National Council for NCOR Osteopathic Research

Snapshot Summary

Effectiveness of ultrasound therapy for the treatment of soft tissue injuries

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Summary of key points

There is a lack of sufficient high quality evidence of clinical benefit to support a recommendation for the use of ultrasound as a treatment for low back pain or sciatica and or peripheral joints.

The only evidence of benefit was of low quality and based on small patient numbers; for the majority of outcomes no benefit was seen.

Given the low quality evidence reviewed, a large scale definitive trial is needed.

Context

This article is intended to give a brief overview of predominantly manual therapy and osteopathic-relevant research, with references provided for further reading. It is not intended to be an exhaustive account of the literature.

Background

Therapeutic ultrasound has traditionally been used in physical therapy since it was introduced around the 1940s after laboratory studies and studies with animals. The emerging animal models indicated some relationship between ultrasound waves and the inflammatory processes that are involved in tissue repair and healing (Speed 2001).

Therapeutic ultrasound involves the administration of high frequency sound waves to the site of injury. The soundwaves are created by a piezoelectric device and delivered through a probe applied to the skin. The sound waves penetrate the tissues at varying depths, depending on the frequency used. Delivered continuously it has a heating effect on the tissues which is thought to generate improved blood flow and facilitate the inflammatory process and tissue healing. When delivered as a pulse it is not thought to have a significant thermal effect but is thought to create small mechanical vibrations / pressure that encourage fluid flow in the tissues exposed to the sound waves (Speed 2001).

Therapeutic ultrasound has traditionally been used on muscles, tendons, bursae and ligaments to encourage soft–tissue repair, and has also been used on bone to encourage fracture repair. The aim is to reduce pain, swelling, inflammation and promote faster healing.

The evidence of benefit has been debated due to weaknesses in research methodology such as small sample sizes, inadequate blinding and randomisation, the nature and type of injuries investigated, the calibration of the machines and the protocol for delivery of the ultrasound waves.

Aim

To conduct a rapid review of the literature to assess the effectiveness of ultrasound therapy for the treatment of soft tissue injury and pain.

Method

A scoping search of the literature indicated an overwhelming amount of articles on ultrasound therapy. The search was therefore restricted to systematic reviews (specifically Cochrane reviews) and NICE guidance, both of which undergo a rigorous quality appraisal process and review.

We searched the Cochrane database of reviews since its inception and reviewed NICE guidance. One reviewer extracted data and summarised the findings.

Results

We found five Cochrane reviews testing the effectiveness of ultrasound therapy for chronic low back pain, carpal tunnel, acute hamstring tendonitis, osteoarthritis of the hip and knee and rheumatoid arthritis. The 2009 NICE guidance gave specific recommendations about ultrasound as did the updated 2016 guidelines for low back pain. Table 1 summarises the reviews and range of studies, it shows that the quality of evidence is generally low to moderate therefore our confidence in the findings is reduced as the data may be due to chance findings and biases inherent in study designs, skewing the results. Despite the methodological limitations of the studies (low quality) the results

consistently indicate no beneficial effects of ultrasound when compared to sham, usual care and/or other treatments.

Table 1. Summary of reviews and guidelines for therapeutic ultrasound

Condition	Year	Number of studies	Outcomes and Results	Level of evidence
Therapeutic ultrasound for osteoarthritis (OA) of the knee and hip	Rutjes *et al.,* 2010	5 Randomised Controlled Trials (RCTs) including 341 patients with knee OA patients, and 0 patients with hip OA	Pain -1.2 cm on VAS (95% CI -1.9 to 0.6cm) Function WOMAC score -1.3 units (95% CI -3.to 0.3) No adverse events	Knee pain only. Low quality uncertain favourable evidence
Therapeutic ultrasound (US) for chronic low back pain (CLBP)	Ebadi S *et al.,* 2014	7 RCTs 362 patients with CLBP	Back specific function. Short term: Standardised Mean Difference (SMD)-0.45 (95% CI -0.84 to -0-05) Pain: US vs placebo SMD -7.12 (95% CI -17.99 to 3.75) Pain: US vs exercise SMD -2.16 (95% CI -4.66 to 0.34) Function: US vs exercise SMD -0.41 (95% CI -3.14 to 2.32)	Moderate quality evidence for small improvement in back specific function. Low quality evidence showing US no better than placebo for pain in the short term Low quality evidence showing US no better than exercise for pain
Therapeutic ultrasound (US) for carpal tunnel syndrome	Page *et al.,* 2013	11 RCTs including 414 participants	No meta-analyses conducted	Poor quality evidence from limited data to show that US is more effective than placebo
Therapeutic ultrasound (US) for acute ankle sprains	van den Bekerom *et al.,* 2011	6 RCTs including 606 participants	0 / 5 RCTs testing US vs sham US showed any benefit on any outcome at 1-4 weeks. Improvement score 1.04 (95% CI 0.92 to 1.17)	Moderate quality evidence does not indicate the statistical or clinical effectiveness of US.
Therapeutic ultrasound (US) for the treatment of rheumatoid arthritis	Casimiro *et al.,* 2002	2 RCTs including 80 participants	US alone to dorsal and palmar aspects of the hand increased grip strength: weighted mean difference (WMD) 28.07 (95% CI 13.37 to 42.77), wrist dorsal flexion WMD 1.02 (95% CI 0.45 to 1.95), number of swollen joints WMD	Poor quality trials showed that US as an adjunctive therapy did not benefit patients. Poor quality evidence showing US alone had small beneficial effects on

			1.02 (95% CI 0.45 to 1.59), number of painful joints WMD 1.20 (95% CI 0.45 to 1.95). No other statistics showed any benefit.	function and a reduction in the number of swollen and painful joints
Non-pharmacological therapy for low back pain (Low back pain CG88)	NICE guidance 2009	Updated see below	Updated see below	Guidance: Do not offer US for the treatment of low back
Low back pain and sciatica in over 16s: assessment and management (NG59)	NICE guidance 2016	4 RCTs US vs Sham 1 RCT US vs usual care 2 RCTs US vs other treatments	Little or no clinically meaningful difference reported (except for pain in one low quality study)	Guidance: Do not offer ultrasound for managing low back pain with or without sciatica

Discussion

Poor methodology of the research hampers definitive conclusions. Interestingly NICE guidance strongly recommends clinicians NOT to offer ultrasound to patients with low back pain as it has little overall clinical benefit.

However the Cochrane reviews make less strong recommendations and suggest that there is a need for further investigation especially testing dose, intensity and exposure to ultrasound for different conditions.

Extracorporeal Shock Wave Therapy (ESWT) is the 'next generation ultrasound';its mechanism of action is not completely clear and the evidence for it is still emerging. A Cochrane review of ESWT for lateral elbow pain found nine trials including 1006 participants who had either ESWT or a placebo. They found the highest, consistent level of evidence from high quality trials that showed no significant benefit of ESWT for pain and function (Buchbinder *et al*., 2005).

Conclusions

Despite the historical widespread use of ultrasound and now the prevaling acknowledgement of its limited clinical utility for soft-tissue repair, there is a lack of high quality of evidence to confirm this conclusively. However, the research findings indicate fairly consistent indications of little or no benefit of ultrasound over sham, placebo or other modes of treatment for pain and function.

References

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