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Electroacupuncture for treatment of diabetic peripheral neuropathy: A systematic review of randomized controlled trials

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KEYWORDS

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Abstract *Objective:* To assess the effectiveness and safety of electroacupuncture for the treatment of diabetic peripheral neuropathy (DPN). Clinical studies in China have shown the beneficial effect of electroacupuncture compared with conventional medicine. However, the effectiveness of electroacupuncture has not been well acknowledged internationally.

Methods: We searched the following databases from their inception through February 2016: MEDLINE, the Cochrane Central Register of Controlled Trials (April, 2015), SinoMed, China National Knowledge Infrastructure, VIP, Wanfang Database, Chinese Important Conference Papers Database, and the Chinese Dissertation Database. Randomized controlled trials (RCTs) were included if they compared electroacupuncture to conventional medicine, placebo, or no treatment on DPN patients. RevMan 5.3 software was used for data analysis, with effect estimate presented as relative risk (RR) and mean difference (MD) with a 95% confidence interval (CI).

Results: Eleven RCTs involving 837 participants were included. The methodological quality of included RCTs was generally poor in terms of sequence generation, allocation concealment, blinding, incomplete outcome data, and selective outcome reporting. Meta-analysis showed that electroacupuncture had a better effect on global symptom improvement than methylcobalamin (RR = 1.29; 95% CI: 1.14–1.46) and vitamin B (RR = 1.60; 95% CI: 1.33–1.94). Only two RCTs reported adverse events.

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Conclusions: Because of the high risk of bias of included trials, we cannot make a conclusion on the effectiveness of electroacupuncture for DPN. More rigorously designed and conducted multicenter double-blind RCTs are needed to support the use of electroacupuncture for DPN. © 2016 Beijing University of Chinese Medicine. Production and hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Diabetes mellitus is the seventh leading cause of death worldwide, causing 1.4 million deaths in 2011 (about 2.6% of total global deaths for that year).¹ Diabetic peripheral neuropathy (DPN) is one of the most common chronic complications of diabetes mellitus, and is among the main causes of disability.² Studies in America have shown that 32.7% of people with diabetes mellitus³ have evidence of DPN and multicenter studies in Europe have shown that 28% of people with diabetes mellitus have evidence of DPN.⁴ The incidence of DPN in worldwide diabetic patients ranges from 5% to 80%, and is still increasing.⁵

DPN involves sensory, motor, and autonomic nerve lesions, with sensory neuropathy most frequently experienced.⁶ The principle clinical features of DPN are progressive loss of sensation and movement in the distal limbs, manifesting as intense limb numbness, severe pain, muscle weakness and atrophy, and weakening or complete loss of tendon reflexes, ultimately leading to foot ulcers, gangrene, and even amputation.^{7,8} These symptoms result in a huge disease burden in terms of disability and depletion of health care resources.^{9–11}

The etiology and pathogenesis of DPN have not been fully elucidated. For this reason, ideal drugs have still not been developed.¹² Glycemic control is fundamental in the prevention and treatment of DPN. Medical therapies that are part of the DPN drug arsenal include methylcobalamin (vitamin B₁₂) to repair nerves, thioctic acid (alpha-lipoic acid) for oxidative stress, prostaglandin E2 to improve microcirculation, aldose reductase inhibitors, such as epalrestat to attenuate morphologic abnormality of the nerves. For symptomatic treatment with anticonvulsants, antidepressants and acesodyne are also used for DPN.^{13–16} Existing pharmaceutical drugs usually have side effects and are costly. Thus, the overall financial burden of DPN and its complications has been estimated at more than four billion USD in one year in America alone.¹⁷ Therefore, better therapy options for DPN are needed.

DPN has been treated using acupuncture for 2000 years.¹⁸ There are many types of acupuncture used in China, including auricular, manual, scalp, electroacupuncture, needle tapping, acupoint injection, blood pricking, warm needling, and moxibustion. Electroacupuncture is one of the most widely applied therapies for DPN to ameliorate symptoms, improve quality of life (QoL), and prevent other complications. In recent years, many clinical trials and animal experiments have shown the benefit of electroacupuncture in the treatment of DPN.^{19–26}

Electroacupuncture for DPN is based on the theory of traditional Chinese medicine (TCM), in which DPN is due to decreases in the body of the fundamental substances of *yin* and essence, which lead to endogenous dryness that eventually damages the *qi* and *yin*. Because of the interdependence of *yin* and *yang*, impairment of *yin* affects *yang*, and results in deficiency of both *yin* and *yang*.²⁷ Deficiency of *yin* and the resulting dry-heat will dry the body fluids, allowing pathogenic *qi* to enter the channels. These two conditions can lead to the stasis of blood and stagnation in the channels such that *yang qi* cannot reach the ends of the four limbs. The sinews and vessels lack the nourishment provided by *qi* and blood, which eventually results in DPN.^{28–30} As DPN is caused by *qi* and *yin* deficiency, blood stasis, and stagnation, the treatment principle involves replenishing *qi* and nourishing *yin*, dissolving stasis and unblocking the channels.

This systematic review aimed to evaluate the potential beneficial and harmful effects of electroacupuncture for the treatment of DPN. Information from this review may provide the foundation for formulating guidelines on electroacupuncture for DPN therapy and prevention.

Materials and methods

Data sources and searches

The following electronic databases were searched from their inception through February 2016: MEDLINE (Table 1), the Cochrane Central Register of Controlled Trials (CENTRAL) (April 2015), SinoMed, Chinese Network Knowledge Infrastructure (CNKI), Chinese Scientific Journals Database (VIP), and Wanfang Database. The Chinese Important Conference Papers Database and the Chinese Dissertation Database were searched for gray literature.

English search terms included: "acupuncture," "acupuncture therapy," "needling," "electroacupuncture," "diabetic neuropathy," "diabetic peripheral neuropathy," "DPN," "clinical trial," and "randomized controlled trial." The Chinese search terms were "zhen ci," "zhen jiu," "dian zhen," "tang niao bing shen jing bing bian," "tang niao bing zhou wei shen jing bing bian," "lin chuang shi yan," and "sui ji." The search terms were used individually or in combination. Reference lists of all relevant studies were also hand-searched.

Two authors (WJX, XF) independently conducted the literature search, study selection and data extraction. Disagreement was resolved by discussion, and consensus was reached through discussion with a third party (WC).

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