Acupuncture in the Management of Myofascial Pain and Headache

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Acupuncture encompasses a host of healing techniques that have been practiced for more than 2000 years. Many different techniques and styles are in use in the West. The scientific study of acupuncture regarding its effectiveness has proven to be problematic and definitive studies are few. This is partly because of the difficulty in studying a dynamic, patient-centered system whose practice paradigms often are artificially limited by the application of a reductionist methodology, which is dictated by the standards of scientific enquiry. However, acupuncture, unlike many indigent medical practices in the world, has withstood the test of time in China and in the West, with many practitioners and patients reporting real benefits for the conditions of headache and myofascial pain when treated by acupuncture. This review provides a brief overview of acupuncture and what is known of its effectiveness in treating headache and myofascial pain.

Introduction

Acupuncture is not a single methodology of healing, but is comprised of multiple inter-related systems with origins that date back more than 2000 years to the Han Dynasty in China (206 BC–220 AD). It was during this time that some of the great Chinese medical classics were written, which continue to provide the theoretical foundations for this healing art. Numerous practitioners, influenced by diverse cultural and societal pressures over the centuries, have refined and expanded the original theories and methods so that there are distinct lineages or styles of acupuncture that flourish throughout the world. This process continues today. Low-energy lasers, alternating electric currents, germanium diode rings, and magnets have been added to the armamentarium of acupuncture tool kits. However, underlying these many different techniques are fundamental beliefs and premises that unite all of the various schools of acupuncture. This system of belief is difficult to understand at times from the perspective of Western medicine because the basic assumptions regarding health and disease are significantly divergent between the two systems. The fundamental premise that underlies the acupuncture theory begins with the concept that there is a flow and balance of energy or Qi within the patient and between the patients and their environment. If this dynamic energetic balance is perturbed, symptoms and diseases can develop. A flux in the energy dynamic of the organism may be brought about by external pathologic factors, dietary and other habits, stresses in the patient's life, and factors inherited from the patient's ancestors. In general, acupuncture works theoretically to restore the balance and flow of energy in the body, hence helping the body heal and preventing further disease. Diagnosis is made by history and physical examination, but the conditions diagnosed do not necessarily correspond to Western concepts of disease. Hence, headache can be a manifestation of numerous energetic imbalances, each with a different set of signs, symptoms, and reflexes and each leading to a different therapeutic regimen. A series of five patients who have been diagnosed with peptic ulcer disease by upper gastrointestinal examination or endoscopy may, when examined by a practitioner of traditional Chinese medicine, be found to have five different conditions, each requiring a different treatment [1••]. However, by using these different treatments, positive therapeutic outcomes may occur. This patient-centered approach is not reduced easily to a disease-centered model, which is prevalent in the West. Common to many styles of acupuncture is the belief that this energy or Qi flows in the body along specific meridians or channels and that specific points along these pathways have various therapeutic effects to restore the normal homeostasis or balance of this energy flow. With a return to homeostasis, symptoms are reduced and the body returns to a healthy state. Other schools use microsystems in which, for example, the whole body is represented in one small anatomic region such as the ear, hand, or scalp. A large number of practitioners in the West use a combination of many different systems in their practice. Acupuncture points may be treated by the introduction of small sterile needles, the hallmark of acupuncture; however, massage, magnets, low-energy laser, the application of a form of burning incense (moxa or mugwort), and cups containing a vacuum are used by various practitioners

with reported success. Different practitioners can use different styles, equipment, and point prescriptions to address a similar problem, all with the expectation of similar rates of success.

Discussion

That acupuncture has potent physiologic effects is no longer in dispute [1••,2••]. Well-designed research as early as 1977 demonstrated that acupuncture reduced laboratory-induced tooth pain in patients. It was documented that the effect was blocked by naloxone, demonstrating that endorphin release was at least partially responsible for the observed effect [1••,3]. Numerous studies also have documented that serotonin plays a role in acupuncture effect, with additional evidence suggesting the possibility of activation of the pituitary hypothalamic axis [1••]. Functional magnetic resonance imaging is a relatively new technique that allows the imaging of specific sites of brain activation using a technique that detects minute changes in regional blood flow to portions of the brain. Experimental designs have compared the effects of acupuncture needle stimulation of a specific acupuncture point with stimulation of nonspecific points or nonacupuncture stimulation versus acupuncture stimulation of an acupuncture point. An example is stroking an acupuncture point superficially with a thin wire versus inserting an acupuncture needle and stimulating the needle appropriately using the acupuncture technique. Studies have demonstrated that true acupuncture stimulation activates specific areas of the brain, which are not related to the cortical sensory mapping of the brain for the area that was stimulated. Furthermore, when a nonacupuncture stimulus is applied using light touch over a point, the regions of the brain seen with verum acupuncture stimulation are silent. The areas activated by acupuncture often are the deeper structures involved with phenomena such as pain modulation and include the nucleus accumbens, amygdala, hippocampus, parahippocampus, hypothalamus, ventral tegmental area, anterior cingulate gyrus, caudate, putamen, temporal pole, and insula [4]. Studies also have found that stimulation of acupuncture points on the foot, which is known to treat eye disorders, demonstrated activation of the primary visual cortex, although the sensory afferents from these areas (between the ankle and small toe) map to the somatosensory cortex, not to the visual cortex. This suggests a deep organization of the organism that is not readily apparent when applying standard neuroanatomic considerations [5,6]. Additionally, acupuncture has been found to deactivate areas of the brain, a finding that is not normally seen with other forms of stimulation of the skin [3,7,8].

These studies and a host of others, including a large body of research using animal models, have unequivocally documented that stimulating an acupuncture point using the appropriate technique leads to profound responses in the body, many of which effect mechanisms known to act on the perception of pain. Therefore, it may be assumed that it would be simple to find documentation of the efficacy of acupuncture for a large number of pain-related aliments. However, the acupuncture literature rarely demonstrates unequivocal results when viewed in the light of rigorous scientific research. This is not to say that the literature finds acupuncture to be ineffective, but that the unequivocal beneficial effects of acupuncture for various ailments have not been documented rigorously. There are many reasons why this particular form of healing has proven to be so problematic for scientific study. Although there have been large numbers of studies published on acupuncture internationally, many of the studies and reports are primarily anecdotal, without randomization or controls. It is difficult to design blinded studies in acupuncture because, under most circumstances, patients would be aware of whether they are being stuck by a needle. This has led to studies that use sham acupuncture points for control subjects. However, although the acupuncture literature supports the concept of optimal point locations and optimal point selection for the treatment of various ailments, there is no evidence to support the concept that other points in the body are completely inactive and thus are appropriate points to serve as sham controls. Certain schools of acupuncture use different point locations for the same named acupuncture point [9]. Placebo stimulation of points using a nonpuncturing needle or sticks have been used [10]; however, these methods often cause some stimulation to the acupuncture point that, according to standard acupuncture theory, also would be expected to produce an effect. This may explain why many studies find that acupuncture and sham acupuncture have therapeutic effects above nontreatment. In addition, large clinical trials often require standardization of treatment across multiple practitioners [11]. This methodology often goes against the fundamental precepts of many schools of acupuncture, which treat the patient and their symptoms as a dynamic system that may require changes in a therapeutic regime during a single treatment session and over time. Large randomized trials directly comparing acupuncture as it is practiced in the clinic without distorting modifications introduced by attempts at scientific standardization are rare in the literature. In 1998, Congress established The National Center for Complementary and Alternative Medicine as an additional institute of the National Institutes of Health. This has infused new research money into the study of complimentary and alternative therapies. In addition, there has been increasing research into this area internationally, with the interest of evaluating therapies such as acupuncture against standard therapies because of the potential benefits with regard to safety and cost effectiveness.

Acupuncture is not without risk to the patient. In 1997, Ernst and White [12] preformed a systematic review of the literature for life-threatening adverse reactions to acupuncture. In a review of 56 articles, five lethal complications were reported; a host of other serious complications that

could be life threatening also were reported. Infection was the most common potential source of serious complications [12]. In 2003, Lao *et al.* [13] published a review that extended over 35 years and 98 publications. They identified 202 incidents from 28 countries that included infection and organ damage and milder adverse effects such as cutaneous disorders, hypotension, fainting, and vomiting. They noted a trend toward decreased reporting of serious complications, which may explain the evolution toward safer techniques over time.

There have been numerous anecdotal reports of complications from acupuncture in the international literature. Relatively rare serious complications have been reported, which include pseudoaneurysm of the abdominal aorta [14], intracerebral air embolism [15], pericardial effusions, fatal cardiac tamponade [16,17], and spinal cord injury [18–20]. These complications often result from acupuncture practices that are not routinely performed by licensed acupuncturists in the United States. More common complications that are encountered are infection [21–28] and pneumothorax [29–35].

In general, the complication rate is exceedingly low when evaluated over the large number of procedures performed. Licensed practitioners in the United States usually are trained in clean needle technique, use disposable needles, and are well trained in using care for those areas in which needle insertion can cause serious complications (*eg,* thorax), making the risk minimal.

The experience of discomfort by patients undergoing acupuncture treatment will vary depending on the patients' background, their expectations, the practitioners' level of skill, and the techniques being used. Some more traditional methods of acupuncture use larger needles, deeper needle placements, and methods of needle manipulation that are expected to elicit strong sensations in the patient. Electric stimulation and the burning of an incense-like substance on the skin (moxa or mugwort) may produce uncomfortable stimulation for some patients depending on the methods being used by the practitioner. In general, most patients feel little or no discomfort during acupuncture treatment [36]. There are techniques such as some of the Japanese schools of acupuncture that use very fine needles and minimal needle manipulation so that the potential for discomfort is very small.

There has been sufficient scientific backing of the use of acupuncture in certain well-defined areas to have gained recognition by the National Institutes of Health. In 1997, a 3-day conference was held evaluating the evidence available on the efficacy of acupuncture and a consensus statement was prepared [37]. The conclusion at that time was that acupuncture research often provided equivocal results because of the complexities of performing controlled research with an invasive treatment method, the small sample sizes of most studies, and the methodologic heterogeneity of the literature. However, promising results were found in postoperative and chemotherapy-induced nausea and vomiting and postoperative dental pain. It also was concluded that other situations in which acupuncture may be useful as an adjunct treatment or an acceptable alternative included headache and myofascial pain (along with addiction, stroke rehabilitation, menstrual cramps, tennis elbow, fibromyalgia, osteoarthritis, low back pain, carpal tunnel syndrome, and asthma) [37,38••].

When reviewing the literature on the efficacy of acupuncture in treating headache, the problem of the heterogeneity of various therapeutic regimes of acupuncture is compounded by the variety of conditions labeled headache (*eg,* migraine, tension-type headache, cluster headache, atypical facial pain). In 1999, Melchart *et al.* [39] published a systematic review of randomized controlled trials of acupuncture for the treatment of recurrent headaches. The following selection criteria for inclusion in the study were included:

1. The trial had to be randomized or quasirandomized.
2. The trial had to include patients with recurrent headaches (migraine, tension headache, cluster headache) that were not precisely classified as chronic or recurrent headaches.
3. The trial had to compare acupuncture (defined as needle insertion at acupuncture points, pain points, trigger points, or other methods of stimulating acupuncture points such as laser acupuncture or electroacupuncture) with a control condition.
4. The trial had to report at least one clinical outcome related to headache.
5. Trials were excluded if they focused explicitly on patients with facial pain, did not compare acupuncture with a allopathic methodology, and lasted for less than 4 weeks.

The review of literature included multiple sources of trials from 1966 to 1998. During that period, 97 studies that mentioned acupuncture and headache were identified. Of those, 40 mentioned the use of a control group or therapy. Methodologic quality of these studies then was assessed using the Jadad scale [39], which rates items on random allocation, double-blinding, and reporting of dropouts and exclusions. An additional scale rated methodology based on the allocation of patients into groups, the baseline comparably between the groups, the methods of blinding the patients and evaluators, and the likelihood of bias by dropout. Of the 97 studies reviewed, only 22 met the inclusion criteria, representing a total of 1042 patients. Most of the studies had methodologic weaknesses, with a median Jadad score of 2 of a maximum of 5 points. Fourteen trials compared acupuncture with sham acupuncture in patients with migraine and tension-type headaches. Two trials found no effects of acupuncture over sham acupuncture and three trials showed trends suggesting that acupuncture was helpful. In six of the trials, the patients in

the acupuncture group did statistically better than those who received sham acupuncture. The other three trials were considered uninterpretable. These data may be interpreted to imply that acupuncture has specific therapeutic effects because, if its benefit was based entirely on the placebo effect, sham acupuncture should be as effective as verum acupuncture. Seven trials compared acupuncture with other treatments or no treatment. In general, these trials yielded contradictory results, with only one study considered by the authors to be a rigorous trial [40]. In this study, 77 patients with migraine were randomized to a 17-week regimen of acupuncture and placebo tablets or placebo acupuncture and 100 mg of metoprolol daily. Both groups exhibited a significant reduction in attack frequency. There was a significant difference in the global rating of attack severity favoring metoprolol, but the authors concluded that acupuncture was equipotent to metoprolol in reducing the frequency and duration of migraine and was superior with regard to negative side effects.

A critical review of the literature published in 2000 [41] reviewing 27 studies of headache that included migraine or mixed forms of headache and more than 1088 patients found that methodologic problems with the studies were common. However, the conclusion of the study found (again) that acupuncture treatment showed promise for this condition.

An additional systematic article published in 2000 [42•] reviewed 26 trials for a combined total of 1151 patients. Again, the conclusion was that there was sufficient evidence to support the potential value of acupuncture in treating idiopathic headache, with the caveat that the quality and amount of evidence are not as convincing. All of these reviews indicate the potential benefit of acupuncture as therapy for headache. However, there continues to be a need for large, well-designed clinical trials to assess the clinical effectiveness and cost effectiveness of acupuncture in various headache syndromes.

A randomized control trial of acupuncture versus sumatriptan versus placebo for the treatment of migraine that included 179 patients was completed recently [43••]. The outcome measure was the prevention of a full migraine for 48 hours after the intervention. A full migraine attack was prevented from occurring in 35% of patients undergoing acupuncture, 36% of patients who were administered sumatriptan, and 18% of patients who were administered placebo. In patients who developed a full attack and were given a second intervention, sumatriptan was more successful than acupuncture (55% for patients who received sumatriptan twice, 80% for patients who received sumatriptan after receiving placebo, and only 13% for patients who failed acupuncture and received a second treatment of acupuncture). These data suggest that, when a patient responds to acupuncture, it appears to be equally effective to sumatriptan; however, for patients who do not respond to acupuncture, further attempts at the same acupuncture treatment regimen may not be warranted (Table 1).

Myofascial pain syndrome frequently involves the supporting musculature of the head and neck and can contribute to headache. A local twitch response (LTR) to snapping palpation, pressure, or needle activation of a trigger point is a characteristic finding in this syndrome [44]. The muscle bands affected are palpably taught, with a focal-sensitive area referred to as a trigger point. Histologically, trigger points contain multiple minute loci that are related closely to nerve fibers and motor endplates [45]. An active trigger point demonstrates spontaneous bursts of activity on electromyography with activation of the LTR. Animal data have documented these phenomena to involve a spinal reflex [46,47]. Active trigger points lead to local and referred pain and trigger points in the musculature of the neck is considered to be one of the causes of headache. One widely accepted mechanism for the treatment of myofascial pain is hyperstimulation analgesia by stimulating the trigger points by dry needling, intense cooling or heating, or chemical stimulation to the skin. The success of these techniques has been ascribed to the gate control theory of pain [46]. It is obvious that acupuncture needling potentially can be an additional method of hyperstimulation; therefore, it may be expected to be a viable treatment for myofascial pain. In 1997, Melzack [47] correlated trigger points and known acupuncture points on the basis of spatial distribution and associated paint patterns and found a remarkably high degree of correspondence (77%) [47]. Additionally, when examining the acupuncture literature from the Tang Dynasty (618–907 AD), it was discovered that Sun Si Miao developed the theory of ah shi points. This theory states that, whenever there is a local soreness or pressure, there is an active acupuncture point regardless of whether the point lies on a classical acupuncture meridian. Many acupuncturists routinely needle such points in therapy, thereby effectively treating many trigger points by dry needling similarly to their allopathic colleagues [48] (Table 2).

In general, there are far fewer studies in the acupuncture literature specifically addressing myofascial pain and headache. Nabeta and Kawakita [49] compared acupuncture with sham acupuncture on tender points (ah shi points) for volunteers with complaints of chronic pain and stiffness in the neck and shoulder. They treated ah shi points once weekly for 3 weeks. They found that there was a short-term improvement using verum acupuncture, but they did not demonstrate a long-term superiority of verum over sham acupuncture [50]. Irnich *et al.* [51] published a randomized, double-blinded, sham-controlled crossover trial comparing dry needling and acupuncture at distant points for chronic neck pain. Each treatment was performed only once. They found that verum acupuncture was superior to sham acupuncture in improving motion-related pain and improving range of motion, and that acupuncture at distant points improved range of motion more than dry needling [49]. Kung *et al.* [52] evaluated meridian-based therapy to chronic myofascial

Table 1. Acupuncture points commonly used in the research of headache

Acupuncture point	Location	Research indication
Liver (LV3)	On the foot in the interosseous muscles between the rays of the first and second metatarsal bones	Pain conditions
Large intestine 4 (LI4)	In the first dorsal interosseous muscle of the hand	Facial pain, dental pain
Gallbladder 14 (GB14)	Above the middle of the eyebrow in the frontalis muscle	Frontal headaches, eye problems
Gallbladder 20 (GB20)	Between the mastoid and occipital bones on the lateral edge of the trapezius insertion	Headaches, neck pain
Gallbladder 21 (GB21)	Apex of the body of the trapezius muscle	Headaches, neck pain
Gallbladder 34 (GB34)	On the lateral side of the leg 3 inches below the knee in the perinius longus muscle	Tendinomuscular pain syndromes
Stomach 6 (ST6)	In the masseter muscle at the angle of the mandible	Temporomandibular joint problems
Stomach 8 (ST8)	At the angle of the forehead at the superior margin of the temporalis muscle	Headaches
Yintang	Extra point between the eyebrows	Headaches, anxiety
Urinary bladder 2 (B2)	In the supraorbital notch above the eye	Headaches
Urinary bladder 10 (B10)	In the origin of the trapezius muscle on the medial aspect at the base of the occiput	Headaches, neck pain
Governing vessel 20 (GV20)	At the top of the head at the intersection of the median line of the head with the line drawn between the ears	Headache, dizziness, insomnia

Table 2. Acupuncture and myofascial trigger point correlations

Acu-Zone	Region of body	Acupoints	Muscles
Tai Yang	Dorsal zone (frontal region of the forehead to the occiput down back to the lateral ankles)	B2, B7, B10, SI9–SI14, B11–B25, B41–B45, B53, B54, B31, B34	Frontalis, suboccipital, scapular muscles, thoracic and lumbar paraspinals, gluteus medias, piriformis
Shao Yang	Lateral zone (temporalis region of the head to the lateral neck and down the arm to the wrist extensors)	GB3–GB6, GB8, GB16, GB20, GB21, TH9, GB24–GB29, GB31	Temporalis, sternocleidomastoid and scalenes, upper trapezius, finger extensors, abdominal obliques, tensor fasciae latae, iliotibial band
Yang Ming	Ventral zone (anterior neck, anterior chest wall down abdomen to the medial aspect of the leg and foot)	ST5–ST7, ST9, ST10, ST14–ST32	Masseter, sternocleidomastoid, pectoral muscles, rectus abdominis, quadriceps muscles

B—urinary bladder; GB—gallbladder; SI—small intestine; ST—stomach; TH—triple heater.

pain in the cervical and upper back regions and found short-term, but not long-term relief. However, the study limited treatment to 3 weeks, with two sessions each week. A randomized trial comparing sham laser acupuncture with massage and acupuncture in 177 patients found short-term benefit without documented long-term benefit after only five treatments over 3 weeks [52]. All of these trials found acupuncture to be effective in the short term, with diminishing effects over time. Additionally, all of these trials used extremely abbreviated treatment regimens. Many practicing acupuncturists would criticize these studies by pointing out that, in routine clinical practice, larger numbers of treatments over longer periods of time are used routinely to treat these conditions. The question of the efficacy of acupuncture in myofascial pain in the cervical region awaits larger controlled trials with acupuncture treatment regimes that reflect current clinical practice to determine the clinical long-term efficacy in patients.

Conclusions

Acupuncture is an ancient healing technique that has been scientifically demonstrated to have potent physiologic effects. Additionally, the efficacy of acupuncture for the treatment of some clinical conditions has been documented. In the setting of headache and myofascial pain, the literature shows promise, but is not definitive. It has been found and the literature supports that, in the setting of headache and myofascial pain, acupuncture should be considered as a potential complimentary or alternative therapy for those patients who do not experience complete relief from allopathic treatment or who have a preference for alternative approaches to their health care. Further studies are needed and many are underway. Ideally, more physicians interested in research in this area will seek appropriate training in acupuncture to ensure authenticity and methodologic integrity. To obtain a full membership in the American Academy of Medical Acupuncturists (AAMA), individuals must have an active MD or DO

license (or equivalent) to practice medicine under US or Canadian jurisdiction, have completed a minimum of 220 hours of formal training in medical acupuncture (120 hours didactic, 100 hours clinical), and have 2 years of experience practicing medical acupuncture. Physicians are able to satisfy the educational and clinical requirements demanded in most states by completing the training offered by the Office of Continuing Medical Education at the University of California, Los Angeles. Harvard Medical School, through the Osher Institute and the Division for Research and Education in Complementary and Integrative Medical Therapies and the Department of Anesthesia at the Beth Israel Medical Center, is also offering a 300-hour CME course in medical acupuncture that would satisfy the AAMA requirements and most state requirements to practice acupuncture. With such high-quality training programs available for physicians, a more definitive answer in acupuncture's role in treating these challenging conditions may be expected in the near future.

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