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REVIEW

Acupuncture – a critical analysis

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Even though widely used in today's clinical practice, acupuncture has remained a controversial subject. Many reviews are currently available but most lack a critical stance and some are overtly promotional. The aim of this overview is to provide a balanced, critical analysis of the existing evidence. Some of the original concepts of traditional acupuncture are not supported by good scientific evidence. Several plausible theories attempt to explain how acupuncture works but none are proved beyond doubt. The clinical effectiveness of acupuncture continues to attract controversy. Many controlled clinical trials and numerous systematic reviews of these studies have been published. Considerable problems are encountered when interpreting these data. Heterogeneity is a significant drawback of both clinical trials and systematic reviews. Some of the controversies may be resolved through the use of the new 'placebo needles' which enable researchers to adequately control for placebo effects of acupuncture. The majority of studies using such devices fails to show effects beyond a placebo response. Acupuncture has been associated with serious adverse events but most large-scale studies suggest that these are probably rare. Nonserious adverse effects occur in 7–11% of all patients. In conclusion, acupuncture remains steeped in controversy. Some findings are encouraging but others suggest that its clinical effects mainly depend on a placebo response.

Keywords: acupuncture, clinical trials, efficacy, reviews, safety.

Introduction

Acupuncture can be defined as the practice of inserting one or more needles into specific sites on the body surface for therapeutic purposes [1]. Acupuncture points can also be 'stimulated' with heat, electrical currents, pressure, laser light [2] or shock waves [3]. Related techniques such as TENS (transcutaneous electrical nerve stimulation) are excluded from this discussion. Despite its long history, acupuncture remains a highly controversial subject. Before 1970, most Western physicians would have considered it little more than a cultural curiosity. Yet today it is a prevalent treatment used in many parts of the world by traditional acupuncturists, doctors, physiotherapists and other healthcare professionals.

Medical acupuncturists in the US treat the following conditions most frequently: low back pain, myofascial pain, headache, sciatica, shoulder problems, tennis elbow, migraine, osteoarthritis of the knee [4]. By contrast, the two most important indications for acupuncture in China are Bell's palsy and cerebrovascular accidents [5]. There are

numerous other national differences. For instance, US acupuncturists treat on average 1.2 patients per hour, whilst their Chinese colleagues treat around 10 [5]. In France 21% of the general population have tried acupuncture [6]. In the US, the 1-year prevalence of acupuncture-use seems to be between 1% and 2% [7, 8]. The main reasons for trying acupuncture in the US are the assumption that it might help, curiosity, and the belief that conventional therapies would not help [7]. The number of US acupuncturists has been projected to quadruple by 2015 [9]. About a quarter of all physicians in the US and the UK currently endorse the use of acupuncture or refer patients to acupuncturists [10, 11]. Generally speaking, primary care physicians seem to favour acupuncture more than hospital doctors or researchers [12] and a German study suggested that 81% of doctors using acupuncture judge its therapeutic success too optimistically, i.e. more favourable than the patient treated with it [13].

Reviews of acupuncture tend to be written by enthusiasts often with the underlying assumption that it is a valuable therapy. The following article is aimed at critically analysing the evidence for and against acupuncture.

History

According to a widely held belief, acupuncture originated in China about 3000 years ago, yet there seems to be surprisingly little sound evidence in support of that assumption [14]. Bizarrely, the 'Ice Man', who lived in the Alps about 5000 years ago, displays tattoo marks on his body which correspond to acupuncture points. To some experts, this suggests that an acupuncture-like therapy was already used in Europe 5 millennia ago [15]. The earliest Chinese texts to mention 'channels' (i.e. meridians) associated with diagnosis and treatment are dated around 150 BC and the earliest reference to therapeutic needling is dated 90 BC [16, 17]. Concepts of vapour-like agents responsible for maintaining health are not unique to traditional Chinese medicine; in ancient Greek medicine the arteries were believed to transport 'pneuma' and not blood [18]. Some experts believe that acupuncture evolved from blood letting [14, 19].

The classic Chinese text 'Huang Di neijing' (Inner Classic of Huang Di) and 'The Great Compendium of Acupuncture and Moxibustion' written during the Ming dynasty (1368–1644) are believed to have laid the foundations for modern acupuncture [20]. In China, interest in acupuncture declined after that period; in 1822 it was excluded from the Imperial Medical Institute by a decree of the Emperor, and in 1922 the practice was outlawed [21]. Chairman Mao directed the diverse styles of acupuncture and Chinese herbal medicine to be systematized into a curriculum for large-scale teaching, thus creating Traditional Chinese Medicine (TCM). This move was politically motivated and born out of the necessity of providing at least some type of healthcare for the Chinese people [22].

The first medical description of acupuncture by a Western physician is attributed to William of Rubruck and dates to the 13th century [23]. Around 1680, the Dutch doctor Ten Rhijne, witnessed acupuncture practice in Japan and brought news about it to Europe [23]. In the first half of the 19th century, a flurry of interest emerged both in the US and Europe [4]. As a consequence, a number of publications appeared in the medical literature including a *Lancet* Editorial of 1823 [24]. By mid-century, however, this fascination had subsided.

In connection with President Nixon's visit to China in 1971, the US journalist James Reston received acupuncture whilst recovering from an appendectomy; and described his experience in the *New York Times* [25]. This article sparked off a new wave of interest in acupuncture analgesia [26]. A 1997 National Institutes of Health 'consensus conference' stated that acupuncture was supported by positive evidence for a range of conditions [27], and a review by the World Health Organisation (WHO) in 2003 concluded that 'acupuncture has been proved' for 28 medical conditions [28].

Traditional concepts

One fundamental concept of acupuncture and TCM is *qi*, usually translated as 'energy'. There are several forms of *qi* and one is believed to be inherited and maintained during life. Circulating in 14 meridians throughout the body, *qi* is thought to nourish and defend our body. On these meridians, 365 acupuncture points have been defined based on 'cosmological correspondence' with the number of days in a year [29].

Health is seen by traditional acupuncturists as a balance of two opposites, *Yin* and *Yang*, sometimes

likened to the sympathetic and parasympathetic nervous systems [30]. Diseases are associated with an imbalance (e.g. 'blockage' or 'deficiency') of *qi* [31] and consequently with a disturbance of energy. Acupuncture is aimed at correcting it. Therefore most medical conditions are viewed as amenable to treatment with acupuncture. Most disturbances are thought to be detectable before they develop into a disease state. Apparently healthy people are thus encouraged to benefit from preventative acupuncture [31]. Viewed from a TCM perspective, acupuncture is a causal therapy in many instances.

There is some tantalizing [e.g. 32, 33], but no compelling scientific evidence for the existence of either meridians or acupuncture points [29]. Different authors disagree about their location or number. The evidence from histological studies or assessments of electrical conductance is unconvincing [29]. Some researchers have suggested that the collagen content within connective tissue imparts electrical conductive properties which correspond to meridians [34]. If one believed modern texts on acupuncture, there would be no space on our body surface which is not an acupuncture point [35].

Modern concepts

Several theories have attempted to explain how acupuncture causes analgesia and other clinical effects. They include the following: (i) stimulation of A delta fibres in the skin and muscle conducting impulses to the spinal grey matter thus inhibiting painful stimuli from the periphery and reducing pain perception, (ii) activation of encephalin-containing interneurones in the substantia gelatinosa of the spinal grey matter resulting in inhibition of the conduction of pain signals to the brain, (iii) release of beta-endorphin and met-encephalin in the brain, (iv) activation of two descending pain control systems in the mid-brain, and (v) modulatory effects on the central pain network in the hypothalamus and the limbic system [36–43]. Viewed from a scientific perspective, acupuncture is rarely, if ever, a causal therapy.

These theories are partly supported by basic research. For instance, functional magnetic resonance studies suggest that acupuncture induces specific effects on specific structures of the human brain [38–48]. Acupuncture could act as a neuromodulating input to the central nervous system. The results of these investigations suggest acupuncture to be point specific amounting to more than non-specific inhibitory control [44]. Some experiments show that acupuncture activates multiple analgesia systems and stimulates pain modulation systems to release neurotransmitters such as endogenous opioids [49]. Other data suggest that it normalizes the protein expression profile of the hypothalamus caused by neuropathic pain [50] and exerts neuroprotective effects on dopaminergic neurones [51, 52].

All this goes a long way towards defining acupuncture's mode of action. However, the theories are not undisputed. Some investigators could not replicate the findings that underpin them [53–55]. Critics also noted that the vast majority of the research supporting acupuncture originates from China [29], and the percentage of 'negative' results published by Chinese investigators is close to zero [56]. Doubts also arise from pre-clinical studies of acupuncture on experimental pain in human volunteers. About half of these investigations show an analgesic effect whilst the other half fails to do so [57]. If the theories were correct, should not the response to acupuncture in experimentally induced pain, be more reproducible?

Clinical effectiveness

The effectiveness of acupuncture has been tested in several hundred controlled clinical trials, and numerous systematic reviews of these studies are now available. Table 1 provides an overview of systematic reviews; for each indication, only the most up-to-date systematic review is listed [58–95]. This table was generated on the basis of a systematic review of the literature (with searches in Medline, Embase, Cochrane Library, up to July 2005, and my own files). Numerous overviews of systematic reviews have also been published [9, 28, 96–101]. Their conclusions range from optimistic enthusiasm to reserved scepticism. For instance, Birch *et al.* [102] recently stated that 'general international agreement has emerged that acupuncture appears to be effective for postoperative dental pain, postoperative nausea and vomiting, and chemotherapy-related nausea and vomiting. For migraine, low back pain, and temporomandibular disorders the results are considered positive by some and difficult to interpret by others. For a number of conditions

Table 1 Systematic reviews of clinical trials of acupuncture

First author (date) [Ref]	Indication	Primary acupuncture studies	Clinical endpoints	Authors' conclusion indicating effectiveness?	Agreement with WHO document?
Ter Riet (1989) [58]	Facial pain	2 RCTs	Pain	No	No
Ter Riet (1990) [59]	Addictions	22 CCTs/RCTs	Cessation	No	No
Ernst (1997) [60]	Weight reduction	4 RCTs	Body weight	No	No
Ernst (1997) [61]	Osteoarthritis	10 RCTs, 3 CCTs	Pain	No	No
Lautenschläger (1997) [62]	Inflammatory rheumatoid disease	9 CCTs, 9 cohort studies	Pain	No	No
Longworth (1997) [63]	Sciatica	7 CCTs, 31 cohort studies	Pain	No	No
Ernst (1998) [64]	Dental pain	16 CCTs	Pain	Yes	Yes
Berman (1999) [65]	Fibromyalgia	3 RCTs, 4 cohort studies	Pain	Yes	Yes
Ernst (1999) [66]	Temporomandibular joint dysfunction	3 RCTs	Pain, function	No	No
Lee (1999) [67]	Nausea/vomiting	26 RCTs	Symptom control	Yes	Yes
White (1999) [68]	Neck pain	14 RCTs	Pain, range of motion	No	No
Ezzo (2000) [69]	Chronic pain	51 RCTs	Pain	No	No
Park (2000) [70]	Tinnitus	6 RCTs	Subjective benefit	No	No
White (1999) [71]	Smoking	18 RCTs	Cessation	No	No
Cummings (2001) [72]	Myofascial trigger point pain	3 RCTs	Pain	No	No
Ezzo (2001) [73]	Knee osteoarthritis	7 RCTs	Pain	Yes	Yes
Linde (2001) [74]	Idiopathic headache	26 RCTs	Pain	Yes	No
Green (2002) [75]	Lateral elbow pain	4 RCTs	Pain, function	No	No
Casimiro (2002) [76]	Rheumatoid arthritis	2 CCTs	Objective signs and subjective symptoms of rheumatoid arthritis	No	No
Proctor (2002) [77]	Primary dysmenorrhoea	1 RCT	Pain	No	No
Sok (2003) [78]	Insomnia	11 reports[a]	Sleep quality, sleep latency	Yes	Yes
Martin (2004) [79]	Asthma	12 RCTs	Lung function	No	No
Trinh (2004) [80]	Epicondylitis	6 RCTs	Pain	Yes	Yes
Lee (2004) [81]	Labour pain	3 RCTs	Pain, medication use	No	No
Lee (2004) [82]	Gastrointestinal endoscopy	6 RCTs	Pain, medication use, tolerance of endoscopy	Yes	NA
Lee (2005) [83]	Cancer-related pain	2 RCTs, 4 UCTs	Pain	No	No
Manheimer (2005) [84]	Back pain	25 RCTs	Pain	Yes	Yes
Mukaino (2005) [85]	Depression	6 RCTs	Symptoms of depression	No	No
Smith (2004) [86]	Induction of labour	1 RCT	Induction of labour	No	NA
Kunz (2004) [87][b]	Alcohol and substance abuse	14 RCTs	Withdrawal symptoms	No	No
He (2004) [88]	Bell's palsy	3 RCTs	Resolution of palsy	No	NA
Green (2005) [89]	Shoulder pain	9 RCTs	Pain	No	No
Jedel (2005) [90]	Xerostomia	3 CCTs	Salivary flow rates	No	No
Stener-Victorin (2005) [91]	Oocyte retrieval	12 RCTs	Pain	No	No
Lee (2005) [92]	Analgesia during surgery	19 RCTs	Analgesic-sparing effect	No	No
Zhang (2005) [93]	Stroke	14 RCTs	Functional recovery	No	No
Bower (2005) [94]	Nocturnal enuresis in children	11 CCTs	Number of wet episodes	''Tentative evidence''	No
van den Berg (2005) [95]	Resolution of breech presentation	5 RCTs	Percentage of resolutions	Yes	Yes

CCTs, controlled clinical trials (nonrandomized); RCTs, randomized clinical trials; UCTs, uncontrolled clinical trials. [a]No restriction on study design; [b]Ear acupuncture only.

such as fibromyalgia, osteoarthritis of the knee, and tennis elbow the evidence is considered promising, but more and better quality research is needed. For conditions such as chronic pain, neck pain, asthma, and drug addiction the evidence is considered inconclusive and difficult to interpret. For smoking cessation, tinnitus and weight loss the evidence is usually regarded as negative'. Perhaps the most obviously over-optimistic overview is the document recently published by the WHO [28] (Table 1). Critics of acupuncture, however, continue to be unimpressed by such evidence and draw far less positive conclusions from the existing evidence [101]: 'effectiveness could not be established with confidence for any condition studied. Taken as a group, reviews of clinical studies published since 1990 on the clinical efficacy of acupuncture do not support the notion that acupuncture is effective for any variety of conditions and cast doubt on efficacy for some specific conditions for which acupuncture has been reported as effective'. The evidence from current systematic reviews (Table 1) suggests that both of these views are incorrect.

None of the overviews available to date is based on the totality of data from systematic reviews of controlled clinical trials. Furthermore, inconclusive results are usually interpreted in opposite ways: acupuncture enthusiasts tend to suggest that they are consistent with the notion of effectiveness [102] whilst sceptics view them as demonstrating the lack of effectiveness [101]. In all this, one ought to remember, of course, that the absence of evidence is not the same as evidence of absence of an effect.

Heterogeneity and variable methodological quality are prominent features of systematic reviews of acupuncture [97]. Selection bias, for instance, was avoided in only 46% of them [103]. It is nevertheless noticeable that remarkable agreement often exists between rigorous attempts to generate an overall conclusion on acupuncture's effectiveness for a given indication. For instance, seven systematic reviews of acupuncture for headache are available to date [74, 104–109]; six of them agree that the evidence is not convincing (Table 2). Similarly, four systematic reviews conclude that acupuncture is effective for nausea [97]. Considerable disagreement, however, originates from the published systematic reviews of acupuncture for back pain [84, 110–118] (Table 3). This is probably because of methodological differences; some of these reviews included trials with neck pain patients [110, 113]; some failed to be comprehensive [113, 115, 116]; others employed different techniques of combining data [111, 112]. The most recent, complete and perhaps the most rigorous meta-analyses [84, 118] both strongly suggest efficacy of acupuncture for chronic back pain (Table 3).

Most clinical trials of acupuncture are underpowered [97]. Some experts therefore hope that the large studies currently emerging from Germany will clarify some of the questions left open by systematic reviews. These three-armed randomized multicentre trials follow a similar design: patients were treated by German physicians experienced in acupuncture with either real acupuncture, or with minimal acupuncture (as a form of placebo), or they did not receive any acupuncture during the trial period. In

Table 2 Systematic reviews of acupuncture for headache

First author (year) [Ref]	Condition treated	No. of studies included	Overall conclusion
Ter Riet (1989) [104]	Facial pain	2 RCTs	None possible, insufficient data
Ter Riet (1989) [105]	Tension type headache	7 RCTs, 1 CCT	None possible, insufficient data
Vernon (1999) [106]	Tension type and cervicogenic headache	8 RCTs	None possible, insufficient data
Goslin (1999) [107]	Migraine	6 RCTs	None possible, insufficient data
Melchart (1999) [108]	Idiopathic headache	22 RCTs	None possible, insufficient data, data suggestive of a positive effect
McCrory (2000) [109]	Tension type headache	6 RCTs	None possible, insufficient data, data suggestive of a positive effect
Linde (2001) [74]	Idiopathic headache	26 RCTs	Cautiously positive

CCTs, controlled clinical trials (nonrandomized); RCTs, randomized clinical trials.

Table 3 Systematic reviews of acupuncture for low back pain

First author (date) [Ref]	Control interventions	Primary data	Results	Comment
Ter Riet (1989) [110]	Not clear	16 RCTs, 6 CCTs	Poor methodological quality, no definitive conclusion	Also included neck pain
Ernst (1998) [111]	Sham, non-acupuncture treatments, no treatment	12 RCTs	Acupuncture better than control interventions but not better than sham acupuncture	Meta-analytical approach
Van Tulder (1999) [112]	Sham, non-acupuncture treatments, no treatment	11 RCTs	Poor methodological quality, heterogeneity, no clear evidence of effectiveness	simple 'vote count'
Strauss (1999) [113]	Sham, non-acupuncture treatments, no treatment	4 RCTs	Poor methodological quality, inconclusive overall result	Did not include all available studies
Smith (2000) [114]	Sham, non-acupuncture treatments, no treatment	13 RCTs	5 studies positive, 8 studies negative; rigorous studies tended to be negative	Also included neck pain
Henderson (2002) [115]	Sham, non-acupuncture treatments, no treatment	3 case studies, 5 RCTs, 2 cross-over CCTs	No conclusive evidence for effectiveness found	Did not include all available studies
Cherkin (2003) [116]	Sham, non-acupuncture treatments, no treatment	6 new RCTs	Poor methodological quality, inconclusive overall result	Mixed analysis of reviews and primary data
Yuan (2004) [117]	Sham, non-acupuncture active treatments, no treatment	10 high quality studies	Acupuncture is a useful supplement to other treatments; its effectiveness as a sole intervention is unclear	Best evidence synthesis
Furlan (2005) [118]	Sham, non-acupuncture active treatments, no treatment	35 RCTs	Evidence of pain relief and functional improvement for acupuncture compared with no treatment or sham (chronic back pain)	Meta-analytical approach
Manheimer (2005) [84]	Sham, non-acupuncture active treatments, no treatment	33 RCTs	Acupuncture more effective than sham or no treatment for short and long-term pain relief (chronic back pain)	Meta-analytical approach

RCT, randomized clinical trial; CCT, controlled clinical trial (not randomized).

addition, all patients received medical care as usual. One such study [119] involved 302 patients with migraine headaches. To monitor therapeutic success, they completed headache diaries from 4 weeks before to 12 weeks after randomization and from weeks 21–24 after randomization. The results show that acupuncture was no more effective than minimal acupuncture but both generated better results than experienced by patients on the waiting list. Another RCT included 270 patients with tension-type headache [120]. Its results were almost identical with those of the previous study. A further trial included 294 patients with osteoarthritis [121]. After 8 weeks of treatment, pain and function were improved more with acupuncture than with minimal acupuncture or no acupuncture. However, these benefits decreased over time. Whilst these studies provide valuable information, they have been criticized, e.g. for the risk of patient de-blinding [122] or for not having adopted the optimal treatment protocol or for the possibility that minimal acupuncture also had therapeutic effects and was therefore an unfair comparator [123]. More importantly, they fail to conclusively answer the question whether acupuncture helps patients through a specific or a nonspecific effect.

On the level of clinical trials, one of the most noticeable characteristic is the high level of statistical and clinical heterogeneity [97, 98]. Acupuncture trials vary in virtually every conceivable way. Their methodological rigour can be high [124], but more often than not it is low [125]; in particular, studies from Asian countries have been noted to frequently lack methodological quality [126, 127]. The type of acupuncture (e.g. manual or electrical stimulation, traditional or formular, ear or whole body) and the treatment schedule (e.g. number of acupuncture points treated, frequency of sessions, length of treatment period) differ vastly. Even when considering only one indication, the nature of the condition treated is far from uniform. For instance, the 'headache' trials have been conducted on tension type, idiopathic, cervicogenic headaches or on migraine (Table 2) [101] and the response to acupuncture may not only depend on the points of stimulation but also on the functional state of the subject [128]. In addition, the nature of the complaint could be acute, subacute or chronic. Acupuncture can be used as a sole therapy or as an adjunct to other treatments. The type of control interventions ranges from no treatment at all, to other therapies of known or unknown effectiveness, to various types of placebo interventions. The research questions addressed in acupuncture trials also differ – from 'is advice to use acupuncture for a given condition better than no such advice?' to 'does needling of specific points generate effects beyond a placebo response?'

Sham devices have recently become available which allow patient-blinding and adequately control for placebo effects by closely mimicking real acupuncture and being physiologically inert [129–135]. The common principle of these devices is that the sham acupuncture needle gives the impression of penetrating the skin whilst, in reality, it shortens under manual pressure similar to a 'mini telescope'. Acupuncture-naïve patients are therefore unable to tell the difference between these types of sham acupuncture and real acupuncture [136]. Patient-blinding in acupuncture trials is crucial not least because patients' beliefs regarding the receipt of acupuncture bear a stronger relationship to pain perception than the specific effects of acupuncture [137]. The new sham devices allow acupuncture trials to be conducted sham-controlled, patient-blind and evaluator-blind. The therapist will not, however, normally be masked as to treatment allocation, and this remains a source of potential bias. The results of all clinical trials currently available (up to July 2005) using such sham-devices [138–150] are summarized in Table 4. Of the 13 studies available to date, nine show no significant difference between real and sham acupuncture in the primary outcome measure. Thus the majority of these trials suggests that the effects of acupuncture could after all be mostly due to a placebo response.

Safety

Acupuncture has occasionally been associated with several serious adverse effects, in particular, trauma to internal organs (e.g. pneumothorax or cardiac tamponade) and infections, such as hepatitis C or HIV [151, 152]. Several large prospective studies have shown that such adverse events are extreme rarities, provided acupuncture is carried out by well-trained practitioners [153–155]. These studies also show that mild, transient adverse effects, e.g. needling pain or bleeding at the site of needling, occur in about 7–11% of all cases. The largest study included

Table 4 Clinical trials using nonpenetrating sham devices

First author (year) [Ref]	Sample size	Condition/patients treated	Main result
Kleinhenz (1999) [138]	52	Rotator cuff tendinitis	Real acupuncture significantly superior to sham acupuncture in improving symptom score
Karst (2000) [139]	39	Chronic tension type headache	No significant difference between real and sham acupuncture in improving intensity or frequency of headache
Karst (2001) [140]	69	Chronic or episodic tension type headache	No significant difference between real and sham acupuncture in improving intensity or frequency of headache
Karst (2002) [141]	34	Alcohol dependence	No significant difference between real and sham acupuncture with regard to all outcome parameters
Streitberger (2003) [143]	80	Patients suffering from nausea during chemotherapy	No significant difference between real and sham acupuncture with regard to patients experiencing nausea
Streitberger (2004) [144]	220	Patients suffering from nausea/vomiting during gynaecological or breast surgery	No significant difference between real and sham acupuncture with regard to patients experiencing nausea
Fink (2004) [145]	25	Leg spasticity after stroke	No significant difference between real and sham acupuncture in spasticity
Linde (2004) [146]	28	Prophylaxis of menstrually related migraine	No significant differences between real and sham acupuncture in attack frequency
Vas (2005) [147]	97	Patients with osteoarthritis/pain	Acupuncture plus diclofenac is more effective than sham plus diclofenac
Guerra de Hoyos (2004) [148]	130	Patients with shoulder pain	Acupuncture better than sham
Kong (2005) [149]	11	Healthy subjects submitted to experimental (thermal) pain	Acupuncture but not sham reduced pain
Downs (2005) [150]	18	Healthy subjects submitted to experimental (thermal) pain	No significant difference between real and sham acupuncture
Park (2005) [142]	116	Patients recovering from acute stroke	No significant difference between real and sham acupuncture with regard to all outcome parameters

Studies confounded by electrical stimulation are excluded from this list.

190 924 chronic pain patients [156]. The data revealed 2.4 serious adverse events per 10 000 patients. However, the authors suspect this figure to be distorted through under-reporting. In their series, only 5% of the average death rate in the German population was reported. Assuming therefore that under-reporting of acupuncture-unrelated death (and by implication serious acupuncture-related adverse events) was 95%, the true incidence of serious adverse events after acupuncture could be as high as 48 per 10 000 patients. A recent UK survey [155] suggested that, in 3% of all cases, nonmedically qualified acupuncturists interfere with the prescribed medications of their patients, which could therefore constitute an indirect risk of acupuncture. The totality of this evidence nevertheless suggests that acupuncture, as used by well-trained professionals, is probably a reasonably safe therapy. Serious adverse effects may be a consequence of poor training and the large number of paramedics exercising the technique.

Comment

Acupuncture is now a widely accepted intervention for the treatment of a range of conditions, many of which are associated with pain. Several tantalizing but not fully proven theories have emerged which could explain how acupuncture works. The question whether it works remains controversial. The best current evidence suggests that it is effective as a symptomatic treatment of dental pain, fibromyalgia, nausea/vomiting, knee osteoarthritis, insomnia, epicondylitis, chronic back pain, idiopathic headache, resolution of breech presentation and as an aid during gastrointestinal endoscopy (Table 1). However, these data could turn out to be false positive due to inadequate control of placebo effects in most of the clinical trials. The majority of RCTs employing new sham-acupuncture devices that allow adequate control of placebo effects imply that acupuncture is not associated with clinical effects beyond a powerful placebo response. Some clinicians argue that the main point about any medical intervention is that it alleviates the suffering of patients regardless of mechanism and that 'it is not meaningful to split complex interventions into characteristic and incidental elements' [157]. If acupuncture alleviates suffering through a powerful placebo effect which theoretically could exceed the total therapeutic effect of conventional therapeutic options, it should be accepted as a useful treatment. Some scientists, however, might find this notion difficult to accept. Of course, the scientific study of placebo effects and mechanism is both feasible and important [158–161], and the results of such research may significantly contribute to our understanding of how acupuncture works. But, if nonspecific factors are that relevant, we should not study them with a view to harnessing them for clinical practice in general and not just for acupuncture?

It seems important to define the therapeutic value of acupuncture more closely and understand its mode of action (if any) more fully. In the interests of patients, we need 'a healthy dialogue between the medical and the acupuncture communities' [162] in order to resolve the many open questions that plague this field.

Conflict of interest statement

No conflict of interest was declared.

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