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# Low intensity pulsed ultrasonography for fractures: systematic review of randomised controlled trials

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**STUDY QUESTION** What is the efficacy of low intensity pulsed ultrasonography for fracture healing?

**SUMMARY ANSWER** Evidence for the effect of low intensity pulsed ultrasonography on healing of fractures is moderate to very low in quality and provides conflicting results. Although overall results are promising, establishing the role of low intensity pulsed ultrasonography in the management of fractures requires large, blinded trials directly addressing outcomes that are important to patients, such as return to function.

## Selection criteria for studies

We identified clinical trials that randomly allocated patients with any form of bone fracture to low intensity pulsed ultrasonography or a control, by an electronic literature search without language restrictions of CINAHL, Embase, Medline, HealthSTAR, and the Cochrane Central Registry of Controlled Trials, from inception of the database to 10 September 2008. All outcomes were included.

## Primary outcome(s)

We focused on patient important outcomes, in particular functional recovery.

## Main results and role of chance

We included 13 randomised trials in the analysis, five of which assessed outcomes of importance to patients (table). Moderate quality evidence from one trial showed no effect of low intensity pulsed ultrasonography on functional recovery from conservatively managed fresh clavicle fractures; whereas low quality evidence from three trials suggested benefit in non-operatively managed fresh fractures (faster radiographic healing, mean reduction in healing time 36.9%, 95% confidence interval 25.6% to 46.0%). A single trial provided moderate quality evidence suggesting no effect on return to function among non-operatively treated stress fractures. Three trials provided very low quality evidence for accelerated functional improvement after distraction osteogenesis (results not shown). One trial provided low quality evidence for a benefit in accelerating healing of established non-unions managed with bone graft. Four trials provided low quality evidence for acceleration of healing of operatively managed fresh fractures.

## Bias, confounding, and other reasons for caution

The trials in our analysis had methodological limitations including lack of blinding of all relevant parties and substantial loss to follow-up in some trials. Results were sometimes inconsistent across trials, and most studies used surrogate end points; larger effects were typically

## EFFECTS OF ULTRASONOGRAPHY ON FRACTURE HEALING

No of studies, patients	Size of effect (95% CI)	Overall quality
<b>Non-operatively managed fresh fractures</b>		
1 trial, 101 patients	1.40 days (-0.56 to 3.36) faster return to function	⊕⊕⊕○ Moderate
3 trials, 158 patients	36.9% (25.6% to 46.0%) reduction in healing time*	⊕⊕⊕○ Low
<b>Non-operatively treated stress fractures</b>		
1 trial, 26 patients	0.4 days (-13.1 to 13.9) faster return to active duty	⊕⊕⊕○ Moderate
<b>Operatively managed non-union</b>		
1 trial, 21 patients	40.4% (30.8% to 48.7%) reduction in healing time*	⊕⊕⊕○ Low
<b>Operatively managed fresh fractures</b>		
2 trials, 61 patients	3.4 weeks (-2.1 to 8.9) faster return to full weight bearing	⊕⊕⊕○ Low
2 trials, 61 patients	16.6% (-76.8% to 60.7%) reduction in healing time*	⊕○○○ Very low

\*Evidence from surrogate measure only (radiographic healing)

reported for surrogates compared with direct measures of function. Concerns about publication bias arose from the limited number of small trials, and the inconsistent reporting of outcomes across trials raises the possibility of selective reporting bias, although we did not rate down the evidence for publication bias or selective reporting bias. The strength of inference is therefore limited.

## Study funding/potential competing interests

JWB, MB, and GHG are currently involved in a multicentre, randomised controlled trial that has received partial funding from Smith and Nephew, the company that manufactures the Exogen ultrasound device that was used in many of the studies. GHG and HJS are members of the GRADE working group.

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