Efficacy of extracorporeal shock wave treatment in calcaneal enthesis.

R Cosentino, P Falsetti, S Manca, R De Stefano, E Frati, B Frediani, F Baldi, E Selvi, R Marcolongo

Abstract

Objective—To evaluate the efficacy of extracorporeal shock wave treatment (ESWT) in calcaneal enthesis.

Methods—60 patients (43 women, 17 men) were examined who had talalgia associated with heel spur. A single blind randomised study was performed in which 30 patients underwent a regular treatment (group 1) and 30 a simulated one (shocks of 0 mJ/mm² energy were applied) (group 2). Variations in symptoms were evaluated by visual analogue scale (VAS). Variations in the grade of enthesitis were evaluated by sonography. Variations in the grade of enthesitis were evaluated by x-ray examination. Variations in the grade of enthesitis were evaluated by sonography.

Results—A significant decrease of VAS was seen in group 1. Examination by x-ray showed morphological modifications (reduction of the larger diameter >1 mm) of the enthesophytosis in nine (30%) patients. Sonography did not show significant changes in the grade of enthesitis just after the end of the treatment, but a significant reduction was seen after one month. In the control group no significant decrease of VAS was seen. No modification was observed by x-ray examination or sonography.

Conclusion—ESWT is safe and improves the symptoms of most patients with a painful heel, it can also structurally modify enthesophytosis, and reduce inflammatory oedema.

(Please note: the rest of the text is beyond the scope of this query.)
month from the end of the treatment (one radiologist carried out all the radiography and was not aware of the type of treatment being given to the patients). The modifications observed were classified as grade 1 (reduction in enthesophytosis <1 mm), grade 2 (reduction in enthesophytosis >1 mm).

Variations in the grade of enthesitis were evaluated by sonography on the heel before starting the treatment, just after the treatment, and one month later (one ultrasonographer carried out all the sonography and was not aware of the type of treatment being given to the patients). Ultrasound examinations were carried out with a Toshiba Tosbee Sal 240 with a linear 7.5 MHz probe and a kitechgo gel pad spacer where necessary. The following signs of enthesitis were considered: enthesophytosis, heterogeneous hypoechogenicity and swelling of enthesis, peritendinous oedema. The modifications observed were classified as grade 1: thickening of enthesis (<2 mm thicker than the contralateral asymptomatic side), heterogeneous hypoechogenicity of enthesis, and enthesophytosis; grade 2: thickening of enthesis (>2 mm thicker than the contralateral asymptomatic side), heterogeneous hypoechogenicity of enthesis, and enthesophytosis; grade 3: grade 2 with peritendinous oedema.

Pain levels were evaluated by a visual analogue scale (VAS), ranging from 0 = no pain to 10 = maximum pain, at rest, after walking on awakening, and after normal daily activity. Such assessment was made before, at the end of the treatment, and one and three months after the end of the treatment. The modifications observed were classified as excellent improvement (a VAS reduction of over 50%), good improvement (a VAS reduction of between 30% and 50%), slight improvement (a VAS reduction of between 15% and 30%).

STATISTICS
A non-parametric Mann-Whitney U test for two independent samples was applied to compare variations of means of VAS, changes of sonographic evaluations (grading of enthesitis), and variations of the larger diameter of spurs in treated patients compared with control patients. The non-parametric Wilcoxon test for
dependent samples was applied to compare means of VAS, changes of sonographic evaluations (grading of enthesitis), and variations of the larger diameter of spurs in the same group.

Results
In group 1 a significant decrease of VAS ($p<0.0001$) was seen just after the treatment and one and three months later at the three reference points—at rest, after walking on awakening, and after normal daily activity (fig 1). In the control group (group 2) no significant decrease of VAS ($p=0.47$) was seen at these points (fig 1).

Sonographic evaluation in groups 1 and 2 showed no significant changes in the grade of enthesitis just after the end of the treatment, though at one month after the end of the treatment a significant decrease was seen ($p<0.001$) in group 1. This reduction in the grade of enthesitis was seen in 12/30 (40%) patients in group 1, and no change was seen in 18/30 (60%) patients in this group. The decrease was significant ($p<0.01$) compared with the control group, where the grade of enthesitis was reduced in only 2/30 (7%) patients, worsened in 4/30 (13%), and was unchanged in 24/30 (80%) (fig 2).

Examination by x-ray showed reduction in enthesophytosis $>1$ mm of 9/30 (30%) patients and reduction in enthesophytosis $<1$ mm or no change in 21/30 (70%) patients. Radiological reduction of enthesophytosis 1 month after the end of treatment was significant in group 1 ($p<0.001$), but not significant ($p=0.068$) in comparison with the control group (fig 3).

No side effects were seen. A temporary, slight redness of the skin and a transient increase in pain levels were within the norm.

Discussion
High energy extracorporeal shock waves have been used in urology for the disintegration of stone concretion for almost 15 years. Valchanou reported the successful application of high energy shock waves in the treatment of pseudarthrosis and delayed union of fractures, stating that the stimulation of osteogenesis achieved by shock waves can be attributed to a local cortical destruction and fragmentation and that the same effect is assumed to lead to a disintegration of calcifications in the treatment of tendinosis calcarea. Since 1992, low energy ESWT has been used in the treatment of pain, in particular of enthesopathy, occurring in precisely locatable areas of the locomotor apparatus.

Loew and Jurgowski reported good results in calcifying tendinitis of the shoulder with low and high energy; Rompe et al suggested that the pain relief observed after ESWT at energy levels comparable with those used in our study might be similar to the hyperstimulation analgesia described by Melzack. The positive clinical outcome of low energy ESWT for chronic plantar fasciitis has been confirmed in clinical studies. Maier et al reported that low energy ESWT can be regarded as an optional non-invasive therapeutic method without major side effects which can be used to avoid surgical treatment in patients with chronic courses of plantar fasciitis associated with heel spurs. Perlick et al also have had good results in the treatment of chronic plantar fasciitis.

In our single blind randomised study we evaluated the efficacy of ESWT on painful heel with heel spurs and noted its effects on pain levels, on the inflammatory oedema, and on the dimension of the enthesophyisis. We also evaluated the placebo effect by comparing one group of patients who underwent treatment with another group in whom the treatment was simulated.

ESWT proved effective in reducing the painful symptoms, and the reduction in pain seen at the end of treatment was maintained over the following three months. Furthermore, it was noted that the inflammatory oedema, assessed by sonography, which did not appear modified to any significant extent at the end of the treatment, was reduced to a significant degree one month later. In 30% of cases we saw a reduction in the enthesophyisis $>1$ mm, though this reduction was not significant compared with the control group. In the control group, no significant changes in pain levels, in the inflammation oedema, or in the dimensions of the enthesophyisis were seen.
Our results confirm that the presence and size of bony spurs do not correlate with clinical symptoms and that ESWT can, in our opinion, be considered the best treatment for painful heel with heel spurs, owing to its lack of side effects and because it is a repeatable and non-invasive treatment without anaesthesia.

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