of the calcaneal tendon is made up of a fusion of tendons from the semitendinosus, biceps femoris and gracilis muscles and inserts on the medial aspect of the tuber calcanei.

Classification: There are three types of Achilles injuries:

Type 1 injury: Traumatic/acute complete disruption of the entire tendon. The outcome is maximal flexion of the hock when the stifle is extended. The separated tendon ends are palpable through the skin. In some cases a skin laceration may be evident, indicative of external trauma.

Type 2 injury: show a variable degree of increased hock flexion with stifle extension and are the result of only partial disruption of the tendon. Type 2 injuries can be further sub-classified into Type 2a, where there is incomplete separation between the gastrocnemius muscle and the tendon. Type 2b where there is total disruption of the tendon, but the paratenon is still intact. Type 2c where the tendons of the gastrocnemius muscle and the semitendinosus, biceps femoris and gracilis muscles are torn from the attachment to the tuber calcanei, leaving the superficial flexor tendon component in tact. Type 2c injuries result in a characteristic hyperflexion of the toes during weight bearing. The increased amount of hock flexion caused by the disrupted gastrocnemius tendon results in increased in tension within the superficial flexor tendon. These patients can be misdiagnosed with proprioceptive deficits due to the curled toes during weight bearing.

Type 3: these injuries may represent an earlier stage of type 2c. The distal end of the gastrocnemius tendon is thickened, as is the fibular tarsal bone. These changes may represent small tears in the tendon. Radiographically there maybe evidence of soft tissue swelling, with calcification or bone fragmentation and changes to the size and shape of the tuber calcanei. It is the type 2c and type 3 injuries that are recognize commonly in Dobermans.

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A type of Achilles tendon injury not covered in this classification is associated with luxation of the superficial digital flexor tendon. The tendon usually luxated laterally and is associated a characteristic lameness. There appears to be an increased incidence in Shetland sheep dogs and collies.

Principles of treating tendon injuries: Damaged tendons heal as one wound by the invasion of fibroblasts and blood vessels from the surrounding paratenon. In a sheathed tendon the resultant scar tissue may result in adhesions between the tendon and the sheath which will limit the normal gliding action of the tendon. Primary wound healing of the tendon within the sheath is possible by collagenization, but this process relies on the preservation of the delicate local circulation and the absence of damage to the tendon sheath. In practical terms this situation is very unlikely.

Following tendon trauma collagen synthesis starts on about the third day and by day 14 it has increased dramatically. The vascular reaction peaks at about the 14-28 day period. Secondary remodeling of the initially random orientation of the collagen fibers starts at about day 21. This very important process goes on for months to increase the strength of the repair and to decrease the mass of the scar. Secondary remodeling is aided by stress or loading which increases the cross-linking between the collagen fibers and ensures that they orientated parallel with the lines of force. Clinically the strength of a repaired tendon relies on three facets:

1. Correct choice of suture pattern and material,
2. Adequate immobilization for sufficient time,
3. Controlled period of rehabilitation.

It is recommended that the suture material of choice should be strong and inert. Stainless steel has been widely used in the past, but it has a tendency to fatigue failure and is probably best avoided. Monofilament nylon, polypropylene,PDS or Maxon are the materials of choice. The gauge is selected according to the size of the tendon to be repaired, but normally a heavy gauge is preferable e.g., between 2/0 and 2. A suture pattern should be selected that minimizes ischemia of the tendon, resists gapping and will not pull through the parallel collagen fibers. The locking-loop is the best choice. I usually use 1-2 locking loop sutures, and then a series of small horizontal mattress sutures to appose the edges of the tendon. In Type 2c injuries, the locking loop is attached to the bone via parallel tunnels drilled in the calcaneus. Chronic cases will have mature fibrosis with poor vascularization. The area should be judiciously resected, with care to leave enough tissue to reattach under as little tension as possible.

A 6-8 week period of complete immobilization in extension is recommended to protect the repair from separation during the critical period of collagen synthesis. Immobilization is as important as the repair itself. Initially, the sutures alone would not be enough to maintain the repair. The immobilization is usually a 3 week rigid fixation, followed by a gradual increase in stress to the tendon, providing forced alignment of the collagen fibers

(which, as mentioned, begins on day 21). Typically for me, this involves a full cast in full, rigid extension for 21 days, followed by a half cast for an additional 21 days. Other methods of maintaining rigid extension include a large transarticular screw from the calcaneus to the distal tibia, and a transarticular external skeletal fixator.

This period of immobilization should then be followed by a period of controlled exercise designed to gradually increase the load on the repair to assist secondary remodeling.

Superficial digitial flexor tendon luxation: A less common injury which is still seen with some frqueny, however, is superficial digital tendon luxation. This is repaired imbrication. Redundant/loose tissue is resected, and a series of simple interrupted nonabsorbable or slowly absorbing sutures are placed in the torn collateral (opposite side to the direction of the luxation). Postoperative immobilization for a month is also important.

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