Does acupuncture improve motor recovery after stroke: a meta-analysis of randomized controlled trials

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Authors' objectives
To assess the efficacy of acupuncture with and without stroke rehabilitation for post-stroke paralysis.

Searching
MEDLINE (from 1966 to March 2001), CINAHL (from 1982 to March 2001), PubMed (to March 2001), EMBASE (from 1980 to December 2000) and the Cochrane Controlled Trials Register (Issue 1, 2001) were searched for publications in English. In addition, the Nanjing Traditional Chinese Medicine University Center for China's Traditional Chinese Medicine Database (from 1981 to January 2000) and the JiangSu Provincial Science and Technology Information Research Institute Database (from 1989 to December 1999) were searched for Chinese publications. The keywords used were stated. Manual searches of Chinese Acupuncture and Moxibustion (from 1981 to December 2000), Journal of Shanghai Acupuncture and Moxibustion (from 1983 to December 2000), the reference lists in identified studies and reviews, and proceedings of acupuncture conferences in China, were also conducted.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) were eligible for inclusion.

Specific interventions included in the review
Studies that compared any type of acupuncture with no acupuncture or sham acupuncture were eligible for inclusion. The included studies used conventional stroke rehabilitation with and without acupuncture, and conventional care with and without acupuncture. Acupuncture was performed electrically and/or manually, and real or sham acupuncture was used. Acupuncture was started within 36 hours to within 90 days of the stroke. The acupuncture points and acupuncture method varied considerably. The duration of acupuncture, where stated, ranged from 4 to 10 weeks.

Participants included in the review
Studies of patients who had had a stroke (cerebral infarction, intracerebral haemorrhage, cerebral embolism, or unclassified) less than 6 months ago were eligible if the stroke had been diagnosed clinically and/or by computed tomography (CT) or magnetic resonance imaging (MRI). Studies that met the other inclusion criteria, but included a mixed group of patients who had had a stroke less than 6 months ago and more than 6 months ago, were included in a subgroup analysis. The included studies were of patients with a first or recurrent stroke and patients with moderate to severe stroke.

Outcomes assessed in the review
Studies that assessed motor impairment or motor disability, using either internationally recognised measures or measures recognised by an academic body in China, were eligible for inclusion. The eligible measures were listed in the text of the review.

How were decisions on the relevance of primary studies made?
Two reviewers independently selected the studies for inclusion and resolved any disagreements through discussion.

Assessment of study quality
Validity was assessed using the Jadad scale, which considers randomisation, blinding and withdrawals. In addition, the following individual validity items were assessed: concealment of treatment allocation, assessor blinding, intention-to-treat analysis, drop-outs and sample size. Two reviewers independently extracted the data and resolved any disagreements through discussion.
Data extraction
Two reviewers independently assessed validity and resolved any disagreements through discussion. Data were extracted on the study characteristics, patient characteristics and outcomes. Where more than one eligible outcome measure was reported, data on the most widely used measure were used. The effect sizes were estimated for continuous outcomes (details of the methods used to deal with different data were given).

Methods of synthesis
How were the studies combined?
The studies were grouped according to the interventions compared: conventional stroke rehabilitation with and without acupuncture; and conventional care with and without acupuncture. The characteristics of the included studies were summarised in the text of the review. Differences in the effect sizes for continuous data were pooled using fixed-effect and random-effects models for motor recovery and disability. The odds ratio (OR) and 95% confidence interval (CI) were estimated for dichotomous outcomes of motor recovery and for disability separately. Random-effects (DerSimonian and Laird) and fixed-effect (Mantel-Haenszel) models were used to generate a pooled OR and 95% CIs. Data from studies in which patients had had a stroke more than 6 months before (or unreported timing) were analysed separately. The pooled effect size between real acupuncture plus conventional stroke rehabilitation, compared with sham acupuncture plus conventional stroke rehabilitation, was also calculated. The possibility of publication bias for the comparison of conventional care with and without acupuncture was explored using a funnel plot.

How were differences between studies investigated?
Statistical heterogeneity was assessed using the chi-squared statistic, where a P-value of less than or equal to 0.1 indicated heterogeneity. The influence of each study was assessed by repeating the analysis after omitting each study in turn. A subgroup analysis was used to assess the influence of study quality (sample size of less than 50 versus at least 50, details of randomisation, assessor blinding) on the results.

Results of the review
Fourteen RCTs (1,213 patients) were included in the main analyses of patients with stroke less than 6 months prior. Eight RCTs (924 patients) enrolling patients greater than 6 months’ post-stroke or where the timing of the stroke was not reported were also included.

Acupuncture plus conventional stroke rehabilitation compared with conventional stroke rehabilitation alone (8 RCTs).
The RCTs were of reasonably good quality. Three RCTs reported concealment of treatment allocation, intention-to-treat (ITT) analysis, drop-outs and death. Three RCTs that did not report ITT analysis did report drop-outs and death, but it was unclear which patients were included in the analysis. In two RCTs all of the outcomes were assessed blindly.

There was no significant difference in motor recovery between acupuncture plus conventional stroke rehabilitation and conventional stroke rehabilitation alone. The pooled effect size (random-effects model) was 0.06 (95% CI: -0.12, 0.24). No significant heterogeneity was detected (P=0.19).

Acupuncture plus conventional stroke rehabilitation significantly improved disability in comparison with conventional stroke rehabilitation; the pooled effect size was 0.49 (95% CI: 0.03, 0.96). This translated into a small difference in the Barthel Index (BI) of 2.6 points. Significant heterogeneity was detected (P=0.05).

The sensitivity analysis showed that omitting either one of two RCTs led to the difference in disability being statistically insignificant. The subgroup analysis found that the difference in disability between acupuncture plus conventional stroke rehabilitation and conventional stroke rehabilitation alone was only significant in studies with inadequate randomisation and studies without assessor blinding. The results were reported in the review.

Acupuncture plus conventional care compared with conventional care alone (6 RCTs).
The RCTs were generally of poor quality. None of the RCTs reported concealment of treatment allocation or ITT analysis. None of the RCTs were outcome assessor blinded. There was no significant difference in motor recovery between acupuncture plus conventional care and conventional care alone for patients with stroke less than 6 months.
prior, but acupuncture significantly improved motor recovery in patients with stroke greater than 6 months before. The pooled effects size was 0.46 (95% CI: -0.20, 1.12) for stroke less than 6 months ago and 1.01 (95% CI: 0.79, 1.22) for stroke greater than 6 months ago (or timing unreported).

Acupuncture plus conventional care significantly improved disability in comparison with conventional care, both in patients less than 6 months post-stroke and in those greater than 6 months post-stroke. The pooled effects sizes were 12.5 (95% CI: 4.3, 36.2) and 8.9 (95% CI: 3.5, 22.3) for stroke less than 6 months ago and greater than 6 months ago (or timing unreported), respectively.

There was no significant difference between real acupuncture plus conventional stroke rehabilitation and sham acupuncture plus conventional stroke rehabilitation for either motor recovery or disability. The pooled effect size was -0.06 (95% CI: -1.24, 1.12) for motor recovery (2 RCTs) and 0.07 (95% CI: -0.34, 0.48) for disability (2 RCTs).

There was no evidence of publication bias (7 RCTs, P=0.10 for slope of regression line).

**Authors' conclusions**

The addition of acupuncture to stroke rehabilitation had no further effect on motor recovery, while the small positive effect it had on disability might have been due to a placebo effect and study quality. The poor quality of the studies comparing acupuncture plus conventional care with conventional care alone meant that the efficacy of acupuncture without stroke rehabilitation could not be adequately assessed.

**CRD commentary**

This was a well-conducted and clearly presented review in which the review question was clear in terms of the study design, intervention, participants and outcomes. Several relevant sources were searched, the search terms were stated, studies published in English or Chinese were eligible, and attempts were made to locate unpublished studies. Two reviewers independently selected the studies and extracted the data, which reduced the potential for bias and errors. Validity was assessed using validated criteria and the results were tabulated together with other relevant information on the included studies. The characteristics of the included studies were adequately summarised in the text. The studies were appropriately combined in a meta-analysis and statistical heterogeneity was assessed. Subgroup analyses were used to explore the influence of individual validity items, while sensitivity analyses were used to explore the influence of other study characteristics. The evidence presented appears to support the authors' conclusions.

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

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

Research: The authors state that well-designed RCTs are required to compare acupuncture with no acupuncture in settings where stroke rehabilitation is unavailable.

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