

Acupuncture: Theory, Efficacy, and Practice

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Traditionally, acupuncture is embedded in naturalistic theories that are compatible with Confucianism and Taoism. Such ideas as *yin-yang*, *qi*, *dampness*, and *wind* represent East Asian conceptual frameworks that emphasize the reliability of ordinary, human sensory awareness. Many physicians who practice acupuncture reject such prescientific notions. Numerous randomized, controlled trials and more than 25 systematic reviews and meta-analyses have evaluated the clinical efficacy of acupuncture. Evidence from these trials indicates that acupuncture is effective for emesis developing after surgery or chemotherapy in adults and for nausea associated with pregnancy. Good evidence exists that acupuncture is also effective for relieving dental pain. For such conditions as chronic pain, back pain, and headache, the data are equivocal or contradictory. Clinical research on acupuncture poses unique method-

ologic challenges. Properly performed acupuncture seems to be a safe procedure. Basic-science research provides evidence that begins to offer plausible mechanisms for the presumed physiologic effects of acupuncture. Multiple research approaches have shown that acupuncture activates endogenous opioid mechanisms. Recent data, obtained by using functional magnetic resonance imaging, suggest that acupuncture has regionally specific, quantifiable effects on relevant brain structures. Acupuncture may stimulate gene expression of neuropeptides. The training and provision of acupuncture care in the United States are rapidly expanding.

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Acupuncture is an important therapy in East Asian medicine (the traditional medicine of China, Japan, and Korea). Treating headache by placing pins in the hands or treating asthma by placing needles in the feet challenges modern biomedical understanding. Thirty years ago, most physicians considered acupuncture a Chinese equivalent of voodoo. Despite the strangeness of its theory and method, in a very short period, acupuncture has changed from a cultural curiosity to an alternative therapy that, at a minimum, deserves a respectful hearing. This essay reviews the historical and theoretical framework of acupuncture, the scientific evidence for its claims to effectiveness, and its safety profile. The essay also discusses the provision of acupuncture therapy.

HISTORY

The earliest health care in China involved shaman-like rituals to placate spirits or demons (1, 2). At the same time, during the first few centuries BC, when philosophical systems such as Confucianism and Taoism were significantly replacing earlier Chinese supernatural thinking, acupuncture and other associated practices began to supplant antecedent magico-religious healing approaches (3, 4). China's emerging philosophies required a new medical system, free of supernatural thought and compatible with "naturalistic," human-centered presuppositions.

The precise origin of acupuncture techniques is a

subject of scholarly debate. A "multilinear development toward acupuncture" seems likely (2). Early awareness of practical, needle-like therapy that used bamboo or bone needles to open abscesses may have contributed to the development of acupuncture (2). Knowledge of exact body locations (now considered acupuncture points) found in nondecorative tattoos on Stone Age mummies suggest another precursor route (5). The earliest Chinese archeologic textual material points to the existence of methods of heat stimulation (see following discussion) at precise regions of the body (which are clearly related to acupuncture channels) before any needling of acupuncture sites occurred (6). Another possible origin of acupuncture may be the bloodletting described in the earliest acupuncture sources. Bloodletting was originally used for "magical" healing, but by the time of the early acupuncture literature, it was being used for "naturalistic" reasons at acupuncture points based on Chinese medicine theory (7). Whatever the exact pathway may have been, by the time East Asian medicine was codified at some time in the first century BC (in a canonical text known as the *Inner Classic of the Yellow Emperor*), acupuncture was already a signature therapy of Chinese medicine.

BASIC THEORY AND CONCEPTUAL FRAMEWORK

From the Chinese perspective, acupuncture is necessarily embedded in a complex theoretical framework that provides conceptual and therapeutic directions. Un-

like the earliest Chinese healing, which relied on supernatural guidance or altered states of consciousness, classic Chinese medicine relies on ordinary human sensory awareness. Its fundamental assertion, like the kindred philosophical systems of Confucianism and Taoism, is that contemplation and reflection on sensory perceptions and ordinary appearances are sufficient to understand the human condition, including health and illness. This assertion is fundamentally different from the biomedical viewpoint, which gives privileged status to objective technology and quantitative measurement. Ideally, the scientific analysis penetrates beyond the visible “life world” of the patient, revealing an underlying pathophysiologic disruption, independent from human subjectivity (8).

Despite acupuncture’s claim to be based on ordinary perceptions, it is full of strange concepts that can act as formidable barriers (or attractions) to many Westerners. In fact, the foreign-sounding key words of acupuncture—for example, *yin*, *yang*, *dampness*, *wind*, *fire*, *dryness*, *cold*, and *earth*—are ordinary images or patterns (some culturally unique) of a person’s state of being and behavior. They represent human “meteorologic” conditions, which are sometimes pathologic and disruptive and sometimes necessary and healthy. They are the fundamental patterns for detecting and synthesizing clinical information. These patterns also create a unique medical thought process.

Yin–Yang

Yin and yang are the basic root intuitions of China. They are recognizable in images akin to weather. Yin is associated with cold, darkness, being stationary, passiveness, receptivity, tranquility, and quiescence. Yang is associated with heat, light, stimulation, excess, assertiveness, dominance, movement, arousal, and dynamic potential. These complementary opposites are successively intertwined for additional levels of descriptive refinement.

A simple example is *dampness*. It has the yin qualities of cold, wet, soft, and lingering and also the yang qualities of excessiveness, dominance, heaviness, and “inexhaustible abundance.” Acupuncturists claim that dampness is easy to recognize and that it applies to “psychological, ecological, and even moral as well as corporeal phenomena” (9). Some damp signs point to imbalance, or “bad weather,” for example, weeping eczema,

edema, “slippery” pulse, heaviness in digestion, indecision, clinging, or being helpful to others at the expense of oneself. Some dampness is an essential component of a healthy state of being, for example, smooth skin, normal secretions and excretions, being imperturbable when threatened, generosity, and patience.

In addition to a general synthesis, yin and yang and their climatic subcategories are used to interpret specific subregions of a person’s health. These subregions can be different from a person’s general meteorologic pattern and can create overlapping domains of yin and yang (for example, yins within yangs) that are as complex as multiple, intersecting circles. Both for the overview pattern and for the subregions, no single sign is conclusive; the overall context defines the parts. Heaviness in digestion or generosity might be “wind” if it appeared in a different configuration of signs. Unlike western medicine, in which signs and symptoms are used analytically to isolate an underlying mechanism, East Asian medicine seeks to discern a *qualitative image* in the overall gestalt or regions of a person’s signs and behaviors. Whereas biomedicine aspires toward the scientific and dimensionally measurable *quantitative*, East Asian medicine emphasizes a human-centered approach of artistic impressions and sensitivities (10). If Chinese medicine resembles anything in the West, it would be the prescientific but rational Greek humoral medical system, which also perceived health status in such images of weather as phlegmatic (cold-moist) and choleric (hot-dry) (11).

Qi

In traditional acupuncture, the connection between such diverse phenomena as edema and generosity is explained by *qi* (pronounced “chee”). Qi is the linkage in the cosmos that, like the Greek notion of *pneuma*, takes myriad forms. The concept of qi has little scientific cogency, but for the Chinese, it provides a rationale for explaining change and linking phenomena. This rationale unites objective and subjective phenomena and locates disorders in the broadest context of a person’s life (12). Whether qi is some kind of “real” quantitative energy in the western sense (akin to 19th century vitalist life-force notions [13]) or a metaphoric way of depicting and experiencing interconnection is not a serious intellectual issue in classic Asian thought (14).

In addition, the target of treatment in Chinese medicine is the state of “disharmony,” any imbalance in yin–

yang and its connecting qi. It is not an abstract diagnosis or “truth” existing independent of the patient. A Chinese diagnosis can be compared to a practical “weather report” to guide the practitioner’s response to the overall configuration of a patient’s life.

ACUPUNCTURE THERAPEUTICS

Imbalances in yin–yang and qi need to be dynamically harmonized. Acupuncture is used to shift a person’s unique “climate.” It can moisten, dry, cool, warm, augment, deplete, redirect, reorganize, unblock, stabilize, raise, or lower a person’s weather patterns. Fine needles are inserted into precisely defined, specific points on the body to correct disruptions in harmony. Heat stimulation, a technique known as *moxibustion*, which burns the herb *Artemisia vulgaris* near the acupuncture point, is sometimes used (especially to warm or move the qi). Hand pressure (“acupressure”) is also sometimes applied. Classic theory recognizes about 365 points, said to be located on 14 main channels (or meridians) connecting the body in a weblike interconnecting matrix. These channels are not detectable by ordinary scientific methods (15). Additional acupuncture points (both on and off the channel) have been added through the millennia, and the total universe of points has increased to at least 2000 (16). In practice, however, the repertoire of a typical acupuncturist may be only 150 points. Traditionally, each acupuncture point has defined therapeutic actions; some points treat an entire yin–yang emblematic configuration, whereas others affect local symptoms. Between 5 and 15 needles are used in a typical treatment, with the point combinations varying during a course of sessions.

China, Japan, and Korea have each developed a distinct version of acupuncture. Thousands of years of history, interpretation, and innovation have produced multiple approaches (17). Specialized acupuncture has also been developed for the ears, scalp, and hands (18). Western nations have developed their own traditions, and one can begin to speak of French (19), British (20), and even American styles of acupuncture (21).

Biomedically trained physicians have developed acupuncture variants that reject “the metaphysical explanations and the necessity for mystical rituals” (22). Their approach emphasizes using acupuncture points based on western understanding of myofascial trigger points, the nervous system, or recent scientific discoveries about the

likely mechanism of acupuncture (23). Some approaches used in ancient as well as modern times use standardized “formularies” involving a fixed menu of consistent points for a particular patient’s symptoms, independent of traditional diagnosis. Although more philosophically compatible with biomedicine, these approaches are not entirely disassociated from traditional knowledge. Whether such approaches produce superior clinical results remains to be determined (24).

ASSOCIATED THERAPIES

Acupuncture is often used in conjunction with other modalities. Chinese herbal interventions, which can include animal parts and minerals in addition to botanicals, have historically been the mainstay of East Asian therapy. Although the Chinese materia medica includes more than 5000 entries (25), most practitioners rely on fewer than 250 substances. A body of biomedical literature on Chinese herbal pharmacology, pharmacokinetics, clinical efficacy, and associated adverse events is emerging, and the interested reader can find extensive information elsewhere (1).

Historically, acupuncturists consider the patient–physician relationship and therapeutic encounter itself to be inherently “potent” and sufficient to promote healing (1). In addition, acupuncturists use physical methods, such as massage, cupping (placing vacuum suction over point areas) (26), and scarification (counter-irritation) (27). Lifestyle counseling in such domains as diet, exercise, and mental health is also a component of acupuncture care. Modern *qi-gong*, which is sometimes used by acupuncturists, is a recent healing technique that combines older health and longevity practices (such as breathing and meditation practices) with an amalgam of Chinese religious ideas (28).

SCIENTIFIC EVALUATION OF ACUPUNCTURE

Clinical Evidence

Since the early 1970s, when acupuncture began to capture the popular imagination of the West, almost 500 randomized, controlled trials (RCTs) have evaluated its efficacy (29, 30). More than half were placebo-controlled trials, and the remainder pragmatically compared acupuncture or acupuncture plus conventional care with routine conventional treatment. A growing number of systematic reviews and meta-analyses that use stringent inclusion criteria has begun to synthesize this

Table 1. Systematic Reviews and Meta-Analyses of Randomized, Controlled Trials of Acupuncture for Pain-Related Conditions*

Condition	Study (Reference)	Year	RCTs, n	Patients, n	Findings	Conclusions
Chronic pain	Patel et al. (31)	1989	14	720	Overall and in most subgroups pooled: positive; for acupuncture placebo trials: negative	Potential bias precluded conclusive findings, but most results were positive
Chronic pain	ter Riet et al. (32)	1990	51†		24 positive and 27 negative; for acupuncture vs. placebo trials: 15 positive and 17 negative	Highly contradictory evidence; efficacy remains doubtful
Chronic pain	Ezzo et al. (33)	2000	51	2423	21 positive and 27 negative; acupuncture was worse than control in 3 trials	Inconclusive evidence for acupuncture being more effective than placebo or standard care
Chronic neck and back pain	Smith et al. (34)	2000	13	522	All placebo-controlled: 5 positive and 8 negative; most valid trials tended to be negative	No convincing evidence for analgesic efficacy in chronic neck and back pain
Back pain	Ernst and White (35)	1998	12	591 (377 pooled)	9 studies pooled: odds ratio of improvement for acupuncture vs. control, 2.30; for placebo trials, 1.37	Acupuncture superior to various controls, but insufficient evidence to conclude whether superior to placebo
Low back pain	van Tulder et al. (36)	1999	11	542	No evidence that acupuncture was better than no treatment; moderate evidence that acupuncture was not more effective than TENS and trigger-point injection; limited evidence that acupuncture was not more effective than placebo	Effectiveness remains unclear
Osteoarthritis	Ernst (37)	1997	13†	437	Most trials had methodologic flaws	Highly contradictory evidence
Osteoarthritis of the knee	Ezzo et al. (38)	2001	7†	393	2 trials compared acupuncture with wait list: both positive; 3 trials compared acupuncture to placebo: 2 positive; 2 trials compared acupuncture to physical therapy: both negative	Acupuncture may play a role in the treatment of osteoarthritis of the knee; additional research is necessary
Acute dental pain	Ernst and Pittler (39)	1998	16	941	12 trials suggested that acupuncture is more effective than controls; 4 trials suggested the contrary	Acupuncture can alleviate dental pain
Neck pain	White and Ernst (40)	1999	14	724	7 positive and 7 negative; acupuncture was not superior to placebo in 4 of 5 trials	Insufficient evidence for claiming efficacy
Fibromyalgia	Berman et al. (41)	1999	3	149	All positive, including 1 high-quality study	Acupuncture may be effective; more high-quality trials needed
Headache (tension-type and cervicogenic)	Vernon et al. (42)	1999	8	264	Placebo trials: 2 positive and 4 negative; results of other trials were contradictory	Too few trials, and contradictory evidence precludes conclusions
Headache	Melchart et al. (43)	1999	22	1042	15 migraine, 6 tension, and 1 mixed; contradictory results in 8 trials that compared acupuncture with other treatments; positive trend in 14 trials that compared acupuncture to placebo	Trend in favor of acupuncture, but evidence not fully convincing

* Positive = significant positive finding for acupuncture compared with control; negative = no significant finding for acupuncture compared with control; RCT = randomized, controlled trial; TENS = transcutaneous electrical nerve stimulation.

† Review and analysis contain some trials that were not randomized.

research. These reviews most often report that trials of acupuncture efficacy are equivocal or contradictory. Four exceptions are RCTs of acupuncture for emesis and dental pain, which have been overwhelmingly positive, and RCTs of various addictions and tinnitus, which have been predominantly negative. Multiple reviews of identical conditions (for example, asthma or low back pain) generally use overlapping studies and

occasionally reach conflicting interpretations. Tables 1 and 2 summarize these studies. The tables are a comprehensive list of all English-language systematic reviews appearing in peer-reviewed journals retrieved from MEDLINE, PsycINFO, Acular, and AMED as well as a compilation of published bibliographies.

In 1997, a National Institutes of Health Consensus Development Panel on acupuncture reviewed the avail-

Table 2. Systematic Reviews and Meta-Analyses of Randomized, Controlled Trials of Acupuncture for Conditions Other Than Pain*

Condition	Study (Reference)	Year	RCTs, n	Patients, n	Findings	Conclusions
Asthma	Kleijnen et al. (44)	1991	13†		8 positive and 5 negative; 3 of the positive and 5 of the negative trials were of high quality	Claims of effectiveness not based on well-performed trials
Pulmonary disease	Jobst (45)	1995	16†	2937	10 positive; when "real" acupuncture was redefined retrospectively, results for acupuncture were positive in 14	Acupuncture is a safe and potentially effective treatment for bronchial asthma and COPD
Asthma	Linde et al. (46)	1996	15	307	All placebo-controlled: 7 positive and 6 negative; 2 unclear	Insufficient data to draw reliable conclusions
Chronic asthma	Linde et al. (47)	2000	7	174	Trial quality varied and results inconsistent	Insufficient evidence to make recommendations
Addiction	ter Riet et al. (48)	1990	13	—	Smoking: 11 positive and 1 negative; Alcohol: 1 positive	Claims of efficacy are not supported by sound trials
Weight reduction	Ernst (49)	1997	4	270	2 positive and 2 negative	Evidence contradictory and claims of efficacy not based on trial outcomes
Smoking cessation	Law and Tang (50)	1995	8	2759	Compared with control, 3% (95% CI, -1% to 6%) more of the patients treated with acupuncture stopped smoking	Acupuncture has little or no effect
Smoking cessation	White et al. (51)	1999	14	3486	Odds ratio, 1.20 (CI, 0.98% to 1.48%)	Acupuncture not better than placebo
Stroke	Ernst and White (52)	1996	5	425	All positive; none compared acupuncture with placebo	Evidence encouraging but not compelling
Stroke	Park et al. (53)	2001	9	538	6 positive and 3 negative; the best trial was negative	No compelling evidence for the effectiveness of acupuncture
Dentistry (mainly TMJ disorder)	Rosted (54)	1998	15		11 positive and 4 negative; most studies had methodologic problems	Acupuncture seems effective for TMJ disorders and facial pain; questions remain concerning use as an analgesic
TMJ disorder	Ernst and White (55)	1999	3	205	All positive; none compared acupuncture with placebo	Studies need confirmation with more rigorous methods
Emesis	Vickers (56)	1996	33†	3123	27 of 29 performed with no anesthesia were positive; in a second analysis that was restricted to 12 high-quality trials, 11 (almost 2000 patients) were positive	Acupuncture point P6 seems to be an effective antiemetic for cancer chemotherapy, pregnancy, and surgery
Emesis	Harris (57)	1997	12	904	Restricted to acupressure trials; acupressure more effective than placebo for nausea during pregnancy, after surgery, and for cancer chemotherapy	Acupressure can be used as an antiemetic
Nausea and vomiting of pregnancy	Murphy (58)	1998	7	686	6 positive and 1 negative; all were acupressure trials	Acupressure benefits many women, but evidence is equivocal
Postoperative nausea and vomiting	Lee and Done (59)	1999	19	1569	Pooled RR similar to antiemetics in preventing early vomiting (RR, 0.89) and late vomiting (RR, 0.80); better than placebo for early nausea (RR, 0.34) and early vomiting (RR, 0.47)	Acupuncture is similar to antiemetics in preventing early vomiting and late vomiting in adults; may be an alternative to receiving no treatment or first-line antiemetics; no benefit in children
Nausea and vomiting of pregnancy	Jewell and Young (60)	2001	4	—	3 positive and 1 negative; the negative trial was the most rigorous	Clear evidence for beneficial effects but results remain equivocal
Tinnitus	Park and White (61)	2000	6	185	2 unblinded positive trials and 4 blinded negative trials	Acupuncture not demonstrated to be efficacious

* Positive = significant positive finding for acupuncture compared with control; negative = no significant finding for acupuncture compared with control. COPD = chronic obstructive pulmonary disease; RCT = randomized, controlled trial; RR = relative risk; TMJ = temporomandibular joint.
† Review and analysis contain some trials that were not randomized.

able evidence from RCTs and reached the following conclusions:

There is clear evidence that needle acupuncture is efficacious for adult postoperative and chemotherapy nausea and vomiting and probably for nausea of pregnancy.

Much of the research focuses on various pain prob-

lems. There is evidence of efficacy for postoperative dental pain. There are reasonable studies (although sometimes only single studies) showing relief of pain with acupuncture on diverse pain conditions. . . . However, there are also studies that do not find efficacy for acupuncture in pain. . . .

Although many other conditions have received some

attention. . . , the quality or quantity of the research evidence is not sufficient to provide firm evidence of efficacy at this time (62).

The research published after 1997 does not provide significant data to modify or contradict this statement.

Methodologic Issues in RCTs of Acupuncture

With a few important exceptions, RCTs designed to test the efficacy of acupuncture seem to produce contradictory outcomes that resemble random events. Several other treatments that do not involve drugs (especially those for pain, for example, TENS [transcutaneous electrical nerve stimulation], therapeutic ultrasonography, and epidural corticosteroids for sciatica) have similarly confusing results (63). Most systematic reviews of acupuncture have called for higher-quality trials to resolve such inconclusive evidence.

Some of the problems encountered with acupuncture RCTs are shared by RCTs in many domains: insufficient sample size, testing in poorly defined illnesses with imprecise outcomes, vague enrollment criteria leading to heterogeneous study groups, high dropout rates, and inadequate follow-up.

Some of the problems are specifically related to the difficulty in performing RCTs with acupuncture. In RCTs, acupuncturists may have positive expectancy, which is likely to introduce significant bias (64). In many situations, blinding the acupuncturist to avoid such performance bias may be an insurmountable problem (65, 66). The quest for a matching sham control—one that is inert, identical in appearance and sensation, and without nonspecific physiologic effects (such as the release of neurotransmitters, which may affect pain thresholds)—is ongoing (67–70). An inordinately high placebo effect from acupuncture may complicate detection of any intervention–sham difference (71).

Lack of knowledge by researchers may aggravate the problems associated with evaluating the efficacy of acupuncture. For example, the supposedly active acupuncture arm of some RCTs may actually have been more suitable as a dummy treatment (72). How to authentically apply acupuncture-flexible diagnostic categories and process-oriented outcomes within the rigid protocols often necessary for RCTs continues to provoke debate in the research community (73). The heterogeneity of acupuncture techniques themselves challenges re-

searchers: Which category of acupuncture should be tested, and, within each category, how much variability can be allowed (74)? For example, in the asthma RCTs, only two trials by the same author used the same acupuncture points (75). It is probably not an accident that the most unequivocal evidence for acupuncture is based on a series of 30 trials that used a fixed, “druglike,” well-defined research model of a single acupuncture point for a particular symptom (emesis), even though this method has little relevance for the daily practice of acupuncture (76).

Basic-Science Evidence

Numerous surveys show that, of all the complementary medical systems, acupuncture enjoys the most credibility in the medical community (77). The RCT research is probably not the main basis for this positive opinion. A more likely reason is the existence of a substantial body of data showing that acupuncture in the laboratory has measurable and replicable physiologic effects that can begin to offer plausible mechanisms for the presumed actions. Extensive research has shown that acupuncture analgesia may be initiated by stimulation, in the muscles, of high-threshold, small-diameter nerves. These nerves are able to send messages to the spinal cord and then activate the spinal cord, brain stem (periaqueductal gray area), and hypothalamic (arcuate) neurons, which, in turn, trigger endogenous opioid mechanisms. These responses include changes in plasma or corticospinal fluid levels of endogenous opioids (for example, endorphins and enkephalins) or stress-related hormones (for example, adrenocorticotrophic hormone) (78).

In one study, the effects of acupuncture in one rabbit could be transferred to another rabbit by cerebrospinal fluid transfusions (79). Although questions remain (80, 81), other studies have shown that acupuncture analgesia could be reversed with naloxone (an endorphin antagonist) in a dose-dependent manner (78, 82). Acupuncture may inhibit early-phase vascular permeability, impair leukocyte adherence to vascular endothelium, and suppress exudative reaction to a degree equivalent to that of orally administered aspirin and indomethacin (83). Evidence also supports the possibility that one mechanism of acupuncture may be a form of stimulation for the gene expression of neuropeptides (84, 85).

Functional magnetic resonance imaging is also be-

Table 3. Reported Adverse Events Related to Acupuncture Treatment from November 1992 through October 1997*

Reported Adverse Event	Patients, <i>n</i>
Forgotten needles	16
Dizziness, discomfort, or perspiration (transient hypotension)	13
Burn injury (caused by thermotherapy)	7
Ecchymosis with pain	6
Ecchymosis without pain	5
Malaise	5
Minor hemorrhage	3
Aggravation of symptoms	3
Itching or redness (suspected contact dermatitis)	3
Pain in the puncture region	2
Fall from bed	1

* Total number of acupuncture treatments was 55 291. Reprinted with permission from Yamashita et al. (105).

ginning to demonstrate that acupuncture has regionally specific, quantifiable effects on relevant structures of the human brain. One study found that a specific acupuncture point, traditionally related to vision, activated an occipital lobe region that was the same area activated by stimulation of the eye using direct light. The point was located on the lateral aspect of the foot; stimulation of nearby sham points did not result in similar activation (86). Other studies show that specific acupuncture points, but not controls, activate structures of descending antinociceptive pathways and deactivate multiple limbic areas that participate in pain processing (87, 88). These functional magnetic resonance imaging studies follow earlier efforts showing that electro-acupuncture results in significantly increased concentrations in the rat brain (specifically, the occipital cortex and hippocampus) of neuropeptide Y, neurokinin A, and substance P (89).

Adverse Events Associated with Acupuncture

Numerous retrospective clinical reports and at least five published systematic reviews of adverse events associated with acupuncture show that, in rare circumstances, acupuncture can produce the complications associated with any type of needle use (90–96). Negative outcomes include transmission of infectious disease, pneumothorax and other problems associated with organ punctures, cardiac tamponade, and broken needles with remnants migrating to other locations (including the spine). Five incidents may have resulted in death (97), although some researchers refute this possibility

(98). Adverse events usually occur when acupuncturists have inadequate training (99).

The reports of adverse events described above are based mainly on retrospective reports. More recently, prospective, systematic surveillances of acupuncture adverse events (which provide a denominator for relative rates) have been performed and indicate that even routine irritating reactions from needles are rare (100–104). For example, one study that followed more than 55 000 treatments at an acupuncture training facility in Japan found 11 adverse effects associated with acupuncture treatment (Table 3) (105). The combined data from prospective and retrospective data indicate that “acupuncture is a very safe intervention in the hands of a competent practitioner” (106).

THE PROVISION OF ACUPUNCTURE CARE IN THE UNITED STATES

In 1976, California became the first state to license acupuncture as an independent health care profession. Since then, 40 states and the District of Columbia have adopted similar laws. Most states (27) allow herbal medicine within the scope of acupuncture practice; only a few states (10) require the supervision of a physician for the almost 11 000 practicing nonphysician acupuncturists.

The number of acupuncturists is rapidly growing and is projected to double by 2005 and quadruple by 2015 (107). The typical education standard for an acupuncturist is between 2000 and 3000 hours of training in independently accredited master’s degree 4-year schools. Although some states allow physicians to practice acupuncture without additional education, most states require between 200 and 300 hours of special training. There are approximately 3000 acupuncturists with medical degrees practicing in the United States. Physician and nonphysician acupuncturists independently maintain that their provision of care is superior (108).

In the West, most patients of acupuncture practitioners present with pain resulting from numerous conditions, including musculoskeletal disorders, headaches or migraines, and neuralgia or neuropathy (109–111). Gastroenterologic, urologic, and gynecologic diseases are also fairly represented. Approximately 70% of acupuncturists practice alone or in acupuncture groups; 30% work in multidisciplinary settings, usually in association

with other alternative providers. Typically, acupuncture care involves a series of biweekly or weekly treatments; a regimen of a dozen treatments is not unusual. Including examination, treatment, and discussion, acupuncture visits are characteristically long, usually exceeding 1 hour (Cooper RA, McKee HJ. Education of health professionals in complementary/alternative medicine. Presented at the Josiah Macy Jr. Foundation Conference, Phoenix, Arizona, 2–5 November 2000). In the West, reports indicate that 50% (112) to 80% (113) of acupuncturists also prescribe herbal medicine.

CONCLUSION

In a short time, acupuncture has been transported to the West and become a visible component of the health delivery system. Its traditional conceptual framework is radically distinct from biomedicine. Research on acupuncture has allowed a consensus to emerge that this therapy may have efficacy, regardless of the “prescientific” perspective of its underlying conceptual framework. As an independent profession, acupuncture and East Asian medicine are growing exponentially.

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