ACHILLES TENDON INJURY TREATMENT STRATEGIES

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Achilles Tendon

. The common calcaneal tendon (CCT) is commonly known as the Achilles tendon. The CCT is composed of the gastrocnemius, superficial digital flexor tendon and the conjoined tendons of the semitendinosus, gracilis and biceps femoris. The gastrocnemius is the most powerful extensor of the hock. It terminates on the proximal lateral surface of calcaneus, while the common tendon (BF, ST, gracilis) terminates on the medial side. The SDT tendon continues past the calcaneus to insert on the digits. The CCT connects the calf muscles to the calcaneus and is essential for normal function including walking, running, jumping and climbing stairs. The tendon is required to support a large amount of force thus is susceptible to injury. Injury may be acute or chronic and includes complete or partial tearing. Treatment includes conservative treatment, physical therapy, bracing, regenerative medicine and surgery depending on the severity of injury and response to previous therapy.

Tendon Injury

Tendon injury usually results from substantial trauma. An important factor to consider in treatment of tendon injuries is the ability to maintain not only structural strength but also gliding function. Structural strength will be greatest if the structure can be returned to as near as normal as possible; the tensile strength of scar tissue is inferior to that of normal tendinous tissue. [1] Prompt repair of tendinous injuries increases the chance of optimal healing and decreases the amount of scar tissue formation. Scar tissue formation between the tendinous and surrounding soft tissues also leads to adhesion formation and loss of gliding function. Factors to limit adhesion formation include early surgical intervention, meticulous handling of tissues, anatomical apposition of tendinous tissues, adjunctive postoperative bandaging, passive range of motion exercise, and appropriate postoperative restriction of activity. Early healing of tendons occurs with formation of immature collagen during the initial four postoperative weeks. Tensile strength of the repair tissue increases as remodeling of the collagen occurs until about 20 weeks postoperatively. [1] Tendon repair is accomplished using a variety of suture materials and suture patterns, depending on the preference of the surgeon. A variety of locking-loop and three-loop suture patterns have been used effectively. [1,2] Non-absorbable suture material such as monofilament nylon, polypropylene and braided polyester is preferable to absorbable material due to the long period of time until adequate tensile strength is reached in the repair tissue. After the tendon is repaired, the paratenon or synovial sheath should also be primarily repaired with appositional sutures if possible. Reestablishment of these structures decreases the chance of adhesions and preserves gliding function.

Repair Guidelines for Tendons[1]

A tendon surrounded by a sheath will usually not heal spontaneously. The tendon ends will heal in a rounded fashion and function is lost because of loss of continuity of a tendon. A tendon not surrounded by a sheath is thought to regenerate by proliferation and extending a pseudopodial mass to attach to the opposite end that also extends tissue. Regeneration is thought to be a result of hematoma organization or paratenon proliferation. Paratenon covered tendons are more vascular than synovial sheathed.

1. After the paratenon and tendon have been completely incised the wound fills with inflammatory products (blood cells, nuclear debris, fibrin). During the first week the fibrin is invaded by fibroblasts (from the paratenon) that combine with invading capillary buds to form the granulation tissue that fills the space between the tendon ends. Fibroblasts begin to synthesize collagen by the 3rd day after trauma
2. During the 2nd week a dramatic fibroblastic proliferation and collagen production continues. The growth and migration of fibroblasts and the collagen fibers between the stumps are orientated perpendicular to the long axis of the tendon and the vascular reaction reaches its peak.

3. During the 3rd and 4th wk the fibroblasts and collagen fibers near the tendon begin to orient themselves // to the long axis of tendon. This orientation is due to directional stress on scar - the more distant or central scar remains unorganized. The difference in orientation of collagen fibers in the newly synthesized scar tissue is defined as **secondary remodeling**. Two important factors in secondary remodeling are increase in tensile strength and reduction in mass of scar tissue. It continues for many months. Increase in tensile strength suggests orientation along stress lines. Collagenization continues until 20 weeks. In animals, tensile strength is more important than gliding motion.

Healing of tendons within a tendon sheath should feasibly occur due to intrinsic repair but in clinical practice is usually a combination of intrinsic and extrinsic.

Injury of the CCT

Injury may be acute or chronic. Injuries may disrupt the entire tendon or a portion of the tendon. Complete tears tend to be acute injuries and most commonly occur adjacent to the musculotendinous junction. Avulsion can also occur at the attachment to the calcaneus. Partial tears are more commonly associated with chronic repetitive injury and commonly occur at the insertion of the gastrocnemius tendon. Both types of injury can be debilitating.

Repair of Acute CCT Tears

Acute tears are typically performed by primary repair of the individual components or the tendon using suturing techniques. Nonabsorbable suture is preferred. A variety of suture patterns have been described to neutralize distractive forces and prevent gap formation. It is critical to position the tarsus in an extended position postoperatively for 8-12 weeks to protect the tendon repair from disruptive forces and failure. Adjunctive support can be provided using braces, external fixators or transarticular implants.

Acute avulsion of the tendon from the calcaneus is reattached using holes drilled through the proximal calcaneus, The tendon is reattached with a locking pulley suture. The tarsus can be temporarily immobilized for 8-12 weeks with a tibiocalcaneal screw, a calcaneal-tibial locking plate, transarticular external fixation or custom orthotic brace.

Chronic Tears of tne Insertion of the Gastrocnemius (at the calcaneus)

Injury of the insertion of the tendon of the gastrocnemius at the calcaneus may be partial or complete. This condition most commonly occurs in Doberman pinschers and Shetland sheepdogs but may occur in any breed. A chronic repetitive injury involving the insertion of the gastrocnemius is most common. The SDF and DDF are usually intact. Clinical signs include hyperflexion of the tarsus and extension of the stifle. Flexion of the digits is also common with partial tendon injury. A gap may be palpable in the tendon in acute cases. The gap fills in with fibrous tissue & difficult to identify in chronic cases. An avulsion fragment and enlargement of the tendon insertion may be seen on radiographs.

Multiple treatment options have been proposed including rest with immobiliztion, bracing, primary tendon repair, resection of damaged tendon and replacement with a graft. Restricted activity and immobilization is effectively used in most humans having Achilles tears. Surgical repair is occasionally needed. The use of restricted activity alone is rarely successful in dogs. Immobilization of the CCT is important in any treatment regime to neutralize distractive large forces during the healing process. Options that have been reported to in dogs include temporary immobilization with a tibiocalcaneal screw, a calcaneal-tibial locking plate, transarticular external fixation and orthotic braces.

References

1. Bloomberg MS. Muscles and tendons. In Slatter DS (ed): Textbook of Small Animal Surgery, Philadelphia, WB Saunders 1993, pp 1996-2020.
2. Moores AP, Owen MR, Tarlton JF. Three loop pulley suture versus two locking-loop sutures for the repair of canine Achilles tendons. Vet Surg 33:131-137, 2004.
3. Beale BS, Lewis DD. Clinical use of titanium anchors for treatment of trauma-induced joint instability in small animals, Proceedings of the 23rd Conference of the Veterinary Orthopedic Society, 1996, pp. 23.
4. Beale BS, Langley Hobbs S, Trout N. Diseases of muscles and tendons. In Morgan RV (ed): Handbook of Small Animal Practice, St Louis, Elsevier, 2008, pp 794-816
5. Boharski RA, Wheeler JL, Cross AR et al. Hybrid, transarticular external fixation with platelet-rich plasma injection as a treatment for partial calcaneal tendon disruption in dogs without primary tenorrhaphy. Vet Surg Online: 1-9, 2024.
6. Baroncelli AB, Ferrero FC, Omodeo L et al. Use of a Transarticular Calcaneo-Tibial Locking Plate for Temporary Immobilization of the Tarsocrural Joint following Surgical Repair of Common Calcaneal. VCOT;34:5:359-366, 2021.
7. Tidwell SJ, Green\wood K, Franklin SP. Novel Achilles tendon repair technique utilizing an allograft and hybrid external fixator in dogs. Open Veterinary Journal;12(3):335-340, 2022.

1. Bloomberg MS. Muscles and tendons. In Slatter DS (ed): Textbook of Small Animal Surgery, Philadelphia, WB Saunders 1993, pp 1996-2020.
2. Moores AP, Owen MR, Tarlton JF. Three loop pulley suture versus two locking-loop sutures for the repair of canine Achilles tendons. Vet Surg 33:131-137, 2004.
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4. Beale BS, Langley Hobbs S, Trout N. Diseases of muscles and tendons. In Morgan RV (ed): Handbook of Small Animal Practice, St Louis, Elsevier, 2008, pp 794-816.
5. Boharski RA, Wheeler JL, Cross AR et al. Hybrid, transarticular external fixation with platelet-rich plasma injection as a treatment for partial calcaneal tendon disruption in dogs without primary tenorrhaphy. Vet Surg Online: 1-9, 2024.
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