Acupuncture Pain Management

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The concept of yin and yang is one of the essential theories of traditional Chinese medicine and acupuncture. It is simple, but its implication is philosophical. It was first mentioned in *The Book of Changes and Simplicity* (*Yi Jing*), a text from about 700 BC. Yin and yang are natural phenomena that exist within the body. They are interdependent and can be transformed into each other. They exist in a constant state of dynamic balance. Yang is related to bright, hot, activity, light, above, outward, increase, dry, and male. Yin is present in the qualities of dark, cold, rest, passivity, below, inward, decrease, wet, and female. Yin and yang define aspects of a whole, and therefore are dependent on each other. For example, "bright" is difficult to define without "dark." "Above" is meaningless without "below." Ying yang inter-dependence is the relationship between structure and function. Optimal physical condition requires a balance of yin and yang within the body. Disease is associated with a disharmony or imbalance between yin and yang. Acupuncture can be used to balance and promote yin and yang energy within the body.

There are more than 365 identifiable acupuncture points in the human body. There are also pathways, called meridians, connecting acupuncture points to each other. Qi (pronounced "chee") is the energy flow through these meridians. Difficult to define, qi represents power and movement, similar to energy. Qi is a functional, dynamic force that resides in living creatures. It is the result of the interaction between heaven and earth, an energy that manifests concurrently in the physical and spiritual levels of human existence. Qi flows throughout the meridians of the body, maintaining life and health. These meridians are not defined by physical structures, such as blood or lymphatic vessels, but by their function. The body is viewed as a dynamic system of organs connected by the flow of qi through the meridians.

When there is stagnation or inadequate flow of qi through the meridians, pain or illness may result. The flow of qi may be restored by the insertion of the very fine needles into a combination of appropriate acupuncture points along the meridians. The manual twirling of these needles produces a sore, heavy, or numb sensation known as "de qi" (obtaining qi). Acupuncture practitioners have observed that stimulating specific acupuncture points results in predictable responses in patients, with a given pattern of signs and symptoms. Practitioners of acupuncture routinely request the patient's detailed history and present illness in pursuing the diagnosis. Physical attention is also focused on the disposition of the pulse and appearance of the tongue. In traditional Chinese medicine, there are six pathologic factors that cause disease—wind, cold, heat, dampness, dryness, and fire. The goal of the history and physical examination is to assess the patient's balance of yin and yang, and to gain insight into other symptoms.

There are eight principal classifications of symptoms, which include yin or yang, external or internal, cold or hot, and deficient or excess. The aim of acupuncture therapy is to restore deficiencies or correct excesses in qi, thus restoring health. It is frequently used for preventive care, as well as for therapeutic purposes.

A Treatise on Acupuncturation, written by James Morss Churchill in 1823, was the first text about acupuncture published in English. Dr. Churchill described his success using acupuncture for rheumatic conditions, sciatica, and back pain. Sir William Osler's *Principles and Practice of Medicine*, first published in 1892, recommended the use of acupuncture for the treatment of sciatica and lumbago. Public awareness and use of acupuncture increased in the United States following *New York Times* writer James Reston's account of his emergency appendectomy in a Chinese hospital. His article described how physicians eased his postsurgical abdominal pain with acupuncture [1].

BASIC RESEARCH IN ACUPUNCTURE

Numerous reports confirm that acupuncture has reproducible neurobiologic effects. Acupuncture inhibits the transmission of pain according to the gate control theory [2]. Acupuncture may act by stimulating sensory A-beta fibers, directly inhibiting the spinal transmission of pain by smaller A-delta and C fibers [3]. Researchers have also been paying attention to the relationship between acupuncture and the production of endogenous opioid peptides, such as the endorphins and enkephalins, and the stimulation of the endogenous descending inhibitory pathways. In an analysis of human cerebrospinal fluid, Sjolund and colleagues [4] have determined that endorphin levels in subjects become elevated following electroacupuncture. Acupuncture analgesia is mainly caused by the activation of the endogenous antinociceptive system to modulate pain transmission and pain response [5].

Electroacupuncture at 2 Hz accelerates the release of enkephalin, beta-endorphin, and endomorphin, whereas that of 100 Hz selectively increases the release of dynorphin. A combination of the two frequencies produces a simultaneous release of all four opioid peptides, resulting in a maximal therapeutic effect [6]. Peripheral stimulation of the skin or deeper structures activates various brain structures, spinal cord, or a combination via specific neural pathways [7]. A human study by Mayer and associates indicated that acupuncture analgesia can be reversed by naloxone [8]. Several serotonin antagonists inhibit the effects of electroacupuncture. Electroacupuncture attenuates behavioral hyperalgesia and stress-induced colonic motor dysfunction in rats [9]. Electroacupuncture also attenuates behavioral hyperalgesia and stress-induced colonic motor dysfunction in rats via serotonergic pathways.

Neuronal correlation to acupuncture stimulation in the human brain has been investigated by functional magnetic resonance imaging (fMRI). Acupuncture needle manipulation on the LI 4 (he gu) point modulates the fMRI activity of the limbic system and subcortical structure [10]. Acupuncture stimulation at analgesic points involving the pain-related neuromatrix have been studied. Acupuncture stimulation at the GB 34 (yang ling quan) acupuncture point has elicited significantly higher activation than sham acupuncture over the hypothalamus and primary somatosensory motor cortex and deactivation over the rostral segment of the anterior cingulated cortex [11].

SIDE EFFECTS OF ACUPUNCTURE

The use of disposable sterile acupuncture needles avoids the risk of cross-contamination. Occasionally, the patient

may experience bruising at the acupuncture site. Mild transient drowsiness may also occur. Pneumothorax is the most frequently reported serious complication related to acupuncture [12-13]. In a study of the cases of 78 acupuncturists, involving 31,822 acupuncture treatments in the United Kingdom, the most common adverse events reported were bleeding (310/10,000 consultations) and needling pain (110/10,000 consultations) [14]. The York acupuncture safety study surveyed 34,000 treatments by traditional acupuncturists. Aggravation of symptoms occurred in 96/10,000 cases. None of these events were serious. There was subsequent improvement in the presenting complaint in 70% of cases [15]. Major adverse consequences of acupuncture appear to be extremely rare [16]. Acupuncture can be considered safe when performed by a competent and experienced acupuncturist [17], including by appropriately trained practitioners in the pediatric population [18].

CLINICAL USE OF ACUPUNCTURE

Acupuncture as a therapeutic intervention is currently widely practiced in the United States. In 1997, the National Institutes of Health [19] concluded that there are promising results supporting its efficacy for adult postoperative and chemotherapy-related nausea and vomiting, and for postoperative dental pain. There are reasonable studies that conclude that the use of acupuncture results in satisfactory treatment for addiction, stroke rehabilitation, headache, menstrual cramps, tennis elbow, fibromyalgia, myofascial pain, osteoarthritis, low back pain, carpal tunnel syndrome, and asthma. Depending on the situation, acupuncture may be used as an adjunct treatment, acceptable alternative therapy, or integrated into a comprehensive management program.

Clinical research into the use of acupuncture for the treatment of pain has consisted primarily of uncontrolled trials. Although beneficial results have frequently been demonstrated, the flawed design of many of the studies places limited value on the outcomes. Systematic reviews of randomized controlled trials (RCTs) have provided the best evidence and the least bias in assessing the efficacy of any medical intervention. Several difficulties are inherent in designing valid, blinded RCTs of acupuncture [20, 21]. An appropriate placebo for the acupuncture control group is difficult to determine. Various studies have used the placement of needles at non-meridian sites, called “sham” acupuncture, to model acupuncture in control group patients.

Thirty percent of study subjects may respond positively to placebos. There are very few criteria in the current literature for the use of placebo in acupuncture research. Sham acupuncture is frequently used as the control treatment in research trials involving acupuncture, however, it presents a unique problem as a placebo. The well-outlined energy channels of the acupuncture meridian systems cover the entire body, linking wei-qi (defense qi), rong-qi (growth and development qi), and yuan-qi (the original qi inherited at birth). As the meridian systems affect the entire body, the sham acupuncture does still provide some acupuncture effect, and therefore cannot be considered to produce a true placebo effect. In the attempt to address this problem, a placebo acupuncture needle has been developed,

which retracts back into the handle of the acupuncture needle and does not penetrate the skin [22].

Richardson and Vincent [23] have reviewed 27 controlled studies of acupuncture for the treatment of acute and chronic pain, as well as several large uncontrolled studies. In 50% to 80% of the patients studied, they noted that it was difficult to assess the long-term effectiveness of acupuncture, based on the collected data. In a meta-analysis of 14 RCTs of acupuncture for chronic pain in adults, Patel and co-workers [24] found that, although few of the individual trials demonstrated statistically significant benefit from acupuncture, the pooled results for several subgroups did, in fact, attain statistical significance in favor of acupuncture.

Postoperative Pain

Acupuncture may be most useful in predictable situations involving acute pain, such as dental procedures and postoperative pain, or in the setting of medical conditions with recurrent episodes of acute pain, such as sickle cell crisis and recurrent abdominal pain. Although effective treatment is available in many cases (e.g., local anesthetics for dental procedures, opioids for severe postoperative pain), side effects such as respiratory depression may occur. Taub and colleagues [25] used acupuncture for the treatment of dental pain in a single blinded RCT, in which 39 adult patients underwent dental restoration for cavities. Patients were randomized between real and sham acupuncture groups. Seventy percent of the experimental group reported good or excellent pain reduction, where 53% of the control group reported good or excellent pain reduction. The results for the two groups showed no statistical significance. Systematic review has shown that acupuncture is effective in relieving dental pain [26]. Also, a study of the effect of acupuncture for pain after lower abdominal surgery revealed that preoperative treatment with low- or high-frequency electroacupuncture reduced the postoperative analgesic requirement and decreased the side effects of systemic opioids [27].

Acupuncture has been shown to reduce postoperative opioid dose requirements in patients and to decrease discomfort. In a randomized, controlled, double-blind study of patients scheduled for elective upper and lower abdominal surgery, acupuncture was found to reduce postoperative pain. Consumption of supplemental intravenous morphine was reduced 50%, and the incidence of postoperative nausea was reduced 20% to 30%. Plasma cortisol and epinephrine concentrations were reduced 30% to 50% in the acupuncture group [28]. In an RCT of electroacupuncture in 100 women undergoing lower abdominal surgery, the incidence of nausea and dizziness during the first 24 hours after surgery was significantly reduced in the electroacupuncture group compared with the control and sham groups. Preoperative treatment with low and high levels of electroacupuncture reduced postoperative analgesic requirements and associated side effects [29]. A study of 27 patients with operable non-small cell lung carcinoma who received either electroacupuncture or sham acupuncture for post-thoracotomy pain control revealed that electroacupuncture may reduce narcotic analgesic usage in the early postoperative period [30]. A study was conducted of 36 patients undergoing thoracotomy, who were treated with epidural plus intradermal insertion of

acupuncture needles. Acupuncture was well tolerated by the patients and did not interfere with standard preoperative care [31].

In a study of pediatric patients undergoing bilateral myringotomy tubes placement, acupuncture treatment provided significant benefit in pain and agitation reduction. The median time for the first administration of postoperative analgesic, acetaminophen, was significantly shorter in the control group. The number of patients who required analgesia was considerably fewer in the acupuncture group than that in the control, as well. No adverse effects related to the acupuncture treatment were observed [32]. A systematic review was performed to quantitatively evaluate the efficacy of acupuncture and related techniques as adjunct analgesics for acute postoperative pain management. Fifteen RCTs compared acupuncture with sham control in the management of acute postoperative pain. The acupuncture treatment group was associated with a lower incidence of opioid-related side-effects, such as nausea, dizziness, sedation, pruritus, and urinary retention. Perioperative acupuncture may be a useful adjunct for acute postoperative pain management [33].

Nausea and Vomiting

Acupuncture using acupuncture needles, electrical apparatus, pressure, or magnets is commonly used for the management of nausea and vomiting caused by surgery or chemotherapy. Stimulation of the PC 6 (Nei guan) acupuncture point is also used to treat nausea and vomiting caused by sea sickness or pregnancy, or to treat side effects from surgery or chemotherapy. A systematic review revealed beneficial results were achieved in 27 out of 33 RCTs of acupuncture, acupressure, or both, in the treatment of nausea and vomiting [34]. An RCT of pediatric patients undergoing tonsillectomy using electroacupuncture for nausea control showed a significant reduction in the occurrence of nausea when compared with the sham and control groups. This study demonstrated that the efficacy of acupuncture for postoperative nausea and vomiting prevention is similar to commonly used pharmacotherapies [35]. These results have been the most consistent in its use for postoperative nausea and vomiting. In 26 trials studying the care of more than 3000 patients, stimulation of the PC 6 acupuncture point was superior to sham acupuncture for the treatment of nausea and vomiting in both adults and children [36].

Low Back Pain

In a meta-analysis of 12 RCTs, acupuncture was found to be superior to various control interventions for the management of low back pain [37]. An RCT of acupuncture versus transcutaneous electrical nerve stimulation for chronic low back pain in the elderly revealed that both are equally effective, with acupuncture improving spinal flexion [38]. An RCT of 50 patients with low back pain showed a significant decrease in pain intensity at 1 and 3 months in the acupuncture groups, as compared with the placebo group. The acupuncture treatment significantly shortened the time the patients were out of work, improved their quality of sleep, and decreased analgesic intake [39]. An RCT has revealed significant improvement from traditional acupuncture in chronic low back pain over physiotherapy, but not over sham acupuncture. The benefits included decreased pain intensity, pain disability, and psychological distress at the end of 12 weeks of treatment. At the 9-month follow-

up, the superiority of acupuncture over the control group had lessened [40]. An RCT of 298 patients with low back pain revealed that acupuncture was more effective in improving pain than no acupuncture treatment, but there were no significant differences between acupuncture and minimal acupuncture [41].

A meta-analysis of 33 RCTs of acupuncture for low back pain indicates that acupuncture effectively relieves chronic low back pain [42]. An RCT of 241 patients with low back pain revealed that a short course of treatment by a qualified traditional acupuncturist is a safe and acceptable method of pain management [43]. Additionally, acupuncture care for low back pain is a cost-effective therapy in the long term. [44]

Headache

Several studies have shown the efficacy of acupuncture therapy for migraine headache [45, 46]. In an RCT of 168 women with migraine, acupuncture was shown to be adequate for migraine prophylaxis. Relative to flunarizine, acupuncture treatment exhibited greater effectiveness in the first months of therapy and superior tolerability [47]. A prospective, randomized, doubleblinded study has shown the efficacy of acupuncture for migraine prophylaxis. The reduction of migraine days in patients receiving acupuncture treatment were statistically significant compared with baseline. The treatment outcomes for migraine do not differ between patients treated with acupuncture or standard therapy [48]. A systematic review of 22 trials, involving a total of 1042 patients, concluded that acupuncture has a role in the treatment of recurrent headaches [49]. In an RCT of 179 patients with acute migraine, acupuncture and sumatriptan were more effective than placebo injection for the early treatment of an acute migraine attack [50]. An RCT of 114 patients with migraine compared acupuncture to the use of metoprolol, and determined that acupuncture might be an effective and safe treatment option for patients unwilling or unable to use drug prophylaxis [51].

Supplementing medical management with acupuncture can result in improvements in health-related quality of life, as well as the perception by patients that they suffer less from their headaches [52]. A Cochrane Database Systemic Review of acupuncture for migraine prophylaxis involves 22 trials with 4419 participants. Available studies suggest that acupuncture is at least as effective as, or possibly more effective than, prophylactic drug treatment, and has fewer adverse effects. Acupuncture should be considered as a treatment option for patients with migraine headache [53]. A Cochrane Database Systemic Review of 11 trials with 2317 participants also indicates that acupuncture can have at least 50% reduction in headache frequency, headache days, pain intensity, and analgesic use. Acupuncture could be a valuable non-pharmacological tool for patients with frequent episodic or chronic tension-type headaches [54].

Temporomandibular Joint Dysfunction

Three RCTs of acupuncture treatment, involving 205 patients with temporomandibular joint dysfunction, revealed positive results. Acupuncture appears to be an effective treatment for painful dysfunction of the temporomandibular joint, but the results still require confirmation from more rigorous trial methods [55-56].

Neck Pain

Several clinical reports have suggested that acupuncture can be useful for the treatment of patients with neck pain. However, 14 RCTs involving 724 subjects with various causes of neck pain did not provide significant evidence in support of acupuncture for the treatment of neck pain [57]. There have been too few studies of sufficient quality and homogeneity to be able to draw conclusions about its effectiveness in the treatment. A scoring system to gauge the effects of acupuncture on neck pain has been proposed, but there are problems with its usage [58]. An RCT of 177 patients with chronic neck pain were randomly assigned treatment of acupuncture (56 patients), massage (60 patients), or "sham" laser acupuncture (61 patients) over a period of 3 weeks. The patients received five treatments of acupuncture during this three-week period, and the acupuncture was found to be an effective short-term treatment [59]. An RCT of acupuncture for 123 patients with chronic neck pain, with 6 months of follow up, revealed that acupuncture is more effective than placebo treatment. The acupuncture treatment improved the patient's quality of life from a physical aspect, improved active neck mobility, and reduced the need for rescue medication [60]. There is some evidence that acupuncture relieves neck pain more effectively than sham treatment or no treatment [61]

Myofascial Pain Syndrome

Myofascial pain syndrome is one of the most common causes of chronic musculoskeletal pain. Melzack and colleagues reported a 71% correlation between acupuncture points and trigger points used for the treatment of myofascial pain [62]. In an uncontrolled study, Lewit reported immediate relief in 87% of cases, and long-term benefit in at least 92 of 288 cases [63].

Knee Pain and Osteoarthritis

Knee pain and osteoarthritis is a common joint disorder, especially among women over 50 years of age. In a randomized controlled trial of 570 patients with osteoarthritis of the knee, patients received 23 weeks of acupuncture treatment. Acupuncture seems to provide improvement in function and pain relief as an adjunctive therapy when compared with sham acupuncture and education control groups [64]. A systematic review and meta-analysis of thirteen randomized controlled trials of acupuncture for knee pain revealed acupuncture to be significantly superior to sham acupuncture for both pain control and regaining function. The differences were still significant at long-term follow-up [65].

Low Back Pain

Low back pain limits daily activities and is a common reason for physician visits. Acupuncture is widely used by patients with low back pain. A meta-analysis of 33 RCTs of acupuncture for low back pain indicates that acupuncture is significantly more effective than sham treatment and no treatment [42]. A study of 298 patients with chronic low back pain compared acupuncture, minimal acupuncture (superficial needling at nonacupuncture points), and a waiting list group as the control. Low back pain was shown to improve after acupuncture treatment for at least six months. The effectiveness of acupuncture, either verum or sham, was almost twice that of conventional therapy [66].

Carpal Tunnel Syndrome

Carpal tunnel syndrome is a common entrapment neuropathy of the median nerve. Eleven mild to moderate carpal

tunnel syndrome patients were randomized into groups receiving real or sham laser acupuncture treatment. Significant decreases in the McGill Pain Questionnaire score, median nerve sensory latency, and Phalen's and Tinel's signs after the actual laser acupuncture treatment series were observed, but not in the placebo group [67]. A study of fMRI in patients with carpal tunnel syndrome revealed that hyperactivity in contralateral sensorimotor cortex diminishes after acupuncture treatment [68].

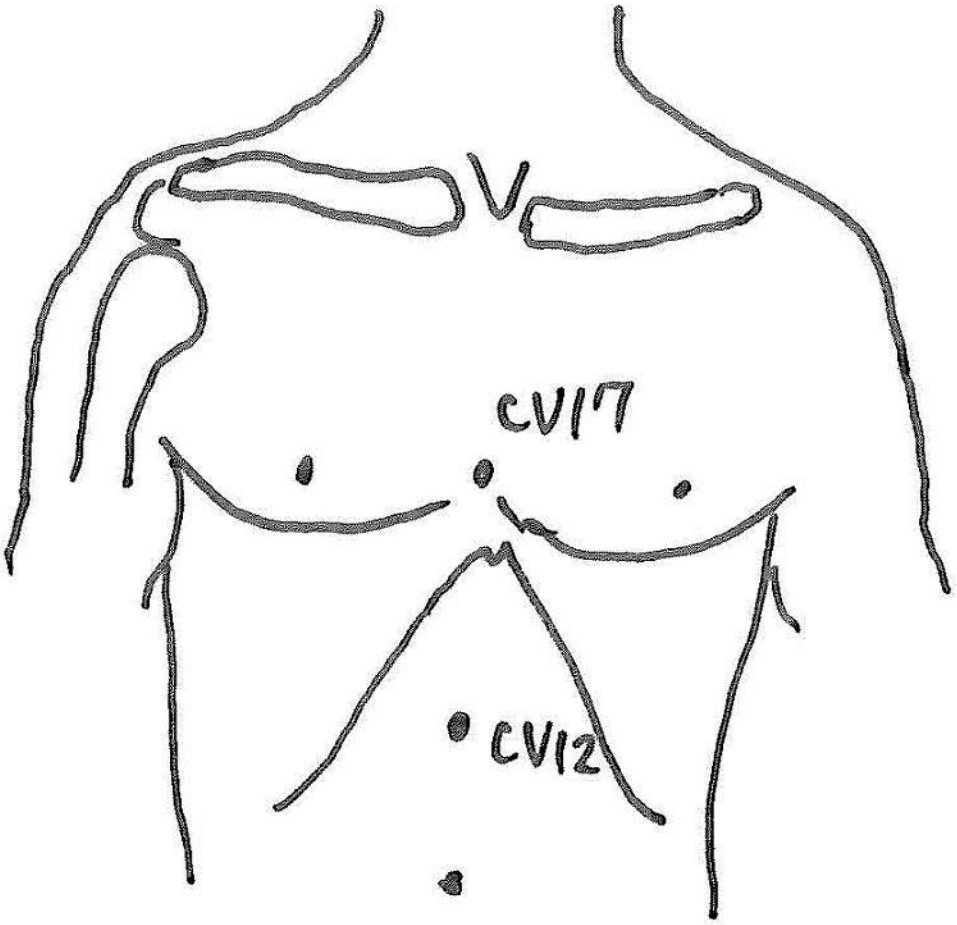
Neuropathic Pain

The efficacy of acupuncture in patients with peripheral neuropathy is unclear. Peripheral neuropathy is common in patients infected with human immunodeficiency virus (HIV). Neither acupuncture nor amitriptyline was found to be more effective than placebo in relieving pain caused by HIV-related peripheral neuropathy [69]. Reports are available on the benefits of traditional acupuncture therapy and auricular therapy in treating complex regional pain syndrome, formerly known as reflex sympathetic dystrophy (RSD) [70-71]. However, each of these reports involved only one to five patients in uncontrolled studies.

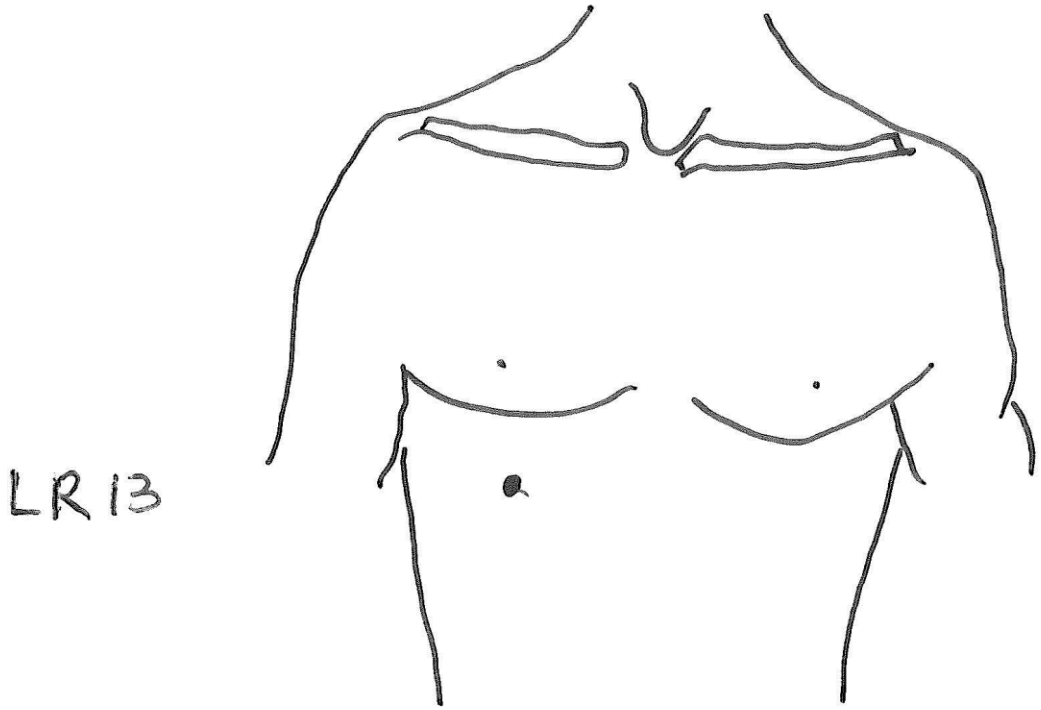
Over the past several years, the use of traditional Chinese medicine has become more common and accepted in the United States. Some health maintenance organization (HMO) insurance plans have begun to cover acupuncture treatments for their patients. Some workmen's compensation boards and personal injury insurance policies will also cover acupuncture. If there is an increase in the number of insurers willing to reimburse acupuncture therapy, patients will be more likely to seek acupuncture treatment in the future [72]. Acupuncture is steadily becoming an integral part of the health care delivery system. Research on acupuncture has allowed for its integration into conventional Western medical practice. More prospective, randomized, and controlled studies on acupuncture are needed to better understand its mechanisms, efficacy, and side effects.

ACUPUNCTURE POINTS

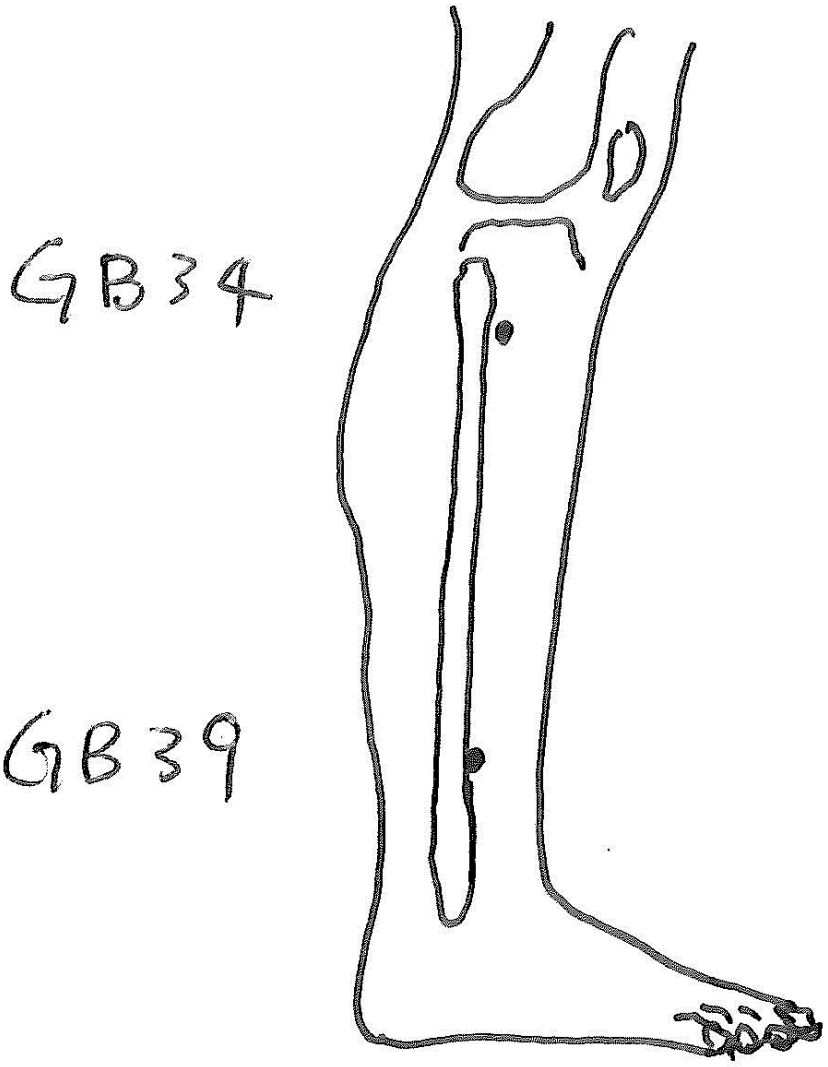
- CV 12 (zhong guan; “central venter”)—located in the midline, 4 tsun above the umbilicus.
- CV 17 (tan chung; “chest center”)—located in the midline of the sternum, between the nipples, at the level of the fourth intercostal space.



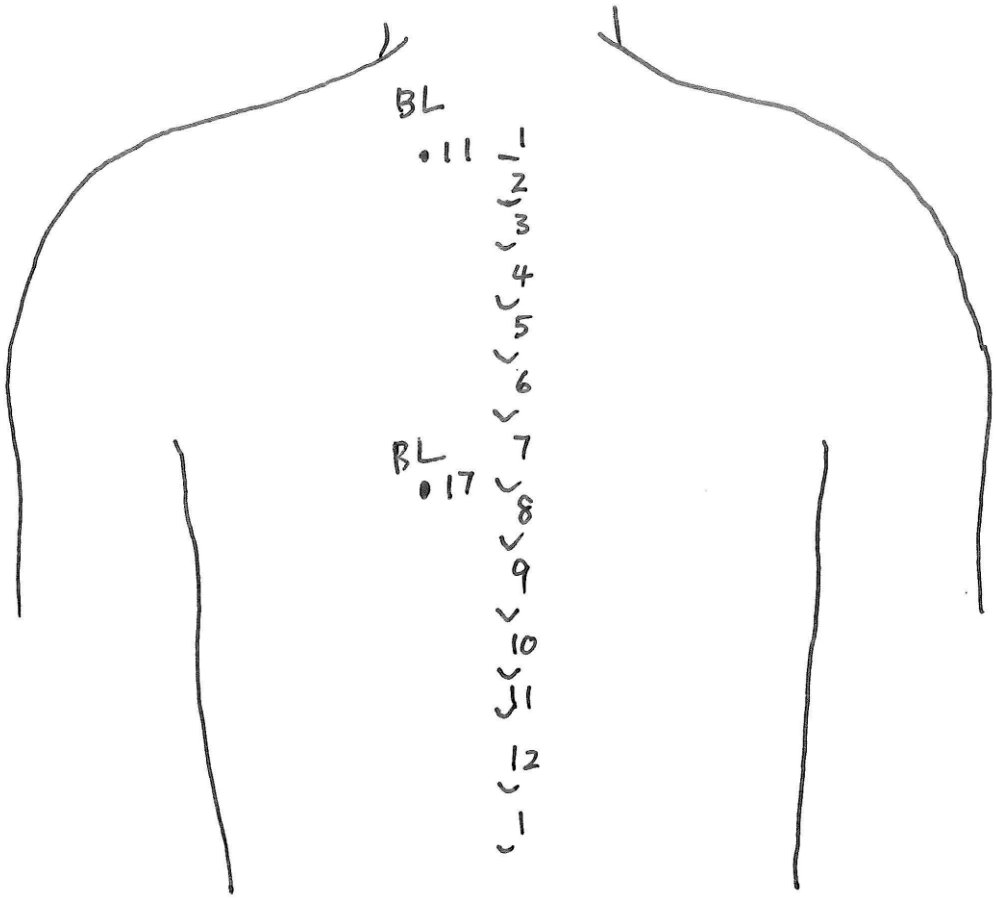
• LR 13 (zhang men; “camphor wood gate”)—located on the lateral side of the abdomen, below the free end of the 11th rib, 2 tsun above the navel and 6 tsun on either side of the midline.



• GB 34 (yang ling quan; “young mound spring”)—located in the deep depression 1 tsun anterior and 1 tsun inferior to the head of the fibula.
• GB 39 (xuan zhong or jue gu; “suspended bell or severed bone”)—located 3 tsun directly above the tip of lateral malleolus, in the depression between the posterior border of the fibula and the tendons of the peroneus longus and brevis.



• BL 11 (da zhu; “great shuttle”)—located 1.5 tsun lateral to the lower border of the spinous process of the first thoracic vertebra.
• BL 17 (ge shu; “diaphragm shu”)—located 1.5 tsun lateral to the lower border of the spinous process of the seventh vertebrae.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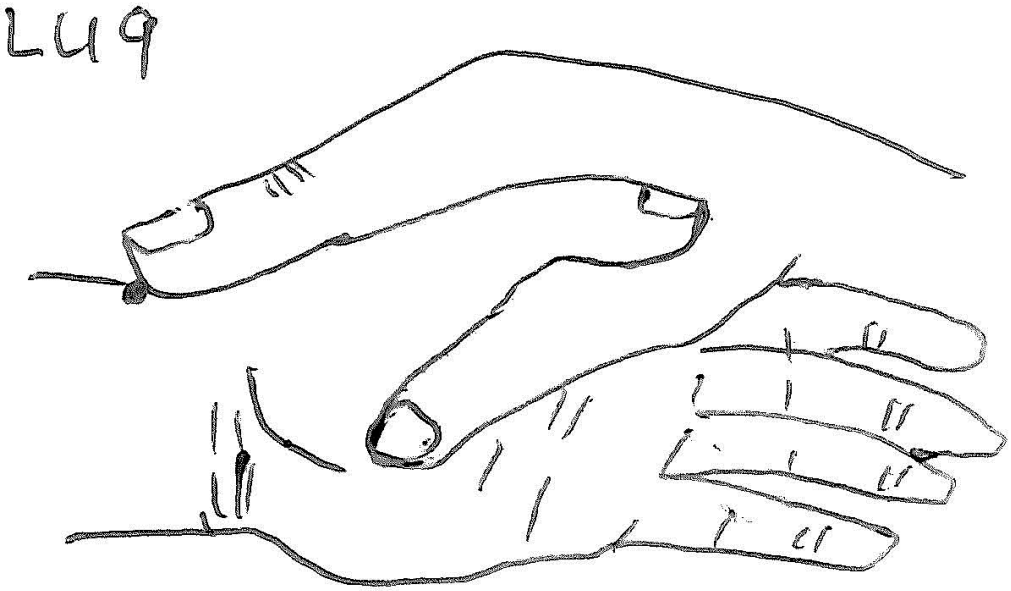
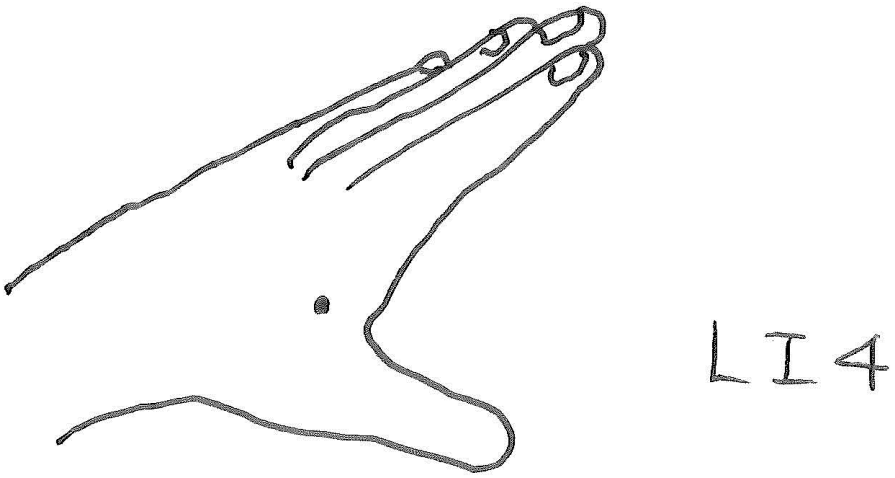
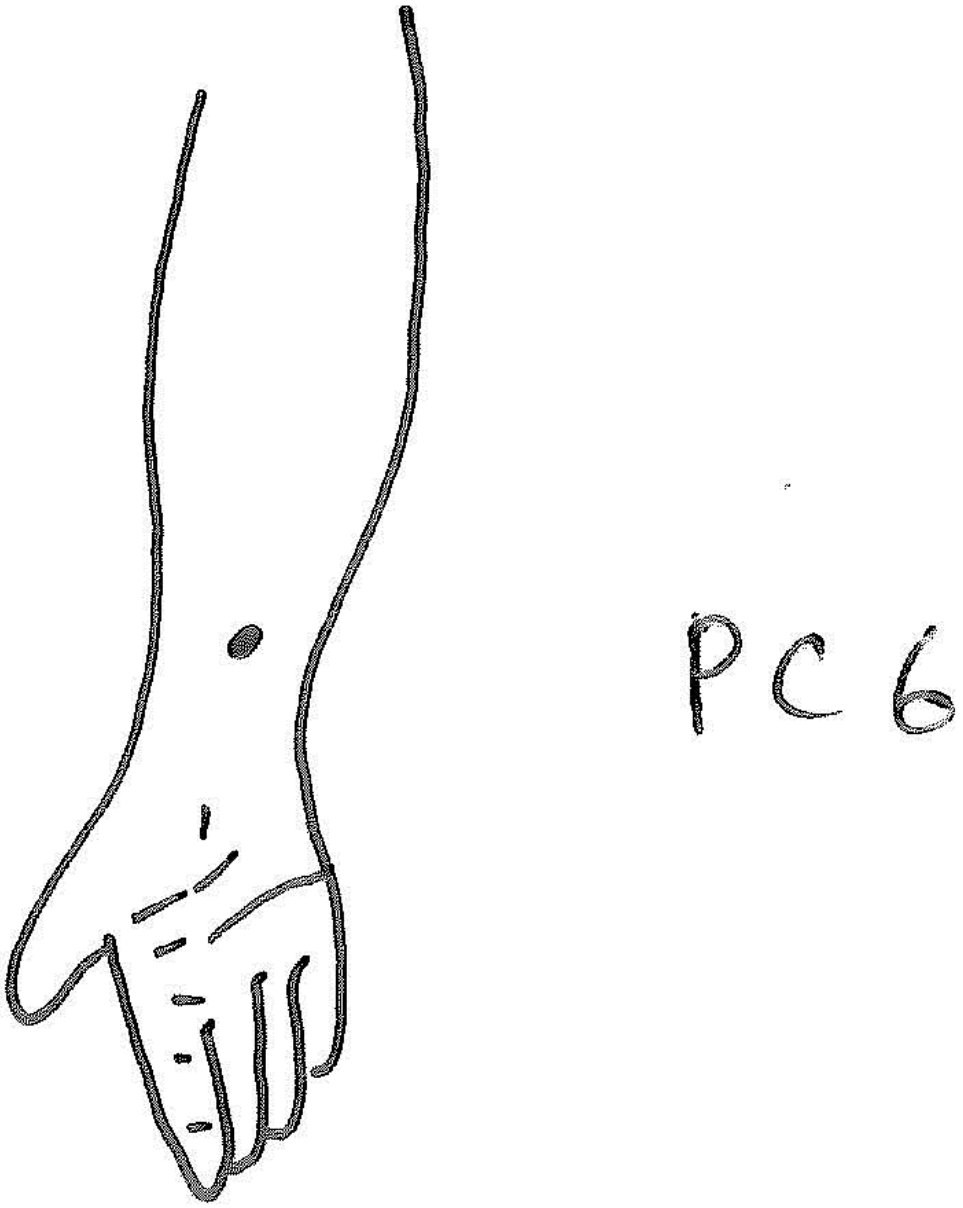
• LU 9 (tai yuan; “great abyss”)—located at the transverse crease of the wrist, in the depression of the lateral side of the radial artery.



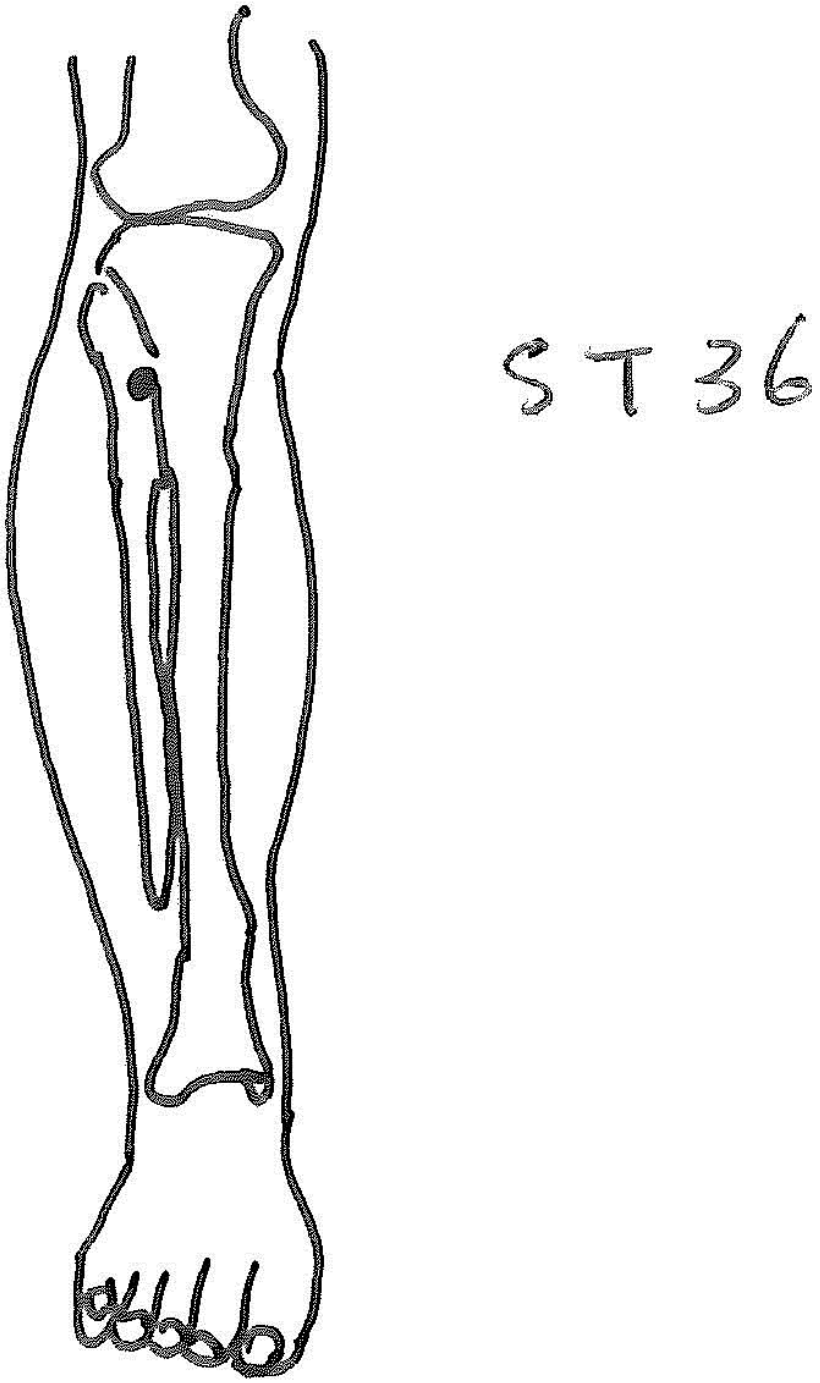
• LI 4 (he gu; “union valley”)—located between the first and second metacarpal bones in the deep depression of the web space.



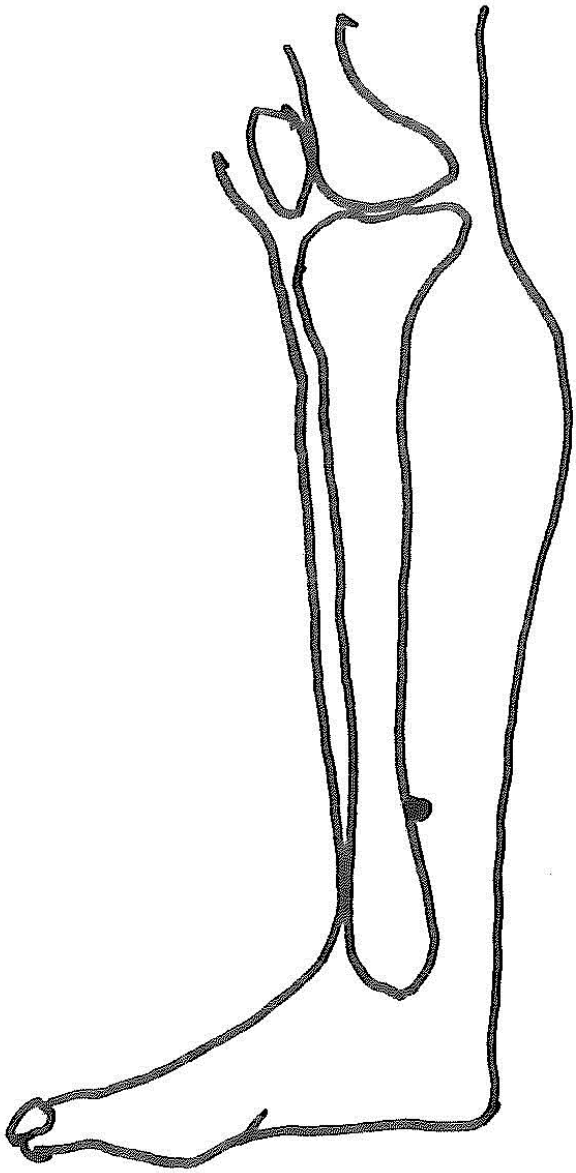
• PC 6 (nei guan; “internal gate”)—located 2 to 3 tsun above the transverse crease of the wrist, a deep depression between the tendons of the long palmar muscle and the radial flexor muscle of the wrist.



• ST 36 (zu san li; “leg three miles”)—located 3 tsun below the patella and 1 tsun lateral to the crest of the tibia.



• SP 6 (san yin jiao; “three yin intersection”)—located 3 tsun above the tip of the medial malleolus, on the posterior border of the tibia.



REFERENCES

1. Reston, J., *Now, let me tell you about my appendectomy in Peking. The New York Times*. 1971: New York.
2. Melzack, R. and P.D. Wall, *Pain mechanisms: a new theory.* Science, 1965. **150**(699): p. 971-9.
3. Lewith, G., Kenyon, JN, *Physiological and psychological explanations for the mechanism of acupuncture as a treatment for chronic pain.* Soc Sci Med, 1984. **19**(12): p. 1367-1378.
4. Sjolund, B., L. Terenius, and M. Eriksson, *Increased cerebrospinal fluid levels of endorphins after electro-acupuncture.* Acta Physiol Scand, 1977. **100**(3): p. 382-4.
5. He, L.F., *Involvement of endogenous opioid peptides in acupuncture analgesia.* Pain, 1987. **31**(1): p. 99-121.
6. Han, J.S., *Acupuncture and endorphins.* Neurosci Lett, 2004. **361**(1-3): p. 258-61.
7. Han, J.S., *Acupuncture: neuropeptide release produced by electrical stimulation of different frequencies.* Trends Neurosci, 2003. **26**(1): p. 17-22.
8. Mayer, D.J., D.D. Price, and A. Rafii, *Antagonism of acupuncture analgesia in man by the narcotic antagonist naloxone.* Brain Res, 1977. **121**(2): p. 368-72.
9. Yonehara, N., *Influence of serotonin receptor antagonists on substance P and serotonin release evoked by tooth pulp stimulation with electro-acupuncture in the trigeminal nucleus cudalis of the rabbit.* Neurosci Res, 2001. **40**(1): p. 45-51.
10. Hui, K., Liu, J; Makris, N., et. al. *Acupuncture modulates the limbic system and subcortical gray structures of the human brain: evidence from fMRI studies in normal subjects.* Human Brain Mapping, 2000. **9**: p. 13-25.
11. Wu, M.T., Sheen, J. M. Chuang, K. H. et. al.*Neuronal specificity of acupuncture response: a fMRI study with electroacupuncture.* Neuroimage, 2002. **16**(4): p. 1028-37.
12. Peuker, E. and T. Filler, *Guidelines for case reports of adverse events related to acupuncture.* Acupunct Med, 2004. **22**(1): p. 29-33.
13. von Riedenauer, W.B., M.K. Baker, and R.J. Brewer, *Video-assisted thorascopic removal of migratory acupuncture needle causing pneumothorax.* Chest, 2007. **131**(3): p. 899-901.
14. White, A., Hayhoe, S.; Hart, A; et al., *Adverse events following acupuncture: prospective survey of 32 000 consultations with doctors and physiotherapists.* BMJ, 2001. **323**(7311): p. 485-6.
15. MacPherson, H; Thomas, K. Walters, S; et al., *The York acupuncture safety study: prospective survey of 34 000 treatments by traditional acupuncturists.* BMJ, 2001. **323**(7311): p. 486-7.
16. Melchart, D., Weidenhammer, W.; Streng, A. et al., *Prospective investigation of adverse effects of acupuncture in 97 733 patients.* Arch Intern Med, 2004. **164**(1): p. 104-5.
17. Ernst, E. and A. White, *Prospective studies of the safety of acupuncture: a systemic review.* Am J Med, 2001. **110**: p. 481-5.
18. Adams, D., Cheng, F; Jou, H; et al., *The safety of pediatric acupuncture: a systematic review.* Pediatrics, 2011. **128**(6): p. e1575-87.
19. *NIH Consensus Statement on Acupuncture.* JAMA, 1997. **15**(5): p. 1-34.
20. Vincent, C., Richardson, PH, *The evaluation of therapeutic acupuncture: concepts and methods.* Pain, 1986. **24**: p. 1-13.

21. Lewith, G.T. and D. Machin, *On the evaluation of the clinical effects of acupuncture.* Pain, 1983. **16**(2): p. 111-27.
22. Streitberger, K. and J. Kleinhenz, *Introducing a placebo needle into acupuncture research.* The Lancet, 1998. **352**: p. 364-365.
23. Richardson, P. and C. Vincent, *Acupuncture for treatment of pain.* Pain, 1986. **24**: p. 15-40.
24. Patel, M.G., F; Paccaud, F; Marazzi, A, *A meta-analysis of acupuncture for chronic pain.* Int J Epidemiol, 1989. **18**(4): p. 900-906.
25. Taub, H., Beard, MC, Eisenberg L,et. al., *Studies of acupuncture for operative dentistry.* JADA, 1977. **99**: p. 555-561.
26. Ernst, E. and M. Pittler, *The effectiveness of acupuncture in treating acute dental pain.* Br Dent J, 1998. **184**: p. 443-7.
27. Barrows, K. and B. Jacobs, *Mind-body medicine.* Medical Clinics of North America, 2002. **86**(1): p. 11-31.
28. Kotani, N., Hashimoto, H.; Sato, Y. et al., *Preoperative intradermal acupuncture reduces postoperative pain, nausea and vomiting, analgesic requirement, and sympathoadrenal responses.* Anesthesiology, 2001. **95**(2): p. 349-56.
29. Lin, J.G., et al., *The effect of high and low frequency electroacupuncture in pain after lower abdominal surgery.* Pain, 2002. **99**(3): p. 509-14.
30. Wong, R.H., Lee, T. W.; Sihoe, A. D;.et al., *Analgesic effect of electroacupuncture in postthoracotomy pain: a prospective randomized trial.* Ann Thorac Surg, 2006. **81**(6): p. 2031-6.
31. Vickers, A.J., et al., *Acupuncture is a feasible treatment for post-thoracotomy pain: results of a prospective pilot trial.* BMC Anesthesiol, 2006. **6**: p. 5.
32. Lin, Y.C., Tassone, R. F.; Jahng, S;.et al., *Acupuncture management of pain and emergence agitation in children after bilateral myringotomy and tympanostomy tube insertion.* Paediatr Anaesth, 2009. **19**(11): p. 1096-101.
33. Sun, Y., Gan, T. J.; Dubose, J. W; et al., *Acupuncture and related techniques for postoperative pain: a systematic review of randomized controlled trials.* Br J Anaesth, 2008. **101**(2): p. 151-60.
34. Vickers, A., *Can acupuncture have specific effects on health? A systematic review of acupuncture antiemetic trials.* J Roy Soc Med, 1996. **89**: p. 303-311.
35. Rusy, L.M., G.M. Hoffman, and S.J. Weisman, *Electroacupuncture prophylaxis of postoperative nausea and vomiting following pediatric tonsillectomy with or without adenoidectomy.* Anesthesiology, 2002. **96**(2): p. 300-5.
36. Ezzo, J., K. Streitberger, and A. Schneider, *Cochrane systematic reviews examine P6 acupuncture-point stimulation for nausea and vomiting.* J Altern Complement Med, 2006. **12**(5): p. 489-95.
37. Ernst, E. and A. White, *Acupuncture for back pain: A meta-analysis of randomized controlled trials.* Arch Intern Med, 1998. **158**: p. 2235-2241.
38. Grant, D., Bishop-Miller, J; Winchester, DM; et al., *A randomized comparative trial of acupuncture versus transcutaneous electrical nerve stimulation for chronic back pain in the elderly.* Pain, 1999. **82**: p. 9-13.
39. Carlsson, C. and B. Sjolund, *Acupuncture for Chronic Low Back Pain: A Randomized Placebo-Controlled Study With Long-Term Follow-Up.* Clin J Pain, 2001. **17**(4): p. 296-305.
40. Leibing, E., Leonhardtb, U; Kösterc, G; et al., *Acupuncture treatment of chronic low-back pain – a randomized, blinded,*

placebo-controlled trial with 9-month follow-up. Pain, 2002. **96**(1-2): p. 189-196.
41. Brinkhaus, B., Witt, C. M.; Jena, S.;et al., *Acupuncture in patients with chronic low back pain: a randomized controlled trial.* Arch Intern Med, 2006. **166**(4): p. 450-7.
42. Manheimer, E., et al., *Meta-analysis: acupuncture for low back pain.* Ann Intern Med, 2005. **142**(8): p. 651-63.
43. Thomas, K.J., Macpherson, H.; Thorpe, L.; et al., *Randomised controlled trial of a short course of traditional acupuncture compared with usual care for persistent non-specific low back pain.* Bmj, 2006. **333**(7569): p. 623.
44. Radcliffe, M., *Acupuncture compared to the other alternative therapies.* Nurs Times, 2006. **102**(5): p. 124.
45. Dowson, D., Lewith, GT, Machin, D, *The effects of acupuncture versus placebo in the treatment of headache.* Pain, 1985. **21**(1): p. 35-42.
46. Loh, L., Nathan, PW, Schott, GD, et. al. *Acupuncture versus medical treatment for migraine and muscle tension headaches.* J Neurol Neurosurg Psychiatry, 1984. **47**(4): p. 333-337.
47. Allais, G., De Lorenzo, C.; Quirico, P. E; et al., *Acupuncture in the prophylactic treatment of migraine without aura: a comparison with flunarizine.* Headache, 2002. **42**(9): p. 855-61.
48. Diener, H.C., Kronfeld, K.; Boewing, G.; et al., *Efficacy of acupuncture for the prophylaxis of migraine: a multicentre randomised controlled clinical trial.* Lancet Neurol, 2006. **5**(4): p. 310-6.
49. Melchart, D., Linde, K.; Fischer, P.; et al., *Acupuncture for recurrent headaches: a systematic review of randomized controlled trials.* Cephalalgia, 1999. **19**(9): p. 779-86
50. Melchart, D., Thormaehlen, J; Hager, S.; et al., *Acupuncture versus placebo versus sumatriptan for early treatment of migraine attacks: a randomized controlled trial.* J Intern Med, 2003. **253**(2): p. 181-8.
51. Streng, A., Linde, K.; Hoppe, A.; et al., *Effectiveness and tolerability of acupuncture compared with metoprolol in migraine prophylaxis.* Headache, 2006. **46**(10): p. 1492-502.
52. Coeytaux, R.R., et al., *A randomized, controlled trial of acupuncture for chronic daily headache.* Headache, 2005. **45**(9): p. 1113-23.
53. Linde, K., Allais, G.; Brinkhaus, B; et al., *Acupuncture for migraine prophylaxis.* Cochrane Database Syst Rev, 2009(1): p. CD001218.
54. Linde, K., Allais, G.; Brinkhaus, B.; et al., *Acupuncture for tension-type headache.* Cochrane Database Syst Rev, 2009(1): p. CD007587.
55. Ernst, E. and A. White, *Acupuncture as a treatment for temporomandibular joint dysfunction: a systematic review of randomized trials.* Arch Otolaryngol Head Neck Surg., 1999. **125**: p. 269-272.
56. Fink, M., Rosted, P.; Bernateck, M; et al., *Acupuncture in the treatment of painful dysfunction of the temporomandibular joint -- a review of the literature.* Forsch Komplementarmed, 2006. **13**(2): p. 109-15.
57. White, A. and E. Ernst, *A systemic review of randomized controlled trials of acupncture for neck pain.* rheumatology, 1999. **38**: p. 143-147.
58. White, P., Lewith, G.; Berman, B; et al., *Reviews of acupuncture for chronic neck pain: pitfalls in conducting systematic reviews.* Rheumatology (Oxford), 2002. **41**(11): p. 1224-31.
59. Irnich, D., Behrens, N.; Molzen, H; et al., *Randomised trial of acupuncture compared with conventional massage and "sham" laser acupuncture for treatment of*

chronic neck pain. Bmj, 2001. **322**(7302): p. 1574-8.
60. Vas, J., Perea-Milla, E.; Mendez, C.; et al., *Efficacy and safety of acupuncture for chronic uncomplicated neck pain: a randomised controlled study.* Pain, 2006. **126**(1-3): p. 245-55.
61. Trinh, K.V., Graham, N.; Gross, A. R; et al., *Acupuncture for neck disorders.* Cochrane Database Syst Rev, 2006. **3**: p. CD004870.
62. Melzack, T., Stillwell, DM, Fox, EJ, *Trigger points and acupuncture points for pain: correlations and implications.* Pain, 1977. **3**(1): p. 3-23.
63. Lewit, K., *The needle effect in the relief of myofascial pain.* Pain, 1979. **6**(1): p. 83-90.
64. Berman, B.M., Lao, L.; Langenberg, P; et al., *Effectiveness of acupuncture as adjunctive therapy in osteoarthritis of the knee: a randomized, controlled trial.* Ann Intern Med, 2004. **141**(12): p. 901-10.
65. White, A., Foster, N. E.; Cummings, M.; et al., *Acupuncture treatment for chronic knee pain: a systematic review.* Rheumatology (Oxford), 2007. **46**(3): p. 384-90.
66. Haake, M., Muller, H. H.; Schade-Brittinger, C.; et al., *German Acupuncture Trials (GERAC) for chronic low back pain: randomized, multicenter, blinded, parallel-group trial with 3 groups.* Arch Intern Med, 2007. **167**(17): p. 1892-8.
67. Naeser, M.A., Hahn, K. A.; Lieberman, B. E; et al., *Carpal tunnel syndrome pain treated with low-level laser and microamperes transcutaneous electric nerve stimulation: A controlled study.* Arch Phys Med Rehabil, 2002. **83**(7): p. 978-88.
68. Napadow, V., Kettner, N;.Liu, J; et al., *Somatosensory cortical plasticity in carpal tunnel syndrome treated by acupuncture.* Hum Brain Mapp, 2007. **28**(3): p. 159-71.
69. Shlay, J.C.,; Chaloner, K.; Max, M. B; et al., *Acupuncture and amitriptyline for pain due to HIV-related peripheral neuropathy: a randomized controlled trial. Terry Beirn Community Programs for Clinical Research on AIDS.* Jama, 1998. **280**(18): p. 1590-5.
70. Leo, K., *Use of electrical stimulation at acupuncture points for the treatment of relfex sympathetic dystrophy in a child: a case report.* Physical Therapy, 1983. **63**(6): p. 957-959.
71. Spoerel, W., Varkey, M, Leung, CY, *Acupuncture in chronic pain.* Am J Chinese Med, 1976. **4**(3): p. 267-279.
72. Eisenberg, D., Cohen, MH; Hrbek, A; et al., *Credentialing Complementary and Alternative Medical Providers.* Ann Intern Med, 2002. **137**(12): p. 965-973.