

Acupuncture as a treatment modality for migraine – a systematic review of the literature

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Abstract

Migraine is a debilitating headache disorder associated with rather high healthcare costs and lost work days costs (estimated nearly \$13 billion annually in the USA as a result of 113 million lost work days). Despite numerous drugs available many patients are unresponsive to treatment or suffer from undesirable side-effects of drugs. Acupuncture is a promising treatment modality for migraine that can be used both in combination with drugs or as a stand-alone therapy. We present recent advances regarding ongoing research of acupuncture in migraine treatment.

Introduction

Migraine is a rather common and usually debilitating headache disorder that causes heavy socioeconomic burden due to direct and indirect healthcare costs as well as school and work absenteeism. Although there are various pharmacological treatment options (e.g. triptans, ergotamines, NSAIDs,) there is a significant percentage of patients unresponsive to treatment. Moreover, this medication and especially combination drugs are often associated with undesirable side-effects (sleepiness, fatigue, nausea, tachycardia etc.). Therefore, there is an unmet need to establish an alternative treatment for unresponsive migraine patients.

In the United States approximately 23% of households have at least one member suffering from migraine (nearly 18% of women and 6% of men) and the total number of patients is estimated to exceed 28 millions, with half of this population reporting reduced work or school productivity [1].

Acupuncture has been widely used in China for more than 2000 years for the treatment of various pain syndromes including migraine. It is a non-pharmacologic treatment modality that could be beneficial both as a supplementary treatment to current medication (increased effectiveness, drug dose reduction and hence side-effects alleviation) but also as an alternative treatment in drug-unresponsive cases.

Mechanisms of action

Cerebral vasodilation is a well established cause of headache and drugs such as triptans mediate their analgesic action, at least in part, through induction of cerebral vasoconstriction [2,3]. Activation of myosin light chain kinase of cerebral vessels is a significant step in the vasoconstriction process [4]. In an experimental animal model of migraine acupuncture has been found to induce activation of myosin light chain kinase in the middle meningeal artery, indicating its effectiveness in preventing and treating migraine attacks [5].

A randomized, double blind, controlled trial of real versus sham acupuncture in frequent migraineurs showed that acupuncture results in significantly less migraine days and pain intensity and increased

pain thresholds [6]. No severe adverse effects were reported in the trial. These results were maintained at three-month follow-up, but not at one-year follow up, suggesting that acupuncture is an effective and safe treatment for short-term relief of frequent migraines and that periodical acupuncture sessions might be necessary to prolong the therapeutic effect [6].

In a clinical study utilizing resting-state functional magnetic resonance imaging (fMRI) scanning between migraine without aura patients and healthy controls functional connectivity of the right frontoparietal network was found significantly decreased among migraine patients [7]. Intrinsically decreased functional connectivity could be reversed after 4 weeks of acupuncture treatment suggesting yet another therapeutic action of acupuncture [7].

Another randomized controlled trial also using resting-state fMRI in patients with migraine showed that acupuncture can regulate some migraine-affected key regions as well as the pain circuitry of the brain and cognitive components of pain processing [8].

Serum nitric oxide (NO) levels (a potent vasodilator contributing to headache) have been found nearly 55% higher in migraine patients compared to healthy controls [9]. Acupuncture treatment can significantly decrease serum NO levels in migraine patients as early as the 5th session and its effects were found to be cumulative with consequent sessions [9].

Acupuncture treatment has been found to significantly decrease matrix metalloproteinase-2 (MMP-2) activity in patients with migraine, without affecting MMP-2 concentrations thus, the analgesic effect of acupuncture might be also associated with this decrease [10].

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Experimental animal studies (using rats) have concluded that acupuncture combined with electrical stimulation of the needles (electroacupuncture) can decrease plasma glutamate levels (which were found significantly increased in rats during acute migraine attacks) thereby relieving pain [11].

Finally, endocannabinoid system activation, which has been proven to exert analgesia and neuroprotection [12,13] is believed to be another mechanism of action of acupuncture on migraine patients [14].

Discussion

Migraine is a common, debilitating pain disorder and current medications do not always achieve sufficient analgesia. Modern research has shown that acupuncture can be a safe and effective treatment for migraine either supplementary to mainstream pharmaceutical treatment or as an alternative stand-alone modality. Severe adverse effects seldom occur during acupuncture treatment which emphasizes its safety profile. The major therapeutic benefit of acupuncture is that it significantly decreases frequency, duration and pain intensity of migraine attacks [15].

Conclusions

Acupuncture has been found to be at least as effective as conventional preventative pharmacologic treatment for migraine [6,16]. It does not only relieve the pain of migraine but also improves the psychological profile of patients [17]. Moreover, it is safe, cost-effective, long lasting and contributes significantly to the improvement of patients' quality of life.

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