Randomized controlled trials of acupuncture for neck pain: systematic review and meta-analysis
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CRD summary
The authors concluded that acupuncture was effective in reducing short-term neck pain, but the effect on long-term pain and disability was not proven. The authors' conclusions appeared to be supported by the evidence, but potential publication bias and the small number of patients in most trials may weaken the strength of the conclusions.

Authors' objectives
To assess the effectiveness of acupuncture in the treatment of neck pain.

Searching
MEDLINE, EBSCO, CINAHL and Cochrane Central Register of Controlled Trials (CENTRAL) were searched from inception up to January 2008 for articles written or translated into English. Search terms were reported.

Study selection
Randomised controlled trials (RCTs) were eligible for inclusion if they investigated the impact of traditional or electro-acupuncture on neck pain in participants with neck pain lasting one month or more. Trials that only compared different types of acupuncture to one another were excluded. Trials where neck pain was not the main symptom, or where there was pain at multiple sites, some of which did not radiate from the neck, were also excluded. The primary review outcome was short-term pain reduction.

Included trials compared acupuncture with: sham acupuncture, sham transcutaneous electrical nerve stimulation (TENS), sham laser therapy, physical therapy, massage, waiting list, non-steroidal anti-inflammatory drugs and routine care. The duration of acupuncture ranged from single session to 14 sessions. The duration of neck pain in patients ranged from one month to two years. Trials differed as to whether radiculopathy was part of their inclusion or exclusion criteria. Outcomes included in the review were short-term (less than three months) and long-term pain reduction, range of motion, short-term disability improvement and cervical radiculopathy.

The authors did not state how the studies were selected for the review.

Assessment of study quality
The methodological quality of the included trials was assessed using a modified version of the Jadad scale, which assessed randomisation, blinding and withdrawals/drop-outs. The maximum score was 5 points, with trials scoring 3 or more deemed high quality.

Two reviewers independently assessed the quality of the included studies.

Data extraction
Data from continuous outcomes were extracted and used to calculate mean differences between pre- and post-intervention scores or mean changes in outcomes. For dichotomous data, the number of participants with an event in each group was extracted and used to calculate odds ratios (OR) with 95% confidence intervals (CI).

Data were extracted independently by two reviewers using predesigned forms. Disagreements were resolved by consensus.

Methods of synthesis
Continuous data were pooled using standardised mean differences (SMD) with 95% confidence intervals. Dichotomous
data were pooled using odds ratios with 95% confidence intervals. Separate analyses were carried out for each outcome and comparing acupuncture to different control conditions. A random-effects model was used for the meta-analyses. Trials with extreme effect sizes were excluded from the meta-analysis. Meta-analyses were only conducted in the absence of significant statistical heterogeneity. Statistical heterogeneity was assessed using the $\chi^2$ and the $I^2$ statistics. Statistical heterogeneity was set at $p<0.05$.

**Results of the review**
Fourteen RCTs were included for review ($n=4,249$ participants); twelve parallel design trials ($n=4,148$ participants) and two cross-over design trials ($n=101$ participants). One RCT with 3,541 participants accounted for 83% of the total number of participants; in other RCTs treatment group size ranged from 6 to 70 participants. Two RCTs were excluded from the review as they were not written in English, however data from the English abstract were used in one of the analyses (number of participants not reported). Two RCTs scored 5 points on the Jadad, nine scored 3 or 4 points, and three scored 2 points.

Acupuncture significantly reduced short-term pain compared to control conditions when measured using continuous data ($SMD=-0.45$, 95% CI -0.69 to -0.22; five RCTs) or dichotomous data ($OR=26.3$, 95% CI 4.9 to 140.2; two RCTs). There was no evidence of significant statistical heterogeneity. There was not a statistically significant difference in long-term pain reduction between acupuncture and control conditions.

Subgroup analyses found that acupuncture significantly reduced pain compared to sham acupuncture ($p=0.012$; three RCTs, $n=109$ participants), sham TENS ($p=0.046$; two RCTs) and sham laser ($p=0.019$; two RCTs, $n=249$ participants). There was evidence of moderate statistical heterogeneity for acupuncture versus sham laser ($I^2=48.8\%$) but not for the other analyses. Acupuncture significantly improved range of motion ($SMD=0.42$, 95% CI 0.19 to 0.65; two RCTs) and radiculopathy ($OR=6.5$, 95% CI 2.6 to 16.6; one RCT and two abstracts) but not disability. Heterogeneity was moderate for radiculopathy ($I^2=60.6\%$) but small to non-existent for range of motion and disability.

**Authors' conclusions**
Acupuncture was effective in reducing short-term neck pain; however the effect on long-term pain and disability was not proven.

**CRD commentary**
The review addressed a clear question with well-defined inclusion criteria. Several relevant databases were searched. Restricting the search to English language articles introduced the risk of language bias. Also, language restrictions and the failure to search any Chinese databases meant that relevant data may have been missed. No attempts appear to have been made to identify unpublished material and publication bias was not assessed, so it could not be ruled out. Appropriate steps were taken in the data extraction and validity assessment processes to minimise the risk of reviewer error and bias. However, it was unclear whether similar steps were taken in the study selection process, so there was a risk of reviewer error and bias. In addition, two trials that did not meet the review inclusion criteria were subsequently included in one analysis, with no information on trial characteristics or validity reported. Appropriate steps were taken to pool the results. Statistical heterogeneity was assessed and was present in two of the secondary outcomes. The number of trials and participants was small for many of the analyses.

The authors' conclusions appeared to be supported by the evidence, but potential publication bias and the small number of patients in most trials may weaken the strength of the conclusions.

**Implications of the review for practice and research**

**Practice:** The authors did not state any implications for practice.

**Research:** The authors stated that further high quality RCTs are needed evaluating the long-term impact of acupuncture on neck pain and functional improvement.

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