CURRENT CONCEPTS

Traditional and Evidence-Based Acupuncture:
History, Mechanisms, and Present Status

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ABSTRACT

Background. In 1983, the *Southern Medical Journal* advised its readers that a scientific basis might underlie the popular practice of ancient Chinese acupuncture. Recent studies have proven this to be correct, and a 1997 National Institutes of Health consensus panel recommended acupuncture as a useful clinical procedure.

Methods. Pertinent articles in the literature were reviewed, including our own research. Significantly, we had access to recent important studies from China.

Results and Conclusions. Most of the 10,000 acupuncturists in the country today practice metaphysically explained "meridian theory" acupuncture using needles to supposedly remove blockages of a hypothesized substance "Qi." Scientific research has shown that healing is not by manipulating Qi but rather by neuroelectric stimulation for the gene expression of neuropeptides. Needles are not necessary. Evidence-based neuroelectric acupuncture requires no metaphysical rituals. It is a simple, useful clinical tool for pain modulation and other conditions and can be easily taught to physicians.

ACUPUNCTURE is one of the most popular treatments in alternative medicine. An estimated 10 million treatments are given each year to more than 1 million American patients. Many acupuncturists lack medical skills to make a proper diagnosis or to recommend other treatments when such are more appropriate. It would be better if physicians learned modern scientific acupuncture and used it when indicated for the no-drug treatment of pain and other selected conditions.

"Acupuncture" is an umbrella term that includes many techniques such as acupressure, Shiatsu, laser acupuncture, Ryodoraku, scalp acupuncture, auriculotherapy, Korean hand acupuncture, moxibustion, electroacupuncture, and more. Most acupuncture techniques involve the use of needles with mystic rituals explained by metaphysical concepts derived from ancient practices of traditional Chinese medicine (TCM). In the last two decades scientific research on acupuncture, coupled with advances in knowledge about pain control mechanisms, has yielded facts sufficient to develop a type of acupuncture technique based entirely on scientific principles.[1]

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TRADITIONAL CHINESE MEDICINE AND ACUPUNCTURE

Theory

About 3,000 years ago, Chinese physicians stimulated body points evoking sensations of pain, touch, and temperature (acupuncture, acupressure, and moxibustion). The theories developed involved theoretical functions to which organ structures were only incidentally attached.[2]

Treatment depended on a knowledge of complex philosophic laws governing an hypothesized relationship of two major forces, Yin and Yang, which reside in both the body and the cosmos. In theory, human and natural forces must be brought into balance for good health. Second only in importance to Yin and Yang were the five evolutionary phases (elements) fire, earth, metal, wood, and water. Ten body organ systems were originally related to these five elements. Later, two more were added for balance, these being the peri-

cardium and the triple heater, the latter a vague area in the lower abdomen. Twelve organ systems with their named energy pathways (meridians) are thought to be represented by twelve pulses whose 27 varieties are detectable at six different locations on each radial artery at the wrist. This concept of pulse diagnosis is still used in several ancient medical systems.

Basic to the Chinese system of medicine is a hypothesized body energy Qi believed to flow through the body's meridian channels. An ancient text, *The Yellow Emperor's Classic of Internal Medicine*,[3] quotes a minister who states "On these meridians there are 365 acupuncture points, one for each day of the year."

It is this complex system of metaphysical thinking that has been introduced into the United States as the basis for training in acupuncture. In addition to acupuncture, herbs were widely used and recommendations made for positive changes in diet and behavior. The concept of disturbances in Qi as a basic causative factor in disease, however, has persisted and is still accepted as the reason contemporary acupuncturists treat by inserting needles in hypothetical meridians to relieve blockages.

History

Missionaries who visited China in the 1700s carried knowledge of acupuncture to Europe and brought ideas of Western medicine to China. Thus, in 1882, the teaching of acupuncture was banned in the Royal Medical Academy. Acupuncture resurfaced in the 1940s when Chairman Mao Tse-tung, faced with a massive population and only a handful of Western trained doctors, solved this problem by reinstituting a nationwide program of Chinese folk medicine. The *Barefoot Doctor's Manual*[4] became the "bible" by which thousands of practitioners were trained to take TCM into the countryside.

In the 1950s, China reported the use of electrically stimulated needles to obtain the strongest possible stimulus for surgical analgesia. In 1971, James Reston, a reporter accompanying President Nixon to China received symptomatic relief from acupuncture given for gas pains after an appendectomy. His report to the US media stirred widespread interest in this new "miracle cure" that "could even substitute for anaesthesia."

The American Medical Association Council (1981)[5] and the National Council Against Health Fraud (1991)[6] both examined available data and concluded acupuncture had no scientific basis. This caused physicians to shun acupuncture, but the public's enthusiasm was not diminished. To meet public demand, persons with no medical training were taught acupuncture techniques. Under lobbying pressure, states developed boards to certify "acupuncturists" who could thus practice medicine without going to medical school.

NEUROBIOLOGY OF EVIDENCE-BASED ACUPUNCTURE

In 1972, the National Institutes of Health (NIH) gave its first grant to study acupuncture. The study reported that acupuncture was not hypnosis[7] and that while needles alone could slightly decrease experimental pain, electrical stimulation added to needles produced statistically significant greater relief.[8]

During the last two decades, research by international scientists has put in question the ancient meridian hypothesis of traditional Chinese acupuncture (TCA). The ideas of the ancients have in a sense been validated but reformulated in terms of modern neurobiology.[1] Energizing a needle by constant twirling or a pulsing DC electrical current stimulates the gene expression of neuropeptides in the central nervous system (CNS). Points used are adjacent to nerve fibers and nerve roots. Such skin points are bilaterally symmetrical and may differ electrically from surrounding tissue.[9] Eighty points are widely used, many being motor points where nerve enters muscle.[10,11]

Proponents of needle acupuncture suggest that pain relief comes from the current of injury produced by tissue damage or that needling produces changes in circulation, temperature, or chemical effects.[12] Deep insertion of needles with continuous vigorous twirling near the muscle zone of insertion overcomes spasticity, healing the neuropathy of injury and disuse supersensitivity.[11]

The initial response experienced with needle piercing is termed "De Qi" and occurs with stimulation of the primary sensory nerve terminal inside a muscle. This in turn sends a message to the spinal cord, then the midbrain and cortex. Stimulation reaching the hypothalamus induces the release of adrenocorticotropic hormone.[13] Ultimate release of glucocorticoids are given as an explanation of why acupuncture can help with arthritis and asthma.[13] The phenomenon of acupuncture analgesia is frequently interpreted by the gate control theory of Melzac and Wall,[14] which

postulates that the nociceptive signal transmitted by small diameter fibers is blocked by acupuncture induced impulses carried by large nerve fibers in the same segment of the spinal cord.

In 1973, Pert and Snyder[15] reported opioid receptors in central nervous tissue, and Kosterlitz and Hughes[16] discovered enkephalins in the brains of pigs. These reports suggested mechanisms for chemical analgesia. In China, Han[17] observed that electroacupuncture analgesia used for surgery had a unique rise and fall that suggested chemical mediation. In the laboratory, he produced acupuncture analgesia in one rabbit and transferred its cerebrospinal fluid (CSF) into the third ventricle of a naive recipient animal, thus producing an analgesic effect in the second rabbit. The results showed that transmitters in the CSF were responsible for the analgesic effect. Han's group showed that the classical neurotransmitter serotonin was an important mediator of acupuncture analgesia.

Mayer et al[18] studied experimental tooth pain in humans. They produced analgesia by manually twisting needles in the hand point Hoku (motor point of the dorsal interosseus muscle). They found that naloxone, an opioid receptor antagonist, blocked this analgesia. Microinjection of naloxone into the periaqueductal gray matter and several other nuclei known to be involved in pain control has been shown to attenuate acupuncture analgesia and morphine analgesia in rats and rabbits.[17]

Han's group also showed a cross tolerance between morphine and electroacupuncture, suggesting that they are mediated by the same receptors.[17] The endogenous opioid peptides or endorphins are grouped into three classes: enkephalins, beta-endorphins, and dynorphin. Collaborating with Terenius, Han and co-workers[19, 20] used the antibody injection technique to show that enkephalins and beta-endorphin are mediators for acupuncture analgesia in the brain. Dynorphins are effective in the spinal cord but not in the brain.[21] Important correlations of the endorphin acupuncture analgesia hypothesis are found in the report of Sjölund and colleagues[22] that showed endorphins are increased in the CSF after electroacupuncture stimulation.

Different frequencies of stimulation can affect the release of different neuropeptides. Han and co-workers[23] showed with serial samples of CSF from human volunteers that different kinds of neuropeptides can be released in the CNS by simply changing the frequency of electrical stimulation without moving the position of the needle. Low frequency (2 Hz) electroacupuncture increases the content of beta-endorphin and met-enkephalin in the CSF, while high frequency (100 Hz) accelerated the release of dynorphin. This scientific evidence of frequency-specific effects that are widespread throughout the CNS is different from the symptom-specific metaphysical theories of specific acupoint needle stimulation. However, stimulation of different points representing different neurotomes can also produce action on those body structures innervated by those neurotomes.

Wang et al[24] compared the effects of electroacupuncture with transcutaneous nerve stimulation (TENS) without using needles. At all frequencies tested, the results were similar, showing that needles are not necessary to produce an acupuncture effect.

CLINICAL APPLICATIONS OF EVIDENCE-BASED ACUPUNCTURE

The NIH/OAM Consensus Panel on Acupuncture[25] reported in November 1997 that there is "clear evidence for acupuncture's efficacy for treating postoperative and chemotherapy nausea and vomiting, the nausea of pregnancy, and postoperative dental pain." The panel also concluded that for a number of pain conditions acupuncture may be an effective adjunctive therapy. These included, but were not limited to, addiction, stroke rehabilitation, headache, menstrual cramps, epicondylitis, fibromyalgia, low back pain, carpal tunnel syndrome, and asthma. The studies presented to the panel were clinical evaluations of patients treated mainly with the techniques of TCA. The panel noted numerous deficiencies in research design, including the need for good double-blind studies. No studies were presented comparing scientific neuroelectric stimulation with TCA.

Pain

The most telling evidence that electroacupuncture is effective for pain control is its use as an analgesic for surgical procedures.[26] Han[27] reported that the term acupuncture analgesia is a misnomer. The correct term is acupuncture assisted anaesthesia. Stimulation for 30 minutes before surgery enabled a reduction of chemical anaesthetic by up to 50%. A 70% rate of success for pain modulation or elimination has been reported

clinically in patients with low back strain, arthritis, myofascial discomfort, migraine, and other painful disorders.[28-30]

Psychiatric Conditions

In China, electroacupuncture is used successfully for the treatment of depression. Two 30-minute periods of electrostimulation are given daily.[31] Double-blind comparison over a 30-day period with hospitalized depressed patients receiving therapeutic doses of amitriptyline revealed an equally favorable response rate but with no side effects in the electroacupuncture group.[32]

Electroacupuncture has been used successfully to treat patients with posttraumatic stress disorder.[33] A conditioning technique for the treatment of anxiety combined with electroacupuncture has been advocated.[34]

Addiction

Wen and Cheung[35] first showed the successful use of electrically stimulated needles in the ear to treat addiction. The needles were placed in the concha, an area innervated by the vagus nerve. "Ear acupuncture for addiction" was soon promoted by auriculotherapists, based on theories postulating a body map in the ear with 168 points supposedly controlling as many body areas. Addictionologists in some 300 US clinics use this ritual with three unstimulated ear needles. Wen's admonition to use electrical stimulation has unfortunately been overlooked. Such unstimulated needle acupuncture has been reported to be mainly placebo.[36-38]

Han et al[39] reported the use of transcutaneous stimulation of body acupuncture points at identified frequencies for the treatment of heroin addicts. The alternating high (100 Hz) and low (2 Hz) frequency stimulation produced the most significant improvement of withdrawal symptoms. A clinical study with more than 500 heroin addicts showed that this treatment significantly decreased heart rate and palpitation and produced a euphoria-like sensation and warm feeling. It also produced a hypnotic effect and an increase in body weight.[40] Favorable results have been reported using neuroelectric stimulation for various types of addiction.[33]

Gastrointestinal Disorders

Stimulation of the point Zusanli (ST 36, motor point of the tibialis anticus muscle) has long been advocated for the treatment of intestinal problems. Jin et al[41] reported this effect in dogs. Li et al[42] reported that electroacupuncture was effective for clinical gastrointestinal disorders.

Cardiovascular Accidents and Sequelae

Recent reports suggest that early electroacupuncture after a stroke may assist with early rehabilitation and decrease time in a nursing home by 50%.[43,44] Studies by Han et al[45] suggest that specific frequencies of stimulation 100 Hz rather than 2 Hz may be effective for the treatment of spinal spasticity.

DISCUSSION

More than 10,000 acupuncturists practice in the United States. Fewer than 3,000 are MDs, and many have no medical training. Thirty-six states have certification regulations for acupuncture.[25] To practice acupuncture in some states, physicians must take the same training required for persons with no medical education. This is a travesty, since more complicated treatment techniques taught in medical schools require no additional certification.

The usual state certification requirement is several hundred hours of training in the pseudoscience of TCA. Such certification may fail to maintain high standards of medical care.[46] The American Association of Oriental Medicine recommends a mandated national standard acupuncture training curriculum of more than 1,500 hours in what is essentially Oriental medicine. It was stated that this ". . . is for physicians so impractical that they will be effectively eliminated from doing acupuncture."[47] In contrast, evidence-based acupuncture techniques can be taught to physicians in a single brief session.[48]

A 1973 NIH acupuncture conference in Bethesda, Md, concluded that "Acupuncture holds some promise as an anaesthetic for certain surgical operations and for the treatment of some acute and chronic painful conditions."[49] In 1997, the NIH/OAM Consensus Meeting on Acupuncture came to essentially the same conclusions after focusing its attention primarily on clinical studies, based on TCA with its pseudoscientific theories of meridians and Qi. The important scientific research reports of Pomeranz in Canada[13] and Han in China received scant notice in the panel's summary statement. The panel did, however, note the role of placebo in TCA wondering if " . . . non-specific effects account for a substantial proportion of its effectiveness and thus should not be casually discounted."

Acupuncture, steeped in the mystical concepts of TCM, was introduced to an America infatuated with New Age magical thinking.[50] Holistic healers capitalize on the growing problems faced by US physicians. Pseudoscience should not triumph over evidence-based medical practices. Since acupuncture is a beneficial treatment for pain control that is easily learned, it should become a useful tool in the armamentarium of all practicing physicians.[48]

Those who call themselves acupuncturists should be properly identified as "practitioners of Oriental medicine." It is significant that in China where TCA had its origins, the Chinese Academy of Science has proclaimed itself in opposition to superstition and pseudoscience. Naive beliefs in unproven explanations of Qi are weakening.[51]

Recent efforts have been successful in convincing some third party payers to cover acupuncture treatments. There has, however, been a failure to make it clear regarding which of the more than 200 types of acupuncture are to be covered. To prevent health care funds from being wasted on pseudomedicine, this dilemma could be avoided by clarifying the difference between TCA and evidence-based acupuncture.

CONCLUSION

Acupuncture done with needles has been used with reported success for hundreds of years. It has been used most commonly for the control of pain. Deep insertion and continuous manipulation of the needles was recommended. In recent years, there has been scientific progress in delineating the neurobiology of acupuncture. It has become apparent that TCA as practiced in the United States is based on unproven pseudoscientific theories. Careful scientific studies have presented evidence of the neurochemical basis of acupuncture. Electrical stimulation presents a more scientific and powerful mode of acupuncture treatment. This method offers opportunities for meaningful controlled clinical studies that could more properly define the role of acupuncture in conventional medical practice.

Specific frequencies of electrical stimulation with defined parameters evoke the gene expression of specific CNS neurohormones. Needles are not necessary since conducting polymer pads are sufficient. Clinical reports using this type of neuroelectric acupuncture have shown promising results in patients with various types of pain, depression, addiction, gastrointestinal disorders, and stroke.

Evidence-based acupuncture is a simple method for no-drug pain control and should be taught in medical schools and made available to all physicians. We believe existing state requirements for acupuncture certification should be specified as for "Oriental medical doctor" with no special certification required for physicians who use acupuncture in their practices.

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