Rheumatology 1999;38:143–147

A systematic review of randomized controlled trials of acupuncture for neck pain

A. R. White and E. Ernst

Department of Complementary Medicine, School of Postgraduate Medicine and Health Sciences, University of Exeter, 25 Victoria Park Road, Exeter EX2 4NT, UK

Abstract

Objective. To establish whether there is evidence for or against the efficacy of acupuncture in the treatment of neck pain.

Methods. A systematic literature review was undertaken of studies that compared needle or laser acupuncture with a control procedure for the treatment of neck pain. Two reviewers independently extracted data concerning study methods, quality and outcome.

Results. Overall, the outcomes of 14 randomized controlled trials were equally balanced between positive and negative. Acupuncture was superior to waiting-list in one study, and either equal or superior to physiotherapy in three studies. Needle acupuncture was not superior to indistinguishable sham control in four out of five studies. Of the eight high-quality trials, five were negative.

Conclusions. In conclusion, the hypothesis that acupuncture is efficacious in the treatment of neck pain is not based on the available evidence from sound clinical trials. Further studies are justified.

KEY WORDS: Acupuncture, Lasers, Neck pain, Spinal diseases, Randomized controlled trial, Systematic review.

Neck pain is a common condition. Bovim *et al*. [1] found that 34% of a sample of 10 000 adults had experienced neck pain in the previous year. The prevalence increases with age and is higher in women than in men. Neck pain may be responsible for as many days lost from work as back pain, depending on the setting; for example, Kvarnstrom [2] reported that back and neck pain in a Swedish manufacturing industry were each responsible for sickness absence of 1.5% of the total work time available. Neck pain frequently becomes chronic: troublesome neck pain of more than 6 months duration was reported by 10% of males and 17% of females [1].

Neck pain is frequently treated by physical therapies such as exercise, traction, acupuncture, heat and cold therapies, and electrotherapies. The effectiveness of physical treatments of neck pain is controversial. One review of physical treatments concluded that 'there is little information available from clinical trials to support many of the treatments for mechanical neck pain' [3]. However, this review was limited to reports published between 1985 and 1993.

Acupuncture is commonly used for neck pain. A survey of acupuncturists in the UK [4] found that 26% of their patients presented with musculoskeletal disorders other than back pain, a substantial number of whom would have suffered from neck pain. Acupuncture may be an effective treatment for neck pain; one uncontrolled cohort study found that 68% of 60 patients suffering from 'cervicobrachial' syndrome displayed a good response to a course of acupuncture and 33% still rated themselves as 'improved' at follow-up 6 months later [5]. Two meta-analyses of acupuncture treatment for pain have not considered neck pain separately from other painful conditions [6, 7]. Patel *et al*. [6] found that the combined outcome of six studies of head and neck pain showed acupuncture to be superior to various control interventions; Ter Riet *et al*. [7] concluded that the efficacy of acupuncture in the treatment of chronic pain remains doubtful.

In view of the importance of the subject matter and the absence of a comprehensive review of acupuncture for neck pain, we undertook a review with the aim of summarizing the existing evidence for or against the hypothesis that acupuncture is an efficacious therapy for neck pain.

Method

Data sources

Searches were performed in January 1998 for controlled trials of acupuncture for neck pain, using Medline (1966–97), Embase (1974–97), The Cochrane Library

Submitted 27 July 1998; revised version accepted 1 October 1998.
Correspondence to: A. R. White.

(Issue 1, 1998), and CISCOM (December 1997), a database specializing in complementary medicine including much of the 'grey literature'. Search terms used were neck pain, cervical, cervicogenic, osteoarthritis, acupuncture and controlled trial. In addition, our own extensive files were searched, including all reviews of acupuncture treatment for pain. Original articles were obtained, and all reference lists were scanned for further relevant articles.

Study selection

All articles were included which reported a randomized controlled trial in which subjects with neck pain were allocated at random to receive either acupuncture or any control procedure. Either needle acupuncture, electroacupuncture or laser acupuncture was permissible. No language restrictions were applied. Studies in which two different forms of acupuncture were compared were excluded, as were those in which no data or statistical comparison were reported. Studies of subjects with headache, even if possibly of nuchal origin, were excluded. Studies which included subjects with either neck or back pain were included, but not those with pain in multiple sites.

Data extraction

Data were extracted independently by both authors using a specially prepared form. All differences were settled by discussion. For each study, trial design, randomization, blinding and handling of drop-outs were recorded, in addition to inclusion and exclusion criteria, details of treatment and control procedures, main outcome measure and study result. The initial protocol for this review anticipated that results from several studies could be combined in a meta-analysis, but this was precluded by the heterogeneity of the studies.

Quality assessment

The quality of studies was assessed by the system of Jadad *et al.* [8], modified to take account of the fact that it is virtually impossible for an acupuncturist to be blinded to the treatment. Points were awarded as follows: study described as randomized, 1 point; additional point for appropriate method, 1 point; inappropriate randomization method, deduct 1 point; subject blinded to intervention (i.e. control procedure was indistinguishable from acupuncture), 1 point; evaluator blinded to therapy, 1 point; description of withdrawals and drop-outs, 1 point. The maximum points available were 5. Subject blinding was assumed where the control intervention was indistinguishable from acupuncture, even if the word 'blinding' did not occur in the report. Observer blinding was only scored if specified in the text.

Results

Description of studies

The searches revealed 32 possibly relevant studies [5, 9–39], of which 18 were excluded for the reasons given in Table 1. Of the 14 studies included, needle acupuncture was employed in all except those by Kreczi and Klinger [23] and Ceccherelli *et al.* [10] in which acupuncture points were stimulated by low-energy laser. Gallacchi *et al.* [15] reported two parallel studies with laser and needle acupuncture, each with respective control procedures.

Table 1. Reports of studies of acupuncture therapy for neck pain which were retrieved by literature searches, but excluded from the systematic review, and reasons for their exclusion

Author (date)	Reason for exclusion
Teng (1973) [34]	Abstract only, no data or statistics
Matsumoto *et al.* (1974) [27]	Not randomized
Gaw *et al.* (1975) [16]	Pain in multiple sites
Laitinen (1975) [5]	Uncontrolled
Boas and Hatangdi (1976) [9]	Not randomized, no data or statistics
Yue (1978) [37]	Brief report, no data or statistics
Lewith (1981) [24]	Not acupuncture
Hertz *et al.* (1983) [18]	Uncontrolled
Rabl *et al.* (1983) [31]	Uncontrolled
von Koenig (1985) [22]	Uncontrolled
Peng *et al.* (1987) [28]	Uncontrolled
Zhang *et al.* (1987) [39]	Uncontrolled
Goidenko *et al.* (1989) [17]	Pain in multiple sites
Fattori *et al.* (1996) [14]	Not randomized
Salim (1996) [32]	Not randomized
Xia (1996) [36]	Acupuncture *vs* acupuncture
Zhang (1996) [38]	Acupuncture *vs* acupuncture
Stone and Wharton (1997) [33]	Uncontrolled

Subjects were recruited from various sources: media advertisements [11], primary care [20], hospital in-patients [29, 23]; in all remaining studies, subjects had been referred for physiotherapy or specialist opinion. Treatment was given in a hospital or university outpatients department in all studies except: Gallacchi *et al.* [15]—Chinese Medical Institute; Junnila [20]—primary care; Petrie and Langley [29] and Kreczi and Klinger [23]—hospital ward; Kisiel and Lindh [21]—physiotherapy department.

Quality of studies

No study gained the maximum score: one study scored 4 points [13]; six studies scored 3 points [10, 11, 15, 23, 26, 35]. The randomization procedure was reported in sufficient detail to be sure that it was appropriate in only two studies [11,15]; subjects were allocated by alternation instead of randomization in two studies [20, 25]. Subject blinding was judged to have been achieved in eight studies [10, 13, 15, 19, 20, 23, 26, 35]. The assessor was reported as blinded in only one study [13].

Outcomes

Overall, the results of the 14 studies were balanced between positive and negative. Of the eight better quality studies with three or more points on the quality assessment, five were negative [13, 15 (two studies), 26, 35] and three were positive [10, 11, 23].

Acupuncture was superior to waiting-list in one study [11]. Three studies compared acupuncture with an existing treatment, i.e. physiotherapy. Acupuncture was

TABLE 2. Randomized controlled trials of acupuncture for treatment of neck pain: study characteristics and results

Author (date)	Design	Study quality[a]	Diagnosis, duration	Treatment n =	Method (no. of sessions)	Control n =	Method	Endpoint (measure)	Follow-up	Result
Gallacchi *et al.* (1981) [15]	parallel	3	neck and back pain, chronic	15	formula (8)	a) 14 b) 14	a) sham needle b) non-point needling	pain (VAS)	no	a) acup = sham acup b) acup = non-point
Gallacchi *et al.* (1981) [15]	parallel	3	neck and back pain, chronic	15	laser, formula (8)	14	sham laser	pain (VAS)	no	laser = sham laser
Coan *et al.* (1982) [11]	parallel	3	neck/root pain, >6 months	15	classical individual (36–48)	15	waiting list	pain (h/day)	3 months	acup sig > waiting list, $P < 0.001$
Junnila (1982) [20]	parallel	2	neck and shoulder pain, >1 month	22	formula (4)	22	sham: pricked with finger-nail	pain (VAS)	1 month	acup sig > sham acup, $P < 0.001$
Loy (1983) [25]	parallel	1	cervical spondylosis ?duration	30	points from list (9–18)	30	physiotherapy (short-wave, traction)	ROM, pain relief (per cent)	6 weeks	acup 87% relief physio 54% relief, no statistics
Petrie and Langley (1983) [29]	parallel	2	neck pain, >2 yr	7	formula (8)	6	sham TENS	pain relief (scale)	no	acup sig > sham TENS, $P < 0.01$
Emery and Lythgoe (1986) [13]	cross-over	4	ankylosing spondylitis, ?duration	10	formula + EA (3)	10	sham: needle-prick only	pain (VAS)	no	acup = sham acup
Kreczi and Klinger (1986) [23]	cross-over	3	neck and back pain, ?duration	21	laser, formula (1)	21	sham laser	short-term pain (VAS)	24 h	laser sig > sham laser up to 6 h, $P < 0.05$ laser = sham laser at 24h
Petrie and Hazleman (1986) [30]	parallel	2	neck pain, >6 months	13	formula (8)	12	sham TENS	pain (VAS)	1 week	acup = sham TENS
Ceccherelli *et al.* (1989) [10]	parallel	3	myofascial neck pain, mean 79 months	13	laser to tender + ac points (12)	14	sham laser	pain (McGill)	3 months	laser sig > sham laser, $P < 0.001$
Lundeberg *et al.* (1991) [26]	parallel	3	OA neck, >6 months	a) 14 b) 15 c) 15	a) formula, manual (1) b) EA 2 Hz (1) c) EA 80 Hz (1)	14	superficial needling	short-term pain (VAS)	140 min	acup = sham acup = EA 2 Hz = EA 80 Hz
Thomas *et al.* (1991) [35]	cross-over	3	OA neck, > 6 months	44	formula (1)	a) 44 b) 44 c) 44	a) superficial b) diazepam c) placebo diazepam	short-term sensory and affective pain (VAS)	2 h	a) acup = superficial acup, b) acup = diazepam, c) acup sig > placebo diazepam, $P < 0.05$
Kisiel and Lindh (1996) [21]	parallel	2	myofascial neck and shoulder pain, >2 months	10	flexible formula (4–10)	9	physiotherapy (massage, stretch, exercises)	pain (VAS)	6 months	acup = physio
David *et al.* (1998) [12]	parallel	2	non-inflammatory neck pain, >6 weeks	35	formula + tender points (6)	35	physiotherapy (mobilization)	pain (VAS)	6 months	acup = physio
Irnich *et al.* (submitted) [19]	cross-over	2	limited ROM of neck, >2 months	34	local and distant points from list (1)	34	sham laser	ROM, short-term pain (VAS)	5 min	acup sig > sham laser, $P < 0.01$

acup, acupuncture; EA, electroacupuncture; OA, osteoarthritis; ROM, range of movement; sig, significant.
[a]Quality assessed by randomization, blinding and drop-outs: see the text for full details.

either equal [12, 21] or superior [25] to physiotherapy. Needle acupuncture was compared with indistinguishable control in five studies [13, 15, 20, 26, 35]: all but one [20] produced negative results. Laser stimulation of acupuncture points was better than sham laser in two studies [10, 23] and no different in one study [15]. Three studies examined the effectiveness of acupuncture for short-term pain relief only: acupuncture was superior to sham laser [19], but not superior to indistinguishable sham acupuncture [26, 35].

Discussion

There are equal numbers of positive and negative randomized controlled trials of acupuncture for neck pain. For the better quality studies, the majority are negative.

In general, the methodological quality of the studies, as assessed by the three criteria of the modified Jadad score for clinical trials [8], was disappointing. Good quality in acupuncture studies requires additional design features, including standardization of the interaction between the acupuncturist and the patients (which was not mentioned in any of the reports), and adequate acupuncture treatment. The adequacy of the acupuncture treatment was not formally tested, but appeared to be satisfactory in most cases. One exception was the course of only three sessions used in the study of Emery and Lythgoe [13]; most acupuncturists would consider this an inadequate treatment for the pain of ankylosing spondylitis. As it happens, this study had the highest methodological score on formal assessment. The adequacy of acupuncture used in clinical trials needs to be addressed more effectively in future studies [40].

Acupuncture was compared to a variety of control procedures, from which various conclusions emerge. First, acupuncture was superior to waiting-list control [11], which lends support to the overall effectiveness of acupuncture. This apparent effectiveness could be due to placebo effects [41] or specific effects of needling. Second, acupuncture was equivalent or superior to physiotherapy [12, 21, 25], i.e. it was no worse than an existing treatment. Unfortunately, the specific effectiveness of physiotherapy is not firmly established [43]. Third, the effect of acupuncture seemed similar to that of sham transcutaneous electrical nerve stimulation (TENS) [29, 30]. It is difficult to draw meaningful conclusions using sham TENS as a control, since it is not an actual therapy, and it can easily be distinguished from genuine acupuncture. Ter Riet *et al.* [7] described the use of sham TENS as a control for acupuncture as a 'fatal mistake' in scientific terms. Fourth, acupuncture was compared with an indistinguishable control procedure in five studies [13, 15, 20, 26, 35]. This is necessary for blinding of the subjects in order to test whether the

effect of acupuncture is point specific and technique specific. Four of these studies were negative. This suggests that acupuncture performed at carefully selected points with precise techniques produces no better results than the generalized physiological response that may occur after random needling of the skin [42, 43]. However, this conclusion is far from definite; the inadequacy of the acupuncture in one negative study [13] has already been referred to above, and the results of the other negative studies [15, 26, 35] may not have been conclusive because they all showed positive trends with small sample sizes.

One reason for using acupuncture in the management of painful musculoskeletal conditions of the neck is that it is perceived to be much safer than orthodox treatment with drugs. It has been estimated that non-steroidal anti-inflammatory drugs are responsible for about 12 000 emergency admissions for gastrointestinal disturbances in the UK each year, and 2560 deaths [44]. Acupuncture is by no means free from life-threatening adverse events [45], although it has not been established how frequently they occur. One estimate, from data provided by a survey of doctors and acupuncture practitioners, suggested that pneumothorax may occur once in every 120 years of an acupuncture practitioner's work [46]. Assuming that acupuncture can be demonstrated to be safe, we believe that there is sufficient equipoise in the results of this review to justify further studies.

In conclusion, the hypothesis that acupuncture is efficacious in the treatment of neck pain is not supported by current evidence from controlled trials. More, better designed trials of acupuncture are required before its place in the management of neck pain can be defined.

Acknowledgement

Funding was provided by Exeter University Departmental funds (Laing Foundation).

References

1. Bovim G, Schrader H, Sand T. Neck pain in the general population. Spine 1994;19:1307–9.
2. Kvarnstrom S. Occurrence of musculoskeletal disorders in a manufacturing industry with special attention to occupational shoulder disorders. Scand J Rehabil Med 1983;suppl. 8:1–114.
3. Gross AR, Aker PD, Goldsmith CH, Peloso P. Conservative management of mechanical neck disorders. Part two: physical medicine modalities (Cochrane Review). In: The Cochrane Library Issue 2, Update Software. Oxford, 1998 (updated quarterly).
4. Wadlow G, Peringer E. Retrospective survey of patients of practitioners of traditional Chinese acupuncture in the UK. Comp Ther Med 1996;4:1–7.
5. Laitinen J. Treatment of cervical syndrome by acupuncture. Scand J Rehabil Med 1975;7:114–7.
6. Patel M, Gutzwiller F, Paccaud F, Marassi A. A meta-analysis of acupuncture for chronic pain. Int J Epidemiol 1989;18:900–6.
7. Ter Riet G, Kleijnen J, Knipschild P. Acupuncture and chronic pain: a criteria-based meta-analysis. J Clin Epidemiol 1990;43:1191–9.
8. Jadad AR, Moore RA, Carrol D *et al*. Assessing the quality of reports of randomized clinical trials: is blinding necessary? Controlled Clin Trials 1996;17:1–12.
9. Boas RA, Hatangdi VS. Electrical stimulation in the relief of pain: a pilot study. NZ Med J 1976;22:230–3.
10. Ceccherelli F, Altafini L, Lo Castro G, Avila A, Ambrosio F, Giron GP. Diode laser in cervical myofascial pain: a double-blind study versus placebo. Clin J Pain 1989; 5:301–4.
11. Coan RM, Wong G, Coan PL. The acupuncture treatment of neck pain: a randomised controlled study. Am J Chin Med 1982;9:326–32.
12. David J, Modi S, Aluko AA, Robertshaw C, Farebrother J. Chronic neck pain: a comparison of acupuncture treatment and physiotherapy. Br J Rheumatology 1998;37: 1118–22.
13. Emery P, Lythgoe S. The effect of acupuncture on ankylosing spondylitis. Br J Rheumatol 1986;25:132–3.
14. Fattori B, Borsari C, Vannucci G *et al*. Acupuncture treatment for balance disorders following whiplash injury. Acupunct Electrother Res 1996;21:207–17.
15. Gallacchi G, Mueller W, Plattner GR, Schnorrenberger CC. Akupunktur- und Laserstrahlbehandlung beim Zervikal- und Lumbalsyndrom. Schweiz Med Wochenschr 1981;111:1360–6.
16. Gaw AC, Chang LW, Shaw L-C. Efficacy of acupuncture on osteoarthritic pain. N Engl J Med 1975;293:375–8.
17. Goidenko VS, Barvichenko AA, Grechko IV. Manual therapy and acupuncture in the treatment of neurodystrophic syndromes in cervical osteochondrosis. Zh Nevropatol Psikhiat 1989;89:45–8.
18. Hertz H, Meng A, Rabl V, Kern H. Treatment of whiplash injuries of the cervical spine with acupuncture. Aktuel Traumatol 1983;13:151–3.
19. Irnich D, Behrens N, Gleditsch J *et al*. Klinische studie zum nachweis von soforteffeckten verscheidener akupunkturformen auf schmerzen und beweglichkeit der halswirbelsaule. In: Marie-Oehler W, Hünten K (eds), Akupunktur und Universität. Hippokrates: Stuttgart 1997; 65–71.
20. Junnila SYT. Acupuncture therapy for chronic pain. Am J Acupunct 1982;10:259–62.
21. Kisiel AC, Lindh C. Smartlindring Med Fysikalisk Terapi Och Manuell Akupunktur. Sjukgymnasten 1996;12:24–31.
22. von Koenig G. Zur Akupunktur des therapieresistenten Zervikalsyndroms. Akupunkt Theorie Praxis 1985;4: 197–200.
23. Kreczi T, Klinger D. A comparison of laser acupuncture versus placebo in radicular and pseudoradicular pain syndromes as recorded by subjective responses of patients. Acupunct Electrother Res 1986;11:207–16.
24. Lewith G. Treatment of cervical osteoarthritis. Acupunct Med 1981;1:6.
25. Loy TL. Treatment of cervical spondylosis. Med J Aust 1983;2:32–4.
26. Lundeberg T, Eriksson SV, Lundeberg S, Thomas M. Effect of acupuncture and naloxone in patients with osteoarthritis pain. A sham acupuncture controlled study. Pain Clin 1991;4:155–61.
27. Matsumoto T, Levy B, Ambruso V. Clinical evaluation of acupuncture. Am Surgeon 1974;40:400–5.
28. Peng ATC, Behar S, Yue S-J. Long-term therapeutic effects of electro-acupuncture for chronic neck and shoulder

pain—a double blind study. Acupunct Electrother Res 1987;12:37–44.
29. Petrie JP, Langley GB. Acupuncture in the treatment of chronic cervical pain. A pilot study. Clin Exp Rheumatol 1983;1:333–5.
30. Petrie JP, Hazleman BL. A controlled study of acupuncture in neck pain. Br J Rheumatol 1986;25:271–5.
31. Rabl V, Bochdansky T, Hertz H, Kern H, Meng A. The effect of standardised acupuncture programs in the aftercare of accident patients. Unfallchirurgie 1983;9:308–13.
32. Salim M. Transcutaneous electrical nerve stimulation (TENS) in chronic pain. Altern Ther Clin Pract 1996;3:33–5.
33. Stone RG, Wharton RB. Simultaneous multiple-modality therapy for tension headaches and neck pain. Biomed Instrum Technol 1997;31:259–62.
34. Teng C. Effect of acupuncture and physical therapy. Arch Phys Med Rehabil 1973;53:601.
35. Thomas M, Eriksson SV, Lundeberg T. A comparative study of diazepam and acupuncture in patients with osteoarthritis. Am J Chin Med 1991;19:95–100.
36. Xia Y-S. Point injection at paravertebral point for cervical spondylosis. Int J Clin Acupunct 1996;7:195–7.
37. Yue SJ. Acupuncture for chronic back and neck pain. Acupunct Electrother Res 1978;3:323–4.
38. Zhang H. A study of cervical spondylosis treated with the chrysanthemum pillow with median hole and electro-acupuncture. J Chin Med 1996;51:18–20.
39. Zhang WN, Wang XY, Miao ML, He YH, Xu ZH. Observation of 30 cases of cervical spondylosis treated by electro-acupuncture. J Trad Chin Med 1987;7:18–20.
40. White AR, Ernst E. Assessing the adequacy of acupuncture treatments: a trial of a new method. Altern Ther Health Med 1998;4:66–71.
41. Ernst E. Placebos in medicine. Lancet 1995;345:65.
42. Lewith G, Vincent C. Evaluation of the clinical effects of acupuncture. Pain Forum 1995;4:29–39.
43. Le Bars D, Dickenson AH, Besson J-M. Diffuse noxious inhibitory controls (DNIC). 1. Effects on dorsal horn convergent neurones in the rat. Pain 1979;6:283–304.
44. Blower AL, Brooks A, Fenn CG *et al*. Emergency admissions for upper gastrointestinal disease and their relation to NSAID use. Aliment Pharmacol Ther 1997;11:283–91.
45. Ernst E, White A. Life-threatening adverse reactions after acupuncture? A systematic review. Pain 1997;71:123–6.
46. Norheim AJ, Fonnebo V. Adverse effects are more than occasional case reports: results from questionnaires among 1135 randomly selected doctors, and 197 acupuncturists. Comp Ther Med 1996;4:8–13.

BRHEUM – MSS No. 8A0341d

A systematic review of randomized controlled trials of acupuncture for neck pain
A. R. White and E. Ernst 000