

## Exercise for tendinopathy

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Author contributions: Dimitrios S solely contributed to this manuscript.

Conflict-of-interest: None.

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Received: February 28, 2015

Peer-review started: March 2, 2015

First decision: April 27, 2015

Revised: May 6, 2015

Accepted: June 1, 2015

Article in press: June 2, 2015

Published online: June 26, 2015

### Abstract

Tendinopathies are one of the most common sports/musculoskeletal injury in modern western societies. Many physiotherapy approaches have been recommended in the literature for the management of tendinopathy. The most effective treatment in the management of tendinopathy is the eccentric training. Load, speed and frequency of contractions are the three principles of eccentric exercises, discussed in this report. However, eccentric training is not effective for all patients with

tendinopathy and the effectiveness of this approach when applied as monotherapy is lower than it is applied as part of the rehabilitation process. For this reason, clinicians combine eccentric training with other physiotherapy techniques such as stretching, isometric and lumbar stability exercises, electrotherapy, manual therapy, soft tissue manipulation techniques, taping and acupuncture in the management of tendinopathies. Further research is needed to find out which treatment strategy combined with eccentric training will provide the best results in the rehabilitation of tendinopathy.

**Key words:** Tendinopathy; Exercise; Physiotherapy; Electrotherapy; Eccentric exercises; Stretching exercises; Electrotherapy; Manual therapy

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**Core tip:** Eccentric exercises are effective in the management of tendinopathy. Eccentric training improves patients' symptoms and reverses tendinopathys' pathology. The ideal eccentric protocol is unknown in the literature. Eccentric training alone does not respond positively in many patients. Therefore, clinicians combine eccentric training with other forms of therapy such as stretching exercises, isometric contraction, electrotherapy, manual therapy, deep transverse friction, taping, acupuncture and improvement of lumbo - pelvic control. More research is needed to find out which treatment strategy combined with eccentric training will provide the best results in the rehabilitation of tendinopathy.

Dimitrios S. Exercise for tendinopathy. *World J Methodol* 2015; 5(2): 51-54 Available from: URL: <http://www.wjgnet.com/2222-0682/full/v5/i2/51.htm> DOI: <http://dx.doi.org/10.5662/wjm.v5.i2.51>

Tendinopathies are one of the most common sports/musculoskeletal injury in modern western societies.

**Table 1 Recommended therapies for the management of tendinopathy**

Exercise	Electrotherapy	Manual therapy	Other therapies
Eccentric	Therapeutic ultrasound	MWMT for LET	DTFM
Stretching	Laser	Cyriax for LET	Taping
Isometric	ESWT		Acupuncture
Lumbo - pelvic control for lower limb tendinopathies	Iontophoresis		

ESWT: Extracorporeal shockwave therapy; LET: Lateral elbow tendinopathy; DTFM: Deep transverse friction massage; MWMT: Mobilization with manual therapy.

The most common tendinopathies of the upper limb are Rotator cuff (mainly supraspinatus) and lateral elbow tendinopathy (LET) usually seen in sports such as volley - ball, tennis, basketball, swimming and so on whereas Achilles and patellar tendinopathy are the most common tendinopathies of the lower limb commonly seen in sports such as volley-ball, soccer, running, jumping and so on<sup>[1]</sup>. Many physical therapy strategies have been proposed for the rehabilitation of tendon disorders. These strategies are electrotherapeutic such as therapeutic ultrasound, extracorporeal shockwave therapy, low level laser, iontophoresis and non-electrotherapeutic modalities such as eccentric training, soft tissue techniques, taping and needle therapy (Table 1). These treatments intend to reduce pain and improve function in tendinopathy but act in a totally different mechanism of action. Generally speaking, the efficacy of a treatment is based on reversing the pathology of the tendinopathy and not only improving the symptoms. Nowadays, eccentric exercise program is the most effective conservative approach in the treatment of tendinopathy<sup>[2,3]</sup>.

Load, speed and frequency of contractions are the three principles of eccentric exercises. The results are poor when the load of eccentric exercises should not be increased according to the patient's symptoms<sup>[4]</sup>. It is impossible to standardize the rate of increase of the load during the treatment period<sup>[5]</sup> but if the eccentric loading exercise can be performed without experiencing any minor pain or discomfort, it will be increased by adding weight.

The speed of eccentric training should be increased in every treatment session<sup>[6,7]</sup>, Stanish *et al*<sup>[8]</sup> (2000) state to simulate the mechanism of injury, which usually occurs at relatively high velocities the load on the tendon should be increased. However, to allow tissue healing and to avoid the possibility of re-injury, eccentric exercises should be performed at a slow velocity<sup>[9]</sup>. Low velocity eccentric loading generates less injurious heat within the tendon and does not exceed the elastic limit of the tendon<sup>[10]</sup>. It is not possible to define the "slowness" of eccentric contractions. This lack of definition is based on the therapists' claim that patients perform the eccentric exercises slowly anyway in order to avoid pain<sup>[11]</sup>. However, the slowness of eccentric training should be defined when researchers develop an exercise programme treatment protocol. It is difficult for therapists to replicate the exercise training and put it

into practice when the slowness is not defined.

Repetitions and sets can vary in the literature. Three sets of 15 repetitions are usually recommended. The sets are performed once or twice per day. The performance of sets based on home or supervised eccentric training. An exercise programme that can be performed any time during the day without requiring supervision by a physiotherapist called home exercise programme. The pain in patellar tendinopathy<sup>[2]</sup>, Achilles tendinopathy<sup>[2]</sup> and LET<sup>[11,12]</sup> was reduced when a home exercise program was performed for about three months. Patients fail to comply with this regimen<sup>[13,14]</sup>. The solution in the above problem is to be performed an exercise program in a clinical setting under the supervision of a physiotherapist. The supervised exercise programme may give good long-term results in one month<sup>[15-20]</sup>. This occurred because a higher degree of patient compliance can be achieved by the supervised exercise programme.

Eccentric programme reduces the pain and improves the function in all sites of tendinopathy? For example, patients with mid-portion Achilles tendinopathy respond positively in eccentric training with dorsiflexion<sup>[21-26]</sup>, but patients with insertional Achilles tendinopathy respond positively in eccentric training without dorsiflexion<sup>[27]</sup>. Therefore, the two sites of Achilles tendinopathy respond positively in two different protocols of eccentric training. Patients with patellar tendinopathy at the inferior pole of the patella respond positively in squats<sup>[2]</sup>; however, the effectiveness of eccentric loading training programme on other sites of patellar tendinopathy has not been investigated. Thus, research is needed to determine the effectiveness of eccentric training at all sites of tendinopathies.

Eccentric training alone is not effective for many patients with tendinopathies<sup>[9]</sup>. Therefore, eccentric training is combined with static stretching exercises in the treatment of tendinopathies with positive results<sup>[15-20]</sup>. The way that eccentric and stretching exercises reverse the pathology of tendinopathy is unknown because evidenced - based studies to confirm that physiological effects translate into clinically meaningful outcomes and vice versa are lacking. In addition, research supports that the combination of eccentric training, with a physical therapy modality, such as therapeutic ultrasound<sup>[28,29]</sup>, low level laser<sup>[30]</sup>, extracorporeal shockwave therapy<sup>[31]</sup> and iontophoresis<sup>[32]</sup>, is more effective therapeutic approach than the eccentric training alone

in the rehabilitation of tendinopathy. Furthermore, clinicians thought that patients with patellar and Achilles tendinopathy have lack of lumbopelvic control (lumbopelvic control defines as the reestablishment of the impairment or deficit in motor control around the neutral zone of the spinal motion segment) and this loss has the potential to alter load distribution on the lower limb kinetic chain<sup>[33]</sup>. My colleagues and I think that the improvement of lumbo-pelvic control can be achieved by performing simple exercises such as single leg bridging in supine and four point prone bridging exercises. Future research is needed to confirm the above relief. Furthermore, a plethora of manual therapies have been advocated for the management of tendinopathy, but there is minimal experimental evidence to support the efficacy of the use of manual therapy for the management of tendinopathy<sup>[34]</sup>. Mulligan Mobilization with Movement and Cyriax physiotherapy are the most common manipulative techniques for the management of LET. It is unknown whether an analogous manipulation procedure may be found for the rehabilitation of other tendinopathies comparable to that used in management of LET or may be difficult in practice of attempting such a technique at other joints<sup>[35,36]</sup>. It is believed that even if a similar technique is found for the rehabilitation of all tendinopathies, this technique will be combined with an exercise training in the treatment of tendinopathy. Finally, a recently published case trial showed that isometric contractions of the wrist extensors as a supplement to eccentric and static exercises of wrist extensors is an effective treatment approach in a patient with LET<sup>[37]</sup>. Future trials to confirm the results of the present case report in all tendinopathies are needed.

Finally, deep transverse friction massage (DTFM), taping and acupuncture have also recommended in the management of tendinopathy. DTFM is a specific type of massage applied precisely to the tendons<sup>[35]</sup>. Details about the application and mechanism of action of DTFM can be found in the article by Stasinopoulos and Johnson<sup>[35]</sup> (2007). The conducted trials do not recommend the use of DTFM in the management of tendinopathy<sup>[15,17,38]</sup>. Taping and acupuncture improve the signs of tendinopathy but it does not reverse the pathology of tendinopathy<sup>[39,40]</sup>.

In conclusion, eccentric training is the most promising treatment approach in the management of tendinopathy. The optimal protocol of eccentric training is needed to investigate. The effectiveness of this approach when applied as monotherapy is lower than it is applied as part of the rehabilitation process. Further research is needed to find out which treatment strategy combined with eccentric training will provide the best results in the rehabilitation of tendinopathy.

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**P- Reviewer:** Charoenphandhu N, Hirohata S **S- Editor:** Ji FF  
**L- Editor:** A **E- Editor:** Wu HL





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