

A guide to tendon rehabilitation

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What is a tendon, and how do overuse injuries occur?

A tendon is the 'rope' that connects muscles to bones. It is mainly made up of a protein called collagen. Tendons transfer the force that muscles produce to our skeleton allowing us to move. Overuse injuries to tendons occur when the micro trauma or damage that occurs to tendons with loading (frequently through exercise) exceeds the repair ability of the body. This may occur due to excess force, insufficient recovery time, or other factors such as metabolic derangements that may be seen in conditions like diabetes.

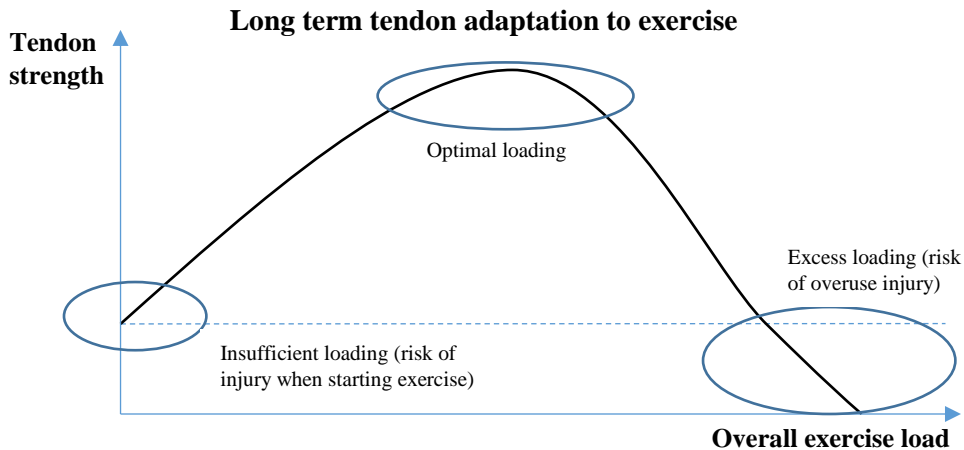
Do I need a scan?

Not every tendon injury needs a scan, even in elite athletes. Typical symptoms of a tendon injury are pain that, in the early stages, improves as you continue to exercise, with a marked increase in your pain the following day. If your symptoms behave like this, and your health professional is confident in the diagnosis, imaging may be unnecessary.

Ultrasound scanning is often unreliable, with findings of tendon problems that don't exist frequently reported. If you obtain an ultrasound, it should be from a sonographer with specific expertise in musculoskeletal ultrasound. MRI scans can provide some information on a tendon, and also other structures surrounding the tendon which can be useful when the diagnosis is uncertain. Tendons are largely invisible on x-rays and CT scans, and in general, they will not provide any useful information.

How can exercise make my tendon stronger?

When we contract a muscle connected to a tendon with enough force, the tendon will stretch slightly. The cells within the tendon can sense this force, and respond by making more proteins to make the tendon stronger. It is interesting to note that other tissues respond in a similar way to applied force, notably muscle and bone. Without the effect of gravity, astronauts are at increased risk of osteoporosis, or weak bones due to the reduced force on their skeleton.



Why does my pain go away, only to return when I resume activity?

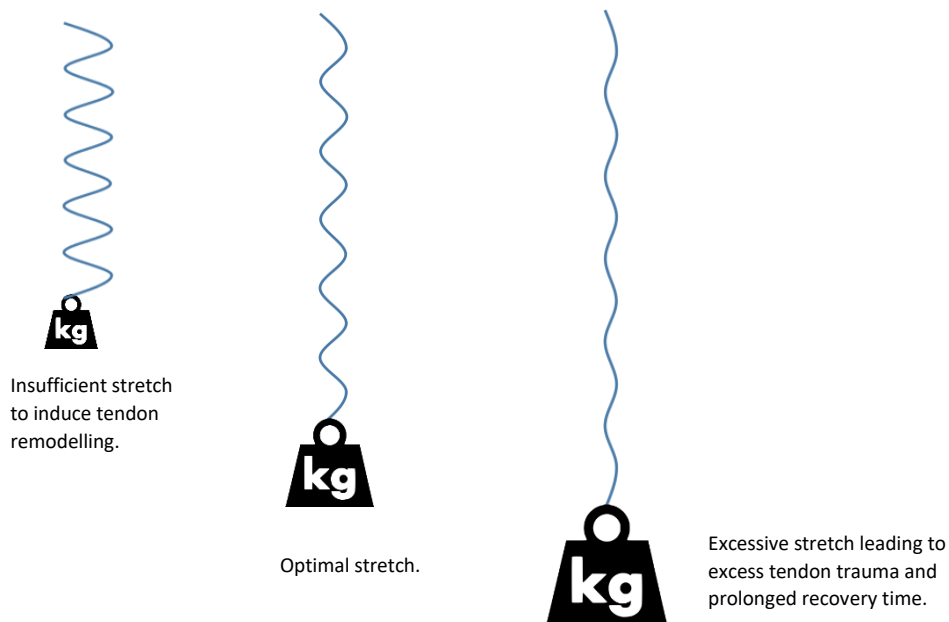
Pain will frequently resolve with rest. After a period of rest however, the tendon will be relatively weak. Resumption of your previous level of activity at this time will likely exceed the load your tendon can safely cope with, and lead to a recurrence of your symptoms. A progressive loading program leading to graded strengthening of your tendon will allow you to return to a higher level of activity.

Is there a special kind of exercise I need to do?

To encourage adaptation of a tendon with exercise, the tendon needs to be targeted specifically. Your therapist will prescribe specific exercises that target the injured tendon. For example, having a bent knee while doing calf raises targets the achilles tendon more effectively than with a straight knee.

How much resistance do I need to use?

Force through a tendon leads to a small degree of stretch. There is a 'goldilocks zone' for the optimal amount of tendon stretch. Too little, and there won't be a sufficient stimulus, too much and the response will be compromised. Your therapist will advise you on appropriate exercise resistance. As your load tolerance increases, the resistance of your exercises will be progressed.



Will every tendon injury respond to the same rehabilitation program?

Sometimes a tendon can be torn. When this happens, there will be a sudden event with immediate pain. This type of injury needs to be managed differently to an overuse injury. Overuse injuries may be either reactive (early) or degenerative (late). In the early stage of a reactive injury, sometimes rest for a short period of time may be all that is necessary. The longer an injury persists, the more likely it is to progress to the degenerative type, where a controlled progressive loading program is needed.

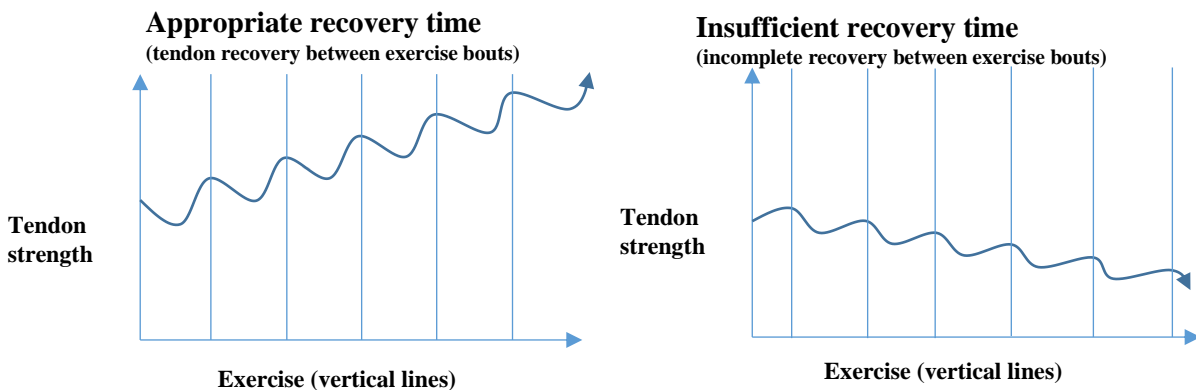
How long does an exercise program take to work?

As a tissue, tendons are not very metabolically active when compared to something like muscle. They therefore take longer to strengthen in response to an exercise program. While some cases may require 6 months or even longer to recover, most cases will resolve within 2-3 months. A graduated exercise program with appropriate rest periods will optimise this recovery period.

How often should I exercise my tendon?

Exercise loading of a tendon creates micro trauma within the tendon. In general, it takes about 48 hours for a tendon to recover. Repeat loading of the tendon before it has recovered can lead to cumulative damage, leading to tendon injury with time. Therefore strengthening exercises should be carried out every 2nd day. Patients with impaired recovery, such as those on cholesterol lowering statin medications, and those with diabetes or fatty liver disease, may need a longer recovery period between bouts of loading.

It should be noted that early in your program you may be prescribed 'isometric' exercises where your muscles contract without moving. This type of exercise is aimed at controlling pain, and may be performed multiple times a day.



Do my exercises have to be completely pain free?

It is unlikely, especially early in the rehabilitation period, that your prescribed exercises will be completely pain free. An acceptable level of discomfort during exercise is 3-4/10. It is more important that the exercise does not make your pain worse over the next 1-2 days.

It is very important to keep a morning pain/stiffness and training diary and monitor your response over the 24-48 hours following exercise. An increase in symptoms over this period may require a downward adjustment of your exercise load, or an extra day or two of rest. Your therapist will provide you with guidance.

Does my diet matter?

Diet can have a significant influence on tendons. Being overweight will increase the load on a tendon, increasing risk of injury. High levels of blood sugar, such as seen in diabetes, can also damage tendons. Enzymes which contribute to the breaking down of tendons are also released in higher amounts with a fatty liver, which is associated with central obesity. A properly supervised low carbohydrate diet can lead to improvement in these factors and should be a part of any comprehensive tendon rehabilitation program.

Are there any supplements that can help?

Research has demonstrated that whey protein can increase the gain in cross sectional size of tendons associated with resistance training. This may be due to the amino acid leucine, which is found in whey protein, and has been shown to induce a positive anabolic stimulus to connective tissues. High doses of fish oil have also been shown to be anti-inflammatory and may also be beneficial. Reduction or elimination of vegetable or seed oils which can be very high in omega 6 fatty acids can also reduce inflammatory load.

Should I take anti-inflammatory medication?

Anti-inflammatory medications have been shown in some studies to impair the healing of tissue. Furthermore, anti-inflammatory medications have side effects which can include increased risk of heart disease, kidney problems and stomach ulcers. In general, use of such medications should only every be short term (< 2 weeks) and be recommended under competent medical supervision.

Will injecting my tendon with cortico-steriod help?

While this has been a common treatment in the past, research indicates that any benefit is short lived. Furthermore, longer term outcomes are likely to be worse. The practice of injecting directly into the tendon is now only rarely performed due to a delayed risk of tendon rupture. In some circumstances it is reasonable to inject into the sheath around the tendon.

How can I keep track of my progress?

It is often difficult to detect the improvements that occur in symptoms with time. A standardised assessment questionnaire, such as the VISA-A (achilles) score or similar will often demonstrate improvement and assist with motivation and compliance. This is usually performed monthly.

A few pointers

Achilles

The majority of achilles tendinopathies involve the portion of the tendon contiguous with the soleus muscle. Therefore most benefit is achieved with calf raises performed with the knee bent. This can be a difficult movement to perform for some patients, as it requires the maintenance of the knee in static flexion while performing a calf raise. The most common mistake made in achilles rehabilitation programs is neglecting appropriate loading of soleus.

Be aware of complicating factors in achilles tendinopathy. Pain is localised to the posterior aspect of the calcaneus indicates an enthesitis which is often seen in systemic inflammatory conditions. This type of presentation often responds poorly to exercise alone, and a complete medical evaluation is recommended.

Retrocalcaneal bursitis, sometimes occurring in the context of Haglunds' morphology, is often sensitive to dorsiflexion, and care should be taken to avoid this unnecessarily. The plantaris tendon inserts onto the medial side of the achilles tendon approximately 6cm proximal to its insertion. This should be considered in any achilles presentation higher than usual, and ultrasound can often be useful to assist diagnosis.

Adjunct treatments often useful in management of achilles tendinopathy include heel lifts (often >2cm) and pulling the achilles tendon laterally with tape (see <http://www.aptei.ca/library-article/achilles-tendon-taping/>). While anatomical studies have cast doubt on the existence of a para tenon, some presentations demonstrate clear crepitus likely related to a fibrotic process. Anecdotally, these tendons respond well to the application of a heparinoid ointment under an occlusive dressing.

De Quervains' tenosynovitis

This is frequently seen in new mothers, likely reflecting compression of the involved tendons and associated tenosynovial sheath by the free edge of the overlying retinaculum. This frequently occurs when the thumb is extended and abducted as holding an infant. Application of a check-rein tape to the thumb or an alternative method to restrict thumb range of motion combined with application of a heparinoid ointment under an occlusive dressing is usually effective. New mothers should be educated on alternative manual handling strategies. Intra-sheath cortico steroid injections can be very effective in refractory cases, or where prompt symptom relief is desired.

Plantar fasciopathy

The plantar fascia is histologically identical to a tendon and responds well to mechanotherapy. Performing a calf raise while the toes are held passively into extension using a small rolled up towel effectively loads the plantar fascia and is the recommended exercise.

Pes anserine bursopathy

This condition likely reflects tendinopathy of the associated pes anserine tendons. It frequently occurs secondary to altered gait biomechanics often seen in knee osteo-arthritis. Patients will often subconsciously rotate at the tibio-femoral joint using the medial hamstring tendons as a pain reduction strategy. Treatment must include recognition of this underlying pathology. Cortico-steroid injections are often effective.

Phases of rehabilitation

Phase 1: isometric exercises

- may be performed multiple times per day for pain relief
- 45-60 second hold
- 1-5 repetitions
- Resistance ~70% MVC (maximum voluntary contraction)

Phase 2: introduction of dynamic exercise

- Concentric and eccentric contraction
- Begin slowly (3 seconds down, 3 seconds up)
- Perform every 2nd day
- Resistance based on 8 RM (repetition maximum)
- Should be no more than 3-4/10 pain while performing exercise
- 24-48 hour pain/stiffness score should be used as a guide to exercise progression or reduction
- When can complete 3 sets 8 RM, progress to next stage.

Phase 3: progression of dynamic exercise (energy storage and release)

- Increase velocity of exercise to improve the ability of tendon to store and release energy like an elastic band
- Exercise will depend on tendon being rehabilitated, and goal activity
- Perform every 2nd or 3rd day

Phase 4: return to sport

- Maintenance program performed with adequate recovery time to allow sporting performance.