Exposure to low amounts of ultrasound energy does not improve soft tissue shoulder pathology: a systematic review


CRD summary
The review concluded that further research was needed to determine whether beneficial effects of ultrasound were associated with certain shoulder pathologies or ultrasound protocols. The review was generally well conducted and the authors' conclusions appear appropriate, although the potential for publication and language bias should be borne in mind.

Authors' objectives
To determine whether the beneficial effects of ultrasound were associated with certain shoulder pathologies or ultrasound protocols.

Searching
CINAHL, Cochrane Central Register of Controlled Trials (CENTRAL), EMBASE and MEDLINE were searched from inception to April 2008 for published English-language studies. Search terms were provided. Reference lists of retrieved articles were searched for relevant studies.

Study selection
Randomised controlled trials (RCTs) of therapeutic ultrasound (pulsed or continuous) in adult patients (minimum age 18 years) with soft tissue shoulder injury (acute or chronic) who were experiencing shoulder pain were eligible for inclusion. Trials had to provide outcomes on pain, muscle strength, range of motion, function impairment or disability measures. Trials were excluded if they included patients with fracture, dislocation, neurological involvement, rheumatism, autoimmune conditions, osteoarthritis, surgery or trigger points. Trials were excluded if they employed diagnostic ultrasound, iontophoresis, did not provide sufficient data to calculate spatial average-temporal average (SATA) or total energy and if they provided outcomes that were the examiner's impression of change.

Included trials assessed both pulsed and continuous therapeutic ultrasound with a total energy that ranged from 181J to 8151J. The average number of treatments ranging from six to 39 sessions. Comparators included mobilisation, exercise, massage and non-steroidal anti-inflammatory drugs (NSAIDs) delivered individually or as multiple concurrent treatments. Patients were treated for various soft tissue shoulder pathologies (such as calcific tendinitis, supraspinatus tendinitis and bursitis). Duration of symptoms of the conditions, where reported, ranged up to more than 12 months. Outcomes assessed included pain, calcium deposits, range of motion, function and disability.

Pairs of authors independently performed study selection. Pair consensus was needed for inclusion in the review.

Assessment of study quality
The Physiotherapy Evidence Database (PEDro) scale was used for quality assessment (10-point checklist providing a score out of 10). Three authors independently assessed study quality.

Data extraction
Data were extracted on key ultrasound parameters and used to calculate SATA, energy density per treatment, total energy delivered during a single session and total exposure to ultrasound over the study duration.

The authors did not state how many reviewers performed data extraction.

Methods of synthesis
A narrative synthesis was undertaken. Studies were grouped by whether they found ultrasound to be beneficial or equivalent to control. Ultrasound was considered beneficial when a statistically significant improvement was reported in
one or more of the chosen outcome measures.

Results of the review
A total of eight RCTs were included in the review (n=586 participants). Study quality was variable, with PEDro scores from 4 to 10 (mean 8).

Ultrasound was considered beneficial in three RCTs (n=121) with statistically significantly reductions compared to control groups for pain and calcium deposits (two RCTs) and significant improvements in function (one RCT). Average total energy per session in these studies was 4,228J (range 2,250 to 6,114). Average total exposure to ultrasound was 5.3 hours (range 1.2 to 10.3 hours). Over the total duration of the RCTs, total ultrasound energy exposure was 107,289J (range 51,840 to 216,028).

Ultrasound was found to be equivalent to control in five RCTs (n=464). There were no differences between groups for pain (five RCTs), calcium deposits (one RCT), range of motion (one RCT) and function/disability (five RCTs). Average total energy per session in these studies was 2,019J (range 181 to 4,095). Average total exposure to ultrasound was 1.3 hours (range 0.5 to 2.5). Over the total duration of the RCTs, total ultrasound energy exposure was 20,394J (range 1,085 to 67,500).

Authors' conclusions
Determining whether therapeutic ultrasound can affect soft tissue shoulder pathology would require further research.

CRD commentary
Inclusion criteria for the review were clearly defined. Several relevant databases were searched. Only published articles were eligible for inclusion and publication bias was not assessed. There was a risk of language bias as only English-language articles were included. Study selection and quality assessment were performed by pairs of reviewers, which should have minimised bias and errors. Study quality assessment was based on a validated checklist, which indicated variable quality of the included studies. A narrative synthesis was undertaken, which was appropriate given the disparity in the included studies. The review was generally well conducted and the authors' conclusions appear appropriate, although potential for publication and language biases should be borne in mind.

Implications of the review for practice and research
 Practice: The authors did not state any implications for practice.

Research: The authors stated that further research was needed that must focus on selecting optimum ultrasound treatment parameters that delivered more than 720J (perhaps closer to 4,228J) of energy per session and treatments schedules that exposed tissues to ultrasound energy for a sufficient period of time (ideally >5 hours). Future research should report sufficient detail of ultrasound protocols to enable critical evaluation, create more homogeneous treatment groups with respect to diagnosis and duration of the disorder, endeavour to eliminate (where ethically possible) use of similar modalities and standardise outcome measures.

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