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Review article

Acupuncture as treatment for nervous system diseases

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ABSTRACT

Acupuncture and moxibustion have been used for at least 2000 years to treat a wide range of diseases. In recognition of the increasing worldwide interest in the subject, the World Health Organization conducted a symposium on acupuncture in 1979 and put forth a list of 40 suitable diseases that can be treated with this approach. In Taiwan, acupuncture is widely used as a tool to treat diseases and disorders of the nervous system such as stroke, dementia, Parkinson's disease, and carpal tunnel syndrome. Although numerous studies on the effectiveness of acupuncture have been conducted, the efficacy of acupuncture as treatment for nervous system diseases or disorders has been questioned mainly because only a limited number of controlled clinical trials have been published. The aim of this review is to determine whether there is enough evidence in previously published trials to support the beneficial effects of acupuncture on diseases of the nervous system.

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1. Introduction

Acupuncture and moxibustion have been used to treat diseases in China for over 2000 years. The meridian theory of acupuncture was first recorded in detail in *The Yellow Emperor's Classic of Internal Medicine* [1,2], although *The Great Compendium of Acupuncture and Moxibustion*, published in the Ming Dynasty, forms the basis of modern acupuncture theory and practice [2]. In recognition of the increasing worldwide interest in the subject, the World Health Organization conducted a symposium on acupuncture in 1979 and put forth a list of 40 suitable diseases that can be treated with this approach [3]. In Taiwan, acupuncture is commonly used to treat diseases and disorders of the nervous system, namely stroke, dementia, Parkinson's disease, epilepsy, Bell's palsy,

carpal tunnel syndrome, and headache. Although numerous studies on the effectiveness of acupuncture have been conducted, the efficacy of acupuncture as treatment for nervous system diseases or disorders has been questioned mainly because only a limited number of controlled clinical trials have been published. The aim of this review is to determine whether there is enough evidence in previously published trials to support the beneficial effects of acupuncture on diseases of the nervous system.

2. Acupuncture in stroke

Stroke is one of the most common diseases in Taiwan, and was the third leading cause of death in that country in 2011 [4].

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Hu et al. conducted a randomized, controlled study to evaluate the effect of acupuncture on acute stroke symptoms. A total of 30 patients with onset of symptoms within 36 hours were randomly assigned to receive acupuncture in combination with conventional supportive treatment or to receive supportive treatment only. Acupuncture was applied three times per week for 4 weeks and patients were then followed-up for 3 months. They found that neurologic outcome was significantly better in the acupuncture group on day 28 and on day 90, and that improvement in neurologic status was greatest in patients with a poor baseline neurologic score [5]. In a randomized controlled study on the effects of electroacupuncture (EA) in patients with first-ever ischemic stroke, Hsieh et al. reported that patients who received eight courses of EA with stimulation pulses alternating between 3 Hz and 15 Hz over a 1-month period showed significantly better improvement in motor function than patients who received conventional rehabilitation treatment only [6]. Johansson et al. studied whether sensory stimulation can improve functional outcome in stroke patients. A total of 78 patients with severe hemiplegia were randomized within 10 days after stroke onset to receive either daily physiotherapy alone (40 patients) or in combination with EA (2–5 Hz) for 30 minutes twice a week for 10 weeks (38 patients). They found that patients who received EA recovered faster than controls and showed greater improvement in balance, activities of daily living (ADL), and quality of life [7]. In a multicenter controlled trial by the same group, 150 patients with moderate to severe hemiparesis were randomized 5–10 days after stroke onset to receive EA, transcutaneous electrical nerve stimulation (TENS), or subliminal electrostimulation (control group). A total of 20 treatment sessions were performed over a 10-week period and outcome variables were assessed at the 3-month and 1-year follow-ups. Interestingly, there were no significant differences among the three groups in improvement in motor function, walking ability or ADL [8], indicating that acupuncture did not produce a beneficial effect on functional outcome in stroke patients. Similar results were reported by Gosman-Hedström et al. in their randomized study on the effects of acupuncture treatment on daily life activities and quality of life in 104 patients with acute stroke [9], and by Sze et al. who found that there was no significant difference in outcome between stroke patients with moderate or severe functional impairment who received acupuncture at 10 acupoints for 10 weeks and stroke patients who received standard post-stroke motor rehabilitation training [10]. Lack of a beneficial effect of acupuncture as treatment for stroke patients has been reported in other studies as well [11,12].

A number of studies, however, have shown that acupuncture is an efficacious post-stroke therapy. For example, Naeser et al. reported that patients with right-sided hemiplegia due to left hemispheric ischemic infarction who received 20 acupuncture sessions over a period of 1 month beginning 1–3 months after stroke onset showed a significantly better response than patients who received sham acupuncture [13]. In addition, Kjendahl et al. found that acupuncture applied for 30 minutes three or four times per week for 6 weeks resulted in a positive long-term effect on motor function, daily life quality, and social interaction in

patients with subacute stage (mean, 40 days) stroke 1 year after hospital discharge [14].

Recently, Liu et al. conducted a randomized, crossover pilot study on the effects of EA on motor recovery in chronic stroke survivors. A total of 10 stroke patients who had suffered a stroke more than 2 years prior to enrolment were randomized to receive either EA (1–2 Hz) plus strength training treatment twice per week for 6 weeks or a 6-week session of strength training treatment only. They found that patients who received 2 Hz EA plus strength training treatment had a marked reduction in muscle spasticity of the wrist and a marked increase in active wrist extension range of motion and Fugl-Meyer upper-limb scores. These effects were not noted in patients who only received strength training treatment. The findings indicate that EA reduces muscle spasticity and enhances performance of motor tasks [15]. Results from a similar study also revealed that EA (twice per week) combined with muscle training exercises for 6 weeks reduced the degree of muscle spasticity in chronic stroke patients [16]. In addition, a recent study showed that acupuncture treatment accompanied by manual twisting of needles at the Baihui (GV20) acupoint and at the spirit acupoints for 20 minutes in patients with first-ever ischemic stroke resulted in significantly greater reduction in displacement area than acupuncture without twisting of needles, indicating that acupuncture with twisting of needles can improve balance function [17].

Rorsman and Johansson investigated whether EA or TENS influences cognitive and emotional outcome after stroke. In their study, 54 stroke patients with moderate or severe functional impairment were randomized to receive acupuncture including EA, TENS, or subliminal TENS (control group). Acupuncture started from 5–10 days after stroke onset, and was performed for 30 minutes, two times per week for 10 weeks. They found that there were no significant differences in changes among the three groups in emotional status or cognitive function at 3 or 12 months after treatment [18]. In contrast, Chou et al. showed that 1 EA (1 Hz) applied to the PC6 and HT7 acupoints for 20 minutes, twice per week for 8 weeks, had a positive effect on cognition and life quality in stroke patients with cognitive impairment [19].

The effectiveness of acupuncture on motor function, ADL, and cognitive function in patients with acute stroke remains controversial. More rigorous randomized controlled studies comprising larger patient populations are needed to definitively determine whether acupuncture is a valuable treatment for stroke patients.

3. Acupuncture as treatment for degenerative disorders

3.1. Alzheimer's disease and vascular dementia

Alzheimer's disease is a chronic progressive degenerative disease. Several systematic review articles have revealed that acupuncture is not effective in patients with Alzheimer's disease [20] or vascular dementia [21,22]. However, Zhou and Jin showed that acupuncture had a beneficial effect in patients with Alzheimer's disease. The researchers used functional magnetic resonance imaging to evaluate brain changes in 26

patients with Alzheimer's disease who underwent EA. Electrostimulation was applied to the Shenmen (HT7) acupoint as an anode and the Zusanli (ST36) acupoint as a cathode as well as to the Fenlong (ST40) acupoint as an anode and the Taixi (K13) acupoint as a cathode. They found that electrostimulation at these acupoints resulted in increased activity in the hippocampal gyrus and insula in the right hemisphere, the temporal lobe, and parietal lobe of the left hemisphere. These regions are associated with cognitive function such as memory and language, suggesting that acupuncture at those acupoints produces a beneficial effect in patients with Alzheimer's disease [23]. In addition, Yang et al. demonstrated that acupressure could reduce the degree of agitated behavior in patients with dementia. The researchers applied acupressure to the Fengchi (GB20), Baihui (GV20), Shenmen (HT7), Neiguan (PC6), and Sanyinjiao (SP6) acupoints for 2 minutes after a 5-minute warm-up activity, twice daily, 5 days a week for 4 weeks in 20 patients with dementia who demonstrated agitated behavior. They found that acupressure dramatically reduced the degree of agitation in their patients [24]. Additional randomized, controlled, double-blinded trials comprising larger patient populations are needed to determine whether acupuncture induces a beneficial effect in patients with Alzheimer's disease or vascular dementia.

3.2. Parkinson's disease

Parkinson's disease is a chronic progressive disease characterized by slow movements, tremors, and walking impairment due to loss of midbrain nigrostriatal neurons and depletion of striatal dopamine. About 63% of patients with Parkinson's disease in Korea [25] and 25% of patients with the disease in Singapore [26] use acupuncture as a complementary therapy; however, a number of large-scale studies have shown that acupuncture is not effective at alleviating the symptoms of Parkinson's disease [27–30]. The results from small-scale studies are similar. For example, Eng et al. used acupuncture in combination with Yin Tui Na massage on a weekly basis as treatment for patients with Parkinson's disease for 6 months and found that scores on the Unified Parkinson's Disease Rating Scale (UPDRS) were significantly higher than baseline scores 6 months after treatment [31]. In addition, Shulman et al. found that acupuncture applied to body or scalp acupoints for 1 hour twice per week for 5–8 weeks in patients with Parkinson's disease resulted in improvements in sleep and rest but did not improve other symptoms of the disease [32]. Functional magnetic resonance imaging studies have shown that acupuncture applied to the Yanglingquan (GB34) acupoint results in the activation of portions of the putamen and the primary motor cortex, resulting in improved motor function [33]. A positron emission tomography study showed that scalp acupuncture and Madopa therapy for 5 weeks resulted in an increase in glucose metabolism in five patients with Parkinson's disease [34]. In another study, although EA administered to the scalp in addition to administration of levodopa for 5 weeks increased hemispheric regional blood flow, administration of those treatments did not result in changes in striatal dopamine transporter density in the basal ganglia [35]. Taken together, although acupuncture including EA does not seem to improve

motor function or ADL in patients with Parkinson's disease, acupuncture does seem to improve blood flow and glucose metabolism in brain tissue in patients with the disease, suggesting that acupuncture does play a beneficial role in delaying intellectual decline in patients with Parkinson's disease. Further large-scale studies are warranted.

4. Acupuncture as treatment for headache

4.1. Migraine

Studies have shown that non-specific psychological interactions play a major role in the improvement of many patients with headache, which might explain why some studies comparing the effects of acupuncture with those of placebo have demonstrated that there are no differences in outcome between the two treatments [36]. Nevertheless, a number of studies have shown that acupuncture is an effective treatment for certain types of headache. For example, studies have demonstrated that acupuncture is both a clinically efficacious and a cost-effective treatment for migraine, especially when applied to the Fenchi (GB20) and Taiyang (EX-HN5) acupoints for 30 minutes twice a week for at least 10 weeks [37–39]. Also, Allais et al. used the needle contact test to detect the most efficacious points on the ear for reducing pain during a migraine episode and found that the insertion of semi-permanent needles into the anterior-internal part of the antitragus ipsilateral to the side of pain resulted in pain relief within 30 minutes and that it persisted for up to 24 hours [40,41].

The results of a multicenter, single-blinded randomized controlled trial comprising 480 patients with migraine revealed that patients who received acupuncture including electrostimulation had significantly fewer days of migraine pain than patients who received sham acupuncture during weeks 13–16 after treatment, indicating that acupuncture produces a clinically minor prophylactic effect [42]. Other studies have shown that acupuncture treatment is more effective than prophylactic drug treatment for migraine headaches [43–45]. In addition, Yang et al. demonstrated that acupuncture applied to the Cuanzhu (BL2), Taiyang (EX-HN5), Yintang (EX-HN-3), and Fengchi (GB20) acupoints resulted in fewer episodes of migraine and led to fewer adverse events than topiramate treatment in patients with chronic migraine [46]. Studies have also demonstrated that acupuncture is more effective than flunarizine treatment at reducing the number of days of migraine pain [47]. Based on the abovementioned findings, acupuncture treatment appears to be beneficial for reducing the degree of pain associated with migraine headaches, particularly when applied as prophylactic treatment.

4.2. Tension-type headache

A Cochrane review of 11 clinical trials comprising 2317 patients with tension-type headache provided evidence that acupuncture treatment is valuable for patients who suffer frequent episodes of that type of headache. A number of other studies have also demonstrated that acupuncture results in a greater reduction in intensity and frequency of tension-type headache than sham acupuncture [48,49]. Acupuncture,

therefore, appears to be beneficial for reducing the frequency and severity of episodic tension-type headaches.

5. Acupuncture in epilepsy

Epilepsy is a chronic neurological condition characterized by excessive synchronization of neuronal networks, behavioral changes, and recurrent seizures. Most studies have demonstrated that acupuncture is not an effective treatment for epilepsy. For example, the authors of a Cochrane review

concluded that there is not enough evidence to support the effectiveness of acupuncture as treatment for epilepsy, mainly because most of the studies were of poor methodological quality [50]. In addition, Kloster et al. showed that there was no difference in the frequency of seizure between patients with chronic intractable epilepsy who received acupuncture and patients who received sham acupuncture at bilateral Taichon (LR3), Hegu (LI4) and Baihui (GV20) acupoints for 30 minutes, three times per week for 7.5 weeks, indicating that acupuncture is not beneficial in patients with chronic intractable epilepsy [51]. A similar study on patients with intractable

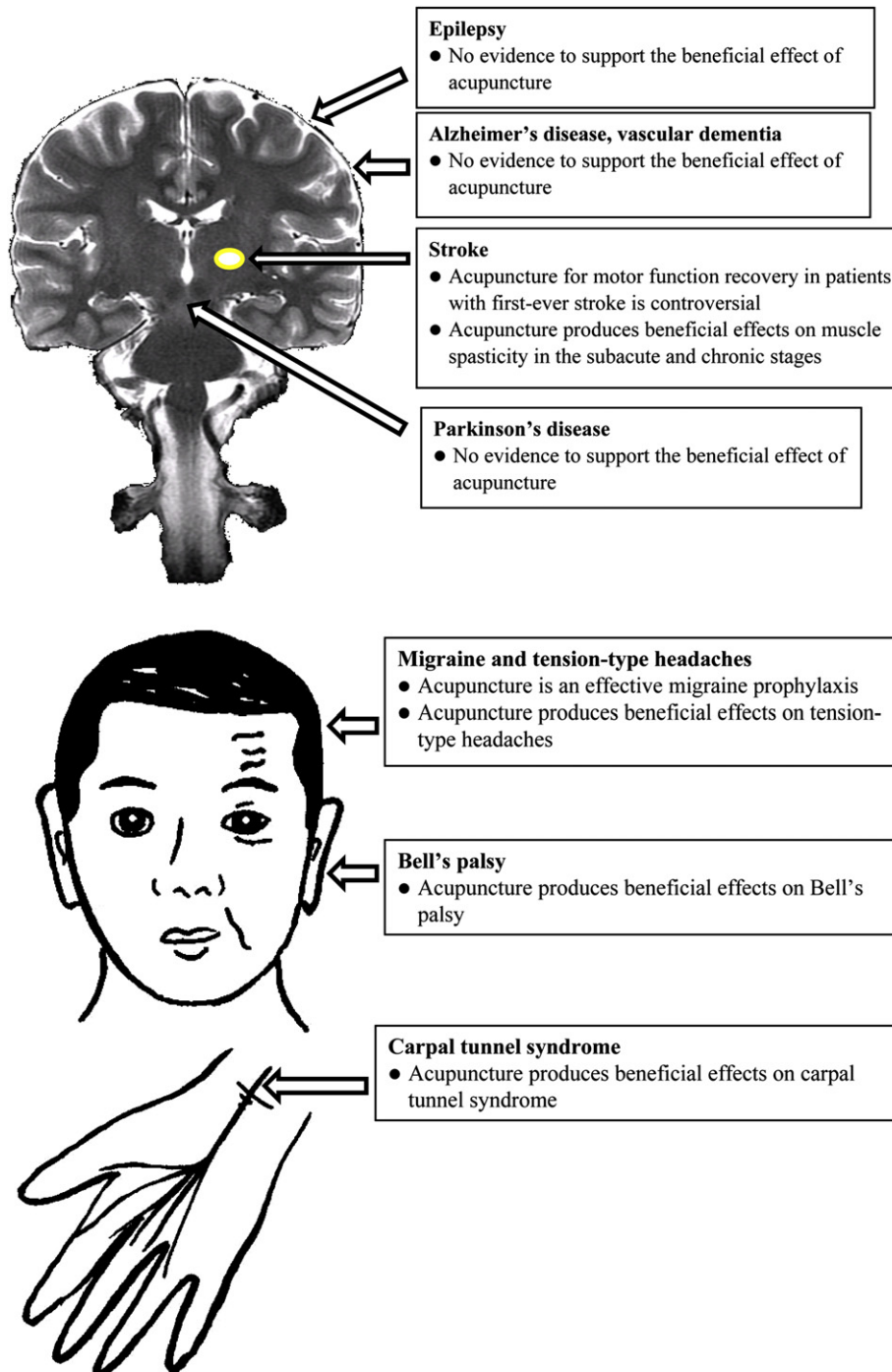


Fig. 1 – Acupuncture as treatment for nervous system disorders.

epilepsy showed that acupuncture treatment did not result in improved health-related quality of life [52]. Therefore, the results of many randomized, controlled trials indicate that acupuncture is not an effective treatment for epilepsy.

Vagal nerve stimulation and EA are promising neuro-protective therapies for patients with intractable epilepsy. Studies have shown that stimulation of acupoints stimulates the vagus nerve, and it is possible that vagal nerve stimulation and EA target the same center of the brain. The nucleus of the solitary tract is also the site of afferent signals produced by vagal nerve stimulation or EA when applied to scalp, face and auricular sites, and the neuroprotective effects of EA in epileptic patients may be due to the anti-inflammatory and neurotrophic actions produced through the nucleus of the solitary tract by stimulation of the vagus nerve [53,54]. We found that 2 Hz and 100 Hz EA applied to bilateral Zusanli (ST36) acupoints resulted in reduced pulse rate, indicating that EA at Zusanli (ST36) induces parasympathetic activity [55]. He et al. hypothesized that auricular acupuncture may suppress epileptic seizures by activating parasympathetic activity. This increase in parasympathetic tone is believed to activate the nucleus of the solitary tract, which might result in the suppression of structures related to the pathogenesis of epilepsy or in the activation of the cholinergic anti-inflammatory pathway [56]. Further studies are needed to determine whether EA stimulation at specific acupoints has an antiepileptic effect as a result of EA-induced parasympathetic activity.

6. Acupuncture in peripheral nerve disease

6.1. Bell's palsy

Bell's palsy is defined as an idiopathic facial nerve paralysis and is the most common unilateral peripheral facial neuropathy. The cause of Bell's palsy is unknown, but mounting evidence suggests that reactivated herpes virus infection plays a key role in its development [57,58]. Although a Cochrane review concluded that there is inadequate evidence to support the effectiveness of acupuncture for Bell's palsy [59], a number of studies have provided evidence that acupuncture is beneficial. For example, Li et al., in their multi-center, single-blinded, randomized controlled trial comprising 480 patients with Bell's palsy, found that acupuncture applied to the Dicang (ST4), Jiache (ST6), Hegu (LI4), Yangbai (GB14), Xiaguan (ST7), and Yifeng (TE17) acupoints for 30 minutes followed by moxibustion for 5 minutes, five times per week for 4 weeks resulted in significant improvement in facial nerve function [60]. In addition, acupuncture treatment was shown to be safe and effective in improving functional and cosmetic outcome in a patient with a 7-year history of Bell's palsy and in a pregnant patient with Bell's palsy [61,62]. More rigorous clinical studies are needed to determine whether acupuncture is an appropriate and effective treatment for patients with Bell's palsy.

6.2. Carpal tunnel syndrome

Carpal tunnel syndrome (CTS) is a nerve disorder of the hand caused by compression of the median nerve. Surgical decompression is considered to be definitive treatment, although

conservative treatment such as steroid injection (e.g., with prednisolone) and splinting is effective in some cases [63]. Acupuncture is often used as adjunct therapy, especially in Asian countries. Sim et al. reviewed 11 studies including 6 randomized controlled trials of the use of acupuncture as conservative therapy for CTS and found that there is not enough evidence to support its efficacy [64]. Yao et al., in their double-blinded, randomized controlled study of 34 patients with CTS, found that verum acupuncture was not superior to placebo acupuncture [65]. However, Napadow et al. used functional magnetic resonance imaging to evaluate differences in somatosensory cortical plasticity after acupuncture treatment between 13 adult patients with CTS and 12 age- and sex-matched healthy adults and found that acupuncture resulted in changes in digital cortical representation in CTS patients 5 weeks after acupuncture treatment. These changes, however, were not noted in the healthy adults [66]. They also found that verum acupuncture activated regions in the hypothalamus and deactivated regions in the amygdala in patients with CTS but not in healthy adults, indicating that acupuncture might modulate the limbic-paralimbic network [67]. In addition, studies have demonstrated that the effects of acupuncture applied to the Daling (PC7) and Neiguan (PC6) acupoints twice per week for 4 weeks on reducing symptoms of CTS were similar to those elicited by the administration of prednisolone [68], and that the effects of acupuncture treatment lasted longer than the effects obtained with that corticosteroid [69]. Although additional studies are needed to prove the efficacy of acupuncture for CTS, it appears that acupuncture is moderately beneficial as conservative treatment in patients with CTS.

7. Conclusion

Acupuncture treatment is beneficial in patients with subacute and chronic stroke, appears to be effective for migraine when used prophylactically, is an effective treatment for tension-type headache, and shows promise as an adjunct therapy for Bell's palsy and carpal tunnel syndrome. More rigorous studies are needed to evaluate whether acupuncture is an efficacious treatment modality for Alzheimer's disease, vascular dementia, Parkinson's disease, and epilepsy (Fig. 1).

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REFERENCES

- [1] Wang B, Wu NL, Wu AQ. The Yellow Emperor's Canon of Internal Medicine. Beijing: China Science & Technology Press; 1997. 1st edition;1999, 2nd edition.
- [2] White A, Ernst E. A brief history of acupuncture. *Rheumatology* 2004;43:662–3.
- [3] Bannerman RH. Acupuncture: the WHO view. *World Health* 1979;12:27–8.

- [4] http://www.doh.gov.tw/CHT2006/DM/DM2_2_p02.aspx?class_no=440&now_fod_list_no=11897&level_no=3&doc_no=80725.
- [5] Hu HH, Chung C, Liu TJ, Chen RC, Chen CH, Chou P, et al. A randomized controlled trial on the treatment for acute partial ischemic stroke with acupuncture. *Neuroepidemiology* 1993;12:106–13.
- [6] Hsieh RL, Wang LY, Lee WC. Additional therapeutic effects of electroacupuncture in conjunction with conventional rehabilitation for patients with first-ever ischemic stroke. *J Rehabil Med* 2007;39:205–11.
- [7] Johansson K, Lindgren I, Widner H, Wiklund I, Johansson BB. Can sensory stimulation improve the functional outcome in stroke patients? *Neurology* 1993;43:2189–92.
- [8] Johansson BB, Haker E, von Arbin M, Britton M, Långström G, Terént A, et al. Acupuncture and transcutaneous nerve stimulation in stroke rehabilitation: a randomized, controlled trial. *Stroke* 2001;32:707–13.
- [9] Gosman-Hedström G, Claesson L, Klingensstierna U, Carlsson J, Olausson B, Frizell M, et al. Effects of acupuncture treatment on daily life activities and quality of life: a controlled, prospective, and randomized study of acute stroke patients. *Stroke* 1998;29:2100–8.
- [10] Sze FK, Wong E, Yi X, Woo J. Does acupuncture have additional value to standard poststroke motor rehabilitation? *Stroke* 2002;33:186–94.
- [11] Sze FK, Wong E, Or KK, Lau J, Woo J. Does acupuncture improve motor recovery after stroke? *Stroke* 2002;33:2604–19.
- [12] Hopwood V, Lewith G, Prescott P, Campbell MJ. Evaluating the efficacy of acupuncture in defined aspects of stroke recovery. A randomized, placebo controlled single blind study. *J Neurol* 2008;255:858–66.
- [13] Naeser MA, Alexander MP, Stiassny-Eder D, Galler V, Hobbs J, Bachman D. Real versus sham acupuncture in the treatment of paralysis in acute stroke patients: a CT scan lesion site study. *J Neuro Rehab* 1992;6:163–73.
- [14] Kjendahl A, Sällström S, Osten PE, Stanghelle JK, Borchgrevink CF. A one year follow-up study on the effects of acupuncture in the treatment of stroke patients in the subacute stage: a randomized, controlled study. *Clin Rehabil* 1997;11:192–200.
- [15] Liu W, Mukherjee M, Sun C, Liu H, McPeak LK. Electroacupuncture may help motor recovery in chronic stroke survivors: a pilot study. *J Rehabil Res Dev* 2008;45:587–95.
- [16] Mukherjee M, McPeak LK, Redford JB, Sun C, Liu W. The effect of electro-acupuncture on spasticity of the wrist joint in chronic stroke survivors. *Arch Phys Med Rehabil* 2007;88:159–66.
- [17] Liu SY, Hsieh CL, Wei TS, Liu PT, Chang YJ, Li TC. Acupuncture stimulation improves balance function in stroke patients: a single-blinded controlled, randomized study. *Am J Chin Med* 2009;27:483–94.
- [18] Rorsman IA, Johansson B. Can electroacupuncture or transcutaneous nerve stimulation influence cognitive and emotional outcome after stroke? *J Rehabil Med* 2006;38:13–9.
- [19] Chou P, Chu H, Lin JG. Effects of electroacupuncture treatment on impaired cognition and quality of life in Taiwanese stroke patients. *J Altern Complement Med* 2009;15:1067–73.
- [20] Lee MS, Shin BC, Ernst E. Acupuncture for Alzheimer's disease: a systematic review. *Int J Clin Pract* 2009;63:874–9.
- [21] Weina P, Zhao H, Zhishun L, Shi W. Acupuncture for vascular dementia (review). The Cochrane Collaboration, published by John Wiley & Sons, Ltd; 2009. Issue 1.
- [22] Peng W, Wang Y, Zhang Y, Liang CM. Acupuncture for vascular dementia (review). The Cochrane Collaboration, published by John Wiley & Sons, Ltd; 2011. Issue 10.
- [23] Zhou Y, Jin J. Effect of acupuncture given at the HT 7, ST 36, ST 40 and KI 3 acupoints on various parts of the brains of Alzheimer's disease patients. *Acupunct Electrother Res* 2008;33:9–17.
- [24] Yang MH, Wu SC, Lin JG, Lin LC. The efficacy of acupressure for decreasing agitated behaviour in dementia: a pilot study. *J Clin Nurs* 2007;16:308–15.
- [25] Kim SR, Lee TY, Kim MS, Lee MC, Chung SJ. Use of complementary and alternative medicine by Korean patients with Parkinson's disease. *Clin Neurol Neurosurg* 2009;111:156–60.
- [26] Tan LC, Lau PN, Jamora RD, Chan ES. Use of complementary therapies in patients with Parkinson's disease in Singapore. *Mov Disord* 2006;21:86–9.
- [27] Lam YC, Kum WF, Durairajan SS, Lu JH, Man SC, Xu M, et al. Efficacy and safety of acupuncture for idiopathic Parkinson's disease: a systematic review. *J Altern Complement Med* 2008;14:663–71.
- [28] Lee MS, Shin BC, Kong JC, Ernst E. Effectiveness of acupuncture for Parkinson's disease: a systematic review. *Mov Disord* 2008;23:1505–15.
- [29] Zesiewicz TA, Evatt ML. Potential influences of complementary therapy on motor and non-motor complications in Parkinson's disease. *CNS Drugs* 2009;23:817–35.
- [30] Cristian A, Katz M, Cutrone E, Walker RH. Evaluation of acupuncture in the treatment of Parkinson's disease: a double-blind pilot study. *Mov Disord* 2005;20:1185–8.
- [31] Eng ML, Lyons KE, Greene MS, Pahwa R. Open-label trial regarding the use of acupuncture and yin tui na in Parkinson's disease outpatients: a pilot study on efficacy, tolerability, and quality of life. *J Altern Complement Med* 2006;12:395–9.
- [32] Shulman LM, Wen X, Weiner WJ, Bateman D, Minagar A, Duncan R, et al. Acupuncture therapy for the symptoms of Parkinson's disease. *Mov Disord* 2002;17:799–802.
- [33] Chae Y, Lee H, Kim H, Kim CH, Chang DI, Kim KM, et al. Parsing brain activity associated with acupuncture treatment in Parkinson's diseases. *Mov Disord* 2009;24:1794–802.
- [34] Huang Y, Jiang X, Zhuo Y, Tang A, Wik G. Complementary acupuncture treatment increases cerebral metabolism in patients with Parkinson's disease. *Int J Neurosci* 2009;119:1190–7.
- [35] Huang Y, Jiang X, Zhuo Y, Wik G. Complementary acupuncture in Parkinson's disease: a SPECT study. *Int J Neurosci* 2010;120:150–4.
- [36] Autret A, Valade D, Debais S. Placebo and other psychological interactions in headache treatment. *J Headache Pain* 2012;13:191–8.
- [37] Schiapparelli P, Allais G, Rolando S, Airola G, Borgogno P, Terzi MG, et al. Acupuncture in primary headache treatment. *Neurol Sci* 2011;32:S15–8.
- [38] Zheng H, Chen M, Wu X, Li Y, Liang FR. Manage migraine with acupuncture: a review of acupuncture protocols in randomized controlled trials. *Am J Chin Med* 2010;38:639–50.
- [39] Nicholson RA, Buse DC, Andrasik F, Lipton RB. Nonpharmacologic treatments for migraine and tension-type headache: how to choose and when to use. *Curr Treat Options Neurol* 2011;13:28–40.
- [40] Allais G, Romoli M, Rolando S, Castagnoli Gabellari I, Benedetto C. Ear acupuncture in unilateral migraine pain. *Neurol Sci* 2010;31:S185–7.
- [41] Allais G, Romoli M, Rolando S, Airola G, Castagnoli Gabellari I, Allais R, et al. Ear acupuncture in the treatment of migraine attacks: a randomized trial on the efficacy of appropriate versus inappropriate acupoint. *Neurol Sci* 2011;32:S173–5.

- [42] Li Y, Zheng H, Witt CM, Roll S, Yu SG, Yan J, et al. Acupuncture for migraine prophylaxis: a randomized controlled trial. *CMAJ* 2012;184:401–10.
- [43] Linde K, Allais G, Brinkhaus B, Manheimer E, Vickers A, White AR. Acupuncture for migraine prophylaxis (review). The Cochrane Collaboration, published by John Wiley & Sons, Ltd; 2009. Issue 4.
- [44] Kelly RB. Acupuncture for pain. *Am Fam Phys* 2009;80:481–4.
- [45] Linde K, Allais G, Brinkhaus B, Manheimer E, Vickers A, White AR. Acupuncture for tension-type headache. *Cochrane Database Syst Rev* 2009;1:CD007587.
- [46] Yang CP, Chang MH, Liu PE, Li TC, Hsieh CL, Hwang KL, et al. Acupuncture versus topiramate in chronic migraine prophylaxis: a randomized clinical trial. *Cephalagia* 2011;31: 1510–21.
- [47] Wang LP, Zhang XZ, Guo J, Liu HL, Zhang Y, Liu CZ, et al. Efficacy of acupuncture for migraine prophylaxis: a single-blinded, double-dummy, randomized controlled trial. *Pain* 2011;152:1864–71.
- [48] Sun Y, Gan TJ. Acupuncture for the management of chronic headache: a systematic review. *Anesth Analg* 2008;107: 2038–47.
- [49] Hopton A, MacPherson H. Acupuncture for chronic pain: is acupuncture more than an effective placebo? A systematic review of pooled data from meta-analysis. *Pain Pract* 2010;10: 94–102.
- [50] Cheuk DKL, Wong V. Acupuncture for epilepsy (review). The Cochrane Collaboration, published by John Wiley & Sons, Ltd; 2006. Issue 3.
- [51] Kloster R, Larsson PG, Lossius R, Nakken KO, Dahl R, Xiu-Ling X, et al. The effect of acupuncture in chronic intractable epilepsy. *Seizure* 1999;8:170–4.
- [52] Stavem K, Kloster R, Røssberg E, Larsson PG, Dahl R, Kinge E, et al. Acupuncture in intractable epilepsy: lack of effect on health-related quality of life. *Seizure* 2000;9:422–6.
- [53] Hsiang JN, Wong LK, Kay R, Poon WS. Vagus nerve stimulation for seizure control: local experience. *J Clin Neurosci* 1998;5:294–7.
- [54] Cakmak YO. Epilepsy, electroacupuncture and the nucleus of the solitary tract. *Acupunct Med* 2006;24:164–8.
- [55] Hsieh CL, Lin JG, Li TC, Chang QY. Changes of pulse rate and skin temperature evoked by electroacupuncture stimulation with different frequency on both Zusanli acupoints in humans. *Am J Chin Med* 1999;27:11–8.
- [56] He W, Rong PJ, Li L, Ben H, Zhu B, Litscher G. Auricular acupuncture may suppress epileptic seizures via activating the parasympathetic nervous system: a hypothesis based on innovative methods. *Evid Based Complement Alternat Med* 2012;2012:615476.
- [57] Kwon HJ, Kim JI, Lee MS, Choi JY, Kang S, Chung JY, et al. Acupuncture for sequelae of Bell's palsy: a randomized controlled trial protocol. *Trials* 2011;12:71.
- [58] Xia F, Han J, Liu X, Wang J, Jiang Z, Wang K, et al. Prednisolone and acupuncture in Bell's palsy: study protocol for a randomized, controlled trial. *Trials* 2011;12:158.
- [59] Chen N, Zhou M, He L, Zhou D, Li N. Acupuncture for Bell's palsy (review). The Cochrane Collaboration, published by John Wiley & Sons, Ltd; 2010. Issue 8.
- [60] Li Y, Liang FR, Yu SG, Li CD, Hu LX, Zhou D, et al. Efficacy of acupuncture and moxibustion in treating Bell's palsy: a multiple center randomized controlled trial in China. *Chin Med J* 2004;117:1502–6.
- [61] Wong CL, Wong VC. Effect of acupuncture in a patient with 7-year-history of Bell's palsy. *J Altern Complement Med* 2008; 14:847–53.
- [62] Lei H, Wang W, Huang G. Acupuncture benefits a pregnant patient who has Bell's palsy: a case study. *J Altern Complement Med* 2010;16:1011–4.
- [63] Carlson H, Colbert A, Frydl J, Arnall E, Elliot M, Carlson N. Current options for nonsurgical management of carpal tunnel syndrome. *Int J Clin Rheumatol* 2010;5:129–42.
- [64] Sim H, Shin BC, Lee MS, Jung A, Lee H, Ernst E. Acupuncture for carpal tunnel syndrome: a systematic review of randomized controlled trials. *J Pain* 2011;12:307–14.
- [65] Yao E, Gerritz PK, Henricson E, Abresch T, Kim J, Han J, et al. Randomized controlled trial comparing acupuncture with placebo acupuncture for the treatment of carpal tunnel syndrome. *PM R* 2012;4:367–73.
- [66] Napadow V, Liu J, Li M, Kettner N, Ryan A, Kwong KK, et al. Somatosensory cortical plasticity in carpal tunnel syndrome treated by acupuncture. *Hum Brain Mapp* 2007; 28:159–71.
- [67] Napadow V, Kettner N, Liu J, Li M, Kwong KK, Vangel M, et al. Hypothalamus and amygdala response to acupuncture stimuli in carpal tunnel syndrome. *Pain* 2007;130:254–66.
- [68] Yang CP, Hsieh CL, Wang NH, Li TC, Hwang KL, Yu SC, et al. Acupuncture in patients with carpal tunnel syndrome: a randomized controlled trial. *Clin J Pain* 2009;25:327–33.
- [69] Yang CP, Wang NH, Li TC, Hsieh CL, Chang HH, Hwang KL, et al. A randomized clinical trial of acupuncture versus oral steroids for carpal tunnel syndrome: a long-term follow-up. *J Pain* 2011;12:272–92.