Review Article

Systematic Review of Adverse Effects: A Further Step towards Modernization of Acupuncture in China

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As a further step towards the modernization of acupuncture, the objective of this review was to figure out the frequency and severity of adverse complications and events in acupuncture treatment reported from 1980 to 2013 in China. All first-hand case reports of acupuncture-related complications and adverse events that could be identified in the scientific literature were reviewed and classified according to the type of complication and adverse event, circumstance of the event, and long-term patient outcome. The selected case reports were published between 1980 and 2013 in 3 databases. Relevant papers were collected and analyzed by 2 reviewers. Over the 33 years, 182 incidents were identified in 133 relevant papers. Internal organ, tissue, or nerve injury is the main complications of acupuncture especially for pneumothorax and central nervous system injury. Adverse effects also included syncope, infections, hemorrhage, allergy, burn, aphonia, hysteria, cough, thirst, fever, somnolence, and broken needles. Qualifying training of acupuncturists should be systemized and the clinical acupuncture operations should be standardized in order to effectively prevent the occurrence of acupuncture accidents, enhance the influence of acupuncture, and further popularize acupuncture to the rest of the world.

1. Introduction

Complications and adverse effects in medical practice are always of concern to the public and the medical profession. While being widely used in current medical treatment, especially in the area of intertrochanteric hip fractures, the cephalomedullary devices (CMN), however, led to a considerably high complication rate of 41.9% according to Puie et al. [1]. Faunø et al. [2] conducted a study on the medical records of 997 patients who were suffering from stoma closure, which revealed 131 cases of early complications and 187 late ones, accounting for 13.1% and 18.8% of the total subject pool, respectively. Umuroglu et al. [3] identified that the nuss procedure showed an overall complication rate of 18.7% through a retrospective analysis. Fortunately, with the increasing attention from the society on medical care safety and the further standardization of doctor’s qualifications, such medical incidents have been decreasing. As acupuncture and moxibustion (A&M) are increasingly used in world, their widening acceptance necessitates continual safety assessment. This review, a sequel to two previous reviews from our team [4, 5], is an evaluation of the frequency and severity of adverse events (AEs) for acupuncture reported between 1980 and 2013 in China. These two reviews reported the AEs of A&M in the West, reported from 1965 to 1999 and from 2000 to 2011, respectively. In the first review, the main source of infection was found to be hepatitis caused by reused needles. In the second review, the majority of infections were bacterial, caused by skin contact at acupuncture sites, without cases of hepatitis. For these two reviews, we just searched English articles, without Chinese reports, so it is unclear which AE happens in China. Since acupuncture is widely used in China, it is necessary to make sure what is happening about AE. In this review, we found internal organ, tissue, or
nerve injuries were the main complications of acupuncture in China from 1980 to 2013. Clearly, guidelines must be followed in order to minimize acupuncture-related AEs and to modernize acupuncture and make it safer to apply.

2. Materials and Methods

2.1. Inclusion Criteria. All case reports concerning acupuncture-related complications or AEs in China published from 1980 to 2013 were identified. Only firsthand reports were included to avoid multiple reports of the same event. Thus, reviews, comments, or case-control studies were excluded from this review.

Complications, defined as "an added difficulty: a complex state, a disease, or an accident superimposed upon another without specific relation," include infections, internal organ or tissue injuries, and other severe consequences. AEs and adverse reactions were defined as "development of an undesired side effect or toxicity" and include less severe consequences, such as contact dermatitis. Side effects, defined as "the action or effect other than that desired," are included within the discussion of AEs [4, 5].

2.2. Search Strategy. The following databases were searched for case reports published from 1980 to 2013: VIP science and technology periodical database (CQVIP), China National Knowledge Infrastructure (CNKI), and Wanfang Database (WF). Search terms included "acupuncture, electro-acupuncture, acupuncture points, ear acupuncture, needling." These terms were combined with "safe, safety, adverse event, adverse reaction, side effects, side events, complications, and risk."

2.3. Data Extraction. A total of 739 papers were found; 133 were relevant (Figure 1). Information pertaining to the author, year of publication, number of patients, patient's age, sex, original treatment, the punctured site, circumstances of the complication or AE, and long-term patient outcome when available was extracted from each case. These data were then organized according to the type of complication or AE.

3. Results

A total of 133 papers published from 1980 to 2013 were reviewed, and 182 cases of complications or AEs were identified to be associated with pneumothorax (n = 30), central nervous system injury (37), peripheral nerve injury (8), organ injury (22), other tissue injury (18), syncope (18), infections (17), hemorrhage (10), complications caused by broken needles (7), and others (15). Pneumothorax and central nervous system injury were the major complications.

3.1. Complications of Acupuncture: Internal Organ, Tissue, or Nerve Injury. A total of 115 cases of internal organ, tissue, or nerve injuries were reported, including pneumothorax (n = 30), central nervous system injury (37), peripheral nerve injury (8), organ injury (22), and other tissue injury (18).

3.2. Pneumothorax (Table 1). Between 1980 and 2013, pneumothorax was the most common complication of acupuncture treatment, as 30 cases in 27 papers were noted to be possibly associated with acupuncture (Table 1). Among the 30 cases presented, 25 recovered through thoracocentesis, thoracic closed drainage, anti-infection treatment, and clinical observation; 2 patients died; and the outcomes of the other 3 cases were not stated or unknown. More than half of them were reported by doctors in emergency rooms or departments of internal medicine, but the practitioner's training background was not reported. The punctured sites were mostly in the chest, supraclavicular fossa, and the back. The patients' major complaints were chest stuffy, chest pain, and dyspnea. One pneumothorax patient did not receive timely treatment and died [6]. Another case died because of a tension pneumothorax after acupuncture treatment [7].

3.3. Central Nervous System Injury (Table 2). There were 37 cases of central nervous system injury associated with acupuncture (Table 2). The 37 patients suffered subarachnoid hemorrhage (n = 27), subdural hematoma (2), spinal cord injury (2), cerebral hemorrhage reformulation (2), cervical spinal epidural hematoma (1), medulla oblongata hemorrhage (1), cisterna magna hemorrhage (1), and leukemia acute intracerebral hemorrhage (1). The causes were acupuncture of cervical acupoints (n = 31), acupoints between the second and third thoracic spinal process [8], acupoints KI01 (Yongquan) [9] and BL37 (Yinmen) [10], waist acupoint [11] (each n = 1), and body acupuncture (n = 2) [12, 13]. Among the 37 cases, 26 recovered and 11 died.

Because of insufficient compliance and protected observation, accidents occurred in 3 schizophrenia patients, of whom 2 died and 1 recovered [14]. Two cerebral hemorrhage patients after receiving body acupuncture died from recurrence, and the authors speculated the reason might be that acupuncture had irritated the parasympathetic nerve, causing vascular contraction and increasing blood pressure and thus cerebral hemorrhage occurred before the original cerebrovascular fracture could be fully restored [9, 12]. Two patients suffered from dizziness and vomiting during treatment, but the acupuncturists did not pay high attention; the symptoms did not improve significantly after treatment, but the acupuncturists did not realize the severity and even allowed the patients to go home. One patient was treated the next day after onset and was diagnosed as subarachnoid hemorrhage; he recovered and left hospital [11]. The other patient died the next day [13].

3.4. Peripheral Nerve Injury (Table 3). There were 8 cases of acupuncture-induced peripheral nerve injury (Table 3). They include aggravated facial paralysis [15], mistakenly hitting the vagus [16], phrenic nerve injury [17], optic atrophy [18], oculomotorius injury [19], right trigeminal nerve injury [20], sciatic nerve injury [10], and peroneus nerve injury [21], respectively. The patient with optic atrophy lost sight [18], the patient with right trigeminal anchor injury improved after 3 days [20], the patient with sciatic nerve injury did not recover [10], and the other 5 patients recovered.
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3.5. Organ Injury (Table 4). Twenty-two cases were reported to have organ injury associated with acupuncture treatment (Table 4). There was cardiovascular injury \((n=7)\) [14, 22–27], thoracic duct injury (1) [28], peritonitis induced by abdominal system (9) [29–33], gastric perforation (3) [34–36], intestinal obstruction (1) [37], and multiple organ injury (1) [38]. Of them, 14 recovered, 7 died, and 1 did not recover. Most of them were caused by too deep puncture and incorrect acupoint location.

One patient received treatment following gastric abscess induced by gastric ulcer. He was treated by electroacupuncture (EA) at ST36 (Zusanli) and the acupoint was located without violation, but the state of illness was not relieved and gastric perforation occurred. The doctor was puzzled and put forward this case for discussion [35]. One patient with a history of stomach bleeding received treatment following knee pains induced by rheumatoid arthritis and took anti-inflammatory analgesic drugs for a long time. The lower limb acupuncture was selected, but the excessive EA irritation during treatment caused an irritative gastric ulcer and then hemorrhagic shock and the patient recovered after timely rescue [36].

3.6. Other Tissue Injuries (Table 5). In addition to injuries of the organs in thorax and abdomen, 18 cases of other tissue injuries were reported (Table 5), including cervical common carotid aneurysm [39], shock [38, 40], asphyxia [41], dyspnea [42], eye injury [18, 43, 44], and the locomotor system injury [10, 44–50]. Among the 18 cases, 12 recovered, 2 improved, 2 did not recover, 1 died, and the outcome of 1 was not stated.
| Author/year (reference) | Cases | Age/sex | Disease treated | Punctured site | Practitioner | Follow-up |
|-------------------------|-------|---------|----------------|----------------|--------------|-----------|
| Jiang, 1980 [117]       | 1     | 54/F    | Gastroptosis    | RN15           | Not specified | Recovered |
| Cai and Wang, 1982 [118]| 1     | 41/M    | Numbness and pain of shoulders and chest | Shoulder and back | Not specified | Recovered (1 mo) |
| Zheng and Pang, 1983 [119]| 1   | 21/M    | Stiff neck      | GB21           | Not specified | Recovered after surgery (1 mo) |
| Gao, 1984 [120]         | 1     | 50/F    | Chest and back pain | Back | Factory doctor | Recovered (12 d) |
| Duan and Wang, 1984 [29] | 2    | 26/F    | Bronchitis      | GB21, BL13, EX-B2 | Not specified | Recovered (3 d) |
| Chang, 1984 [121]       | 1     | 33/M    | Back pain       | BL12           | Not specified | Recovered (19 d) |
| Yan, 1985 [122]         | 1     | 55/F    | Chronic bronchitis | RN22           | Health center | Recovered (16 d) |
| Hu, 1986 [123]          | 1     | 58/F    | Pulmonary heart disease | BL13           | Not specified | Recovered (13 d) |
| Zhang, 1986 [124]       | 1     | 52/M    | Cervical pain   | Left shoulder  | Factory doctor | Recovered (20 d) |
| Yang, 1986 [6]          | 1     | 57/F    | Chronic asthmatic disease | BL12           | Dead         |           |
| Jin, 1987 [125]         | 1     | 26/F    | Shoulder pain   | SI13           | Acupuncturist | Recovered (9 d) |
| Song and Xu, 1987 [126] | 1    | 60/F    | Shoulder pain   | GB21           | Not specified | Not specified |
| Ruan et al., 1992 [127] | 1     | 35/F    | Hysteria        | Supraclavicular fossa | Acupuncturist | Recovered (10 d) |
| Zhang et al., 1992 [38] | 3     | 53/F    | Chronic bronchitis and emphysema | BL18           | Recovered (1 wk) |
| Lu, 1993 [128]          | 1     | 60/M    | Cough           | RN22           | Recovered (1 mo) |
| Xia, 1993 [129]         | 1     | 60/M    | Back pain caused by hyperplastic spondylitis | BL18, BL23 | Recovered (10 d) |
| Li and Chen, 1997 [130] | 1     | 65/F    | Shoulder pain   | Scapular region | Clinic | Recovered (5 d) |
| Ma and Zhang, 1997 [131]| 1     | 48/M    | Neck and shoulder pain | Shoulder and back | Clinic | Recovered (1 wk) |
| Wang, 1999 [7]          | 1     | 47/F    | Shoulder and leg pain | LI17           | Dead         | |
| Song and Wu, 2001 [9]   | 1     | 45/F    | Scapulohumeral periartthritis | GB21, SI11 | Hospital | Recovered (1 wk) |
| Qin and Ao, 2003 [132]  | 1     | 55/M    | Intercostal neuralgia | The sixth intercostal space on the anterior axillary line | Factory doctor | Recovered (2 wk) |
| Zha, 2006 [133]         | 1     | 32/M    | Chronic hepatitis B | Chest and back | Itinerant doctor | Recovered (14 d) |
| Gan et al., 2006 [134]  | 1     | 30/M    | Neck and back pain | Back | Individual clinic | Not specified |
| Huo et al., 2007 [135]  | 1     | 39/M    | Chest and back pain | Not specified | Individual clinic | Not specified |
| Liu, 2007 [136]         | 1     | 50/M    | Cervical and back pain | Back | Individual clinic | Recovered |
| Ma, 2007 [137]          | 1     | 35/F    | Shoulder pain   | Not specified | Individual clinic | Not specified |
| Zhang and Zhao, 2012 [138]| 1    | 65/F    | Cervical spondylopathy | GB21           | Acupuncturist | Recovered (10 d) |
| Author/Year (reference) | Cases | Age/Sex | Disease treated | Punctured site | Complication | Onset after acupuncture | Follow-up |
|-------------------------|-------|---------|-----------------|---------------|--------------|------------------------|-----------|
| Liu, 1980 [139]         | 1     | 19/F    | Impaired vision | GB20          | Subarachnoid hemorrhage | 1h         | Recovered (20 d) |
|                         |       | 16/M    |                 | DU16          | Subarachnoid hemorrhage |           |                      |
| Liu, 1981 [14]          | 3     | 30/F    | Schizophrenia   | DU14          | Cervical and thoracic cord injury | Immediately | Dead |
|                         |       | 30/M    |                 | GB20          | Subarachnoid hemorrhage | 1h         | Recovered (47 d) |
|                         |       | 30/F    | Eyelid muscle twitch | GB20 | Subarachnoid hemorrhage |           | Recovered (14 d) |
| Bao and Gao, 1983 [140] | 3     | 27/M    | Bulbar palsy    | DU15          | Subarachnoid hemorrhage | Immediately | Recovered (20 d) |
|                         |       | 40/F    | Headache        | GB20          | Subarachnoid hemorrhage |           | Recovered (19 d) |
| Chen and Wu, 1985 [141] | 1     | 30/F    | Hysteria        | Ex-HN18       | Subarachnoid hemorrhage and medulla oblongata hemorrhage | 1d         | Dead |
| Yang et al., 1985 [8]   | 1     | 15/M    | Chronic tracheitis | Between 2 and 3 thoracic spinous process | Subarachnoid hemorrhage | Immediately | Recovered (1mo) |
| Chen and Huang, 1985 [142] | 1     | 57/M    | Facial Spasm    | Neck          | Subarachnoid hemorrhage | Immediately | Recovered (3 wk) |
| Su et al., 1985 [143]   | 1     | 11/F    | Deaf-mute       | DU15          | Subarachnoid hemorrhage | At night    | Recovered (1 wk) |
|                         |       | 42/M    | Psychosis       | DU15          | Subarachnoid hemorrhage | Several hours | Recovered (1 mo) |
|                         |       | 4.5/M   | Cerebral agenesis with aphasia | DU15 | Subarachnoid hemorrhage | Immediately | Recovered (20 d) |
| Yu, 1986 [144]          | 7     | 29/M    | Weakness of limbs | DU15, DU16 | Subarachnoid hemorrhage | Minutes after treatment | Recovered (1 mo) |
|                         |       | 22/M    | Acid swells of the neck | Back neck | Subarachnoid hemorrhage |             | Recovered (40 d) |
|                         |       | 55/F    | Aural vertigo   | Back neck     | Subarachnoid hemorrhage | Immediately | Recovered (20 d) |
|                         |       | 24/F    | Stuffy head     | GB20          | Subarachnoid hemorrhage |           | Recovered (1 mo) |
|                         |       | 22/M    | Facial paralysis | Ex-HN21       | Subarachnoid hemorrhage |           | Recovered (1 mo) |
| Chen, 1987 [145]        | 1     | 37/F    | Neck pain       | DU15          | Subarachnoid hemorrhage | 1 min       | Recovered (1 mo) |
| Jiang and Chen, 1987 [146] | 1     | 77/F    | Stiff neck      | GB20          | The cerebellopontine and subarachnoid hemorrhage | After treatment | Dead |
| Zhou, 1988 [147]        | 1     | 15/M    | Cold            | GB20          | Subarachnoid hemorrhage | During the treatment | Dead |
| Mi et al., 1989 [148]   | 1     | 28/F    | Neurosis        | DU15          | Subarachnoid hemorrhage | 2d          | Recovered (27 d) |
| Wu and Xu, 1990 [149]   | 1     | 57/M    | Stroke          | Ashi points near C3 | Subarachnoid hemorrhage | 1h          | Dead (10 d) |
### Table 2: Continued.

| Author/Year (reference) | Cases | Age/Sex | Disease treated | Punctured site | Complication | Onset after acupuncture | Follow-up       |
|-------------------------|-------|---------|-----------------|----------------|--------------|------------------------|----------------|
| Liu, 1992 [150]         | 1     | 28/M    | Insomnia        | GB20           | Acute subdural hematoma | 3 hours               | Recovered after surgery |
| Mi, 1993 [12]           | 1     | 73/M    | Cerebral hemorrhage | LI1, LI4, GB30, ST36, GB39, GB14, GB2 | Cerebral hemorrhage reformulation | 10 min              | Dead                 |
| Jiang et al., 1996 [151]| 2     | 45/M    | Cervical spondylopathy | GB20        | Subarachnoid hemorrhage | Immediately          | Recovered (30 d) |
|                         |       | 54/M    |                 | Neck           |             |                        | Recovered (1 mo) |
| Liu et al., 1996 [152]  | 1     | 35/M    | Ankylosing Spondylitis | DU16         | Medulla oblongata hemorrhage | 5 hours              | Dead                 |
| Bian et al., 1997 [153] | 1     | 29/F    | Headache caused by pesticide poisoning | GB20         | Subarachnoid hemorrhage | 3 min                | Recovered (1 mo) |
| Wang, 1999 [10]         | 1     | 54/M    | Low back pain   | BL37           | Acute subarachnoid hemorrhage | Immediately      | Recovered            |
| Wang, 1999 [154]        | 1     | 39/F    | Neurosis        | GB20           | Cervical cord injury | Immediately        | Dead                 |
| Song and Wu, 2001 [9]   | 1     | 58/M    | Hypertensive cerebral hemorrhage | KI01         | Cerebral hemorrhage reformulation | Immediately | Dead                 |
| Li et al., 2003 [155]   | 1     | 55/M    | Neck and back pain | Neck and back | Cervical spinal epidural hematoma | Immediately | Recovered            |
| Niu and Zhang, 2006 [156]| 1   | 42/M    | Headache        | Neck           | Cisterna magna hemorrhage | Not specified | Recovered after surgery |
| Li et al., 2008 [157]   | 1     | 36/F    | Migraine        | DU16           | Subarachnoid hemorrhage | At night           | Recovered (3 wk) |
| Chen, 2009 [11]         | 1     | 43/F    | Lumbago pain    | Waist          | Subarachnoid hemorrhage | Immediately | Recovered (1 mo) |
| Li et al., 2011 [13]    | 1     | 45/F    | Toothache       | RN16, RN10, RN9, RN4 | Leukemia acute intracerebral hemorrhage | Immediately | Dead (2 d)        |

### Table 3: Peripheral nerve injury.

| Author/year (reference) | Cases | Age/sex | Disease treated | Punctured site | Complication | Practitioner | Follow-up   |
|-------------------------|-------|---------|-----------------|----------------|--------------|--------------|-------------|
| Tang and Fang, 1986 [15] | 1     | Not specified | Facial paralysis | Not specified | Aggravated facial paralysis | Not specified | Recovered   |
| Nie and Zhou, 1990 [16]  | 1     | 26/M    | Left eye pain   | SJ17           | Cardiac arrest | Acupuncturist | Recovered (1 min) |
| Yan, 1994 [17]           | 1     | 57/M    | Cervical dislocation | Bitong point     | Phrenic nerve injury | Acupuncturist | Recovered (1 wk) |
| Yang and Wang, 1996 [18] | 1     | 62/M    | Lateral rectus paralysis | Ex-HN07          | Optic atrophy | Acupuncturist | Blind       |
| Xu and Liu, 1997 [19]    | 1     | 48/M    | Tinnitus and hearing loss | ST1, ST2, BL2, LI20, SJ21, SI19 | Oculomotorius injury | Not specified | Recovered (17 d) |
| Huang and Wei, 1997 [20] | 1     | 53/F    | Trigeminal nerve pain | Around the mandible | Trigeminal nerve injury | Acupuncturist in the stomatological hospital | Improved (3 mo) |
| Wang, 1999 [10]          | 1     | 54/F    | Lumbago         | GB30           | Sciatic nerve injury | Private practitioner | Unrecovered |
| Ruan et al., 2009 [21]   | 1     | 67/F    | Lumbago         | GB34           | Peroneous nerve injury | Not specified | Recovered (3 wk) |
One patient suffered from retinal detachment, and eyesight was corrected to 0.2 after treatment [43]. One patient lost eyesight because of traumatic cataract [18]. One patient experienced femoral neck fracture after strong stimulation to myospasm [45]. One patient suffered from subluxation in right wrist joint due to excessive EA intensity [48].

3.7. Syncope (Table 6). A total of 18 cases of acupuncture-associated syncope were reported (Table 6). Syncope occurred during the treatment in 9 cases, several minutes after the treatment in 5 cases, and several hours later in 4 patients. Two patients fainted after taking liquors [51, 52]. The positions were sitting (n = 5), lying (5), and not specified (8).
Table 5: Other tissue injury.

| Author/year (reference) | Cases | Age/sex | Disease treated | Punctured site | Complication | Practitioner | Follow-up |
|-------------------------|-------|---------|-----------------|----------------|--------------|--------------|-----------|
| Chen, 1980 [39]         | 1     | 33/F    | Sore throat     | Neck           | Cervical common carotid aneurysm | Not specified | Recovered after surgery (3 mo) |
| Wang, 1987 [40]         | 1     | 42/F    | Thyroid cancer (anaesthesia for thyroidectomy) | SI17 | Sinus caroticus syndrome, shock | Not specified | Recovered |
| Zhang et al., 1992 [38] | 1     | 39/M    | Asthma          | BL13           | Pleural shock | Not specified | Recovered (2 d) |
| Zhu, 1986 [41]          | 1     | 56/M    | Chest distress  | RN22           | Asphyxia      | Acupuncturist | Dead |
| Gao, 1989 [42]          | 1     | 73/M    | Cough           | LI18           | Dyspnea       | Not specified | Recovered (3 d) |
| Liu et al., 1988 [43]   | 1     | 53/M    | Blepharospasm   | The lateral upper eyelid | Retinal detachment | Health worker | Recovered after surgery |
| Yang and Wang, 1996 [18]| 1     | 63/F    | Left eye ptosis | Periocular     | Traumatic cataract | Acupuncturist | Blind |
| Wang, 1982 [44]         | 2     | 35/F    | Right migraine  | EX-HN5         | The orbicularis oculi muscle tremor | Not specified | Recovered (3 d) |
| Li and Zhou, 1980 [45]  | 1     | 40/M    | Schizophrenia   | EX-HN5         | Femoral neck fracture | Acupuncturist | Not specified |
| Liang and Song, 1984 [46]| 1    | 23/M    | Cramp           | BL57           | Flexor hallucis muscle and digitorum longus muscle scar contracture | Health worker | Recovered after surgery |
| Chen, 1992 [47]         | 1     | 17/F    | Shortsightedness| GB20, EX-HN17  | Nape spasm   | Acupuncturist | Recovered (6 d) |
| Wang, 1994 [48]         | 1     | 65/F    | Stroke          | LI4, SJ5, LI15 | Subluxation of wrist | Intern | Recovered (1 wk) |
| Shi and Chen, 1994 [49] | 1     | 52/M    | Facioplegia     | LI11           | Elbow pain    | Acupuncturist | Recovered (2 wk) |
| Wang, 1999 [10]         | 1     | 53/M    | Cough, epistaxis| LU6            | Amyotrophy    | Private practitioner | Unrecovered |
| Luo and Huang, 2006 [50]| 2     | 42/M    | Amyotrophic lateral sclerosis | Upper limb | Fasculation | Not specified | Improved |
|                         |       | 63/M    | Amyotrophic lateral sclerosis | Upper limb |            |              | Improved |

Most patients recovered with rest and drinking sugar water, while 2 patients recovered after injection of metoclopramide via ST36 [53]. Two cases suffered from sudden cardiac arrest and were cured after first aid [54, 55]. One patient recovered after massaging an ear acupoint [56].

3.8. Infection (Table 7). A total of 17 cases were infections associated with acupuncture (Table 7). Among them, 10 recovered, 3 died, 2 improved after 3 days, 1 was disabled, and 1 was not stated. The infection was caused by tetanus bacillus (n = 6) [10, 57–61], hydatid (1) [62], *Escherichia coli* (1) [63], and *Mycobacterium tuberculosis* (3) [64]. One patient was infected after deep 3-degree burning [65] while others were not stated.

In one patient, the right epigastric mass due to acupuncture-tured liver hydatid caused extensive metastasis in hydatid abdominal cavity; the patient recovered after operation [62]. One diabetic patient without controlling blood glucose suffered from diabetic feet because of infection and recovered after hypoglycemic and anti-infection treatments.

3.9. Hemorrhage (Table 8). Among 10 cases of acupuncture-induced local hemorrhage (Table 8), 8 patients recovered, 1 improved, but 1 died. The positions of hemorrhage included eyes (n = 2) [6, 66], extraperitoneal (1) [67], thyroid (1) [68], hypoglossus (2) [69, 70], suffocated death from hematoma compressed trachea (1) [71], hand (1) [72], 1 case of buttock
Table 6: Syncope associated with acupuncture.

| Author/year (reference) | Cases | Age/sex | Disease treated                      | Punctured sites          | Position      | Start time  | Causes       | Practitioner | Follow-up    |
|-------------------------|-------|---------|--------------------------------------|--------------------------|---------------|-------------|--------------|--------------|--------------|
| Yang, 1986 [6]          | 1     | 32/M    | Facioplegia                           | GB14, ST6, ST4, SJ17, LI20, LI4 | Sitting       | 5 min after inserting needle | Limosis      | Acupuncturist | Recovered    |
| Shao, 1989 [51]         | 1     | 53/M    | Myotonsitis of long head of biceps brachii | LI15, LI11, ashi          | Not specified | After inserting needle | After drinking | Acupuncturist | Recovered (20 min) |
| Shi and Chen, 1994 [49] | 1     | 57/F    | Stomachache                           | L13, ST36, PC6            | Not specified | Finish needling | Limosis      | Acupuncturist | Recovered (30 min) |
| Guo, 1995 [158]         | 2     |         | Scapulohumeral periarthritis          | Ex-UE01, GB21, LI14, LI11, SJ5, LI4, BL40, ashi point and acupoint of bladder meridian | Clinostatism  | Finish needling | Weakness     | Acupuncturist | Recovered    |
| Wu et al., 2001 [56]    | 1     | 24/F    | Insomnia                              | PC6, ST36, HT7            | Not specified | At night     | Not specified | Acupuncturist | Recovered (2 d) |
|                        | 1     |         | Lumbago pain                          | BL23, BL40, DU3, GB30, KI7 | Not specified | Finish needling | After drinking | Acupuncturist |              |
| Liu, 2001 [52]          | 3     | 34/F    | Shoulder pain                         | LI11, LI14, L115, S1, S14 | Sitting       | After inserting needle | Tiredness    | Acupuncturist | Recovered    |
|                        | 1     | 56/F    | Right thumb pain                      | L14, L15, L11, ashi point | Not specified | On the way home | Limosis      | Acupuncturist | Recovered    |
| Ma, 2005 [54]           | 1     | 28/M    | Prosopalgia                           | EX-HN5, LI14, ST6, SJ5   | Sitting       | 5 min after inserting needle | Not specified | Acupuncturist | Recovered (30 min) |
|                       | 1     | 72/M    | Stroke                                | LI11, SJ5, ST36, SP6, EX-UE17, EX-LE1 | Clinostatism | 10 min after inserting needle | Nervous      | Acupuncturist | Recovered (2 min) |
| Long et al., 2006 [55]  | 3     | 41/F    | Cervical spondylopathy                | BL10, GB20                | Sitting       | 1 min after inserting needle | Not specified | Acupuncturist | Recovered (30 min) |
|                        | 1     | 42/F    | Lumbago pain                          | ST36                     | Clinostatism | After inserting needle | Heavy stimulus | Acupuncturist | Recovered (2 min) |
| Liu, 2007 [159]         | 1     | 42/F    | Scapulohumeral periarthritis          | Ex-UE01, LI14, Ashi point, S3 | Sitting       | 10 min after inserting needle | Not specified | Acupuncturist | Recovered (30 min) |
| Chen, 2009 [11]         | 1     | 42/M    | Acute lumbar sprain                   | EX-B5, BL40              | Not specified | Finish needling | Not specified | Acupuncturist | Recovered (10 min) |
| Liao and Guo, 2009 [160] | 1    | 57/F    | Gouty arthritis                       | GB20                     | Clinostatism | After inserting needle | Limosis      | Acupuncturist | Recovered (10 min) |
| Li et al., 2009 [53]    | 2     | 48/M    | Cervical spondylopathy radiculaire    | GB21, LI11, SJ5, Ex-B5   | Not specified | 6 h after treatment | Not specified | Acupuncturist | Recovered after stop treatment |
|                        | 2     | 68/F    | Facial paralysis                      | GB14, ST2, ST4, ST6, SJ17, LI4, Ex-HN16 | Not specified | 12 h after treatment | Not specified | Acupuncturist | Recovered after stop treatment |
| Author/year (reference) | Cases | Age/sex | Disease treated | Punctured site | Diagnosis                        | Practitioner         | Follow-up                 |
|-------------------------|-------|---------|-----------------|----------------|----------------------------------|----------------------|---------------------------|
| Zhang, 1980 [161]       | 1     | 5/F     | Heat, cough     | Ex-UE19        | Infection                       | Not specified        | Middle finger disability  |
| Xie and Zong, 1983 [62] | 13    | 8/F     | Right upper abdominal mass and discomfort | Ashi points | Abdominal metastatic hepatic hydatid | Local hospital       | Recovered after surgery   |
| Gao and Qi, 1989 [65]   | 1     | 54/M    | Right leg pain  | Local points   | Third-degree burns with infection | Clinic               | Not specified              |
| Xu, 1990 [162]          | 1     | 19/M    | Migraine        | EX-HN5, GB14, DU20 | Head abscess, intracranial infection | Health worker in the army | Recovered                  |
| Xia, 1993 [129]         | 1     | 37/F    | Facioplegia     | ST5            | Right cheek hematoma with infection | Not specified        | Recovered (1 wk)          |
| Chen and Gao, 1995 [63] | 1     | 30/M    | Insomnia        | Head           | Encephalopathy                   | Not specified        | Recovered after surgery   |
| Zhou, 1999 [64]         | 3     | From 22 to 28/M (1); F (2) | Lumbar muscle strain | Loin | Tuberculous abscess on the body surface | Not specified        | Recovered (3–6 mo)        |
| Song and Wu, 2001 [9]   | 1     | 38/M    | Rheumatic arthritis | EX-LE4, EX-LE5, GB34, SP9 | Pyogenic arthritis         | Individual clinic in the country | Recovered (2 wk)          |
| Ding et al., 2008 [112] | 1     | 60/F    | Scapulohumeral periarthritis | ST38 | Diabetes foot | Not specified | Remission after 3 days |
| Yang et al., 1990 [57]  | 1     | 2/F     | Malnutritional stagnation | Ex-UE19 | Tetanus           | Village acupuncturist | Recovered (2 wk)          |
| Liu, 1991 [58]          | 1     | 52/F    | Headache        | Ex-HN05, DU20, GB20, LI4 | Tetanus               | Village acupuncturist | Recovered (2 wk)          |
| Liu, 1992 [59]          | 1     | 52/F    | Leg pain        | Not specified  | Tetanus             | Private practitioner | Recovered (1 mo)          |
| Sun and Hu, 1997 [60]   | 1     | 23/M    | Facioplegia     | Not specified  | Tetanus             | Health-center        | Remission after 3 days    |
| Wang, 1999 [10]         | 1     | 60/M    | Headache and fever | GB20, GB21, SJ5 | Tetanus          | Not specified        | Dead                      |
| Chen et al., 2008 [61]  | 1     | 62/F    | RA              | Knee           | Tetanus             | Illegal treatment    | Dead                      |

One patient was not allergic after several acupuncture treatments, but systemic allergy occurred after EA treatment [65]. Among three patients with acupuncture-induced epilepsy, only one had a history of epilepsy [85, 86].

### 3.10. Complications Caused by Broken Needles (Table 9)

Seven cases of accidents due to broken or bent needles were identified (Table 9). Five recovered after the surgery [75–79], and 2 cases of bent needles were slowly pushed out by acupuncturists [6, 80].

### 3.11. Other Complications Associated with Acupuncture (Table 10)

A total of 15 other complications associated with acupuncture were reported (Table 10): aphonia [81], hoarseness [82], allergy to electroacupuncture [83] and metal [84], epilepsy [85, 86], fever [87], cough [88], thirst [88], infusion reaction [89], hyperventilation syndrome [90], and aggravation of fatigue [91]. Of them, 14 cases recovered completely and 1 improved.

Hematoma due to acquired hemophilia B which improved after treatment [73], and lower limb (1) [74].

**4. Discussion**

The studies about safety of acupuncture are gradually increasing. One study protocol of a randomized controlled trial is efficacy and safety of acupuncture for chronic dizziness [92]. This trial’s aim is to get result that acupuncture has good efficacy and without adverse effect for chronic dizziness. We hope it is success.

Some studies that researched acupuncture as an alternative means for pediatric diseases found that it is safe, feasible, and acceptable [93–99]. One study explored acupuncture as an effective therapy of pain relief for children and adolescents after tonsillectomy [100]. Severe throat pain can result from
tonsillectomy and last up to 10 days in children. Codeine elixir has long been used for pain relief but has recently been banned by the Food and Drug Administration due to a recently recognized risk of death. This study suggested that acupuncture decreases perceived pain in children and adolescents after tonsillectomy. These data, combined with the cost effectiveness, safety, and ease of administering acupuncture, suggest that further studies exploring the effectiveness of acupuncture in juveniles after tonsillectomy are merited.

One research evaluated the feasibility of delivering acupuncture in an emergency department (ED) to patients presenting with pain and/or nausea [101]. The acupuncture

| Author/year (reference) | Cases | Age/sex | Disease treated | Punctured site | Complication | Practitioner | Follow-up |
|-------------------------|-------|---------|-----------------|----------------|--------------|--------------|-----------|
| Yang, 1986 [6]          | 1     | 28/F    | Chronic conjunctivitis | BL1            | Eye hematoma     | Acupuncturist | Recovered (14 f) |
| Li, 1989 [67]           | 1     | 62/F    | Teratoma of ovary    | Hypogastrum    | Extrapitoneal hematoma Thyroid intracapsular hemorrhage with apnea | Roving doctor | Recovered after surgery |
| Cai, 1991 [68]          | 1     | 47/M    | Neck mass          | Neck           | Not specified    | Not specified | Recovered after surgery |
| Han, 1994 [69]          | 1     | 56/M    | Stroke             | RN23           | Sublingual hematoma Hematoma compression tracheal cause apnea | Roving doctor | Recovered (10 d) |
| Zeng and Liu, 1996 [71] | 1     | 50/M    | Cough              | ST9            | Unspecified           | Unauthorized acupuncturist | Dead |
| Wang, 1996 [70]         | 1     | 72/M    | Cerebral infarction| Ex-HN20        | Sublingual hematoma | Not specified | Recovered (2 d) |
| Gan, 2000 [66]          | 1     | 46/F    | Cold headache      | Ex-HN05        | Orbital hemorrhage | Not specified | Recovered (1 mo) |
| Jiang, 2001 [72]        | 1     | 68/M    | Hypertension, stroke| LI4            | Hand hematoma     | Acupuncturist | Recovered (7 d) |
| Duan, 2007 [73]         | 1     | 65/F    | Neck, waist, and leg pain | Hip            | Buttock hematoma  | Not specified | Improved |
| H. Liu and X. H. Liu, 2007 [74] | 1 | 61/M | Cerebral thrombosis | SP6            | Lower extremity hematoma | Acupuncturist | Recovered (1 d) |

| Author/year (reference) | Cases | Age/sex | Disease treated | Punctured site | Complication | Practitioner | Follow-up |
|-------------------------|-------|---------|-----------------|----------------|--------------|--------------|-----------|
| Yang, 1986 [6]          | 1     | 45/M    | Flaccid paralysis | ST36, LI11     | Bent needle Hemopneumothorax caused by broken needle | Acupuncturist | Recovered |
| Lu and Teng, 1994 [75]  | 1     | 39/M    | Scapulohumeral periarthritis | Supraclavicular fossa | Not specified | Country doctor | Recovered after surgery |
| Wang, 2000 [80]         | 1     | 54/M    | The left upper limb dysfunction | Upperlimb       | Sticking of needle | Not specified | Recovered |
| Geng, 2005 [76]         | 1     | 58/M    | Chronic bronchitis and emphysema | LU1            | Damage of arteria coronaria and cardiac tamponade caused by embedded needle Palpitation and paroxysmal pricking pain caused by broken needle | Self | Recovered after surgery |
| Quan, 2008 [77]         | 1     | 43/F    | Gastric disease  | Xiphoid        | Not specified | Not specified | Recovered after surgery |
| Liu and Yu, 2010 [78]   | 1     | 45/F    | Multiple injuries by traffic | RN23           | Pulmonary bulla caused by embedded needle | Not specified | Recovered after surgery |
| Cheng, 2010 [79]        | 1     | 55/M    | Lumbago          | Lower limb     | Broken needle  | Not specified | Recovered after surgery |
Table 10: Other complications associated with acupuncture.

| Author/year (reference) | Cases | Age/sex | Disease treated | Acupoint | Complication | Practitioner | Follow-up |
|-------------------------|-------|---------|----------------|----------|--------------|--------------|-----------|
| Wang and Lan, 1980 [81] | 2     | 46/F    | Intercostal neuralgia | PC6      | Aphonia      | Not specified | Recovered (3 d) |
|                         | 36/F  |         | Obstinate hiccup  |          |              |              |           |
| Zhou et al., 2005 [82]  | 1     | 43/F    | Neck pain         | Ex-B05   | Hoarseness   | Acupuncturist | Recovered (10 min) |
| Peng, 1982 [83]         | 1     | 54/not specified | Scapulohumeral periarthrits | Ex-UE01, GB21, LI11, SJ5 | Allergy to electroacupuncture | Acupuncturist | Recovered (10 min) |
| Gao and Zheng, 2008 [84]| 2     | 72/M    | Nerve root cervical spondylopathy | EX-B2 | Allergy to metal | Not specified | Recovered (1 wk) |
|                         | 49/F  |         | Cervical spondylopathy | EX-B2 |              |              |           |
| Wang, 2004 [85]         | 1     | 35/M    | Soft tissue injury | Ashi point | Epilepsy | Acupuncturist | Recovered |
| Dai, 2012 [86]          | 2     | 45/M    | Epilepsy          | Not specified | Epilepsy | Acupuncturist | Recovered (2 min) |
|                         | 53/M  |         | Cervical spondylosis |          |              |              | Recovered (1 min) |
| Li, 2000 [87]           | 1     | 52/M    | Cerebral concussion | DU20, GB20, GB30, GB39, LI14, LI11, ST36 | Fever | Acupuncturist | Recovered |
|                         | 65/F  |         | Facial neuritis   | GB14, BL2, ST2, SI18, RN24, LI14, ST36, LR3 | Cough | Acupuncturist | Recovered (2 min) |
| Shang, 2006 [88]        | 2     | 46/F    | Obesity           | Not specified | Thirsty | Acupuncturist | Recovered |
|                         |       |         |                  |          |              |              |           |
| Quan and Jiang, 2008 [89]| 1    | 45/F    | RA                | Local points | Infusion reaction | Acupuncturist | Recovered (2h) |
| Fang, 2010 [90]         | 1     | 35/F    | Cervical pain     | GB20, EX-B2 | Hyperventilation syndrome | Acupuncturist | Recovered (15 min) |
| Wang, 2010 [91]         | 1     | 46/F    | Nasopharyngeal carcinoma radiation sequela with fatigue | LI11, LI14, ST36, SP6, KI3, LU7, SI6, SJ3 | Aggravation of fatigue | Acupuncturist | Improved |

Group comprised 200 patients who received usual medical care and acupuncture; the usual care group comprised 200 patients with retrospective data closely matched from ED electronic health records. The results confirmed that acupuncture in the ED appears safe and acceptable for patients with pain and/or nausea. Further high-quality, sufficiently powered randomized studies evaluating the cost-effectiveness and efficacy of the add-on effect of acupuncture are recommended.

Some reports confirmed that acupuncture for pregnant women is safe and effective [102–109]. For example, one reported a complete recovery from Bell’s palsy (BP) of a 27-year-old woman, 27-week pregnant, after 2 weeks of acupuncture treatment. Prior to treatment, her House-Brackmann facial nerve grading system (HBS) was II, Nottingham facial nerve grading system was 50.88%, and the Facial Disability Indexes (FDI) were 90. After 2 weeks, her symptoms had disappeared, her face was restored to normal, HBS was I, Nottingham was 96.46%, and FDI was 100. These results suggest that acupuncture may be a safe, alternative treatment for BP in pregnancy [110]. Another study described patients' experience of acupuncture treatment in low back and pelvic pain during pregnancy. Women received acupuncture treatment from gestational week 20 or week 26, for a period of 6 weeks divided into eight sessions of 30 minutes each. The results of Pain-O-Meter and visual analogue scale (POM-VAS), Short-Form McGill Questionnaire (SF-MPQ), and Short-form-36 health survey (SF-36) showed a relief of pain. Telephone interviews confirmed that expectations of treatment were fulfilled. The authors suggested that it may be advantageous
to begin acupuncture therapy later in pregnancy to maximize pain relief [31].

However, complications and adverse effects in medical practice always concern the public and the medical profession. Acupuncture has been used for several thousand years in China. Although it has been deemed a safe and reliable therapy, the rare adverse effects and complications should arouse concerns. During the 33 years from 1980 to 2013, about 182 cases of acupuncture-associated complications and adverse effects were reported in China, including 25 fatal cases. The frequency of acupuncture associated complications reported in China appears to be steady over time (see Figure 2).

As indicated in Table 1, the most frequent complication of acupuncture treatment is internal organ, tissue, or nerve injury. Of the 115 reported cases involving internal organ, tissue, or nerve injury, 30 (26.08%) were pneumothorax, 37 concerned the central nervous system (32.17%), others included injury in peripheral nerve, organ, and other tissues. Based on our research, one major cause of direct thrusted injuries to organ, tissue, or nerve is the lack of knowledge about anatomy and other systems. In 1980s, the acupuncturists or individuals in many country grassroot regions performed acupuncture because of low cost and convenience, but the deficient knowledge on anatomy led to many cases of pneumothorax and subarachnoid hemorrhage, as well as injuries to abdomen organs, heart, and peripheral nerves. With the increasing requirement for acupuncturists, these accidents decreased from the 1990s. Particularly, the frequency of pneumothorax and central nervous system injury appears to be on the decline since the 2000s (see Figure 3). This may be because the government has demanded that the acupuncturists should have licenses and formal education background if they practice in clinic in recent years. They should also undergo short time training every year. All these make the acupuncture technique become more and more standardized so that the accidents of pneumothorax and central nervous system injury are reduced. However, there is a possibility that we lack the accident reporting system so that the incidences were underreported.

We put forward suggestions for the medical system in order to avoid more accidental injury on organ, such as enhancing training on anatomy for acupuncturists; setting up more continuation courses on the safety of acupuncture practice for acupuncturists; establishing a reporting system on the incidents of acupuncture adverse effect; and safety courses and certificates should be required in order to obtain the license of acupuncture in China.

The acupuncturists (1) should avoid important organs and tissues during selection of acupoints and reposition if the patient changes body position; (2) do not distract attention during treatment and do not move the patient after acupuncture so as to avoid accidents; for unconscious patients unable to cooperate, shallow needling or not retaining needle is preferred, and the process of treatment should be strictly monitored; (3) inquire detailed medical history and carefully determine the needling depth for patients with emphysema or hemorrhagic disease. Moreover, traditional medicine holds that acupuncture should be performed to bring about the desired sensations of "sour, numb, heavy, and swelling." Many acupuncturists and patients think that a stronger sensation of needling will bring about better therapeutic effects, but excessively violent operation will also cause accidents. The 2 cases of irritable stomach bleeding due to excessive irritation [35, 36] and the 1 case of femoral neck fracture due to myospasm [45] are typical examples and should alert clinicians. In case of suspected acupuncture-induced injury, the doctor should prolong the time of observation and warn for prompt treatment.

Syncope is also a common acupuncture-induced accident. The hungry, thirsty, drunken, or nervous patients should be asked to eat, drink, or rest for half an hour before treatment and calm down. They should be observed for a moment during and after treatment to avoid syncope. Once syncope occurs, needles should be pulled out immediately, sugar water should be provided, and the patient should lie down with head low; if the symptom becomes severe, take appropriate treatment. Two patients had severe adverse reaction like shock, with the clinical manifestation, including loss of consciousness, respiratory arrest, and carotid pulselessness. After doing CPR, both of them recovered [54, 55]. Reviewing medical history, one was found to have the similar experience several years ago [55]. Therefore, acupuncturists
are required to inquire patients’ medical history carefully and learn to deal with emergencies.

Acupuncture infection usually occurs in rural grassroots health centers with low awareness of hygiene, but accidents will be largely controlled along with the use of disposable needles and the popularization of health knowledge. Moreover, tetanus is still an adverse event that should be strictly prevented, and once it occurs, it will cause a high mortality rate. Along with the increasing incidence of diabetes, for patients with poorly controlled blood glucose [112], careful operation is required to avoid infection due to disunion of acupuncture-caused wounds.

The acupuncture-induced bleeding and hematoma are unavoidable; thus to reduce their incidence rates, acupuncturists should (1) get familiar with the anatomy of acupoints and avoid blood vessels during needle manipulation; (2) avoid manipulation methods such as lifting and thrusting when acupuncturing intraorbital acupoints; (3) appropriately extend the time of compression for patients with hypertension, arteriosclerosis, or inclination to hemorrhage and for women during the menstrual period. The acupuncture-induced hematoma is usually cold compressed within 24 hours and hot compressed after 24 hours. H. Liu and X. H. Liu [74] suggested pressing the local hematoma site heavily for a long time, which could immediately disperse the swelling, without leaving bruises. This method is recommended for other acupuncturists.

With a long history in China, acupuncture has been widely accepted and applied in people’s daily life due to its exceptional therapeutic effects and low side effects. As early as 1980, WHO unveiled 43 kinds of diseases that can be treated with acupuncture. The number had increased to 107 in 2002 [113], from which we can see that acupuncture has been recognized by an increasing number of people and more research in this field is being undertaken. In countries where acupuncture is widely used, it is inevitable to encounter the occurrence of some side reactions in acupuncture therapies. However, the accident rate in acupuncture is relatively low. Although existing reports in China show no statistical data about acupuncture accidents, some studies conducted in large subject pools in Germany reveal some relevant information. It has been reported that Endres et al. [114] conducted a study about accidents in acupuncture therapies on 190,924 patients. The study showed an occurrence of 14,449 acupuncture accidents, which accounted for 7.57% of the total subject pool. According to statistics conducted by Witt et al. [115] on 229,230 clinical acupuncture cases, there were 19,726 accidents, which occupied 8.6% of the total subject pool. Chinese literatures show that most of the acupuncture accidents are caused by acupuncturist’s lack of corresponding techniques and nonstandard operations. Since 2005, the Chinese National Administration of Quality Supervision, Inspection and Quarantine and the Chinese National Standardization Management Committee have issued a total of 18 acupuncture technical operation specifications in two batches, including terms and definitions, operating procedures and requirements, operating methods, attentions, and contraindications. Among them, operating procedures and requirements specifically include the selection of needles, acupuncture points and acupuncture positions, environmental requirements, the disinfection of needles, selected acupuncture points and acupuncturist’s hands, specific operation techniques, and after-treatments of wounds [116]. The acupuncture technical operation specification series covers a wide area and contains comprehensive and specific contents, but it still shows some deficiency in the popularization and implementation of acupuncture.

In conclusion, we recommend that the qualifying training of acupuncturists should be systemized and the clinical acupuncture operations be standardized in order to effectively prevent the occurrence of acupuncture accidents, enhance the influence of acupuncture, and further popularize acupuncture to the rest of the world. All this would mean a huge step towards modernization of acupuncture.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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