

Use of acupuncture in the rehabilitation of patients with spinal cord injury

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ABSTRACT

Although many patients surviving spinal cord injury (SCI) show some recovery in motor and sensory function below the initial level of injury, spontaneous recovery in patients with complete SCI is quite limited. However, there have been reports of patients improving with surgery, pharmacological interventions, and alternative medical approaches such as acupuncture. The purpose of this study was to review the use of acupuncture in the rehabilitation of patients with SCI. For this reason, a review of the current literature was performed using the online PUBMED database and the PRISMA guidelines. Inclusion criteria were human studies, studies written in English language, and studies that evaluated the use of acupuncture in the rehabilitation of SCI patients. Finally, 14 studies were included in the present review. There is emerging evidence that acupuncture may have a beneficial effect in the rehabilitation of SCI patients, particularly in terms of restoring motor and sensory function, and controlling chronic pain, neurogenic bladder and bowel and secondary osteoporosis. However, high quality studies are scarce. Further prospective, randomized, controlled studies are needed to fully elucidate the role of acupuncture in the rehabilitation of SCI patients.

Key Words: acupuncture, spinal cord injury, tetraplegia, quadraplegia

Introduction

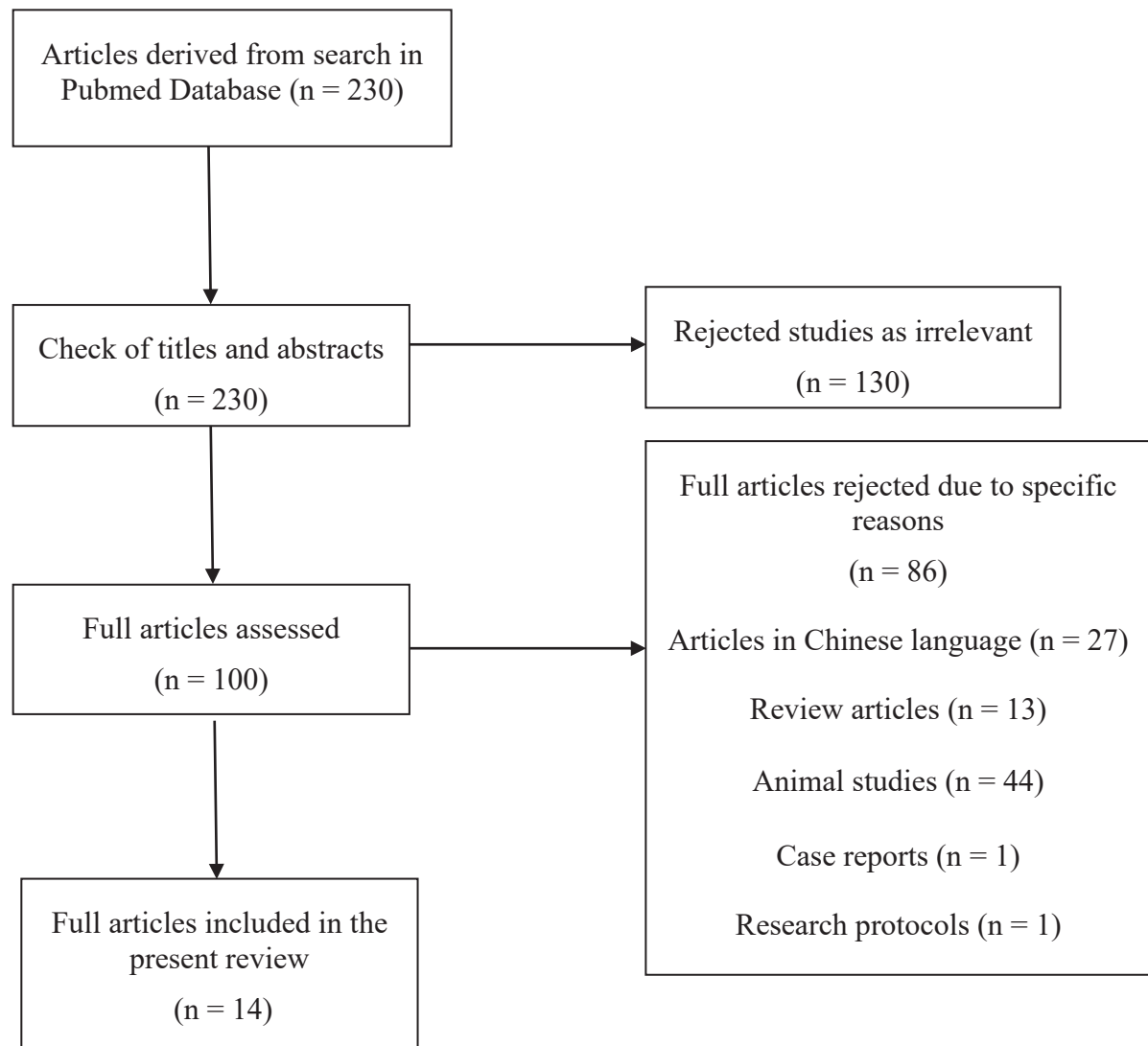
Patients suffering from a spinal cord injury (SCI), face a variety of changes in motion and sensation, which negatively affect their quality of life. The degree of functional disability depends on the site and extent of injury. SCI, regardless the type, can lead to serious complications, including loss of motion, loss or alteration of sensation, respiratory insufficiency, loss of bowel or bladder control, excessive reflex activity or contractions and chronic pain due to spinal cord damage [1]. Although, nowadays, such lesions are irreversible, scientists are constantly working on the implementation

of new therapies. These include nerve implants and medications that can promote nerve cell regeneration or improve function of the remaining intact nerves [2].

Despite the fact that many patients surviving a SCI show some recovery in motor and sensory function below the initial level of injury, spontaneous recovery in patients with complete SCI is quite limited. However, there have been reports of patients improving with surgery, pharmacological interventions, and alternative medical approaches such as acupuncture [3-4]. Acupuncture is a popular, complementary, mildly invasive, non-pharmacologi-

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**Table 1:** Flowchart

cal therapeutic technique. It is used in controlling acute and chronic pain and in the rehabilitation of patients with sports injuries and neuromuscular diseases. There is plenty of evidence of a beneficial effect of acupuncture in patients with knee osteoarthritis, chronic low back and neck pain, migraines and chronic tension-type headaches, postoperative nausea and vomiting, pregnancy related vomiting, and infertility and in the reduction of side effects of chemotherapy and radiotherapy [5-8]. The purpose of this study was to review the use of acupuncture in the rehabilitation of patients with SCI.

A review of the current literature was performed using the online PUBMED database and the PRISMA guidelines, using the following key words: "acupuncture" AND ("spinal cord injuries" OR "spinal cord injury" OR "tetraplegia" OR "quadriplegia"). Inclusion were human studies, studies written in English language, and studies that evaluated the use of acupuncture in the rehabilitation of SCI patients. Studies in other than English language, animal studies, reviews, case reports, clinical protocols, studies that did not evaluate acupuncture and studies that did not involve SCI patients were excluded.

Discussion

Primary search results included 230 papers. After reviewing titles and abstracts, 130 studies were rejected as irrelevant. Of the remaining 100 studies evaluated, 86 were rejected (27 studies in Chinese, 13 review studies, 44 experimental studies, 1 case report study and 1 research protocol). Eventually, 14 studies were included in this review (Table 1).

Experimental studies have shown that acupuncture contributes to the differentiation of stem cells into neuron-like cells and to the mobilization of CD133(+)34(-) cells in SCI patients [9-10]. Although the mechanisms of action of acupuncture in SCI patients are largely unknown, a few human studies have been published investigating the role of acupuncture in the rehabilitation of SCI patients.

Motor and sensory function

The beneficial role of acupuncture in the recovery of motor and sensory function after SCI has been investigated in a plethora of animal studies. Electroacupuncture has been found to influence neuronal apoptosis, inhibit astrogliosis, increase acetylcholinesterase activity and downregulate platelet-derived growth factor (PDGF), thus improving motor neuronal activity and recovery [11,12]. However, human studies are rare. In a prospective, randomized trial by Wong et al on 100 SCI patients, acupuncture was found to produce statistically significant improvement in sensory and motor scores one year after injury, in comparison to the control group [13]. Another case series showed no effects on heart rate variability of patients with complete SCI when a laser acupuncture was applied below the level of injury, in contrast with their healthy counterparts who showed the opposite pattern [14].

Chronic neuropathic pain

Several studies have shown the benefits of acupuncture in decreasing neuropathic pain intensity in SCI patients. In a randomized clinical trial including 24 SCI patients, an 8-week acupuncture regimen resulted in significant reduction in neuropathic pain [15]. Norrbrink et al, in a randomized trial on 30 SCI patients comparing a 6-week treatment with massage and acupuncture, reported that both acupuncture and massage may relieve neuropathic pain [16]. In a pro-

spective, cohort study by Nayak et al, 22 SCI patients with moderate to severe pain received a course of acupuncture treatments for 7.5 weeks. About 46% showed significant improvement in pain intensity. However, 27% reported an increase in pain intensity lasting for at least 3 months. The authors concluded that the effect of acupuncture on neuropathic pain depends on the site and type of pain, as well as the type of SCI. Incomplete SCI patients have a better response in comparison to patients with complete SCI [8]. In a retrospective study on 36 SCI patients subjected to an electroacupuncture protocol, 2/3 of patients showed significant post-intervention improvement. The possibility of improvement after acupuncture was higher in cases of bilateral or symmetrical pain, burning and constant pain [17].

Shoulder pain

Chronic shoulder pain is a frequent problem for SCI patients using wheelchairs. A randomized, double-blind, placebo-controlled study in 10 SCI patients, showed that acupuncture may reduce shoulder pain by 66%, but no statistical significance was observed in comparison to the control group [18]. In another prospective clinical trial on 18 SCI patients with chronic shoulder pain who used manual wheelchair as their primary means of mobility, acupuncture was found to have equal analgesic effect with Trager Psychophysical Integration (type of manual therapy) [19].

Neurogenic bladder

Recently, acupuncture has gained popularity in the treatment of bladder dysfunction. Five clinical studies have been identified, investigating the effects of acupuncture on neurogenic bladder in SCI patients [20-23]. In a randomized, controlled trial by Cheng et al, acupuncture was found to be beneficial in the management of neurogenic bladder of SCI patients, and the earlier patients received electro-acupuncture therapy, the sooner the bladder balanced. On the other hand, acupuncture had no effect in patients with complete SCI and severe detrusor-sphincter dyssynergia or persistent areflexic bladder [20]. In another randomized, controlled trial, electroacupuncture was found effective in the treatment of urinary retention in SCI patients by increasing voided volume, promoting the balance of vesical function, and reducing residual urine

volume and frequency of intermittent catheterization [21]. Another clinical trial on 13 SCI patients suffering from urinary incontinence showed that in patients treated with acupuncture, incontinence disappeared in 15% of cases and decreased in 50% of cases. Maximum cystometric bladder capacity increased significantly in the acupuncture group [22]. In addition, the authors of a prospective, observational study including 14 SCI patients, reported that acupuncture may decrease urinary incontinence and post-void residual urine volume, improving neurological detrusor underactivity [23]. Finally, in a prospective, randomized trial by Wong et al, including 100 SCI patients, acupuncture was found to produce statistically significant improvements in bladder control scores one year after the injury, in comparison to the control group [13].

Autonomic Dysreflexia

A prospective, cohort study evaluated the effects of acupuncture needle insertion above and below the level of SCI, in 15 SCI patients at risk for autonomic dysreflexia. Though systolic and diastolic blood pressures did not alter over 15 treatment sessions, 3 SCI patients experienced acute elevation of systolic blood pressure that suggested incipient dysreflexia. The authors suggested a careful monitoring of blood pressure in SCI patients receiving acupuncture treatment [24].

Neurogenic bowel


Two clinical studies were identified to investigate the effect of acupuncture in bowel dysfunction in SCI patients. In a prospective, randomized trial by Wong et

al, including a total of 100 SCI patients, acupuncture was found to produce statistically significant improvements in bowel functional independence measures one year after the injury, in comparison to the control group [13]. In another prospective, observational study including 14 SCI patients, the authors noticed that after a 2-month acupuncture regime, 29% of patients resumed normal bowel movement and 36% of patients reduced the dependence on supplementary defecation methods [23].

Secondary osteoporosis

Secondary osteoporosis is a frequent complication of SCI, due to prolonged immobilization. In a randomized, controlled trial, the addition of acupuncture to standard anti-osteoporotic treatment led to increased bone mineral density; however, the difference was not significant [25].

Conclusions

There is emerging evidence that acupuncture may have a beneficial effect in the rehabilitation of SCI patients, particularly in terms of restoring motor and sensory function and controlling chronic pain, neurogenic bladder and bowel and secondary osteoporosis. However, high quality studies are scarce. Further prospective, randomized, controlled studies are needed to fully elucidate the role of acupuncture in the rehabilitation of SCI patients. 

Conflict of interest

The authors declare no conflicts of interest

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