



NEWSLETTER

Post-Operative Management of Tendon Repairs

Focus on the common calcaneal tendon and the digital flexor tendons



Last issue we discussed calcaneal tendon injuries. (Check it out by going to www.fourleg.com, log into the membership site and go to the newsletter archives section to find 2012 Vol 1: Issue 1.)

This issue will address rehabilitation of tendon injuries. In particular the common calcaneal tendon of the rear leg and the superficial or deep digital flexor tendon of the front leg will be highlighted.

Thinking Out Loud!

There is a smattering of information in the human literature regarding post-operative achilles tendon repair rehabilitation. There's nothing in veterinary literature directed to the same topic.

This is the dilemma that we find ourselves in on a day-to-day basis in the canine rehabilitation field. Where to begin, is to find the BEST AVAILABLE literature to guide our treatment planning. Therefore, we need to look at the human literature, analyze it's applicability to the canine patient, and bear in mind the canine differences, and anatomy.

So lets begin. Read on!

-Laurie Edge-Hughes

Worth et al. Ability to work and owner satisfaction following surgical repair of common calcaneal tendon injuries in working dogs in New Zealand. NZ Vet J. 52 (3): 109 - 116, 2004.

Surgical treatment of injures to the common calcaneal tendon in working dogs carries a good prognosis for a return to full working function if post-operative complications are avoided. Overall, 7/10 dogs returned to full or substantial levels of work; 2/7 had moderate persistent lameness thereby equating to 71% having good to excellent functional recovery.



Rigid immobilization for 6 weeks by a combined screw and cast technique may offer better results than using casting alone, and is recommended where a surgeon has access to surgical instrumentation necessary for screw application. Alternatively, a trans-articular external surgical fixture could be employed. Lameness may persist in some dogs despite an acceptable ability to work, as judged by owner assessment.

HOW TO REHABILITATE THE POST-OPERATIVE TENDON REPAIR...

Textbook Answer for HUMANS:

Brotzman SB. After Surgical Repair of Acute Achilles Tendon Rupture in Athletes. In Handbook of Orthopaedic Rehabilitation, 2nd Edition. (Brotzman & Wilk eds) Mosby Elsevier, Philadelphia, PA, 2007, pp 606 - 607.

- 20 degree plantar-grade splint initially post-operatively.
- Non-weight bearing x 4 weeks (with crutches)
- Partial weight bearing with crutch-assisted ambulation in a cast.

For High-Level Athletes

- 15-20 degree plantar-grade boot
- Active non-weight bearing ROM exercises (starting at day 7 post-op when incision well healed)
 - Initial exercise = gentle passive plantar flexion & active dorsiflexion (to 20 degrees, 2 sets x 5 reps x 3/day)
 - At 1 month: Walking boot for 6 - 8 weeks, and weaning of heel lift heights
 - At end of the 6 - 8 week boot phase, graduate to shoes with heel lifts (gradually weaning the lifts again)

- At 6 weeks, stationary bicycle (no resistance) and swimming
 - When full strengths and full endurance, and after training in a running program - may gradually return to competition
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For Lower-Demand Athletes

- Non-weight bearing cast in 20 degrees plantar-grade for 6 - 8 weeks - progress to 1-cm heel lift in removable boot x 1 month
- Progressive NWB resistance exercises started at 8 - 10 weeks
- At 8 - weeks, start stationary bicycling & swimming
- Return to athletic activity (light running) at 5 - 6 months
- Return to activity takes 12 - 18 months.

Sorrenti SJ. Achille tendon rupture: effect of early mobilization in rehabilitation after surgical repair. Foot Ankle Int 27(6): 407 - 410, 2006.



64 patients with Achilles tendon ruptures treated surgically and with early mobilization.

Rehab: After wound closure, an early mobilization rehabilitation program was initiated, which consisted of wearing a moveable ankle brace for 4 to 6 weeks

in 0 to 15 degrees of dorsiflexion and 10 weeks of regular exercises.

Results: All 64 patients resumed normal activities in an average of 3.3 months regardless of whether the rupture was acute or chronic. Tendons healed with no reruptures. There were 13 complications, all wound infections, which healed when treated with antibiotics. The infection rate dropped markedly when wounds were inspected and dressings changed 1 week postoperatively, instead of at 2 weeks.

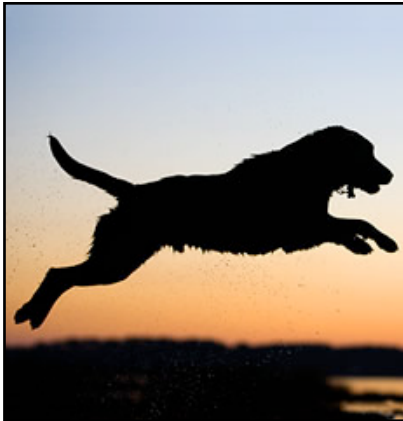
Conclusion: Surgery combined with early mobilization reduces range of

motion loss, increases blood supply, and reduces the degree of muscle atrophy that typically occurs after Achilles tendon rupture, thereby decreasing the time to resumption of normal activities. Applying tension to the tendon also improved strength of the calf muscles and improved ankle movement. The main concern with early mobilization is rerupture, but this was lessened by patients carefully following the weightbearing and early mobilization protocols. The results of this study strengthen the argument to employ early mobilization rehabilitation after surgical repair.

'Working like a dog'

It is believed that this originates from the fact that a sheepdog works from dawn till dusk for only room and board and affection and this phrase is often used to describe someone who is working very hard/for long hours.

JUST SOME BITS AND PIECES IN THE HUMAN LITERATURE!



I think both athletic dogs and high-energy dogs NEED rehab to return to sport or just the park! - LEH

Booth FW. Physiologic and biochemical effects of immobilization on muscle. Clin Orthop Relat Res 219: 15 – 20, 1987.

The greater the degree of plantar flexion in which the ankle is immobilized the greater will be the subsequent atrophy

Akizuki KH, Gartman EJ, Nisonson B et al. The relative stress on the Achilles tendon during ambulation in an ankle immobiliser: implications for rehabilitation after Achilles tendon repair. Br J Sports Med 35(5): 329 – 333, 2001

Heel lifts can be used to reduce stress on the repair while the patient progresses in weight bearing status.

Suchak AA, Bostick GP, Beaupre LA et al. The influence of early weight-bearing compared with non-weight-bearing after surgical repair of the Achilles tendon. 90(9): 1876 – 1883, 2008.

Human prospective studies and randomized controlled trials have shown that, compared with cast immobilization, the use of early postoperative ROM and weight bearing showed significant improvement in health-related quality of life in the early post-operative period, posed no additional risks and demonstrated a trend toward a reduction in lost work days and an earlier return to sports.

"A dog, I will maintain, is a very tolerable judge of beauty, as appears from the fact that any liberally educated dog does, in a general way, prefer a woman to a man."
 - **Frances Thompson** New York Times Magazine May 14, 1967

POTENTIAL OPTIONS FOR POST-OPERATIVE STAGED REHABILITATION

THERAPAW
www.therapaw.com

Material of the splint itself can contribute to stability

Additional materials (i.e. thermoplastics sheets or rods, velcro, elastic or rigid straps, and padding can assist to stage your rehabilitation



ORTHOPETS
www.orthopets.com

Can be a rigid splint or have hinges added on in later stages to function as a splint

Hinges allow for gradual increase in ROM and active use.



“He is your friend, your partner, your defender, your dog. You are his life, his love, his leader. He will be yours, faithful and true, to the last beat of his heart. You owe it to him to be worthy of such devotion.”

Maquirriain J. Achilles tendon rupture: Avoiding tendon lengthening during surgical repair and rehabilitation. Yale J Biol Med 8(3): 289 – 300, 2011.

The clinical dilemma is that no stress accelerates atrophy, whereas too much stress may jeopardize the repair

In summary, Achilles tendon rupture is a serious injury for which the best treatment is still controversial. The surgeon should evaluate a patient's functional requirements carefully and treatment should attempt an optimal restoration of tendon length, tension, and stiffness. Therefore, in trying to prevent excessive elongation of the tendon, which is associated with a poor clinical outcome, there is consensus that operative treatment is the preferred therapeutic alternative for the majority of patients, especially young athletes.

Secure tendon repair fixation is essential to prevent gapping and allow for an accelerated rehabilitation. Selection of the suture material and knotting technique is also crucial to prevent tendon repair separation. Locking-loop stitches using strong non-absorbable sutures, knot tying away from the rupture site, and epitendinous augmentation are highly recommended. Although there is no clear consensus regarding the optimal postoperative rehabilitation protocol for this injury, most physicians advocate for early range of motion exercises and weight bearing. In the future, tissue engineering may lead to improved management of these injuries.

Willits K, Amendola A, Bryant d, et al. Operative versus nonoperative treatment of acute Achilles tendon ruptures: a multicenter randomized trial using accelerated functional rehabilitation. 92(17): 2767-2775, 2010.

BACKGROUND:

To date, studies directly comparing the rerupture rate in patients with an Achilles tendon rupture who are treated with surgical repair with the rate in patients treated nonoperatively have been inconclusive but the pooled relative risk of rerupture favored surgical repair. In all but one study, the limb was immobilized for six to eight weeks. Published studies of animals and humans have shown a benefit of early functional stimulus to healing tendons. The purpose of the present study was to compare the outcomes of patients with an acute Achilles tendon rupture treated with operative repair and accelerated functional rehabilitation with the outcomes of similar patients treated with accelerated functional rehabilitation alone.

METHODS:

Patients were randomized to operative or nonoperative treatment for acute Achilles tendon rupture. All patients underwent an accelerated rehabilitation protocol that featured early weight-bearing and early range of motion. The primary outcome was the rerupture rate as demonstrated by a positive Thompson squeeze test, the presence of a palpable gap, and loss of plantar flexion strength. Secondary outcomes included isokinetic strength, the

Leppilahti score, range of motion, and calf circumference measured at three, six, twelve, and twenty-four months after injury.

RESULTS:

A total of 144 patients (seventy-two treated operatively and seventy-two treated nonoperatively) were randomized. There were 118 males and twenty-six females, and the mean age (and standard deviation) was 40.4 ± 8.8 years. Rerupture occurred in two patients in the operative group and in three patients in the nonoperative group. There was no clinically important difference between groups with regard to strength, range of motion, calf circumference, or Leppilahti score. There were thirteen complications in the operative group and six in the nonoperative group, with the main difference being the greater number of soft-tissue-related complications in the operative group.

CONCLUSIONS:

This study supports accelerated functional rehabilitation and nonoperative treatment for acute Achilles tendon ruptures. All measured outcomes of nonoperative treatment were acceptable and were clinically similar to those for operative treatment. In addition, this study suggests that the application of an accelerated-rehabilitation nonoperative protocol avoids serious complications related to surgical management.

So Now What?





HERE'S WHAT I'D DO!

In The Acute Stage:

After the cast is removed, I think it makes good sense to utilize modalities during this phase. Ultrasound, laser, and pulsed electromagnetic field therapy have all been shown to help with tendon healing. I would likely continue with their use for 3 - 4 weeks in order to achieve benefits.

During this time frame, I would also want the animal in a splint / orthotic. In the past (for both Achilles Tendon repairs and forelimb Superficial Digital Flexor Tendon repairs, I have utilized Therapaw's custom Tarsoflex or CarpoFlex splints (respectively). I would start with full support and gradually reduce the amount of support every couple of weeks. The dog could likely start with 5-10 minute walks to 'toilet' with the brace on, and again progress from there.

The Underwater treadmill would be useful in this stage as well, but with the height of the water at hip height to reduce weight bearing forces (with the brace off).

In the Subacute Stage:

(I should clarify that the timeframe for this stage is 2 or 3 weeks after the initiation of rehab - i.e. cast removal.) Here, the main goal is to protect the tendon repair while gradually allowing greater amounts of activity and 'guided' exercise and 'stress'. An adjustable splint/brace is invaluable in this stage - for new and more strenuous activities, increase the support. As the dog masters the task, reduce the support. Continue this system throughout the entire rehab event.

Some of the exercises I like: Sit practice (for extensibility, Tarsal flexion ROM, and eccentric strengthening... and it can be made harder by making them sit facing UP a hill), cavaletti's / obstacle poles to step over (to increase weight bearing), weave poles (for individual leg use), backing up (for proprioception), and 3-leg stands, progressing to diagonal leg stands (for balance and coordination training).

In the Late Stage:

As the dog progresses, I like to have them do hill walking, crawling under, trotting, and eventually jumping and short retrieves. I want the owner walking at home - they should have started on flat easy surfaces, then progress to uneven terrain (adding splint support when the task is made harder). When that goes well, then the dog should start trialling short bouts of off-leash activity (again adding splint support with the new activity and working down in support). Advisement is the most important thing you can offer!

Thank You!

Thank you for your interest and support in Four Leg Rehab Inc. I am truly humbled and honoured that you would join me in this venture and journey.

In case, you've not heard this enough... Please let me know what you would like to see here - and I will do my best to create it! I want to serve our rehab community, and I want to help you to achieve your rehab goals and inspire you in your business!

Wishing you health, happiness, prosperity and great rehab knowledge and skills!

Laurie

Laurie@fourleg.com

References for 'What I'd do!'

Laurie Edge-Hughes

Khan KM, Scott A. Mechanotherapy: how physical therapists' prescription of exercise promotes tissue repair. *Br J Sports Med.* 43(4): 247-252, 2009.

Saini NS, Roy KS, Bansal PS et al. A preliminary study on the effect of ultrasound therapy on the healing of surgically severed achilles tendons in five dogs. *J Vet Med A Physiol Pathol Clin Med.* 49 (6): 321 - 328, 2002.

Wood UT et al. Collagen changes realignment induced by low-level laser therapy and low intensity ultrasound in the calcaneal tendon. *Lasers Surg Med* 42(6): 559 - 562, 2010.

Lee BC, Cho NS, Rhee YG. Effect of two rehabilitation protocols on range of motion and healing rates after arthroscopic rotator cuff repair: aggressive versus limited early passive exercises. *Arthroscopy* 28(1): 34 - 32, 2012.

Monitoring the Tendon



As you are working with your post-operative patient, be sure to continue to monitor the Achilles Tendon (or Superficial Digital Flexor Tendon of the front leg) by palpating the

tendon itself to assess for pain, measuring it's width, and stretching the individual components of the tendon / each tendon. Look for extensibility and also for pain.



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Drop me a line! Send me your questions!



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