

Chronic Achilles tendon pain: tendon microcirculation and radial extracorporeal shock wave therapy (rESWT).

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Introduction:

Achilles tendinopathy is a common cause of posterior heel pain and is often difficult to treat. This condition is more frequent in athletes, particularly runners and jumpers, but it can affect non-athletes as well. The origin and pathogenesis of the tendinopathy are unknown, however some intrinsic and extrinsic factors have been implicated (1,2). Intrinsic factors include abnormal range of motion of the subtalar joints such as those seen in hyperpronation syndrome or a leg length discrepancy. Extrinsic factors for athletes include training errors with subsequent excessive mechanical overload. Other possible extrinsic causes are advanced age, fatigue, and obesity (3,4,5,6,7,8). Recently, some clinical studies have demonstrated the association between increased tendon microvascularity and the symptomatic chronic Achilles tendinopathy. Using Doppler Ultrasonography, an increased vascular density in the Achilles tendon has been demonstrated that is clinically associated with chronic Achilles tendinopathy (9,10,11,12,13). Traditional non-operative treatment of chronic Achilles tendinopathy consists of rest and the administration of NSAIDS. Some studies have suggested different types of therapeutic interventions such as: steroid injection, sclerosing therapy, aprotinin injection, eccentric training, heel lifts and custom orthoses (14,15,16,17,18,19,20). Recently, extracorporeal shock wave therapy (ESWT) has been reported to be effective for the treatment of Achilles tendinopathy, but until now few studies have investigated the efficacy of ESWT for the treatment of chronic Achilles tendinopathy (21, 22, 23 and 24). The purpose of this study is to evaluate the correlation between increased tendon microvascularity and pain and to determine the efficacy of low energy radial ESWT for the treatment of chronic Achilles tendinopathy.

Methods:

Twenty-four subjects were evaluated. Twelve athletes (group A – 9 males and 3 females) with an average age of 25.9 years were included. The athletes were runners of mid and long distance races. All twelve patients displayed evidence of chronic Achilles tendinopathy in painful phase and had undergone medical treatment and physical therapy for a minimum of 3 months without clinical improvement. For the control group, we selected 12 subjects (group B – 9 males and 3 females) with an average age of 25.6 years and morphologic characteristics similar to subjects of group A, but who were sedentary. All subjects were chosen for this study after obtaining informed consent and undergoing accurate clinical examination, excluding patients with associated pathologies that would prohibit them from receiving ESWT; coagulopathies, local infection, or tumors. The intensity of pain was registered using a VAS scale for pain with direct palpation of the tendon as well as pain during ambulation. In group B subjects no pain was reported. All 24 subjects underwent one identical ultrasonographic evaluation with Color Doppler, provided by a single operator, using a Toshiba Power Vision 9000 scanner with a small parts 5-12 MHz transducer. The twelve athletes with tendinopathy demonstrated a diffuse disomogeneous hypoechogenicity of the Achilles tendon with blood flow at the depth over 5 mm (mean 5.5 mm, range 4.5/6.5 mm). All 12 group B subjects demonstrated normal sonographic characteristics of the tendon.

All 24 subjects underwent low energy (less than 3 bar) radial ESWT by the same operator, using a Swiss Dolorclast device by EMS. Treatment consisted of three sessions, one every 72 hours, during which subjects received 2,000 shocks each session, for a total of 6,000 shocks, using a flux of energy density averaging 2.2 bar. No local anesthetic was used and no patients required pain medication. A Color Doppler examination was performed one month and six months following the end of the treatment with ESWT and all subjects underwent clinical evaluation one month and six months after the end of the treatment. We also evaluated whether patients had pain under direct palpation or pain with ambulation. All subjects were

asked to refrain from athletic activities and allowed only to walk normally during the treatment phase. A return to normal activities was allowed for all subjects one month after the end of the treatment.

Results:

Doppler Ultrasonographic evaluation of subjects who underwent radial ESWT treatment demonstrated a reduction of the microvasculature present prior to treatment in group A subjects, with a disappearance of microvasculature in 58.3 % of group A subjects (7 out of 12) at one month and 83.3 % (10 out of 12) at six months. In group B subjects we noted no significant differences and no symptoms. Furthermore, at six months after the end of the treatment we registered a reduction of local pain on walking or running in 83.3% of the athletes of the group A ($P < 0.0001$ – T test) (TAB. II). No significant complications were observed in either treatment group, except for a temporary increase in paratendon edema in three subjects of group A, which responded to local cryotherapy.

Discussion:

Many studies have evaluated the association of increased microvasculature of the Achilles and patellar tendons and the associated clinical symptoms in patients with Achilles and patellar tendinopathy with Color Doppler. This test has proven to be highly specific (100%) and 50% specificity for the evaluation of altered microvasculature with tendinopathy (10,25). Ohberg (9) used Colored Power Doppler ultrasonography to demonstrate an increase of microvasculature in patients with Achilles tendinopathy. The same author also noted a reduction of pain in 8 of 12 subjects in whom he injected a sclerosing agent in the paratendon near the Achilles tendon insertion. In 2003 Silvestri observed a hypervascularity (paratendinosis) in patients with acute tenosynovitis, compared with normal subjects (26). Other authors have also demonstrated an increase of microvasculature in patients with Achilles tendinopathy, while in asymptomatic subjects no altered microvasculature was observed (12,13). Treatment of Achilles tendinopathy has included many types of treatment, but in some cases complications have occurred (17,18). Injection of steroids may reduce pain and microvasculature, but are associated with rupture of the tendon (17). Some studies have evaluated the effect of eccentric exercise on the pain and microvasculature of the Achilles tendon and have shown successful results in 83% of patient symptoms and alteration of the microvasculature in 17% of patients (16). Recently injection of aprotine, a proteinase inhibitor, has been proposed, but results have been unsatisfactory (18). Among treatment modalities of Achilles tendinopathy, ESWT has become for many authors a treatment of choice with satisfactory results in more than eighty percent of patients (22,24). We observed a similar improvement in 83% of patients without significant side effects. In our study we observed a decrease in tendon microvasculature in group A subjects within one month of treatment with radial ESWT. This was associated with a significant decrease ($P < 0.0001$) in discomfort at rest and during ambulation (average VAS 1.04 at rest and 1.25 during ambulation), and allowed the majority of athletes to return to sports activity. No significant difference in pain was noted in group B subjects.

Conclusion:

This study was designed to demonstrate the changes of the microvasculature of the Achilles tendon in patients with chronic Achilles pain, before and after treatment with radial extracorporeal shock wave therapy (rESWT). Twelve athletes with chronic Achilles pain (group A) were compared with twelve athletes free of Achilles pain (group B), all of whom were of a similar age, sex, and weight. Each group received the same treatment protocol with radial ESWT. Clinical evaluation was undertaken prior to treatment and at one month and six months after treatment was terminated. The microvasculature of all 24 subjects was evaluated with Color Doppler echography both prior to treatment with radial ESWT and at one month and six months following treatment. In group A we observed greater microvasculature of the tendon than in group B. This hypervascularity was noted to have decreased when patients were evaluated one month after the treatment with radial ESWT. Clinically, 80% of patients of group A experienced absence of pain and were able to return to sports activity at one month after the end of the treatment with radial ESWT. No significant clinically adverse effects were noted in any subjects who received radial ESWT.