

Acupuncture: Does it alleviate pain and are there serious risks? A review of reviews

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ABSTRACT

Acupuncture is commonly used for pain control, but doubts about its effectiveness and safety remain. This review was aimed at critically evaluating systematic reviews of acupuncture as a treatment of pain and at summarizing reports of serious adverse effects published since 2000. Literature searches were carried out in 11 databases without language restrictions. Systematic reviews were considered for the evaluation of effectiveness and case series or case reports for summarizing adverse events. Data were extracted according to predefined criteria. Fifty-seven systematic reviews met the inclusion criteria. Four were of excellent methodological quality. Numerous contradictions and caveats emerged. Unanimously positive conclusions from more than one high-quality systematic review existed only for neck pain. Ninety-five cases of severe adverse effects including 5 fatalities were included. Pneumothorax and infections were the most frequently reported adverse effects. In conclusion, numerous systematic reviews have generated little truly convincing evidence that acupuncture is effective in reducing pain. Serious adverse effects continue to be reported.

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1. Introduction

Acupuncture is frequently used for pain patients, and theories about its mode of action have been developed [35,164]. Hundreds of clinical trials testing its clinical effectiveness for pain-related syndromes are available. However, the results of trials and systematic reviews are far from uniform. Uncertainty also surrounds acupuncture's safety.

This overview is aimed at critically evaluating all systematic reviews of acupuncture as a treatment of pain and at summarizing reports of serious adverse effects published between 2000 and 2009.

2. Methods

2.1. Effectiveness

Literature searches were carried out (January 2010) in Medline, Embase, AMED, CINAHL, the Cochrane Library, and 6 Korean and Chinese databases without language restrictions, using terms for acupuncture and pain combined with "systematic review" or "meta-analysis." Departmental files and bibliographies were hand searched. Reviews were defined as systematic if they included an

explicit Methods section describing the search strategy and inclusion/exclusion criteria. Systematic reviews had to focus on the effectiveness of any type of acupuncture for pain. Systematic reviews of complex packages of interventions were excluded. Data were extracted and evaluated [107] independently by 2 authors (EE and MSL) using predefined criteria (Table 1). For the Chinese literature, one author (TYC) did the data extraction.

2.2. Serious adverse effects

Embase, Medline, CINAHL, AMED, and the Cochrane Library were searched (October 2009) without language restrictions. Departmental files and bibliographies were hand searched. We included all case reports and case series relating to serious adverse effects, that is, an unwanted clinical outcome that needed medical/surgical attention or led to death. Reports of adverse effects due to injecting drugs into acupuncture points were excluded.

3. Results

3.1. Effectiveness

Our searches generated 266 hits. Fifty-seven systematic reviews met our inclusions criteria. Key data are summarized in Table 1 [7,16,19,21,25,27,29–34,36–39,42,46,64,65,71–73,75,76,80–84,88–94,110,119,121,125,129,130,133–135,139,145,146,148,157–159,

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Table 1
Systematic reviews (SR) of acupuncture for pain.

First author Year [Ref]	Treatment	Type of pain	No. primary studies	Quality of primary studies	Conclusion (quote)	Quality of SR	Result +/-
Gong [36]China	A	Ankylosing spondylitis	7	Poor	Acupuncture treatment is effective for ankylosing spondylitis	Poor	+
Madsen [89]Denmark	A	Any pain	13 (3 armed trials)	Good	A small analgesic effect of acupuncture was found which seems to lack clinical relevance...	Excellent	+/-
Lee [73]UK	A	Cancer pain	7 (3 RCTs and 4 CCTs)	Mostly poor	The notion that acupuncture is effective ... is not supported by ... rigorous clinical trials	Good	-
Yang [157]China	EA	Cervical spondylosis	5	Mostly poor	Electro-acupuncture is effective for improving the symptoms of cervical spondylosis	Poor	+
Sun [129]USA	A/EA	Chronic headache	25	Variable	Needle acupuncture is superior to sham acupuncture	Good	+
Ezzo, 2000 [29]USA	A	Chronic pain	51	Mostly poor	... inconclusive evidence that acupuncture is more effective than placebo, sham acupuncture or standard care	Good	-
Cho [16]Korea	AP	Dysmenorrhoea	4	Variable	The available data ... suggest that acupressure alleviates menstrual pain.	Good	+
Yang [158]China	A + related therapies	Dysmenorrhoea	32 (30 RCTs and 2 CCTs)	Mostly poor	... there is no convincing evidence.	Good	-
Langhorst [67]	A	Fibromyalgia	7	Variable	acupuncture cannot be recommended for the management of fibromyalgia syndrome	Good	-
Martin-Sanchez [93]Spain	A	Fibromyalgia	6	Mostly poor	... found no evidence of benefit.	Poor	-
Mayhew [94]UK	A	Fibromyalgia	5	Mostly poor	... not supported by the results from rigorous clinical trials.	Good	-
Peng [110]China	A	Frozen shoulder	6	Good	... on frozen shoulder that acupuncture is the safe therapy and effective ...	Moderate	+
Yu [159]China	A	Herpes zoster	10	Poor	Acupuncture ... is effective	Poor	+
Zhao [163]China	A	Herpes zoster	7	Poor	... acupuncture has a certain curative effect on herpes zoster without obvious toxic side effects	Moderate	+
Luo [88]China	A	Intervertebral disk displacement	10	Poor	Acupuncture treatment ... is effective	Moderate	+
Lee [71]UK	A	Labour pain	3	Good	... the evidence for acupuncture as an adjunct to conventional pain control during labour is promising but ...	Good	+/-
Trinh [135]Canada	A	Lateral elbow pain	6	Good	All the studies suggested that acupuncture was effective in the short-term relief...	Good	+
Green [37]Australia	A	Lateral elbow pain	4	Variable	There is insufficient evidence	Good	-
Ee [25]Australia	A	Low back pain in pregnancy	3	Good	... limited evidence supports acupuncture use...	Good	+/-
Yuan [160]UK	A	Low back pain	23	Variable	There is strong evidence that acupuncture can be a useful supplement to other forms of ... therapy...	Good	+
Furlan [34]Canada	A + dry needling	Low back pain	35	Variable	The data do not allow firm conclusions	Good	+/-
Manheimer [92]USA	A	Low back pain	33	Variable	Acupuncture effectively relieves back pain...	Good	+
Zhu [165]China	A	Low back pain	9 (8 RCTs and 1 CCT)	Variable	... might be effective to lower ...	Poor	+
Ernst [27]UK	A	Low back pain	12	Variable	Acupuncture is superior to various control interventions, although there is insufficient evidence to state whether it is superior to placebo	Good	+/-
Henderson [42]USA	A	Low back pain	6	Poor	... did not provide definitive evidence ...	Poor	+/-
Li, 2008 [81]China	EA	Lumbar intervertebral disk herniation	6	Good	EA is effective and safe on treating pain...	Poor	+
Linde [83]Germany	A	Migraine prophylaxis	22	Variable	No evidence for an effect of "true" acupuncture over sham interventions	Excellent	-
Zhang [161]China	A	Migraine	12	Variable	... trials published in China by now cannot evaluate ... accurately.	Poor	-
Griggs [39]UK	A	Migraine	13	Mostly poor	(more research needed)	Poor	+/-
Lee [75]UK	BVA	Musculoskeletal pain	11	Variable	... the total number ... and sample sizes ... were too small to draw definite conclusions	Good	-
Tough [133]UK	A	Myofascial trigger point pain	7	Variable	There is limited evidence derived from 1 study	Good	+/-
Cummings [19]UK	A	Myofascial trigger point pain	23	Variable	Direct needling of myofascial trigger points appears to be an effective treatment	Good	+
Fu [33]USA	A	Neck pain	14	Variable	Confirm short-term effectiveness and efficacy...	Good	+
Trinh [134]Canada	A	Neck pain	10	Variable	... moderate evidence that acupuncture relieves pain better than some sham treatments...	Good	+
Schuller	Laser acup	Orthopaedic diseases	8	Variable	Better ... trials ... are mandatory	Poor	+/-

[119]German Manheimer	A	Osteoarthritis(peripheral joint)	16	Variable	Sham-controlled trials show statistically significant benefit	Excellent	+
[90]USA Selfe [121]USA	A	Osteoarthritis	10	Good	...acupuncture is an effective treatment	Poor	+
Manheimer [91]USA	A	Osteoarthritis (knee)	11	Variable	Sham-controlled trials show clinically irrelevant short-term benefits.	Good	+/-
White [148]UK	A	Osteoarthritis (knee)	13	Variable	...acupuncture is ... significantly superior to sham-acupuncture.	Good	+
Kwon [64]UK	A	Osteoarthritis (peripheral joints)	18	Variable	...acupuncture is an option worthy of consideration	Good	+
Ferrandez Infante [31]Spain	A	Osteoarthritis (knee)	4	Mostly poor	... insufficient evidence ...	Poor	-
Ezzo [30]USA	A	Osteoarthritis (knee)	7	Variable	... play a role in the treatment	Good	+
Stener-Victorin [125]Sweden	EA	Pain during oocyte-retrieval	12	Variable	...no consensus on which method is optimal ... was found.	Poor	+/-
Usichenko [139]Germany	AA	Post-op pain	9	Variable	AA reduces post-op pain is promising but not compelling	Good	+/-
Sun [130]USA	A	Post-op pain	15 (sham controlled RCTs)	Good	Perioperative acupuncture may be a useful adjunct ...	Good	+/-
Li [80]China	A	Rheumatoid arthritis	6	Mostly poor	Of existing clinical evidence shows that acupuncture combined drug therapy more effective than pure rheumatoid arthritis drug	Poor	+
Lee [76]UK	A	Rheumatoid arthritis	8	Variable	...sham-controlled RCTs failed to show specific effects	Good	-
Wang [145]China	A	Rheumatoid arthritis	8	Variable	...conflicting evidence exists	Good	-
Casimiro [7]Canada	A	Rheumatoid arthritis	2	Poor	The conclusions are limited by methodological considerations	Good	-
Wang [146]China	A	Sciatica	6	Poor	Acupuncture treatment is effect for sciatica	Poor	+
Green [38]Australia	A	Shoulder pain	9	Variable	There is little evidence ...	Good	-
Lee [72]UK	A	Surgical pain	19	Variable	Strong evidence exists that real acupuncture is not significantly different for placebo acupuncture.	Good	-
La Touche [65]Spain	A	Temporomandibular joint pain	4	Good	... evidence is limited ...	Poor	-
Fink [32]Germany	A	Temporomandibular joint pain	6	Variable	Acupuncture appears to be a suitable complementary therapy	Poor	+
Linde [84]Germany	A	Tension-type headache	11	Variable	...acupuncture could be a valuable ...	Excellent	+
Davis [21]USA	A	Tension-type headache	8	Good	...acupuncture compared with sham ... has limited efficacy...	Good	-
Jedel [46]Sweden	A	Tension-type headache	6	Variable	... is limited evidence ...	Poor	-
Li [82]China	A	Tension-type headache	13	Variable	...current evidence cannot evaluate ...	Poor	-

+, Overall positive or tentatively positive; -, Fails to show effectiveness; +/-, Unclear; A, acupuncture; EA, electro-acupuncture; BVA, bee venom acupuncture; CCT, controlled clinical trial; RCT, randomized controlled trial.

Table 2
Case reports of infection after acupuncture.

First author(year)	Country	Patient	Reason for acupuncture	Symptoms	Diagnosis	Treatment	Outcome	Causality
Chien [15]	Taiwan	68-year-old man	LBP	Delirium	Epidural abscess caused by <i>Haemophilus aphrophilus</i>	Antibiotics, surgery	Full recovery	Possible
Kuo [62]	Taiwan	57-year-old man	LBP	Fever, pain	Bilateral psoas abscess	Antibiotics	Full recovery	Certain
Ogasawara [104]	Japan	50-year-old woman	LBP	Fever, pain joint-swelling	Polyarticular septic arthritis and bilateral psoas abscess	70 days of antibiotics, drainage of abscess	Full recovery	Probable
Woo [152]	Hong Kong	43-year-old woman	Knee pain	Swelling of knee joint	Methicillin-resistant septic arthritis	i.v. levofloxacin, later i.v. vancomycin	Full recovery	Certain
Wu [155]	China	12-year-old girl	Neurologic sequelae of encephalitis	Swelling, fever	Pott puffy tumour with pseudomonas infection	Surgery, antibiotics	Full recovery	Probable
Hwang [43]	Korea	25-year-old woman	LBP	Fever, right flank pain	Pneumoretroperitoneum	Antibiotics	Full recovery	Certain
Lee [74]	Korea	78-year-old man	LBP	Tetraplegia	Spinal epidural abscess	Antibiotics surgery	Full recovery	Certain
Lee [77]	Korea	79-year-old man	LBP	Fever, abdominal pain	Necrotizing aortitis	i.v. antibiotics, surgery	Full recovery	Certain
Tien [132]	Taiwan	78-year-old man	Rheumatoid arthritis	Swelling and pain in right knee	Septic arthritis	i.v. antibiotics	Full recovery	certain
Tien [132]	Taiwan	78-year-old man	Knee pain	Swelling of knee joint	Septic arthritis	i.v. oxacillin	Full recovery	Probable
Morgan [96]	Lima	16-year-old girl	Weight loss	Pain	Abscess caused by <i>Pseudomonas aeruginosa</i> infection	Oral amoxicillin	Full recovery	Certain
Bang [2]	Korea	64-year-old man	LBP	Paraplegia, loss of consciousness	<i>Escherichia coli</i> sepsis, bilateral psoas abscess	i.v. antibiotics	Patient remained paraplegic	Certain
Seely [120]	US	31-year-old man	Muscle strain, hip pain	Thigh pain, shortness of breath, vomiting, fever	Thigh abscess bacteraemia, diabetic ketoacidosis	Vancomycin, nafcillin	Full recovery	Certain
Chen [12]	Taiwan	44-year-old man	Neck pain	Pain, fever, hemiparesis	Cervical subdural haematoma	Laminectomy, antibiotics	Minor neurological deficits	Certain
Daivajna [20]	UK	48-year-old woman	LBP	Pain	Septic arthritis	i.v. antibiotics, surgery	Full recovery	Certain
Kim [59]	Canada	50-year-old man	LBP	Pain	Spondylodiscitis caused by staphylococcus	i.v. antibiotics	Full recovery	Probable
Saw [118]	Malaysia	55-year-old woman	Osteoarthritis of the knee	Fever, pain, swelling	Necrotizing fasciitis	i.v. antibiotics, surgery	Full recovery	Certain
Studd [126]	Australia	64-year-old woman	Epigastric pain	Abdominal pain	Intra-abdominal abscess	i.v. antibiotics	Full recovery	Certain
Vucicevic [143]	Croatia	53-year-old woman	Shoulder stiffness	Fever, remittent rigors	<i>Staphylococcus aureus</i> sepsis, pleural empyema, polyarthritis, left hand phlegmon	Oxacillin, clindamycin	Full recovery	Probable
Ara [1]	Spain	58-year woman	Weight loss	Subcutaneous nodules on abdomen	<i>Mycobacterium chelonae</i> infection	Oral clarithromycin	Full recovery	Probable
Cho [17]	Korea	56-year-old man	No information	Fever swelling	Retroperitoneal abscess	Surgery, antibiotics	Full recovery	Certain
Kettaneh [55]	France	70-year-old woman	No information	Oedema, fever	Facial erysipelas	i.v. amoxicillin	Full recovery	Probable
Kim [57]	Korea	62-year-old woman	Arthritis	Skin lesions	Syphilis infection	Penicillin i.m.	Full recovery	Probable
Wiwanitkit [150]	Thailand	60-year-old woman	Muscle pain	None	Infection with HIV-virus	None	No information	Probable
Woo [151]	Hong Kong	73-year-old man	LBP	Swelling in back	<i>S. aureus</i> infection	i.v. cloxacillin	Full recovery	Certain
Laing [66]	Ireland	45-year-old woman	Postoperative recovery	Pain swelling	Septic arthritis	Antibiotics, surgery	Full recovery	Certain
Leavy [69]	US	33-year-old man	Hip pain	Pain	<i>S. aureus</i> septicaemia	Oxacillin	Full recovery	Probable
Shah [122]	UK	37-year-old man	Tendonitis	Pain	Infected compartment syndrome	Surgery, antibiotics	Full recovery	Certain
Woo [153]	Hong Kong	79-year-old woman	Chronic pain	Swelling	Mycobacterial infection (right leg)	Antibiotics	Full recovery	Certain
Woo [153]	Hong Kong	21-year-old man	Lupus erythematosus	Swelling	Myobacterial infection (left ankle)	Antibiotics	Full recovery	Certain
Woo [153]	Hong Kong	62-year-old woman	Dizziness	Wrist tenosynovitis	Myobacterial infection (right wrist)	Antibiotics	Full recovery	Certain
Woo [153]	Hong Kong	72-year-old man	Chronic pain	Wrist	Myobacterial infection (left	Antibiotics	Full	Certain

Table 2 (continued)

First author(year)	Country	Patient	Reason for acupuncture	Symptoms	Diagnosis	Treatment	Outcome	Causality
Ishibe [44]	Kong Japan	13-year-old	No information	tenosynovitis Severe back pain	wrist) Septic arthritis of a lumbar facet joint	Antibiotics	recovery Full	Certain
Nambiar [100]	UK	42-year-old woman	LBP	Fever polyarthritis	Prosthetic valve endocarditis	Surgery, antibiotics	recovery Full	Probable
Woo [154]	China	79-year-old woman	Knee osteoarthritis	Induration of right leg	Soft tissue infection with mycobacterium chelonae	Imipenem, clarithromycin, amikacin	Full recovery	Certain
Castro-Duran [8]	Spain	48-year-old woman	Arthritis	Ulcerative skin lesion	Pyoderma gangrenosum	Antibiotics	Full recovery	Probable
McCartney [95]	UK	52-year-old man	LBP	Swelling of both hands	Bilateral hand oedema	None	Full recovery	Probable
Origuchi [106]	Japan	67-year-old man	No information	High fever, intractable back pain	Infectious aortic aneurysm	i.v. antibiotics	Full recovery	Certain

LBP, low back pain; i.v., intravenous; i.m., intramuscular.

163,165]. They focused on a wide range of pain syndromes (Table 1), and most were published within the last 2 years.

Four systematic reviews were judged to be of excellent methodological quality [83,84,89,90] and 19 were poor [31,32,36,39,42,46,65,80–82,93,119,121,125,146,157,161,165]. None from the rigorous reviews originated from China, while 9 of the poor ones did. Of the 25 reviews with positive conclusions, 11 originated from China.

Twenty-five reviews reached a clearly or tentatively positive conclusion [16,21,27,31,33,34,36–38,64,71,76,83,84,86,88,91,94,

119,121,125,129,134,157,163,165]. In areas where multiple reviews were available, a substantial degree of contradiction emerged.

3.2. Serious adverse effects

Ninety-five cases were found and grouped into 3 main categories: infection (Table 2) [1,2,8,12,15,17,20,42,44,55,57,59,62,66,69,74,77,95,96,100,104,106,118,120,122,126,132,143,150–155], trauma (Table 3) [6,9–11,13,18,22,24,41,45,49–51,53,54,56,60,

Table 3

Case reports of tissue trauma after acupuncture.

First author(year)	Country	Patient	Reason for acupuncture	Symptoms	Diagnosis	Treatment	Outcome	Causality
Saifelddeen [116]	UK	31-year-old man	Shoulder pain	Dyspnoea	Pneumothorax	None	Full recovery	Certain
Verhelst [141]	Holland	57-year-old woman	Tension headache	Dyspnoea	Bilateral pneumothorax, pneumomediastinum	Symptomatic	Full recovery	Certain
Zhao [162]	China	No information	No information	No information	Tension pneumothorax	No information	Death	Certain
Juss [49]	UK	50-year-old woman	Neck and back pain	Breathlessness, nausea	Pneumothorax	Opiate analgesia	Full recovery	Certain
Lee [70]	Korea	47-year-old man	Abdominal pain	Pain, numbness of left thumb and index finger	Median nerve neuropathy	Physiotherapy, gabapentin	Full recovery	Certain
Nishimura [103]	Japan	81-year-old woman	Stiffness of finger	Swelling and pain in right hand	Haemorrhage in carpal tunnel	Surgery	Full recovery	Certain
Onda [105]	Japan	31-year-old woman	Neck pain	Sensory deficit	Injury of cervical spinal cord	No information	Permanent deficit	Certain
Richter [114]	New Zealand	35-year-old woman	LBP	Dyspnoea	Pneumothorax pleural empyema	Chest drain, antibiotics	Full recovery	Certain
Tsukazaki [136]	Japan	32-year-old woman	Sudden bilateral headache, vomiting	Subarachnoid haemorrhage	No information	No information	No information	No information
Vega-Vega [140]	Spain	26-year-old man	Algodystrophy	Dyspnoea	Pneumothorax	Chest drain	Full recovery	Certain
Liou [86]	Taiwan	29-year-old man	Dizziness	Neck and shoulder pain	Broken-off needle penetrating epidural space at C2 level	Surgery	Full recovery	Certain
Nakanishi [99]	Japan	71-year-old man	Intermittent claudication	Pain and swelling of leg	Popliteal artery pseudoaneurysm	Stent graft	Full recovery	Certain
Rosted [115]	UK	47-year-old man			Temporomandibular joint pain		Numbness in face	Bell's palsy Steroids
Minor deficit Son [124]	Probable Korea	62-year-old man	No information	Dyspnoea	Pneumothorax	No information	No information	Certain
Son [124]	Korea	74-year-old woman	No information	Dyspnoea	Pneumothorax	No information	No information	Certain
Su [127]	Singapore	52-year-old woman	Chronic cough	Breathing difficulties	Bilateral pneumothorax	"Conservative management"	Full recovery	Certain

(continued on next page)

Table 3 (continued)

First author(year)	Country	Patient	Reason for acupuncture	Symptoms	Diagnosis	Treatment	Outcome	Causality
Von Riedenaer [142]	US	25-year-old man	Shoulder pain	Acute dyspnoea, chest pain	Pneumothorax	Video-assisted thoracoscopic removal of migratory needle	Full recovery	Certain
Chauffe [10]	US	27-year-old man	No information	Dyspnoea, chest pain, nonproductive cough	Pneumothorax	Chest drain	Full recovery	Certain
Chen [11]	Taiwan	30-year-old man	Back pain	Numbness of both legs	Epidural haematoma	i.v. steroids, laminectomy	Full recovery	Certain
Karst [53]	Germany	47-year-old woman	Colitis ulcerosa	Pain and swelling of arm	Injury of arteria brachialis, ischemia of hand	Surgery	Amputation below the elbow	Certain
Chang [9]	Korea	68-year-old man	LBP	Abdominal pain, nausea, vomiting, fever, haematemesis	Aorta-duodenal fistula, shock	Cardiopulmonary resuscitation	Death	Certain
Cheng [13]	Taiwan	37-year-old woman	Weight loss	Abdominal pain, nausea, vomiting	Rectus sheath haematoma	“managed conservatively”	Full recovery	Certain
Lee [78]	Hong Kong	36-year-old woman	LBP	Tachypnea	Bilateral pneumothorax	Chest drain	Full recovery	Certain
Park [108]	Korea	49-year-old woman	Shoulder pain	Chest pain	Cardiac tamponade	Operative removal of acupuncture needle	Full recovery	Certain
Patrick [109]	US	63-year-old man	LBP	Leg pain	Broken-off needle tip impinging on posterior root of ganglion of L5 nerve root	Operative removal of needle tip	Full recovery	Certain
Uhm [137]	Korea	42-year-old woman	Dyspepsia	Severe periumbilical pain	Acute traumatic pancreatitis (due to puncture of pancreas by long acupuncture needle)	Fasting, i.v. fluids	Full recovery	Certain
Hama [41]	Japan	70-year-old man	No information	None	Acupuncture needle fragment in medulla oblongata	None	Full recovery	Certain
Kasuda [54]	Japan	71-year-old woman	Shoulder stiffness	Dyspnoea, chest	Bilateral pneumothorax	Resuscitation	Death	Certain
Peuker [111]	Germany	38-year-old woman	Breathing problems, stress	Dyspnoea, pain	Tension pneumothorax	Chest drain	Full recovery	Certain
Cantan [6]	France	25-year-old woman	No information	Haemodynamic shock	Bilateral pneumothorax, cardiac tamponade	Reanimation, surgery	Full recovery	Certain
Iwadata [45]	Japan	72-year-old woman	LBP	Severe dyspnoea	Bilateral tension pneumothorax	Chest drain	Death	Certain
Sato [117]	Japan	62-year-old woman	Sciatica	Pain and numbness in left leg	Peroneal nerve due to fractured acupuncture needle	Surgical removal	Permanent hyperaesthesia	Certain
No author named [87]	Hong Kong	65-year-old man	No information	Dyspnoea	Pneumothorax	No information	Death	Certain
De Kuyper [22]	Holland	32-year-old woman	Asthma	Dyspnoea	Pneumothorax	Chest drain	Full recovery	Certain
Kao [51]	Taiwan	61-year-old woman	Knee osteoarthritis	Enlarging pulsatile mass in left thigh	Pseudo-aneurysm of popliteal artery	Vascular surgery	Full recovery	Certain
Kao [50]	Taiwan	28-year-old woman	LBP	No information	Bilateral pneumothorax	Oxygen, bed rest	Full recovery	Certain
Kim [56]	South Korea	54-year-old man	Abdominal pain	Abdominal pain	Pseudoaneurysm of abdominal aorta	Surgery	Full recovery	Certain
Leung [79]	Hong Kong	70-year-old woman	Asthma	Severe dyspnoea	Left-sided pneumothorax	Chest drain	No information	Certain
Dianjing [24]	China	56-year-old woman	Asthma	Dyspnoea, chest pain	Pneumothorax	Surgery	Full recovery	Certain
Choo [18]	US	44-year-old man	Neck pain	Severe headache, vomiting	Intracranial haemorrhage	Nimodipine, opioids	Full recovery	Certain
Kirchgatterer [60]	Austria	83-year-old woman	No information	Bradycardia, syncope	Cardiac tamponade	Blood transfusion, pericardiocentesis open heart surgery	Full recovery	Certain

70,78,79,87,99,103,105,108,109,111,112,114–117,124,127,136,137, 140–142,162], and other adverse effects (Table 4) [3–5,40,47,48, 58,61,97,98,131,138,156]. Five patients died. Patients were from all age groups and most had consulted their acupuncturist for relatively minor problems.

Thirty-eight cases of infections were reported (Table 2) [1,2,8,12,15,17,20,42,44,55,57,59,62,66,69,74,77,95,96,100,104,106,118,120,122,126,132,143,150–155]. Bacterial infections were the most commonly encountered complication. They usually responded well to antibiotics.

Table 4
Other adverse effects after acupuncture.

First author(year)	Country	Patient	Reason for acupuncture	Symptoms	Diagnosis	Treatment	Outcome	Causality
Jeong [48]	Korea	24-year-old woman	Weight loss	Painful skin lesion on both arms	Factitial panniculitis	No information	No information	Certain
Jeong [48]	Korea	22-year-old woman	Weight loss	Painful skin lesion on abdomen	Factitial panniculitis	No information	No information	Certain
Ulloth [138]	US	52-year-old man	LBP	Headache, nausea, vomiting	Cerebrospinal fluid fistula	Surgical removal of acupuncture needles and repair of fistula	Full recovery	Certain
Bradbury [3]	UK	50-year-old woman	Shoulder pain	Feeling unwell and dizzy, inability to walk or stand up	Nystagmus, vertigo, hypotension	None	Full recovery	Probable
Campbell [5]	UK	Woman (no age provided)	Chronic pain in left hallux	Leaking left breast	Galactorrhoea of left breast	None	Full recovery	Probable
Kung [61]	Taiwan	72-year-old man	Pain in right forearm	Dizziness, cold sweats, loss of consciousness	Epileptic fit	None	Full recovery	Probable
Kung [61]	Taiwan	63-year-old woman	Pain in left ankle	Dizziness, nausea, loss of consciousness	Epileptic fit	None	Full recovery	Probable
Ha [40]	Korea	68-year-old woman	LBP	Aggravation of LBP	Granuloma compressing lumbar 4th nerve	Surgical decompression	Full recovery	Probable
Brouard [4]	Switzerland	65-year-old woman	No information	None	Basal cell carcinoma of earlobe (at acupuncture sites)	Surgery	Dysaesthesia at ear lobe	Probable
Jenner [47]	UK	41-year-old women	Cancer pain	Galactorrhoea	None	None	Full recovery	Probable
Kim, 2002 [58]	Korea	37-year-old woman	Abdominal pain	Skin lesions	Pseudolymphoma, gold allergy	Intralesional triamcinolone	Improved	Certain
Murray [98]	UK	35-year-old man	Tennis elbow	Red skin lesions	Behçet disease	No information	No information	Probable
Takeishi [131]	Japan	66-year-old woman	Skin lesions	Arthritis	Argyria	No information	No information	Certain
Morimoto [97]	Japan	65-year-old woman	Shoulder stiffness	Dermatitis, pain	Contact dermatitis, trigeminal neuralgia	Nerve block	No information	Certain
Yanagihara [156]	Japan	55-year-old woman	Musculoskeletal pain	Tumours at site of treatment	Silicone granuloma; suspected sarcoidosis	Observation	No information	Certain

LBP, low back pain.

Forty-two case reports of organ trauma emerged (Table 3) [6,9–11,13,18,22,24,41,45,49–51,53,54,56,60,70,78,79,86,87,99,103,105,108,109,111,112,114–117,124,127,136,137,140–142,162]. The most frequently reported complication was pneumothorax. Most patients recovered fully, but 4 patients died due to a pneumothorax.

A wide range of other adverse effects are summarized in Table 4 [3–5,40,47,48,58,61,97,98,131,138,156]. Most patients made a full recovery after receiving adequate treatment.

4. Discussion

A similar overview, covering 1989 to 2000, included 17 systematic reviews of acupuncture for pain [85]. The interest in acupuncture is evidently increasing. The majority of the early reviews arrived at negative conclusions [85], while the majority of the 57 recent reviews were positive. Yet there are many contradictions and doubts. For instance, there is no plausible reason why acupuncture should reduce pain in some conditions while failing to work in many others.

Multiple reviews exist for a range of conditions, and agreement between them existed for only 4 conditions: fibromyalgia, herpes zoster, neck pain, and postoperative pain. Acupuncture failed to be demonstrably effective for fibromyalgia, but it seemed to be effective for neck pain. For postoperative pain, both reviews re-

flected uncertainty. More primary studies are therefore required. As to herpes zoster, the primary studies and one of the reviews were of poor quality. Thus, we would caution against drawing positive conclusions and advocate more rigorous primary studies.

The majority of the (high-quality) reviews were positive for low back pain and osteoarthritis. For myofascial trigger-point pain, a positive trend existed, with one review being positive and one unclear. For the treatment of migraine, rheumatoid arthritis, and tension headache, the conclusions were largely negative. For dysmenorrhoea and temporomandibular joint pain, the evidence was contradictory, suggesting that more and better primary studies are required.

For indications where only one systematic review was available (Table 1), definitive conclusions were usually prevented by the paucity or poor quality of the primary studies or the poor quality of the reviews: ankylosing spondylitis, cervical spondylosis, frozen shoulder, intervertebral disk displacement, lumbar intervertebral disk herniation, orthopaedic diseases, pain during oocyte retrieval, and sciatica. One systematic review suggested effectiveness for chronic headache. Chronic headache is a broad category, and more specific diagnoses might be more informative (see above). Other single reviews failed to show effectiveness for cancer pain, migraine prophylaxis, musculoskeletal pain, shoulder pain, and surgical pain. All of the remaining single reviews arrived at unclear conclusions.

These findings should be seen in the light of recent results from high-quality randomized controlled trials. Cherkin et al. [14] have shown that, for chronic low back pain, individualized acupuncture is not better in reducing symptoms than formula acupuncture or sham acupuncture with a toothpick that does not penetrate the skin. All 3 forms of acupuncture, however, were more effective than usual care. The authors consider, therefore, that the benefits of acupuncture “resulted from nonspecific effects such as therapist conviction, patient enthusiasm, or receiving a treatment believed to be helpful” [14]. This view was further strengthened by a recent randomized controlled trial in patients with osteoarthritis examining the effects of acupuncturists’ communication style [128]. Real and sham acupuncture were both more effective in reducing pain than no acupuncture at all, but real acupuncture was no better than sham. Moreover, a communication style generating high expectations in patients resulted in improved outcomes compared to a normal style, regardless of the type of acupuncture administered. In the primary studies included in the systematic reviews evaluated above, the risk of bias was often considerable. Adequately controlling for nonspecific effects in future is likely to demonstrate that acupuncture has no or few specific effects on pain [89].

Serious complications after acupuncture continue to be reported. Many are not intrinsic to acupuncture, but caused by malpractice of acupuncturists. This might explain why surveys of adequately trained therapists failed to yield such complications [28,147,149]. Most of the case reports originated from Asia (Tables 2–4), possibly reflecting the fact that, in Asia, acupuncture is more widely practised than elsewhere. Alternatively, it might be due to more Asian therapists being poorly trained [113]. Tables 2–4 also disclose many serious adverse events from developed countries, including Australia, Austria, Canada, Croatia, France, Germany, Holland, Ireland, New Zealand, Spain, Sweden, Switzerland, the United Kingdom, and the United States. The number of adverse effects reported from the United Kingdom seems particularly remarkable, possibly indicating less under-reporting in the United Kingdom than elsewhere.

The most frequent complications included pneumothorax, and bacterial and viral infections. Viral infections are rarely published as case reports, but other types of investigations suggest that they are relatively frequent [23,26,52,63,68,101,102,123,144].

One might argue that, in view of the popularity of acupuncture, the number of serious adverse effects is minute. We would counter, however, that even one avoidable adverse event is one too many. The key to making progress would be to train all acupuncturists to a high level of competency.

In many of the case reports, causality was uncertain (Tables 2–4), not least because of a lack of sufficient detail. Yet, most of the authors seemed confident about causality. In future, authors and editors should ensure that the quality of case reports increases.

In conclusion, many systematic reviews of acupuncture for pain management are available. Yet they only support few indications, and contradictions abound. Acupuncture remains associated with serious adverse effects. In order to minimize the risk, all acupuncturists should be trained adequately.

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