Conservative management of tendinopathy: an evidence-based approach

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Summary

Tendinopathy is one of the most frequent overuse injuries associated with sport. It is a failure of a chronic healing response associated with both chronic overloaded and unloaded states. Although several conservative therapeutic options have been proposed, very few of them are supported by randomized controlled trials. Eccentric exercises provide excellent clinical results both in athletic and sedentary patients, with no reported adverse effects. Combining eccentric loading and low-energy shock wave therapy produces higher success rates compared with eccentric training alone or shock wave therapy alone. High-volume injection of normal saline solution, corticosteroids, or anesthetics can reduce pain and improve long-term function in patients with Achilles or patellar tendinopathy. The use of injectable substances such as platelet-rich plasma, autologous blood, polidocanol, and corticosteroids in and around tendons is not support by strong clinical evidence. Further randomized controlled trials are necessary to define the best conservative management of tendinopathy.

Key words: Eccentric exercises, injury, injection, shock wave therapy, tendinopathy.

Introduction

Tendinopathy is one of the most frequent overuse injuries associated with sport (1). Usually it occurs in major tendons, such as the Achilles, patellar, rotator cuff, and forearm extensor tendons. The term ''tendinopathy'' is currently accepted to indicate an overuse pathological condition in and around tendon. Histopathological assessment is required to detect degenerative changes with lack of inflammatory features ("tendinosis") or inflammatory process ('tendonitis'' or ''tendinitis'') (2).
At histopathological examination, tendinopathy is a failed healing response, characterized by haphazard proliferation of tenocytes, disruption and alterated organization of collagen fibers, increase in non collagenous matrix and neovascularization (3, 4). In chronic stage of disease, inflammation is absent or minimal (5). However, inflammation could play a role only in the initiation, but not in the propagation and progression, of the disease process (5).
Several theories have been proposed to explain the pathogenesis of tendinopathy. Probably there is a continuum of tendon pathology from asymptomatic tendons to tendon tears (6, 7). Thus, a clinically acute tendinopathy is actually a well-advanced failure of a chronic healing response.
Histopathological features of tendinopathy have been associated with both chronic overloaded and unloaded states, inducing a decrease of mechanical integrity of the tendon and its vulnerability to damage (6, 7).
Although several conservative therapeutic options have been proposed, very few of them are supported by randomized prospective, placebo-controlled trials (8, 9). We reported the best available evidence for the conservative management of tendinopathy.

Eccentric Exercises

Eccentric exercises have been proposed to promote collagen fiber cross-linkage within the tendon, enhancing a remodeling process (10). This remodeling results from the structural adaptation of the musculotendinous units to protect them from increased stresses related to exercises. However, hystological evidence of changes following a program of eccentric exercise is lacking, and the mechanisms of pain relief remain unclear. Several theories have been proposed, such as decrease of pain mediators in tendinopathic tendon (11) or progressive habituation of patient to painful stimuli (12, 13). On the other hand, Color Doppler sonography demonstrated decreased neovascularization following eccentric training intervention (14).
Excellent clinical results have been reported both in athletic and sedentary patients (15, 16), although they were not reproduced by other study groups (5). The overall trend suggests a positive effect of eccentric exercises in term of pain relief and functional improvement, with no adverse effects (12). One study investigated the combination of eccentric training and shock wave therapy reporting success rates that were higher than those with eccentric loading alone or shock wave therapy alone (17).

Extracorporeal Shock Wave Therapy

Extracorporeal shock wave therapy is becoming more widely used to address the failed healing response of a tendon (10). The rationale for this intervention includes the stimulation of soft-tissue healing and inhibition of pain receptors, through mechanical forces generated directly or indirectly via cavitation (18).
Extracorporeal shock wave therapy can be performed following two modalities: repetitive low-energy extracorporeal shock waves, which do not require local anesthesia, or high-energy extracorporeal shock waves, which require local or regional anesthesia (18).
Low-energy shock wave therapy or eccentric training for the management of Achilles tendinopathy showed comparable results in a randomized controlled trial, and both management modalities produced outcomes superior to those of no intervention (10). Moreover, the association of eccentric loading and repetitive low-energy shock wave therapy is more effective than eccentric loading alone (17).

High-Volume Injections

The rationale for this intervention is that high-volume injections of normal saline solution, corticosteroids, or anesthetics would produce local mechanical effects causing new blood vessels to stretch, break, or occlude. The occlusion or disruption of neovessels should lead to the accompanying nerve supply also being damaged by either trauma or ischemia, with subsequent decrease of pain in patients with refractory Achilles tendinopathy.
Hydrocortisone acetate is used in the high-volume injections, primarily to prevent an acute mechanical inflammatory reaction produced by the large amount of fluid injected in the proximity of the tendon. The injection is performed under ultrasound guidance to avoid intratendinous injection of corticosteroids (19). Preliminary studies showed that high-volume injection of normal saline solution, corticosteroids, or anesthetics reduces pain and improves short and long-term function in patients with Achilles (20) or patellar (21) tendinopathy. High-volume injection is safe and relatively inexpensive, resulting in a quicker return to sports (19).

Platelet-Rich Plasma

Tendon healing occurs through three overlapping phases (inflammation, proliferation, and remodeling), which are controlled by a variety of growth factors (22, 23). The rationale for the use of platelet-rich plasma to promote tendon healing is the high content of these cytokines and cells in hyperphysiologic doses of platelet-rich plasma. Several studies on the application of platelet-rich plasma to promote tendon healing are ongoing worldwide, although the exact mechanisms by which platelet-rich plasma promotes tendon healing are still not clear. One double-blind, placebo-controlled trial of fifty-four patients with Achilles tendinopathy has been performed, in which patients received exercises associated with injection of either platelet-rich plasma or saline solution (placebo group) (24). The authors concluded that, compared with the saline-solution injection, the platelet-rich-plasma injection did not result in greater pain relief or improvement in activity.

Autologous Blood Injection

The rationale of autologous blood injection consists in enhancing tendon healing through collagen regeneration and the stimulation of a well-ordered angiogenic response (25), by providing cellular and humoral mediators. However, good experimental models for tendinopathy are lacking, and clinical application is anecdotal (26, 27).

Polidocanol

The injection of the sclerosing substance polidocanol (Aetoxisclerol; Kreussler Pharma, Wiesbaden, Germany) has been proposed to desrupt the pathological neovascularization and nerve ingrowth outside and inside the tendon, considered a cause of the pain complained during tendinopathy (28). The injection can be performed under ultrasonography and color Doppler guidance in the area with neovessels outside the tendon (29, 30).
In a randomized controlled trial, injections with polidocanol showed the potential to reduce tendon pain during activity in patients with chronic painful midportion Achilles tendinopathy (31). Injections of polidocanol close to the tendon seem to be remarkably safe.

Intratendinous Injections of Corticosteroids

The use of corticosteroid injections is highly controversial (32). At present, there is insufficient evidence to support local corticosteroid treatments for Achilles tendinopathy. Three randomized controlled trials have been performed: two of them demonstrating some benefit in terms of healing (33, 34), and one showing no positive effects (35). A meta-analysis of the effects of corticosteroid injections reported little benefit (36). The injection procedure can be safer when performed under ultrasound imaging guidance. With the high-volume-injection technique, the needle is kept extratendinous and outside the peritendinous space (37), so that the fluid is injected only in the Kager triangle (for the Achilles tendon) or in the Hoffa body (for the patellar tendon).

The best evidence-based management of tendinopathy

In general, the first-line treatment of tendinopathy should be represented by physical therapy based on a program of eccentric exercises. It may be appropriately performed with daily sessions for twelve weeks. If the tendinopathy is refractory, shock wave therapy could be considered as second-line intervention, acoording to their effectiveness similar to an eccentric strengthning program. These two approches can be combined. As alternative to shock wave

therapy or when tendinopathy does not respond to those interventions, high-volume injections could be considered. A strong evidence for other type of injections is lacking. Finally, surgical management should be considered once conservative interventions have failed.

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