Achilles and patellar tendinopathy are the most common tendinopathies of the lower limb. The main complaints of patients with tendinopathy are pain and decreased function both of which may affect daily activities. Diagnosis is based on defining pain features (e.g. localized pain) as well as reproducing pain with specific clinical tests and palpation. Although the signs and symptoms of tendinopathy are relatively clear, to date, no ideal treatment has emerged. Many clinicians advocate a conservative approach as the treatment of choice for tendinopathy. For example, many physical therapy strategies have been proposed for the rehabilitation of tendon disorders. These include electrotherapy such as therapeutic ultrasound, extracorporeal shockwave therapy, low level laser, iontophoresis and non-electrotherapeutic modalities such as exercise, soft tissue techniques, taping and dry needling or acupuncture. These treatments aim to reduce pain and improve function in tendinopathy via different mechanism of action. There is no evidence that any treatment is able to reverse the pathology of the tendinopathy. Such a variety of treatment options suggests that the optimal treatment strategy is not known, and more research is needed to discover the most effective treatment in patients with tendinopathy.
Nowadays, eccentric training of the “injured” tendon is the most commonly used conservative approach in the treatment of tendinopathy. It was first proposed by Alfredson et al. (1) who advocate 3 sets of 15 repetitions of eccentric exercises at a slow speed twice daily, 7 days/week, for 12 weeks. The patients are advised that tendon soreness during the first weeks of training is to be expected. In the beginning, only body weight is used to load the tendon, isolating the eccentric component by using the non-injured leg to return to the start position. Patients are advised to continue even if they experience pain, unless the pain becomes disabling. If the subjects could perform the eccentric loading exercise without experiencing any minor pain or discomfort, they are instructed to increase the load by adding weight.

Previous systematic reviews have evaluated the evidence for eccentric loading of the injured tendon in tendinopathy, concluding that outcomes are promising but high-quality evidence is lacking (10, 20, 24). Furthermore, eccentric training of the injured tendon alone is not effective for many patients with tendinopathies (6). Therefore, eccentric training of the injured tendon is combined with static stretching exercises of the injured tendon in the treatment of tendinopathies as it was first proposed by Stanish et al (28). In the Stanish exercise program, the patients perform a program consisting of five steps. The first step is a general, whole-body warm up exercise. The second step is static stretching exercises for the «injured» tendon. Next, 3 sets of 10 repetitions of the eccentric exercises are carried out once daily for six weeks and after six weeks, the patients are instructed to carry out 3 sets of 10 repetitions, three times per week for six more weeks. The intensity of the exercise should be such that pain, or discomfort, is experienced in the last set of 10 repetitions. The progression of eccentric training is shown in Table 1. Every session ends with the same static stretch exercise as in the step 2. The patients are also instructed to use ice on the «injured» tendon for 5 - 10 min after the program. There is lack of evidence to investigate the effectiveness of the Stanish exercise protocol in the management of tendinopathy.

Only one pilot trial compared the above two reported protocols in Achilles tendinopathy in recreational athletes who were between 35 and 55 years old (29). The Alfredson exercise program was superior to Stanish exercise program reduced pain and improved function at the end of the treatment and at six month follow-up. The superiority of Alfredson exercise program can be explained by two mainly reasons: Firstly, the load of eccentric exercises in the Alfredson exercise protocol was increased according to the patients’ symptoms otherwise the results are poor (11) and secondly eccentric exercises in the Alfredson exercise protocol were performed at a low speed in every treatment session because this allows tissue healing (15).

Studies have shown positive results in the treatment of tendon injuries of upper limb (Lateral elbow Tendinopathy) using eccentric training as described
by Alfredson and static stretching exercises as described by Stanish (19, 30, 31). Well – designed trials are needed for lower limb tendinopathies to investigate whether the results can be better when the patients who undergo the Alfredson eccentric exercise protocol also undertake static stretching exercises as described by Stanish before and after the eccentric exercise program.

Malliaras and his colleagues (17) performed a systematic review of studies comparing two or more loading programs in Achilles and patellar tendinopathy. They concluded that clinicians should consider eccentric-concentric loading alongside or instead of eccentric loading. A Heavy Slow Resistance (HSR) program is recommended in the management of lower limb tendinopathy (4, 13). The HSR program is performed 3 times per week using resistance equipment in a fitness center. Each session consists of three 2-legged loaded quadriceps and lower limb kinetic chain exercises. The patients complete 3 or 4 sets in each exercise with a 2- to 3-minute rest between sets and a 5-minute rest period between the 3 exercises. The number of repetitions decreases, and load gradually increases, every week. The repetitions and loads are as follows: 3 times, 15-repetition maximum (15RM), in week 1; 3 times, 12RM, in weeks 2 to 3; 4 times, 10RM, in weeks 4 to 5; 4 times, 8RM, in weeks 6 to 8; and 4 times, 6RM, in weeks 9 to 12. All exercises are performed in the full range of motion of ankle joint for Achilles midportion? tendinopathy and until 90° of flexion for patellar tendinopathy. Patients are instructed to spend 3 seconds completing each eccentric and concentric phase (ie, 6 seconds per repetition). The HSR program was produced equivalent pain and function improvement (VISa) than the Alfredson eccentric program, but significantly better patient satisfaction at six month follow–up. This clinical improvement was accompanied by increased collagen turnover in the HSR group. In the Achilles tendon, eccentric and HSR have recently been shown to yield similar clinical outcomes (VISa and patient satisfaction) at 1 year follow up. Based on the above findings, the HSR program can be recommended as an alternative to the Alfredson eccentric program lower limb tendinopathy rehabilitation.

The question that arises is whether HSR program is effective for all patients with lower limb tendinopathy and for all sites of Achilles and Patellar tendinopathy? It is seems that HSR program is recommend for young active people. In addition, research has shown that different sites of Achilles tendinopathy are managed with different protocols of eccentric exercises. For example, eccentric training with dorsiflexion is effective for patients with mid-portion Achilles tendinopathy (1, 16, 21, 23, 25) but eccentric training without dorsiflexion has positive effects on patients with insertional Achilles tendinopathy (12). As mentioned above, all exercises in HSR are performed in the full range of motion of ankle joint for Achilles tendinopathy. Therefore, HSR may not to be an effective approach for insertional Achilles tendinopathy unless range of motion is modified. Squat is an effective treatment approach when the patellar tendinopathy is at the inferior pole of the
patella; however, no studies have investigated the effectiveness of training on other sites of patellar tendinopathy. Thus, studies determining the effectiveness of exercises at other sites of patellar tendinopathy are needed.

Recently, isometric exercises have been recommended to reduce and manage patellar tendon pain (2) and initiate muscle-tendon unit loading when pain limits the ability to perform isotonic exercises (7). Five repetitions of 45-second isometric mid-range quadriceps exercise at 70% of maximal voluntary contraction have been shown to reduce patellar tendon pain for 45 minutes post exercise and this was also associated with a reduction in motor cortex inhibition of the quadriceps that was associated with patellar tendinopathy (22). It is our belief that isometric contraction is more effective with the knee near extension unless the patient has fat pad syndrome. The dosage will depend upon individual factors but evidence and clinical experience suggests performing 5 repetitions of 45 seconds hold, 2-3 times per day, with 2 minutes rest between holds to allow recovery (18). Isometric evidence is currently limited to the patellar tendon.

Thus, rehabilitation of lower limb tendinopathy is changing and now eccentric training is not the only exercise option. Isometric, concentric-eccentric, stretching - eccentric and isolated eccentric loading may be indicated depending on factors multiple factors such as pain, function, age, site of tendinopathy, access to equipment, etc.

A component lacking from evidence-based programs is adequate consideration of the kinetic chain. Poor lumbopelvic control has the potential to alter load distribution on the lower limb kinetic chain and increase the risk of lower limb tendinopathy. It is our belief 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[8,14]. Future research is needed to confirm this suggestion.

In addition, hip extensor weakness has been associated with patellar tendinopathy (26). Exercises to strengthen these muscle groups should be considered in exercise protocols and patellar tendinopathy. Functional activities such as jumping, cutting and sprinting should also be included in lower limb tendinopathy rehabilitation programs among athletes, but have so far not been included in popular programs in the literature (18, 26).

According to previous reported issues, it is time to stop strengthening the tendon only eccentrically. The tendinopathy management should be based on a progressive loading of the lower extremity (kinetic chain), muscle-tendon unit, and tendon itself. However, the optimal protocol of exercise training needs to be investigated.

Finally, electrotherapeutic modalities, manual therapy techniques, bracing/ taping and acupuncture have also been recommended in the management of tendinopathy. There is minimal experimental evidence to support the efficacy of the use of the above approaches for the management of tendinopathy (3, 5, 9, 27).
The above recommended therapies should not be substitute but instead an adjunct to an exercise program. Further research is needed to find out which treatment strategy, if exists a treatment strategy, combined with progressive exercise training will provide the best results in the rehabilitation of tendinopathy.

Writing this article it is not our intention to increase the knowledge of physiotherapists but to generate questions about why they do not use the same treatment protocol for the management of all lower limb tendinopathies. It is believed that even if an exercise program is found for the management of all tendinopathies of the lower limb, this program will not be used as a sole treatment.

REFERENCES


Address for correspondence:

Stasinopoulos Dimitrios (PhD)
Vice-Chairperson/ Assistant Professor, Physiotherapy
Physiotherapy Program,
Dep. of Health Sciences, School of Sciences
Coordinator of MSc in Sports Physiotherapy
Coordinator of Physiotherapy Program
6, Diogenes Str. Engomi, P.O.Box 22006, 1516, Nicosia, Cyprus
Tel. +35722713044 [f] +35722713013
D.Stassinopoulos@euc.ac.cy [w] www.euc.ac.cy