



Pediatric Pain: New Approaches for Our Most Vulnerable Patients

Acupuncture for Pediatric Pain Management

Yuan-Chi Lin, MD, MPH

Shu-Ming Wang, MD

Acupuncture has progressively been integrated into comprehensive pain management programs worldwide. More than 30% of pediatric pain centers in North America offer acupuncture service. A survey of 1,100 pediatric patients and families conducted in the United States during the preoperative visit indicated that more than 6% of patients have used acupuncture (*Pain Res Manag* 2014;19:198-204).

Acupuncture has been part of Traditional Chinese Medicine (TCM) for more than 2,000 years. As early as 100 B.C., the first Chinese medical textbook “Huang Di Nei Jing” clearly described *jin jiao* (針灸) the practice of needling and placing smoldering moxa (*Artemisia vulgaris*) over the acupuncture points. Traditional Chinese acupuncturists believe that Qi, vital energy, is essential for the well-being of a person. Qi is created by the force between heaven and earth. Qi travels through specific pathways called meridians within the body. There are 12 principal meridians of the body that form the infrastructure of Qi flow from major internal organs to the surface of the body. Illness and pain occur when flow of Qi in the corresponding meridians is stagnated and blocked leading to an imbalance of Yin and Yang. Along the meridian, there are about 365 acupuncture points where Qi is flowing closest to the surface of the body. Acupuncture consists of inserting a hair thin, metallic needle into acupuncture points. Through manipulation of the needle, the flow of Qi can be restored, leading to the balance of Yin and Yang and improving overall well-being.

Since President Richard Nixon’s visit to China in 1972, acupuncture has become increasingly popular in the U.S. In 1998, the NIH Consensus Development Conference on acupuncture concluded there is sufficient evidence of acupuncture’s efficacy to expand its use into conventional medicine and continue further research studies (*JAMA* 1998;280:1518-24). Promising evidence supports the efficacy of acupuncture in reducing postoperative dental pain and chemotherapy-related nausea and vomiting. There are also encouraging results of its use for headache, menstrual cramps, tennis elbow, fibromyalgia, myofascial pain, osteoarthritis, low-back pain, and carpal tunnel syndrome (*JAMA* 1998;280:1518-24).

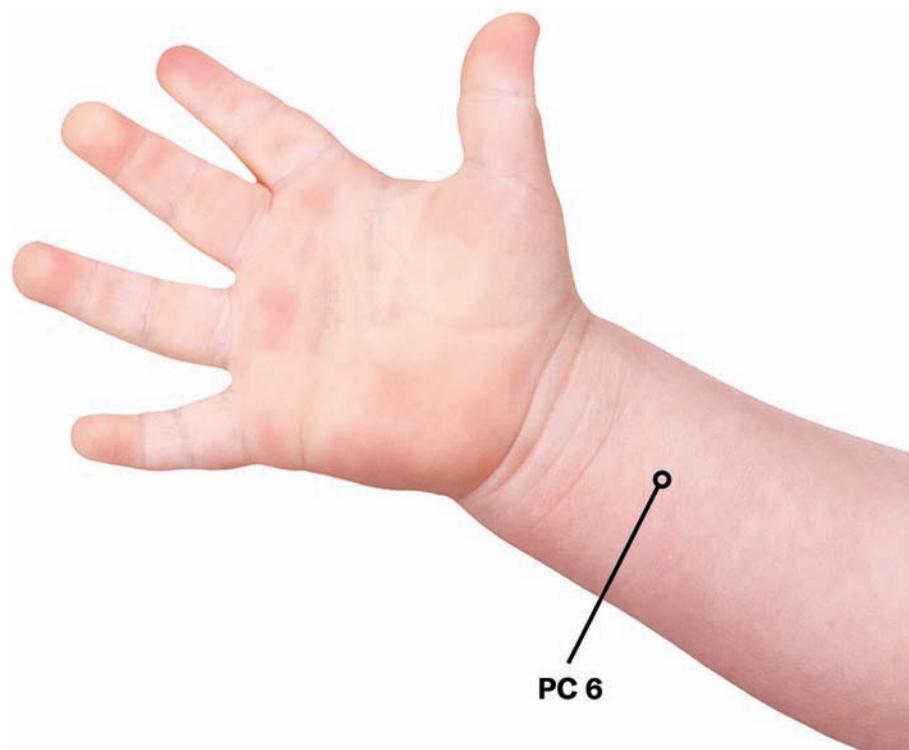


Figure 1: PC 6 (Nei Guan) Acupuncture Point.

To date, scientists have found that acupuncture and related techniques trigger a sequence of events, including the release of neurotransmitters, endogenous opioid-like substances, and activation of *c-fos* within the central nervous system. The potential mechanisms of acupuncture analgesia include increasing the release of endorphins, enkephalins, dynorphins, and monoamines such as serotonin and norepinephrine centrally and peripherally to modulate pain and decrease inflammation. Low-frequency versus high-frequency electroacupuncture (EA) resulted in different activation of opioid receptors. Low-frequency (2 to 15 Hz) EA triggered the release of β -endorphin, enkephalin, and endomorphins working on μ - and δ -opioid receptors. In contrast, high-frequency (100 Hz) EA caused release of dynorphin to κ -receptors in the spinal cord (*Trends Neurosci* 2003;26:17-22). Neuroimaging studies, including fMRI and PET scans, have shown cortical and subcortical activity with acupuncture stimulation thought to be helpful in pain modulation.

Acupuncture in the hands of experienced trained practitioners is safe for both adult and pediatric patients. Acupuncture appears to be most effective in short-term management of pain. Although there is an increasing interest in using acupuncture and related techniques for pediatric pain

management, the data derived from evidence-based randomized controlled trials (RCTs) are limited. Despite the limitation, there are also few, but important, studies supporting the use of acupuncture for pediatric procedural pain, infantile colic, adolescent pelvic pain, and headaches under specific intervention methods (*J Tradit Complement Med* 2019;10:315-9).

The perioperative period

Acupuncture can be utilized in pediatric perioperative periods (*Paediatr Anaesth* 2006;16:231-5). Preoperative acupuncture can decrease preoperative anxiety and stress in both pediatric patients and their parents. Auricular acupuncture or auricular acupressure was utilized to decrease preoperative anxiety. Parental auricular acupressure was effective in reducing parental anxiety during induction of anesthesia (*Anesthesiology* 2004;100:1399-404). For pediatric patients undergoing surgery and gastrointestinal procedures, acupressure bead intervention at the EX-NH3 (Yin-Tang) acupoint reduces preprocedural anxiety in children (*Anesth Analg* 2008;107:811-6).

Perioperative acupuncture can potentially optimize preoperative conditions, e.g., regulating blood pressure, glucose, and enhance gastric emptying. Acupuncture was used to diminish both



Yuan-Chi Lin, MD, MPH

Associate Professor of Anaesthesia and Pediatrics, Harvard Medical School; Director, Medical Acupuncture Service and Senior Associate in Anesthesia and Pain Medicine, Department of Anesthesiology, Critical Care and Pain Medicine, Boston Children’s Hospital.



Shu-Ming Wang, MD

Clinical Professor, Department of Anesthesiology, University of Connecticut, Hartford, Connecticut.

pain and emergence agitation in children after bilateral myringotomy tube insertion without adverse effects (*Paediatr Anaesth* 2009;19:1096-101). A study of acupuncture treatment prior to tonsillectomies and adenoidectomies concluded that capsicum plasters on the bilateral HT7 (Shen Men) acupoints decreased the incidence of emergence agitation, lowered postoperative pain scores, and shortened the duration of recovery (*Paediatr Anaesth* 2012;22:1105-9). Using intraoperative acupuncture for a group of children undergoing tonsillectomy, Tsao et al. found that patients who received intraoperative acupuncture reported significantly lower pain scores and earlier oral intake (*Laryngoscope* 2015;125:1972-8). Stimulation of LI4 (He Gu) acupuncture point may reduce pain and autonomic distress in children during local anesthetic injection for dental procedures (*Clin J Pain* 2016;32:82-6).

Acupuncture has also been used for anesthesia-related side effects such as postoperative nausea and vomiting (PONV). In children, PC6 (Nei Guan) (Figure 1) acupuncture point injection with 0.2 ml of 50% dextrose is as effective as droperidol in controlling early PONV (*Anesthesiology* 2002;97:359-66). Using electroacupuncture intraoperatively and postoperatively in a group of pediatric patients undergoing tonsillectomy showed a significant reduction in the occurrence of nausea when compared with sham and control groups. This RCT study demonstrated that the efficacy of acupuncture for PONV prevention is similar to commonly used pharmacotherapies (*Anesthesiology* 2002;96:300-5). Application of acupuncture and related techniques onto the PC6 (Nei Guan) acupuncture point shows the

Continued on page 28

Acupuncture

Continued from page 27

most consistent result in decreasing the incidence of PONV either used prophylactically or as treatment.

Infantile colic

There are few RCTs addressing acupuncture and infantile colic. One study involved inserting the needles for two to 30 second intervals with four to six treatments over two to three weeks. Through diaries and questionnaires completed by the parents, these treatments were found to be effective in decreasing the intensity and amount of time infants spent crying, with no major side-effects. A system review reveals that of the 601 studies conducted, most used minimum acupuncture on LI4 (He Gu) (Figure 2) or ST36 (Zu San Li). From narrative analysis, acupuncture appears to be effective in alleviating symptoms of colic without major adverse effects. However, the clinical efficacy of acupuncture to treat infantile colic cannot be concluded, owing to clinical heterogeneity and small sample size (*Evid Based Complement Alternat Med* 2018;2018:7526234).

Headaches

Acupuncture is safe and effective to treat pediatric patients suffering from various types of headache. Laser acupuncture was found to provide significant benefit for children with migraine and tension-type headaches (*Pain* 2008;137:405-12). This research tailored the acupuncture treatment based on the presenting headache symptoms and the diagnosis made by the acupuncturist. In patients presenting for frontal headaches, researchers would apply acupuncture to LI4 (He Gu) and ST36 (Zu San Li); for lateral headaches, SJ6 (Zhi Gou) and GB34 (Yung Ling Quan) were selected; for occipital headaches, SI3 (Hou Xi) and BL60 (Kun Lun) were selected; and for holo-cephalic pain, GV20 (Bai Hui) was chosen. Additional body and auricular points were also chosen based on the diagnosis made by the acupuncturist. A review of acupuncture for migraine prophylaxis involving 22 trials with 4,985 participants suggested that adding acupuncture as a symptomatic treatment for attacks reduces the frequency of headaches. The available trials also suggest that effectiveness of acupuncture may be comparable to prophylactic drug treatment (*Cochrane Database Syst Rev* 2016;2016:CD001218). Another review of 12 trials with 2,349 participants indicated that acupuncture could lead to at least a 50% reduction in headache frequency, headache days, pain intensity, and analgesic use. In addition, acupuncture is effective for treating frequent episodic or chronic tension-type



Figure 2: LI 4 (He Gu) Acupuncture Point.

headaches (*Cochrane Database Syst Rev* 2016;4:CD007587).

Adolescent pelvic pain

Acupuncture has been used to ease adolescent pelvic pain. There is evidence that auricular acupressure/acupuncture can relieve dysmenorrhea and menstrual distress. Application of adhesive plasters with cowherb at auricular Shenmen, kidney, liver, internal genitals, central rim, and endocrine acupoints, pressing the seeds for one minute four times a day for two days, has been shown to relieve menstrual pain and distress to a significantly greater degree than those who received sham auricular acupressure (*J Altern Complement Med* 2013;19:313-8).

Low back pain

There is an increased incidence of low back pain (LBP) as children mature. Unfortunately, LBP has significant negative impacts on a person's daily living. Acupuncture can effectively relieve chronic LBP. A large German acupuncture study involving 1,162 patients with chronic LBP revealed that either real acupuncture or sham acupuncture was almost twice as effective as conventional therapy and was as cost-effective as long-term treatment (*Arch Intern Med* 2007;167:1892-8). Additionally, acupuncture can provide improvements in both pain and function for patients with chronic LBP.

Chronic musculoskeletal pain

It is not uncommon for children and adolescent to complain of chronic musculoskeletal pain. There is evidence supporting the use of acupuncture as a treatment for fibromyalgia. A meta-analysis of 12 RCTs on the effects of acupuncture therapy on

pain intensity and quality of life in patients with fibromyalgia compared acupuncture to sham acupuncture or conventional medications. Acupuncture was significantly better than sham acupuncture for relieving pain and improving quality of life, with low to moderate quality evidence in the short term. A long-term follow-up study showed acupuncture was also superior to that of sham acupuncture in improving the severity of pain.

Acupuncture can be recommended for the management of fibromyalgia (*J Pain Res* 2019;12:527-42).

Neuropathic pain

The efficacy of acupuncture in patients with peripheral neuropathy is unclear. Reports are available on the benefits of traditional acupuncture therapy and auricular therapy in treating complex regional pain syndrome. A retrospective service evaluated acupuncture in the management of 18 patients who received a course of six weekly acupuncture sessions for chemotherapy-induced peripheral neuropathy. Eighty-two percent of patients reported an improvement in symptoms following acupuncture. Acupuncture could be an option for these patients with chemotherapy-induced peripheral neuropathy (*Acupunct Med* 2011;29:230-3).

Referring patients for acupuncture

The World Health Organization recommends acupuncture for about 100 medical conditions. Acupuncture can be applied to many pain conditions (Acupuncture Pain Management, 2014). Based on the clinical RCT data available, acupuncture is effective in treating illnesses such as anxiety, depression, headache, fibromyalgia, postoperative pain, nausea and vomiting, anxiety/depression, and headache, etc. There is also an increase in the number of third-party payors covering the cost of acupuncture treatments. Moreover, the cost of acupuncture treatment is far less than many other forms of pain management. Although there is still a paucity of pediatric acupuncture clinical trials in various pain conditions, acupuncture is increasingly becoming an integral

part of pediatric health care. Pain service practitioners need to discuss treatment preferences and outcome expectations with patients and their families. It is essential to review the safety and efficacy of acupuncture or other complementary medical therapies with patients. Pediatric patients should be referred to qualified acupuncture providers and have follow-up appointments scheduled to monitor treatment responses. There are physicians who are trained and certified in medical acupuncture by the American Board of Medical Acupuncture (asamonitor.pub/2PZNTXm). Most licensed acupuncturists are not medical doctors but have undergone training in acupuncture and are certified by the National Certification Commission for Acupuncture and Oriental Medicine. To find medical doctors who are trained in acupuncture, the American Academy of Acupuncture can be a helpful resource (asamonitor.pub/2OE6jY).

What should be done to move forward?

For the last few years, the U.S. health care system has faced a severe opioid epidemic. Practitioners in the U.S. have been under pressure to minimize the use of opioids and move toward nonpharmacologic interventions (*Anesth Analg* 2017;125:2081-93). Thus far, acupuncture and its related techniques have shown substantial efficacy in various pain conditions. There is an increased awareness of acupuncture as part of comprehensive pain management, but it is still insufficient. In order to transform pediatric pain care, there is a need to educate patients and providers on the efficacy of acupuncture, advocate for policy initiation, break down reimbursement barriers, and continue to identify and expand the applications for pediatric pain conditions. Additionally, there must be an effort to promote ongoing basic and clinical research focusing on the short- and long-term therapeutic impact and cost-effectiveness of comprehensive pain care practice in the pediatric population. ■

Make Your Voice Heard

Drug shortages. The opioid epidemic. Surprise medical bills. These are just a few of the issues on which you can make a difference. Sign up with the ASA Grassroots Network now at asahq.org/grassroots.