

RESEARCH

Acupuncture in the Treatment of Chronic Low Back Pain

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Abstract

Chronic low back pain is a costly medical complaint in Canada and other industrialized nations. In most cases, the specific etiology of the problem cannot be clearly identified, and treatment success is variable. As such, a considerable proportion of patients with chronic low back pain turn to acupuncture as an alternative to conventional medical therapy. This review aims to synthesize current clinical evidence for acupuncture as a treatment for chronic low back pain, by summarizing the 2005 Cochrane systematic review on acupuncture and low back pain, along with more recent systematic reviews. The existing literature suggests that acupuncture is a useful therapy for chronic low back pain patients, despite a currently incomplete understanding of its physiological basis.

Low back pain is among the most common chronic conditions afflicting Canadians.¹ In one study of Saskatchewan residents, the lifetime prevalence of low back pain was estimated to be 84.1%,² a figure in accord with other estimates reporting a lifetime prevalence of 70%-85% among all Western industrialized nations.³ Low back pain may be triggered by a wide variety of different causes, including trauma, disc degeneration, inflammation, and cancer; however, in 85% of cases no specific cause can be readily identified.⁴

Fortunately, episodes of low back pain are generally self-limiting and 90% of patients experience a cessation of pain within two weeks.⁵ In spite of this, an appreciable proportion of patients do encounter recurrence of their pain. Within one year of recovery, 24-30% of patients report a recurrent episode of acute low back pain, lasting six weeks or less.⁶ Regrettably, up to 7% of patients eventually develop chronic low back pain, defined as episodes lasting longer than three months.⁷

Chronic low back pain can lead to long-term disability and presents a significant cost to society. For example, one national survey reported that 2.3% of all physician visits in the United States were related to low back pain.⁸ Overall, the condition is estimated to cost over \$100 billion per year in the United States alone, primarily in terms of lost wages and productivity.⁹ Given the high cost to society posed by low back pain, it is important that patients can access treatment that will reduce their pain and restore normal function, with the ultimate goal of allowing them to return to the workplace.

The current Joint Clinical Practice Guidelines published by the American College of Physicians and the American Pain Society recommend nonsteroidal anti-inflammatory drugs (NSAIDs) and analgesics such as acetaminophen as the first line treatments for chronic low back pain.^{10,11} In addition to this, the Joint Clinical Practice Guidelines also include a weak recommendation for alternative nonpharmacologic modalities, such as acupuncture.

Acupuncture

Acupuncture is a major modality in complementary and alternative medicine (CAM). It is one of many therapeutic practices associated with traditional Chinese medicine and involves the insertion of fine diameter needles into a number of specific sites on the body. As in other traditional Chinese medicine modalities, traditional acupuncture theory is based on a belief in qi, described as a vital energy flowing through the body along distinct paths, known as meridians. In this ancient conception of physiology, disease is viewed as a blockage of qi, which may be alleviated by the placement of needles at defined points either along the meridians or outside of the meridians (extrameridian), a practice thought to restore the orderly flow of qi.¹²

For patients suffering from low back pain, a typical acupuncture session may begin with a medical history and physical examination by the acupuncturist.^{13,14} Based on this assessment, the specific sites of needle insertion are tailored to the patient's condition. The patient lies prone, with their lower back exposed while the acupuncturist inserts fine, typically stainless steel needles 6.4 to 31.8 mm into the skin.¹³ Often, the acupuncturist manually stimulates the needles to

produce a localized feeling of soreness, numbness, and heaviness at the sites of needle insertion, though these sensations may also spread to other areas of the body. The needles are then left in place for approximately 15 to 30 minutes while the patient is advised to relax and rest.¹³

In addition to traditional acupuncture with dry needles, there are variant styles of acupuncture that may involve massage, electrical stimulation, injection of herbal extracts, or the burning of the moxa herb, *Artemisia vulgaris*.¹⁵ Moreover, there are several alternative schools of acupuncture based on different theoretical bases, including Korean Constitutional Acupuncture, Japanese Meridian Therapy, and French Energetic Acupuncture, to name a few. However, the present review will only focus on traditional acupuncture.

According to Foltz and colleagues, acupuncture is used by 20.6% of Canadians with chronic back pain.¹⁶ This figure lags behind the usage rates of chiropractic (74.4%) and massage therapy (55.5%); however, acupuncture is still one of the main CAM modalities used in Canada. In general, many patients with chronic conditions are thought to be dissatisfied with the effectiveness of conventional medicine, while some are perhaps concerned with possible adverse effects of conventional therapeutics.¹⁶

Evidence-Based Medicine and Acupuncture

It is understandable that physicians may be hesitant to recommend acupuncture or other CAM therapies to their patients, given the paucity of evidence demonstrating the effectiveness of such modalities. Yet, there is a growing body of research investigating the use of acupuncture for many indications, notably pain relief. While Canadian physicians tend to hold negative views of CAM in general,¹⁷ there is evidence to suggest that they are receptive to the use of acupuncture, at least in the treatment of chronic pain conditions.^{18,19,20}

As a starting point, Cochrane systematic reviews are an excellent resource for evaluating the available evidence for a medical intervention. Furlan and colleagues' Cochrane systematic review of acupuncture in the treatment of chronic low back pain assessed thirty-five randomized controlled trials published between 1976 and 2003, of which two were excluded from analysis for major flaws.²¹ Their pooled analysis examined the efficacy of acupuncture compared to:

- 1) no treatment;
- 2) sham (placebo) acupuncture; and,
- 3) other interventions or acupuncture in addition to other interventions.

First, the comparison with no treatment found that acupuncture is more effective at short- (up to 3 month) and intermediate-term (3 to 12 months) follow-ups for pain outcomes, and produced short-term functional improvement. Compared to sham therapy (e.g., non-penetrative needle insertion, or needling outside of traditionally-defined points), acupuncture resulted in more effective pain relief immediately after the end of sessions and at short-term follow-up, but this benefit was not observed at longer-term follow-ups. In terms of functional outcomes, there was no benefit of acupuncture over sham therapy.²¹

The Cochrane systematic review also reported comparisons between acupuncture and other interventions for chronic low back pain, specifically spinal manipulation, massage, NSAIDs, and transcutaneous electrical nerve stimulation. In these comparisons, there was no advantage of acupuncture in either pain or functional outcomes. In some comparisons, acupuncture was found to be worse than these interventions. However, as an adjunct to other interventions (e.g., exercises, NSAIDs), acupuncture was found to improve both pain and function outcomes immediately after sessions, and after short- and intermediate-term follow-up.²¹

Based on this, Furlan and colleagues concluded that there was some evidence for the effectiveness of acupuncture as a therapy for chronic low back pain, but this conclusion was tentative.²¹ Based on characteristics such as sample size, attrition, and description of methodology, they had ranked most of the studies discussed in their systematic review as being of relatively low methodological quality. Overall, they cited a need for higher-quality randomized controlled trials (RCTs) to be conducted before clear recommendations could be made.

Since the last Cochrane systematic review update in 2005,²¹ a number of RCTs and systematic reviews have been published. The present review aims to synthesize these new research findings, and assess whether it is now possible for stronger conclusions to be reached.

Methods

In the present review, Pubmed was searched from 2005 to August 2011 for more recent systematic reviews concerning the effectiveness of acupuncture in the treatment of chronic low back pain. This search was confined to English language articles, and excluded articles on acute pain, reviews conducted without systematic methodology, and studies concerning cost effectiveness. The search details are described in the online appendices.

Results

The search yielded twenty-two hits. Fifteen did not meet the inclusion criteria.

In all, there were seven relevant systematic reviews retrieved in the search.^{11,15,22,23,24,25,26} One of these only included studies already mentioned in the 2005 Cochrane systematic review, and was subsequently omitted from the present summary.¹¹ The present article summarizes the six remaining systematic reviews published since 2005; these systematic reviews described nine studies not included in the Cochrane systematic review update (Table 1).

*Systematic Review 1: Manheimer et al (2005)*²³

The systematic review by Manheimer and colleagues arrived at similar conclusions as the 2005 Cochrane systematic review update. They expressed that acupuncture is an effective modality for treatment of chronic low back pain, but called for trials examining its longer-term effects. Of the thirty-three studies used in Manheimer and colleagues' meta-analysis, all but two were already reported by Furlan et al.^{27,28}

*Systematic Review 2: Keller et al (2007)*²²

Keller and colleagues conducted a meta-analysis, focusing on the effect sizes of various treatments for acute and chronic low back pain, including: acupuncture, spinal manipulation, behavioural therapy, exercise therapy, and NSAIDs. The meta-analysis included seven moderate to high quality studies on acupuncture; all these studies were already examined in the 2005 Cochrane systematic review update, except for one retrospective survey of physiotherapy patients.²⁹ In their meta-analysis, Keller et al identified that all treatments for chronic low back pain had very modest effect sizes (i.e., standardized mean differences from 0.22 to 0.61); however, acupuncture and NSAIDs were tied for the largest effect size.

*Systematic Review 3: Ammendolia et al (2008)*¹⁵

Ammendolia and colleagues' systematic review included seventeen RCTs, and ultimately found acupuncture

to be an effective treatment modality, but they also noted that sham acupuncture produced similar patient outcomes. Skeptical whether the beneficial effects of acupuncture could simply be attributed to placebo effect, they cautiously urged that further research needed to be conducted before definitive conclusions could be reached. The majority of trials examined in this systematic review were already included in the 2005 Cochrane systematic review update; however, Ammendolia et al contributed three novel trials of interest.^{30,31,32}

*Systematic Review 4: Yuan et al (2008)*²⁶

Yuan and colleagues were in accordance with Ammendolia et al, concluding that acupuncture did not differ from sham in pain reduction or functional improvement. They also affirmed previous findings that acupuncture is more effective than no treatment at all, and that acupuncture improves outcomes as an adjunct to other therapy. Moreover, in a rigorous meta-analysis, they found larger effect sizes for these comparisons than previous systematic reviews. As in prior systematic reviews, Yuan et al could not conclude with certainty whether acupuncture was more effective than other specific therapies.

In addition, Yuan et al investigated whether the beneficial outcomes of acupuncture were not only statistically significant, but also clinically significant (i.e., 20% reduction in pain or more). They found that a quarter of their included studies achieved this criterion for pain reduction. Unfortunately, there was insufficient data for functional outcomes, so it was impossible for them to determine whether functional improvements were also of a clinically significant magnitude.

Yuan and colleagues included nineteen RCTs also mentioned in previous systematic reviews, as well as two additional, relatively high quality studies.^{32,34}

*Systematic Review 5: Rubenstein et al (2010)*²⁴

Rubenstein et al published a systematic review of three common CAM therapies for chronic low back pain: acupuncture, herbal medicine, and spinal manipulation. All eighteen studies included in their acupuncture analyses were previously discussed by Yuan et al.²⁶ Based on one study alone,³⁰ Rubenstein and colleagues hesitantly concluded that acupuncture is more effective than no treatment at short term pain relief. Moreover, they determined that acupuncture has a statistically significant advantage over sham in terms of pain relief and functionality at short- and intermediate-term follow-up; however, these effect sizes were too small to be considered clinically significant. Acupuncture in

addition to usual care or another therapy was generally found to ameliorate pain and improve function better than other therapy alone. Finally, again based on a single study,³³ Rubenstein et al concluded that acupuncture was more effective than standard care at improving pain and function at immediate and short-term follow-up, but only function was improved to a clinically significant degree.

*Systematic Review 6: Trigkilidas (2010)*²⁵

Trigkilidas' systematic review was the most recently published, and examined studies from 2005 onward. It included three studies already discussed in other systematic reviews,^{30,31,33} as well as one new trial.³⁵ Based on these trials, Trigkilida considered acupuncture to be more effective than usual care, but also noted the similar outcomes produced by sham acupuncture regimens.

Discussion

Summary of Recent Literature

Since the publication of the 2005 Cochrane systematic review update, there has been considerable research into the effect of acupuncture on chronic low back pain. The greatest contribution to has been made by the conclusion of three high quality German RCTs, which are among the largest clinical trials on acupuncture ever conducted.^{30,32,33} These trials were intended to advise the German government in deciding whether to reimburse acupuncturists for treatment of chronic conditions such as low back pain. Additionally, high quality RCTs in the United States³⁵ and United Kingdom³¹ further demonstrated the effectiveness of acupuncture therapy. Thomas and colleagues have been particularly helpful in demonstrating the effects of acupuncture on a longer-term basis (2 years).³¹

Sham Acupuncture

Puzzlingly, it is a recurrent observation in acupuncture trials that sham acupuncture treatments produce comparable health benefits to traditional acupuncture. Further complicating matters, it is unclear what type of methodology should constitute sham acupuncture. Many RCTs have administered to their sham treatment groups a form of minimal acupuncture, involving superficial needle insertion, sometimes at extra-meridian sites; as Itoh and colleagues noted,³⁴ some schools of acupuncture use such techniques in their "real" acupuncture therapy, bringing into question whether any sort of penetrative needling technique could reasonably be considered a "sham." Itoh et al advocated the use of non-penetrative needling as a sham but, at this time, it is unclear whether variations in sham technique significantly differ in their outcomes.

The unexpected effectiveness of sham acupuncture may lead some clinicians to dismiss traditional acupuncture as a viable treatment for their patients. Certainly, it is possible that the apparent benefits of acupuncture are largely due to psychosocial factors, including the novelty of acupuncture therapy,³⁶ patient expectations,²⁵ or focused attention from the acupuncturist.¹³ However, a growing body of animal and human evidence has identified a number of physiological correlates associated with acupuncture. For instance, recent imaging studies suggest that neural regions responding to acupuncture are distinct from those mediating placebo.³⁷ Other investigators have demonstrated the effects of acupuncture on neuronal signaling.^{38,39} Regardless, it is apparent that more investigations will need to be carried out before there is significant understanding of the physiologic or psychosomatic mechanisms behind real and sham acupuncture treatments.

Considerations for Clinicians

For clinicians considering acupuncture for their patients, a potential ethical dilemma lies in the choice of whether to disclose the possibility that the therapy could be a placebo.⁴⁰ However, given the role that the placebo effect already plays in conventional medicine and pharmacologic therapeutics, the patient-centered approach may simply be to recommend acupuncture therapy to chronic back pain patients, while informing them that the physiological mechanisms underlying their pain relief are presently undetermined. In general, therapies for chronic low back pain tend to have relatively small effect sizes and, as Keller et al reported, acupuncture appears to have a comparatively large effect for pain relief.²²

Some studies suggest that certain patient populations are particularly responsive to acupuncture therapy for pain relief; for instance, patients with greater positive expectations for acupuncture.⁴¹ Presently, few high quality studies have investigated the psychosocial modulators of acupuncture effectiveness. Witt and colleagues recently found that acupuncture was enhanced by factors such as: being female, cohabitation with other people, having prior positive experiences with acupuncture, and having unsuccessfully tried other treatments.²⁵ However, other high quality studies did not observe such effects,⁴² so it is uncertain what patient differences reliably contribute to acupuncture success.

Also, in choosing whether to recommend acupuncture to patients with chronic low back pain, it is important to consider the possible adverse effects. The adverse

Table 1. Summary of systematic reviews since 2005

Systematic Review	Comparisons	Description	Sample Size	Outcomes	Findings
Novel studies					
Manheimer et al (2005)²³	Acupuncture; Physical therapy alone	Acupuncture treatment comprised 6 sessions over a 2 week period. Both groups received physical therapy.	Acupuncture n=17 No acupuncture n=17	<i>Pair:</i> VAS Measured at baseline and end of treatment	Acupuncture as an adjuvant produced greater pain relief than physical therapy alone.
Ito (2000) ²⁷	Acupuncture; Analgesics	Acupuncture treatments were individualized for each patient, and consisted of 4 sessions over 2 weeks. Analgesic group was treated with various analgesics (including Japanese herbal remedies)	Acupuncture n=14 Analgesics n=12	<i>Pair:</i> numeric scale Function: JOA Measured at baseline; end of treatment; 4 months after treatment	Acupuncture was found to be slightly more effective than analgesics.
Keller et al (2007)²²			n=200		
Kerr, Walsh, and Baxter (2001) ²⁹		Survey of patients who had received acupuncture treatment from an outpatient physiotherapy clinic. This survey did not attempt to compare acupuncture with other treatment modalities.		Questionnaire about perceived pain reduction, functional outcomes (at home, at work), and other modalities used	94% of respondents 'satisfied' or 'very satisfied' with acupuncture treatment. Majority of respondents achieved sufficient pain reduction to carry out daily activities at home (80%) and at work (57%)
Ammendolia et al (2008)¹⁵					
Brinkhaus et al (2006) ³⁰	Acupuncture; Sham acupuncture; Waiting list	Acupuncture treatments were semi-standardized, and consisted of 16 sessions over 12 weeks. Sham acupuncture consisted of the same number, duration, and frequency of sessions, as well as the same pre-defined list of treatment points. Superficial needling was employed in the sham acupuncture group. Waiting list patients began acupuncture therapy 8 weeks after baseline assessment.	Acupuncture n=146 Sham acupuncture n=73 Waiting list n=79	<i>Pair:</i> VAS <i>Function:</i> HFAQ <i>Other:</i> PD1, S, AD, SF-36 Assessed at baseline; 8, 26, 52 weeks after baseline assessment	At 8 weeks, both acupuncture and sham groups achieved greater pain reduction than the waiting list group, but acupuncture and sham groups were not significantly different from each other in terms of pain reduction). Acupuncture and sham groups also reported improved back function over the waiting list group. At 1 year, acupuncture and sham groups did not gain further pain reduction or functional improvement, but maintained their earlier improvement. At 1 year, the waiting list group also reported improvements, such that the three groups were indistinguishable.

AD: Allgemeine Depressionskala (Depression), HFAQ: Hanover Functional Ability Questionnaire, JOA: Japanese Orthopedic Association (Function), LBPRS: Low Back Pain Rating Scale, MGPII: McGill Present Pain Index, OPDI: Oswestry Pain Disability Index, PD1: Pain Disability Index, RMQ: Roland Morris Questionnaire, S: Schmerzempfindungsskala (Emotional Aspects of Pain), SF-36: Medical Outcomes Study 36-Item Short Form, SFHS: Short Form Health Survey, VAS: Visual analogue scale, VKCPGS: Von Korff Chronic Pain Grade Scale

Thomas et al (2006) ³¹	Acupuncture; Usual care only	Acupuncture care included up to 10 sessions over 3 months. Needling was individualized for each patient. Both acupuncture and usual care groups employed multiple treatment modalities (e.g., physiotherapy, medication, exercise).	Acupuncture n=159 Usual care only n=80	Pain: SF-36, OPDI, MPPi Assessed at baseline; 12, 24 months after baseline assessment	At 2 years, acupuncture produced greater pain reduction than usual care alone. Functional outcomes were not different between groups.
Witt et al (2006) ³²	Immediate acupuncture; Delayed acupuncture; Nonrandomized acupuncture	Acupuncture treatments were individualized for each patient, and included a maximum of 15 sessions, over 3 months. The delayed acupuncture group was placed on a waiting list for 3 months before beginning course of treatment. Usual care was also provided for all participants. A separate set of analyses were conducted with data from patients who did not consent to possible randomization into the delayed acupuncture group.	Immediate acupuncture n=1549 Delayed acupuncture n=1544 Nonrandomized acupuncture n=8537	Pair: LBPRS Function: HFAQ Other: SF-36 Assessed at baseline; 3, 6 months after baseline assessment	Immediate acupuncture group showed improved back function and pain scores at 3 months, compared to the delayed acupuncture group. At 6 months, both groups had a similar level of pain reduction; however, at 6 months, the immediate acupuncture group still reported better improvement in back function. At 6 months, nonrandomized patients had statistically significant improvement in pain and back function over randomized acupuncture patients, and also reported better physical quality of life.
Yuan et al (2008) ³³	Acupuncture; Sham acupuncture; Usual care	Acupuncture groups received 10 to 15 sessions, generally 2 sessions per week. Insertion sites were chosen for each patient from a list of standardized sites. Sham acupuncture treatment consisted of superficial needling at pre-defined extra-meridian sites.	Acupuncture n=387 Sham acupuncture n=387 Usual care n=388	Pair: VKCPGS Function: HFAQ Other: SFHS Assessed at baseline; 1.5, 3, 6 months after first treatment	At 6 months, both acupuncture and sham acupuncture outperformed usual care in terms of pain reduction and function. However, outcomes for acupuncture and sham acupuncture were statistically indistinguishable.
Itoh et al (2006) ³⁴	Acupuncture; Sham acupuncture	Participants aged 65 years or over received either 3 weeks of individualized acupuncture followed by 3 weeks of sham acupuncture, or vice versa. There was a 3 week observation between the two sets of treatments. Sham acupuncture was non-penetrative.	Acupuncture - Sham acupuncture n=13 Sham acupuncture - Acupuncture n=13	Pair: VAS Function: RMQ Assessed at baseline; 3, 6, 9, 12 weeks after first treatment	Acupuncture produced statistically significant pain reduction and functional improvement over sham acupuncture. At 12 weeks, all participants were indistinguishable in terms of pain reduction and functional improvement, regardless of the order of treatments.
Rubenstein et al (2010) ²⁴	None				
Trigkidas (2010) ³⁵	Individualized acupuncture; Standardized acupuncture; Sham acupuncture; Usual care only	Acupuncture groups received 10 sessions, over 7 weeks. Sham acupuncture group received non-penetrative needling.	Individualized acupuncture n=157 Standardized acupuncture n=158 Sham acupuncture n=162 Usual care only n=161	Pair: 10-point scale Function: RDQ Assessed at baseline; 8, 26, 52 weeks after first treatment	At 1 year, all three acupuncture groups reported functional improvement over usual care, but no statistically significant symptom reduction

effects of acupuncture are well summarized in the systematic review by Ammendolia and colleagues, who determined that they are experienced by 0 to 23% of patients.¹⁵ Many were minor in nature, involving local bleeding, hematoma, drowsiness, or dizziness, and comparable in severity to conventional treatments such as NSAIDs or exercise therapy. However, some patients experience a worsening of their chronic low back pain, and extremely rare cases have been reported of pneumothorax or serious complications resulting from practitioner error.³⁶ Overall, severe adverse effects from acupuncture are very uncommon, especially in comparison with first line treatments for chronic low back pain (e.g., NSAIDs).

Importantly, the modern clinician is increasingly called upon to treat their patients with therapeutics that are not only efficacious, but also cost-effective. This may be particularly salient for the treatment of low back pain patients, given that their health care costs are increasing more rapidly than the general patient population.⁴³ At this time, economic evaluations of acupuncture treatment have been conducted in a number of industrialized nations, such as the United Kingdom,⁴⁴ Germany,³² and South Korea.⁴⁵ Overall, the available evidence finds the cost-effectiveness of acupuncture to be quite acceptable, despite these studies varying drastically in their specific estimates.^{32,44,45} This heterogeneity may call for more high-quality economic analyses to be conducted, perhaps even using Canadian data. Regardless, in a systematic review of cost effectiveness for multiple treatment modalities, Lin et al concluded that there was more evidence for acupuncture than other guideline-recommended treatments, such as massage or yoga.⁴⁶

Many private medical insurance plans cover acupuncture, but it is not explicitly covered by provincial Medicare plans in Canada, so some patients may have to pay for treatment out of pocket. It is possible that these patients may feel considerable financial pressure if they are recommended to try acupuncture therapy; however, it is worth noting that a significant proportion of physiotherapists offer acupuncture services and physiotherapy may be covered, if it is delivered in a hospital setting or has a physician's referral. British Columbia has recently begun to offer limited reimbursement for acupuncture services,⁴⁷ and the Ontario Workplace Safety & Insurance Board currently offers acupuncture reimbursement, at least on a trial basis.⁴⁸ At this time, it is unclear whether additional provinces will choose to explicitly include acupuncture as an insured service in the future.

Conclusion

Recent evidence on the effectiveness of acupuncture for chronic low back pain indicates that it may be an effective option for patients suffering from this condition. Clinicians are justified in recommending acupuncture therapy, especially as an adjunct to other treatment modalities. Further research is needed to determine the physiological mechanisms underlying real and sham acupuncture.

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