COMMENTARY

The optimal treatment of Achilles tendon rupture is evolving. Most investigators have favored operative over nonoperative repair, citing a lower rerupture rate balanced against a higher risk of complications such as infection, sural nerve injury, and scar contracture. Recent studies have suggested lower rerupture rates and superior outcomes in both operative and nonoperative treatments with early mobilization and weight bearing. In most of the previously published studies, nonoperatively treated patients were nonweight bearing and immobilized longer than patients in the surgical group. Nilsson-Helander et al compare the incidence of rerupture and the functional outcomes of acute Achilles tendon ruptures treated operatively and nonoperatively, but using an identical early mobilization rehabilitation protocol.

This methodologically well-designed randomized controlled study involved 97 patients presenting within 72 hours of injury. After being randomized to surgery or nonoperative treatment, both groups were placed in a gravity equinus short leg cast for 2 weeks, followed by 6 weeks in a range-of-motion walking boot. Weight bearing as tolerated was allowed at 6 weeks. At 8 weeks, the boot was removed and both groups began an identical supervised rehabilitation program. The authors concluded that the difference in the primary end point of rerupture (12% in the nonsurgical group and 4% in the surgical group) was not statistically significant, but the study was underpowered. As with previous studies, there was a higher incidence of complications in the operative group, including 1 deep infection, 1 Achilles tendon contracture requiring reoperation, and several sensation and scar complaints.

Patients were evaluated using validated outcome measures. There was no significant difference in the patients' own opinions about their symptoms and level of activity. Some strength and endurance tests were better at 6 months in the surgical group, but by 12 months, only 1 measure (heel-rise work) remained significantly higher in the surgical group.

The rates of rerupture found in this study are similar to a recent meta-analysis favoring surgical repair.[1] Although Nilsson-Helander et al used a protocol that involved early mobilization, weight bearing was delayed for 6 weeks. Several recent studies have advocated earlier weight bearing. A larger recent randomized controlled trial conducted by Willits et al[2] using earlier weight bearing at 2 weeks and more aggressive functional range-of-motion exercise found even lower rates of rerupture (operative group 2.8%, nonoperative group 4.2%).

Advances in nonoperative management, especially with regard to early mobilization and weight bearing, are yielding rerupture risk and functional outcomes that approach those found in surgical repair but without the risk of surgical complications. Thus, nonoperative treatment may become a more viable option. Larger multicenter trials using the same accelerated functional rehabilitation program in both surgical and nonsurgical groups will better clarify functional outcomes and the relative risk of rerupture.

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Shockwave Therapy for Chronic Proximal Hamstring Tendinopathy

Cacchio A, Rompe JD, Furia JP, et al. Shockwave therapy for the treatment of chronic proximal hamstring tendinopathy in professional athletes. *Am J Sports Med*. 2011;39:146–153.

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Objective: To compare the effectiveness of shockwave therapy with a traditional conservative treatment program for chronic proximal hamstring tendinopathy in professional athletes.

Design: Randomized controlled trial, with 12 months of follow-up. Sample size was calculated with 80% power to show a difference of 3 points on a visual analog scale (VAS, 0-10 points; "no pain" to "worst pain") at $P \leq 0.05$, adjusted for multiple comparisons.

Setting: Tertiary imaging and rehabilitation center in Sulmona, Italy, with enrollment between February 2004 and September 2006.

Participants: Patients with chronic proximal hamstring tendinopathy diagnosed by the presence of $\geq$2 of 3 positive clinical tests (the Puranen-Orava test, the fast hamstring-stretch test, or the hamstring strength test), a pain score of $\geq$4 cm on the VAS, and abnormalities in the proximal hamstring tendon on magnetic resonance imaging using a grading system devised for Achilles tendinopathy (Khan system) were eligible. Exclusion criteria were other clinical syndromes and conditions, including hamstring muscle tears or pain of presumed lumbar spine origin, age $\geq$18 years, and any treatment in the previous 4 weeks. Of 52 patients assessed for eligibility, 27 men and 13 women met criteria.

Intervention: The 20 patients in the shockwave therapy group were assigned to 4 sessions, once per week, of 2500 shocks per session at an energy flux density of 0.18 mJ/mm^2 directed to the area of maximal tenderness. Weight bearing and unrestricted range of motion were allowed immediately. No cointerventions except intermittent icing of the treated area were permitted. Patients were instructed to avoid activities that increased their symptoms. The patients in the traditional conservative treatment group were instructed to rest and to take 600-mg ibuprofen twice daily for the first week. For the first 2 weeks, they were assigned to physiotherapy consisting of daily ultrasound and transverse friction massage 3 times per week. This was followed by 3 weeks of stretching and strengthening work, including isotonic exercises, lunges, and jumps, performed 3 times per week.

Main Outcome Measures: The primary outcome measures 3 months after

treatment were a mean difference of ≥3 cm between groups in the reduction in pain scores on the self-rated VAS and a mean difference in improvement between groups on the Nirschl phase rating scale (NPRS, phases 1-7, least pain and activity limitation to constant pain at rest). Patients who had surgery (15%) were not evaluated subsequently.

Main Results: After 3 months, the mean reduction in pain scores was 5.0 cm for the shockwave therapy group compared with 0.2 cm for the traditional conservative treatment group (95% confidence interval [CI] for the difference of 4.7 cm, 1.3-7.2). The mean NPRS improved for the shockwave therapy group (5.1 at baseline to 1.8 at 3 months) but worsened slightly for the traditional conservative treatment group (5.3 at baseline to 5.5 at 3 months; 95% CI for the difference of 3.7, 1.4-4.8). After 12 months, 80% of the patients in the shockwave therapy group were rated much improved or completely recovered and 80% had returned to their preinjury level of sport participation (mean time to return, 9 weeks; range, 6-15 weeks) compared with none in the traditional conservative treatment group. Surgical intervention was more common in the traditional conservative treatment group than the shockwave therapy group (5 patients vs 1 patient).

Conclusions: Shockwave therapy for athletes with hamstring tendinopathy was more effective in reducing pain and accelerating return to sport than "traditional" conservative treatment. Improvements were evident 3 and 12 months after treatment.

COMMENTARY

Cacchio et al provide a limited but relatively well done and promising study regarding the use of shockwave therapy in the treatment of proximal hamstring tendinopathy. Many reports have identified the potential for benefit from shockwave therapy for a variety of tendinopathies, although the published literature is limited by study quality, sample size, issues of blinding and control interventions, length of follow-up, and wide variations in treatment protocols. The biological effect of shockwave therapy also remains elusive. Despite its promise, a recent review on shockwave therapy in Achilles tendinopathy concluded that it is "impossible to recommend a specific treatment protocol" based on the current literature.[1]

One of the major obstacles in studying the treatment of hamstring tendinopathies is the lack of an accepted definitive treatment. Various authors have reported the outcomes of local corticosteroid injections, surgery, and rehabilitation programs, particularly those emphasizing eccentric training. Despite some positive reports, there remains no consensus on treatment.[2,3]

The study by Cacchio et al attempts to shed some light into what can be a frustrating clinical arena. The authors clearly defined the diagnostic criteria for hamstring tendinopathy and for the exclusion of potentially overlapping syndromes. They also nicely detailed their protocol for treatment and reported 12-month follow-up data. Unfortunately, there are some limitations to this study. The participants in the control arm were assigned to relatively wide-ranging rehabilitation approaches. Although the source of the subjects and their prior treatment is not described, it seems highly likely that athletes with symptoms of hamstring tendinopathy for a year or more probably received some combination of the modalities, massage, stretching, and exercises that comprised the control arm intervention in this trial. If the participants had previously received these treatments, then the effect of the control intervention would be expected to be minimal, as it was. Shockwave therapy would be particularly amenable to the use of a sham treatment, as has been done by other investigators, which would allow for a truly double-blinded study.[1] Given the complexities of chronic pain, it also would have been useful to have information regarding psychosocial factors that might have been at play in the study group and to understand if there was any bias toward receiving the shockwave therapy among those enrolled in the study. Further discussion of the biological basis for potential benefit from shockwave therapy would also be helpful because a large percentage of the athletes returned to high-level function rather rapidly after treatment, which raises questions as to what exactly occurred to allow this.

Overall, the study adds to the literature that shows the potential for substantial benefit from shockwave therapy in the treatment of chronic tendinopathies. However, to further support its benefit and provide clearer recommendations on its use, large, well-designed, double-blind, randomized controlled trials are still needed.

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