The effectiveness of extracorporeal shock wave therapy on chronic Achilles tendinopathy: a systematic review
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CRD summary
The review found satisfactory evidence for the effectiveness of low-energy Extracorporeal shock wave therapy in the treatment of chronic insertional and noninsertional Achilles tendinopathies at a minimum three months' follow-up. Uncertainty about the reliability of these conclusions was created by lack of meta-analysis (especially for RCTs), clinical variations between studies, small sample sizes and possible language bias.

Authors' objectives
To explore the effectiveness of Extracorporeal Shock Wave Therapy (ESWT) in the treatment of chronic insertional and noninsertional Achilles tendinopathy.

Searching
MEDLINE, EMBASE, SPORTDiscus, CINAHL and Cochrane Central Register of Controlled Trials (CENTRAL) were searched for relevant studies published in English. Search term were reported but not the search date. Reference lists of relevant studies articles were examined.

Study selection
Studies were eligible for inclusion if they investigated the effect of ESWT with or without control (any conservative or sham) treatment. Participants were adults aged 18 years and over with both insertional (which is close to the calcaneus) and/or noninsertional (which is found 2cm to 6cm proximal to the calcaneus) chronic achilles tendinopathy. Only studies published within the last ten years and with follow-up at least three months or more post-intervention were included.

Chronic Achilles tendinopathy was defined as a condition lasting for more than three months. Outcomes of interest were pain and foot/ankle or lower extremity function score. From the six included studies, two were noninsertional, one was insertional, two were both types and the final one did not specify the type of tendinopathy. The age of participants ranged from 35 and 69.5 years. The duration of symptoms ranged from three to 42 months. The dosage of ESWT ranged between 0.08 and 0.51 mJ/mm2 (reported in energy flux density) and impulses per session ranged from 1500 and 2500 impulses. The number of treatment sessions ranged from three to five. The time interval between treatments was one week to one month. Most studies examined ESWT as a single intervention apart from two studies which used analgesics, stretching and an eccentric loading training program as co-interventions.

Either Visual Analog Scale (VAS) or Numerical Rating Scale (NRS) was used for the pain scores. The scales used for measuring function were VISA-A (Victorian Institute of Sport Assessment–Achilles), Disability Rating Index/Functional Index for Lower Limb Injuries (FIL), American Orthopaedic Foot and Ankle Society (AOFAS) score, and Ankle Hindfoot Scale (AHS).

Two reviewers independently identified studies for eligibility. Any disagreements were resolved by consensus.

Assessment of study quality
The study quality was assessed using the PEDro scale for the randomised controlled trials (scored out of 10) and the Modified McMaster Quantitative Critical Appraisal Tool for non-randomised controlled trials (maximum score of 15). National Health and Medical Research Council (NHMRC) evidence Framework was used to assess the quality of evidence, clinical impact, consistency of findings, generalisability of the results and the recommendations. The level of evidence was rated as A (excellent), B (Good), C (satisfactory) and D (poor).

Two reviewers independently assessed study quality. Any differences were resolved by discussion until a consensus was reached.
Data extraction
Data extraction was undertaken by one author and checked by the second author. Data of population interventions, outcomes and the results of individual studies were extracted.

Methods of synthesis
The studies were combined in a narrative synthesis.

Results of the review
Six studies were included in the review; four randomised controlled trials (RCTs) and two pre-post studies (16 to 127 participants, 365 tendons). PEDro scores for RCTs ranged from 7 to 10. All studies reported random allocation, comparability at baseline, assessor blinding, adequate follow-up, and intention-to-treat analysis. Five studies reported allocation concealment. Therapists were not blinded in all studies and only two studies reported participant blinding. The quality assessment for two non-randomised controlled trials obtained the score of 9 and 11 out of 14. The overall level of evidence was rated ‘A’ for quality of evidence, ‘C’ for consistency, ‘C’ for clinical impact, ‘A’ for generalisability and ‘C’ for grades of recommendation. Follow-up period ranged from three months to 24 months.

Pain: Although there was a variation in the ESWT application parameter, four out of six studies reported statistically significant improvement with ESWT in pain scores (VAS or NRS) at a minimum of four months period.

Function: Four out of five studies reported statistically significant improvement in functional outcomes with ESWT.

Overall appraisal of evidence: There was an overall satisfactory (Grade C) level of evidence for the effectiveness of ESWT on pain and function. Despite inconsistencies in the inclusion criteria, type of tendinopathy and area of application, four out of six studies showed significant positive effect with ESWT.

Authors' conclusions
The review showed satisfactory evidence for the effectiveness of low-energy ESWT in the treatment of chronic insertional and noninsertional Achilles tendinopathies at a minimum three months’ follow-up. Therefore, ESWT may be considered before considering surgery if other conservative management fails.

CRD commentary
The review question and inclusion criteria were clear. Relevant sources were searched. Searches were restricted to papers in English and the authors acknowledged that the exclusion of two non-English studies may have resulted in language bias. Attempts were made to minimise reviewer errors and bias in the review process. Study quality was assessed using appropriate criteria and the overall level of evidence were satisfactory. Study details were reported but it would have been better to report the comparators of the interventions. A narrative synthesis was used for the synthesis but meta-analysis with sensitivity and subgroup analyses would have been more useful for the reader. Also out of four RCTs only two showed significant effects with ESWT compared with control.

The authors’ conclusions reflect the evidence presented, but uncertainty about the reliability of these conclusions was created by lack of meta-analysis (especially for RCTs), clinical variations between studies, small sample sizes and possible language bias.

Implications of the review for practice and research
Practice: The authors stated that due to improved pain and functional outcomes for a minimum of three months, ESWT may be considered before surgery if other conservative management fails.

Research: The authors stated that further research should look at the long-term effect of the treatment and a clear dose-effect relationship by comparing high-intensity ESWT with low-intensity ESWT. Also future research should explore the effect of ESWT on the different age groups, as well as duration and severity of symptoms.

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.