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Review Article

Acupuncture for Spasticity after Stroke: A Systematic Review and Meta-Analysis of Randomized Controlled Trials

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The aim of this systematic review was to determine how effective acupuncture or electroacupuncture (acupuncture with electrical stimulation) is in treating poststroke patients with spasticity. We searched publications in Medline, EMBASE, and the Cochrane Library in English, 19 accredited journals in Korean, and the China Integrated Knowledge Resources Database in Chinese through to July 30, 2013. We included randomized controlled trials (RCTs) with no language restrictions that compared the effects of acupuncture or electroacupuncture with usual care or placebo acupuncture. The two investigators assessed the risk of bias and statistical analyses were performed. Three RCTs in English, 1 in Korean, and 1 in Chinese were included. Assessments were performed primarily with the Modified Ashworth Scale (MAS). Meta-analysis showed that acupuncture or electroacupuncture significantly decreased spasticity after stroke. A subgroup analysis showed that acupuncture significantly decreased wrist, knee, and elbow spasticity in poststroke patients. Heterogeneity could be explained by the differences in control, acupoints, and the duration after stroke occurrence. In conclusion, acupuncture could be effective in decreasing spasticity after stroke, but long-term studies are needed to determine the longevity of treatment effects.

1. Introduction

Stroke is a disease that causes high rates of mortality and after-effects worldwide [1]. Spasticity is the most common poststroke complication [2], appearing in 20–40 percent of stroke survivors [3]. This not only restricts motor function [4] but also leads to deterioration in the quality of life for stroke patients [5].

Rehabilitation therapy for spasticity after stroke includes potentiating medication, neuromuscular electrical stimulation after botulinum toxin injections, restoring biomechanics through orthotics, stretching, functional electrical stimulation and treadmill exercises, and physical modalities, such as ultrasound, vibration, and thermotherapy, which should be adopted together and performed simultaneously to promote the improvement of motor function [5, 6]. However, more than half of stroke survivors with spasticity experience moderate to severe disabilities in spite of the conventional treatments [7].

The long-term management of spasticity is a financial burden to patients and their careers and also increases societal costs [1]. One study showed that the direct cost for 12-month stroke survivors with spasticity was Purchasing Power Parities US dollars (PPP$) 84,195, which is 385% higher than the PPP$ 21,842 for patients without spasticity [8].

These limitations have prompted researchers to look for new treatments to replace conventional treatments for post-stroke spasticity and to consider the utility of acupuncture or electroacupuncture therapy.

Acupuncture therapy has been used to treat stroke patients for many years in Asian countries [1, 9] and also recently in the West [10]. Acupuncture stimulation sends

signals to the central nerve system to release opioid peptides, resulting in an increase in the threshold of pain receptors [9, 11]. By controlling pain, acupuncture therapy helps muscles to relax and move more passively, resulting in an increase in rehabilitation [12].

A few recent systematic reviews have examined the effectiveness of acupuncture for poststroke rehabilitation [1, 13–17]. However, none have focused on spasticity after stroke. In an attempt to fill this gap, the current systematic review assesses how effective acupuncture or electroacupuncture is in treating poststroke patients with spasticity.

2. Methods

2.1. Identification of Eligible Trials. The search was performed without restriction with respect to language or year of publication. We searched Medline, EMBASE, and the Cochrane Central Register of Controlled Trials from database start through to July 30, 2013, combining medical subject headings and keyword terms for stroke, acupuncture, and muscle spasticity outcomes (Appendix A). For Korean publications, we manually searched 19 traditional medicine journals, which were accredited or chosen as candidates for accreditation by the National Research Foundation of Korea (http://www.nrf.re.kr) for relevant articles (Appendix B). The China Integrated Knowledge Resources Database (http://www.cnki.net) was also included to search related articles in Chinese. A hand search of relevant references from previous systematic reviews was conducted. Finally, we also searched an international database (https://www.clinicaltrials.gov/) for trial registrations to identify ongoing or recently completed trials.

2.2. Inclusion/Exclusion Criteria. Relevant clinical trials were manually selected based on the following criteria: (1) patients were diagnosed with stroke, (2) acupuncture was compared to placebo or other conventional therapy, and (3) the study was a randomized controlled trial (RCT). RCTs were included if acupuncture was used at acupoints as the sole treatment or as an adjunct to other treatments for spasticity after stroke.

Trials were excluded if study designs were not suitable to evaluate the effectiveness of acupuncture for spasticity after stroke, that is, any studies that (1) compared different types of acupuncture, (2) adopted complex treatment without specifying the sole effects of acupuncture, or (3) reported insufficient information.

2.3. Data Extraction. Two investigators (Sungmin Lim and Junghee Yoo) extracted data from each paper independently using a standardized data extraction form and reached consensus on all items. The extracted data included authors, published year, study design, patient characteristics, interventions, and main outcomes. We extracted the outcomes of pain, function, and symptom severity for all time points reported. When a given study reported more than one pain, function, or symptom severity measure, we gave preference primarily with Modified Ashworth Scale (MAS).

2.4. Assessment of Risk of Bias (ROB). The two reviewers (Sungmin Lim and Junghee Yoo) independently assessed the methodological quality and the risk of bias of the included studies by means of the risk of bias tool in the Cochrane Handbook for Systematic Reviews of Interventions (version 5.0.2). This instrument consists of 6 domains and 8 items: random sequence generation; allocation concealment; blinding of participants, personnel, and outcomes; incomplete outcome data; selective outcome reporting; and the other source of bias which uses the following three categories (high risk, low risk, and unclear) to rank the evidence from research studies but is also appropriate for evaluating the methodological quality of RCTs. Disagreements between the reviewers were resolved by discussion and the input of a third reviewer (Euiju Lee). Publication bias was not a factor in the trials due to the limited number of studies.

2.5. Statistical Analysis. All statistical analyses were performed with the Reviewer Manager Software, version 5.0 (Cochrane Collaboration, Oxford, UK). As all outcomes were continuous variables, the mean difference with accompanying 95% confidence intervals was calculated. We assessed the clinical and methodological heterogeneities of the enrolled studies, according to which subgroup analysis was performed. The statistical heterogeneity in the subgroups was analyzed using the chi-square test (the significance level was $P < 0.1$). Statistical heterogeneity was considered to be significant when $I^2 > 50\%$. Even when a low heterogeneity was detected, a random-effects model was applied, because the validity of tests of heterogeneity can be limited with a small number of component studies.

3. Results

3.1. General Characteristics of the Studies. We identified 187 publications, of which 5 RCTs were finally included by the eligibility criteria (Figure 1). The excluded studies are listed in Appendix C. The articles included in the analysis are summarized in Table 1. The 5 articles were published from 2003 to 2012. Two of them originated from Korea [18, 19], 2 were from China [20, 21], and the other was from Germany [22]. The language of publication varied from English [19, 20, 22] to Chinese [21] or Korean [18].

Fink et al. [22] and Zhao et al. [20] studied the effectiveness of acupuncture on spasticity after stroke. The former study performed verum needle treatment on acupoints in the acupuncture group, which was compared with placebo needle treatment on nonacupoints in the control group. The latter study gave acupuncture therapy and standard therapy to the intervention group; the outcome was compared with that of a standard therapy group. Moon et al. [19], Lee et al. [23], and Zong [21] used electroacupuncture for participants with poststroke spasticity. In all of these studies, an electroacupuncture group with standard therapy was compared with a control group receiving only standard therapy.

The primary assessment tool for the 5 studies was the modified Ashworth scale (MAS). Four of the studies reported

Table 1: Summary of randomized controlled trials of acupuncture for spasticity after stroke.

Author (year) country	Sample size (analyzed)	Intervention group				Control group			Main outcomes (regions evaluated for MAS)
		N (analyzed)	Duration after stroke	Treatment	Regimen	*N* (analyzed)	Duration after stroke (mo/d)	Regimen	
Moon et al. (2003) [19] Korea	35 (35)	15 (15)	3.7 ± 3.7 mo	EA	8 sessions (EA, plus ST)	(A) 10 (10) (B) 10 (10)	(A) 2.7 ± 1.4 (B) 2.5 ± 1.8 mo	(A) ST (routine AT, exercises) (B) moxibustion, plus standard therapy	MAS (elbow)
Fink et al. (2004) [22] Germany	25 (25)	13 (13)	66.5 ± 50.2 mo	AT	8 sessions (AT)	12 (12)	64.2 ± 48.3 mo	Placebo AT	MAS (ankle) VAS, CGI, 2MWT, RMA, RMI, step length, cadence, mode of initial foot contact, goniometry, QOL measures
Lee et al. (2007) [23] Korea	20 (18)	10 (10)	NR	EA	10 sessions (EA, plus ST)	10 (8)	NR	ST (oral medication)	MAS (wrist) H/M ratio, FMA
Zhao et al. (2009) [20] China	131 (120)	67 (60)	16.34 ± 6.09 mo	AT	30 sessions (AT: surface projection zone of decussation of pyramid, standard therapy)	64 (60)	16.76 ± 6.89 mo	ST (oral medication, routine AT)	MAS (wrist, elbow, knee, ankle) FMA, BI, EMG
Zong (2012) [21] China	80 (80)	40 (40)	24.5 ± 5.88 days	EA	30 sessions (EA, plus ST)	40 (40)	23.6 ± 7.08 days	ST (oral medication, rehabilitation)	MAS (NR) FMA, MBI

EA: electroacupuncture, ST: standard therapy, MAS: Modified Ashworth Scale, AT: acupuncture therapy, VAS: visual analog scale, CGI: clinical global impressions, 2MWT: 2-minute walk test, RMA: Rivermead motor assessment, RMI: Rivermead mobility index, QOL: quality of life, NR: not reported, FMA: Fugi-Meyer motor function, BI: Barthel index, EMG: electromyography, and MBI: modified Barthel index.

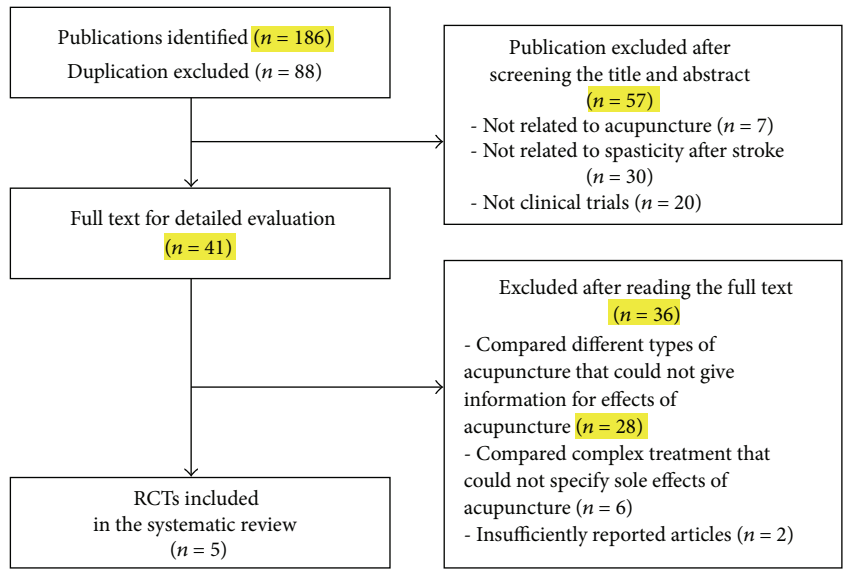

Figure 1: Flow chart of the trial selection process.

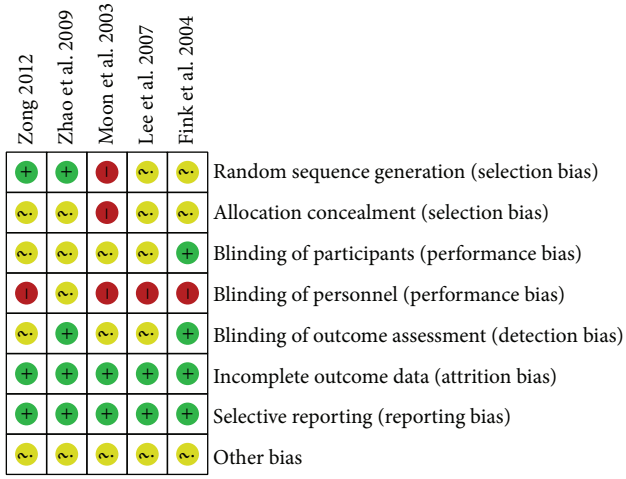

Figure 2: Assessment of risk of bias with selected studies.

that acupuncture or electroacupuncture significantly reduced the spasticity after stroke.

3.2. Assessment of Risk of Bias (ROB). The results of ROB were shown in Figure 2. Two RCTs [20, 21] had a low ROB with regard to adequate sequence generation; two [22, 23] had an unclear ROB; and one had a high ROB [19]. With regard to allocation concealment, four RCTs [20, 21] had an unclear ROB and one had a high ROB [19]. With regard to participant blinding, four RCTs [19–21, 23] had an unclear ROB and one had a low ROB [22]. With regard to personnel blinding, four RCTs [19, 21–23] had an unclear ROB and one had an unclear ROB [20]. With regard to assessor blinding, three RCTs [23, 24] had an unclear ROB [19, 21, 23] and two had a low ROB [20, 22]. All six RCTs had a low ROB in incomplete outcome data and selective outcome reporting. All six RCTs had an unclear ROB in other sources of bias.

3.3. Meta-Analysis of the Results. The pooled meta-analysis of the data showed a weighted mean difference of 0.72 and 95% confidence intervals of 0.29 to 1.14 on the MAS, indicating that acupuncture or electroacupuncture had a significant effect on decreasing poststroke spasticity ($P < 0.001$, $n = 268$; Figure 3).

In the subgroup analysis examining the types of acupuncture, electroacupuncture therapy significantly decreased spasticity after stroke (weighted mean difference of 0.76, 95% CI [0.25, 1.27], $P = 0.004$, $n = 123$), while acupuncture therapy showed slightly, but not significantly, decreased spasticity (weighted mean difference of 0.58, 95% CI [−0.69, 1.85], $P = 0.37$, $n = 145$; Figure 3).

The subgroup analysis based on the regions of spasticity revealed that acupuncture or electroacupuncture significantly reduced spasticity of wrists (weighted mean difference of 0.68, 95% CI [0.03, 1.33], $P = 0.04$, $n = 138$), knees (weighted mean difference of 0.70, 95% CI [0.51, 0.89], $P < 0.001$, $n = 120$), or elbows (weighted mean difference of 0.74, 95% CI [0.55, 0.94], $P < 0.001$, $n = 145$). There was some alleviation of spasticity of ankle region, but this was not statistically significant (weighted mean difference of 0.58, 95% CI [−0.69, 1.85], $P = 0.37$, $n = 145$; Figure 4).

4. Discussion

Our findings indicated that acupuncture or electroacupuncture therapy is effective in reducing the spasticity after stroke. Although the subgroup analyses indicated a nonsignificant effect of acupuncture on spasticity after stroke, this is partly an effect of the Fink et al.'s [22] study design. In this study, the control group did not receive any standard therapies, such as rehabilitation therapy, unlike the control groups from other studies using acupuncture interventions. If the data from Fink et al. [22] is excluded, the overall effect is 0.72 (weighted mean difference), which is a considerable elevation of grades on the MAS.

Study or subgroup	Experiment Mean	SD	Total	Control Mean	SD	Total	Weight	Mean difference IV, random, 95% CI	Year
1.1.1 MAS (AT)									
Fink et al. 2004	−0.3	0.85	13	−0.2	0.63	12	16.5%	−0.10 [−0.68, 0.48]	2004
Zhao et al. 2009	1.35	0.58	60	0.15	0.51	60	22.8%	1.20 [1.00, 1.40]	2009
Subtotal (95% CI)			**73**			**72**	**39.4%**	**0.58 [−0.69, 1.85]**	
Heterogeneity: $\tau^2 = 0.80$; $\chi^2 = 17.14$, df = 1 ($P < 0.0001$); $I^2 = 94\%$									
Test for overall effect: $Z = 0.89$ ($P = 0.37$)									
1.1.2 MAS (EA)									
Moon et al. 2003	1.2	0.8	15	0.3	0.63	10	16.9%	0.90 [0.34, 1.46]	2003
Lee et al. 2007	0.55	0.26	10	0.21	0.36	8	21.5%	0.34 [0.04, 0.64]	2007
Zong 2012	1.97	0.53	40	0.91	0.58	40	22.3%	1.06 [0.82, 1.30]	2012
Subtotal (95% CI)			**65**			**58**	**60.6%**	**0.76 [0.25, 1.27]**	
Heterogeneity: $\tau^2 = 0.17$; $\chi^2 = 13.69$, df = 2 ($P = 0.001$); $I^2 = 85\%$									
Test for overall effect: $Z = 2.90$ ($P = 0.004$)									
Total (95% CI)			**138**			**130**	**100.0%**	**0.72 [0.29, 1.14]**	
Heterogeneity: $\tau^2 = 0.20$; $\chi^2 = 35.55$, df = 4 ($P < 0.00001$); $I^2 = 89\%$									
Test for overall effect: $Z = 3.32$ ($P = 0.0009$)									
Test for subgroup differences: $\chi^2 = 0.07$, df = 1 ($P = 0.80$); $I^2 = 0\%$									

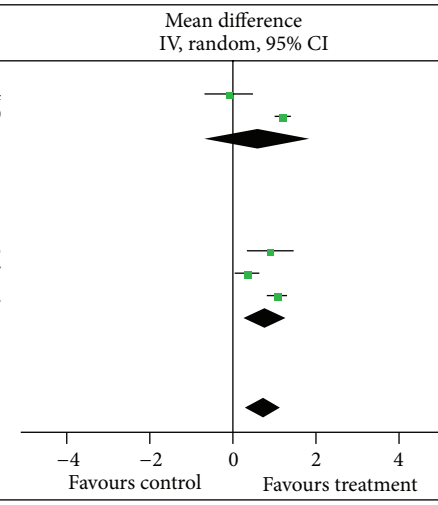

Figure 3: Meta-analysis of acupuncture for spasticity after stroke.

Study or subgroup	Experiment Mean	SD	Total	Control Mean	SD	Total	Weight	Mean difference IV, random, 95% CI	Year
1.2.1 MAS (wrist)									
Lee et al. 2007	0.55	0.26	10	0.21	0.36	8	48.7%	0.34 [0.04, 0.64]	2007
Zhao et al. 2009	1.27	0.69	60	0.27	0.48	60	51.3%	1.00 [0.79, 1.21]	2009
Subtotal (95% CI)			**70**			**68**	**100.0%**	**0.68[0.03, 1.33]**	
Heterogeneity: $\tau^2 = 0.20$; $\chi^2 = 12.54$, df = 1 ($P = 0.0004$); $I^2 = 92\%$									
Test for overall effect: $Z = 2.06$ ($P = 0.04$)									
1.2.2 MAS (elbow)									
Moon et al. 2003	1.2	0.8	15	0.3	0.63	10	12.0%	0.90 [0.34, 1.46]	2003
Zhao et al. 2009	1.4	0.59	60	0.68	0.57	60	88.0%	0.72 [0.51, 0.93]	2009
Subtotal (95% CI)			**75**			**70**	**100.0%**	**0.74 [0.55, 0.94]**	
Heterogeneity: $\tau^2 = 0.00$; $\chi^2 = 0.35$, df = 1 ($P = 0.56$); $I^2 = 0\%$									
Test for overall effect: $Z = 7.46$ ($P < 0.00001$)									
1.2.3 MAS (ankle)									
Fink et al. 2004	−0.3	0.85	13	−0.2	0.63	12	47.7%	−0.10 [−0.68, 0.48]	2004
Zhao et al. 2009	1.35	0.58	60	0.15	0.51	60	52.3%	1.20 [1.00, 1.40]	2009
Subtotal (95% CI)			**73**			**72**	**100.0%**	**0.58 [−0.69, 1.85]**	
Heterogeneity: $\tau^2 = 0.80$; $\chi^2 = 17.14$, df = 1 ($P < 0.0001$); $I^2 = 94\%$									
Test for overall effect: $Z = 0.89$ ($P = 0.37$)									
1.2.4 MAS (knee)									
Zhao et al. 2009	1.15	0.55	60	0.45	0.5	60	100.0%	0.70 [0.51, 0.89]	2009
Subtotal (95% CI)			**60**			**60**	**100.0%**	**0.70 [0.51, 0.89]**	
Heterogeneity: not applicable									
Test for overall effect: $Z = 7.29$ ($P < 0.00001$)									
Test for subgroup differences: $\chi^2 = 0.15$, df = 3 ($P = 0.99$); $I^2 = 0\%$									

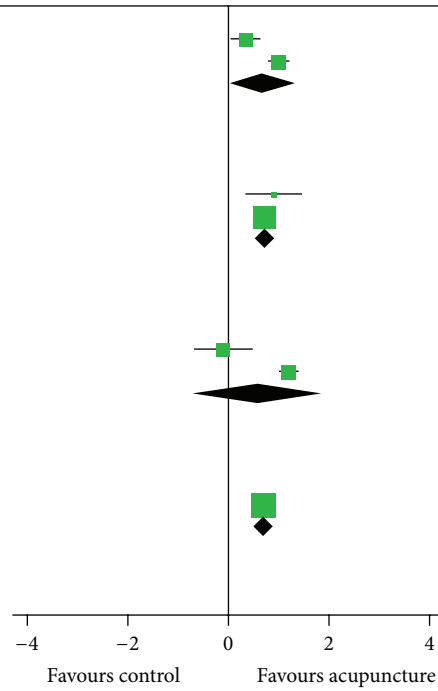

Figure 4: Meta-analysis of acupuncture for spasticity after stroke according to region.

The difference between the mean value of 1.2 in Moon et al. [19] and the mean value of 0.55 in Lee et al. [23] results from the difference between the treatment groups of the two studies. Moon et al. [19] used electroacupuncture with routine acupuncture therapy, while Lee et al. [23] strictly excluded other standard therapies for the intervention group, demonstrating a more precise effect of acupuncture on poststroke spasticity.

Acupuncture or electroacupuncture is more effective in alleviating the spasticity of wrist, knee, and elbow after stroke. In this subgroup analysis, we were not able to estimate the effect on all of the regions, because only Zhao et al. [20] presented the MAS evaluation results of wrist, knee, elbow, and ankle. Since other studies measured only one region of spasticity, the total sum of data could be the cumulative effect on the different regions.

Caution should be exercised in including data from Fink et al. [22] in the overall synthesis and interpretation, for the following reasons: Firstly, the study has a different control group than the control groups in other studies. That is,

other studies compared the standard therapy group with the acupuncture group; in contrast, Fink et al. [22] used placebo therapy (blunt needles on nonacupoints) compared with acupuncture therapy. Secondly, Fink et al. [22] acupunctured all over the body, including spasticity regions, unlike the other studies that used affected parts as the only regions for acupuncture. Thirdly, duration after stroke for participants included in the Fink et al. [22] study differs from that in the other studies. The duration after stroke onset was 1 to 17 months in most studies, while in Fink et al. [22] the patients were 65 months on average poststroke. It is very unlikely that patients whose stroke occurred 5 years ago would experience any alleviation of spasticity by the acupuncture treatments, because the after-effects of a stroke usually persist for 24 months. In other words, the timing of treatment is very important for spasticity after stroke. We could infer that acupuncture might be more effective in acute or semiacute stages of stroke than in the chronic stage. However, the small sample size prevents us from generalizing from this data.

In interpreting the results of this systematic review, there are several strengths to consider. Firstly, because acupuncture or electroacupuncture is effective for patients within 2 years after stroke onset, it should be adopted for the initial treatment of poststroke spasticity. Secondly, acupuncture therapy can promote the effectiveness of meaningful standard therapies to reduce spasticity. Thirdly, we aimed to identify all studies on the topic. The distorting effects of publication bias and location bias on systematic reviews are well documented [24–26]. In the present review, there were no restrictions on the review publication language, and a large number of different databases were searched. We are therefore confident that our search strategy located all relevant data on the subject.

However, certain limitations need to be considered as well. Above all, the number of RCTs included was small. This is because we restricted the inclusion criteria to the specific condition of spasticity after stroke and excluded publications studying the response within 24 hours after acupuncture therapy. Moreover, many of the reviewed studies were of low quality and had methodological shortcomings, such as an inadequate level of blinding. Although blinding of the therapists who applies acupuncture would be difficult, blinding of patients and other care providers, as well as outcome assessors, should be attempted to minimize the performance and assessment bias of trials. Lastly, there was no consistency in the regions of spasticity among studies. Only Zhao et al. [20] measured four regions of wrist, knee, elbow, and ankle, compared with the other studies, which treated only one of the regions.

Future trials should adhere to rigorous trial designs that are suitable for the research questions being addressed. To improve the trial design quality, level of performance, and the degree of reporting of clinical acupuncture trials, future researchers should follow not only the basic guidelines for reporting clinical trials such as the CONSORT statement [27], but also the STRICTA recommendations, which provide specific guidelines for the reporting of acupuncture trials [28]. Long-term studies are also needed to determine the longevity of treatment effects. Moreover, a cost analysis should also be considered.

5. Conclusions

Acupuncture or electroacupuncture could be effective in decreasing the spasticity after stroke, but long-term studies are needed to determine the longevity of treatment effects.

Appendices

A. The Search Strings of Medline, EMBASE, and Cochrane Library

Medline

(1) "Cerebrovascular Disorders"[tiab] OR "Brain Ischemia"[tiab] OR "Cerebral Hemorrhage"[tiab] OR "Stroke"[tiab] "Cerebrovascular"[tiab] OR "Cerebrovascular Disorder"[tiab] OR "cva"[tiab] 11511

(2) ((("Cerebrovascular Disorders"[Mesh:NoExp]) OR "Brain Ischemia"[Mesh:NoExp]) OR "Cerebral Hemorrhage"[Mesh]) OR "Stroke"[Mesh] 157920

(3) 1 or 2 161875

(4) "acupuncture"[tiab] OR "electroacupuncture"[tiab] OR "electro-acupuncture"[tiab] 15154

(5) (("Acupuncture"[Mesh]) OR "Acupuncture Therapy" [Mesh:NoExp]) OR "Electroacupuncture"[Mesh] 13999

(6) 4 or 5 17948

(7) 3 and 6 562

(8) 7/hsss 265

(9) "Muscle Spasticity"[tiab] OR "Spasm"[tiab] OR "Muscle Hypertonia"[tiab] OR "Spasticity"[tiab] OR "Muscle tightness"[tiab] OR "Muscle stiffness"[tiab] OR "Muscle pull"[tiab] 25331

(10) "Muscle Hypertonia"[Mesh]8687

(11) 9 or 10 25331

(12) 11 and 8 21.

Embase

(1) 'brain hemorrhage'/exp OR 'brain infarction'/exp OR 'brain ischemia'/exp OR 'cerebrovascular accident'/exp 323266

(2) 'Cerebrovascular Disorders':ab,ti OR 'Brain Ischemia':ab,ti OR 'Cerebral Hemorrhage':ab,ti OR 'Stroke':ab,ti 'Cerebrovascular':ab,ti OR 'Cerebrovascular Disorder':ab,ti OR 'cva':ab,ti 16523

(3) 1 or 2 327481

(4) 'acupuncture'/de OR 'electroacupuncture'/exp 29411

(5) 'acupuncture':ab,ti OR 'electroacupuncture':ab,ti OR 'electro-acupuncture':ab,ti 21298

(6) 4 or 5 31248

(7) 3 and 6 1215

(8) 'clinical trial'/exp OR 'randomized controlled trial':it OR 'controlled clinical trial':it OR randomized:ab,ti OR placebo:ab,ti OR randomly:ab,ti OR trial:ab,ti OR groups:ab,ti NOT ('animals'/exp NOT 'humans'/exp) 2399837

(9) 7 AND 8 499

(10) 'muscle hypertonia'/de OR 'muscle rigidity'/exp OR 'spasticity'/exp 24583

(11) 'Muscle Spasticity':ab,ti OR 'Spasm':ab,ti OR 'Muscle Hypertonia':ab,ti OR 'Spasticity':ab,ti OR 'Muscle tightness':ab,ti OR 'Muscle stiffness':ab,ti OR 'Muscle pull':ab,ti 26387

(12) 10 or 11 42831

(13) 12 and 9 38.

Cochrane

(1) "Cerebrovascular Disorders" OR "Brain Ischemia" OR "Cerebral Hemorrhage" OR "Stroke" "Cerebrovascular" OR "Cerebrovascular Disorder" OR "cva":ti,ab,kw (Word variations have been searched) 3878

(2) MeSH descriptor: [Cerebrovascular Disorders] this term only 1365

(3) MeSH descriptor: [Brain Ischemia] this term only 922

(4) MeSH descriptor: [Cerebral Hemorrhage] explode all trees 619

(5) MeSH descriptor: [Stroke] explode all trees 4440

(6) 1–5/or 7503

(7) "acupuncture" OR "electroacupuncture" OR "electro-acupuncture":ti,ab,kw (Word variations have been searched) 6438

(8) MeSH descriptor: [Acupuncture] explode all trees 134

(9) MeSH descriptor: [Acupuncture Therapy] this term only 1785

(10) MeSH descriptor: [Electroacupuncture] explode all trees 416

(11) 7–10/or 6438

(12) 6 and 11 234

(13) "Muscle Spasticity" OR "Spasm" OR "Muscle Hypertonia" OR "Spasticity" OR "Muscle tightness" OR "Muscle stiffness" OR "Muscle pull":ti,ab,kw (Word variations have been searched) 2420

(14) MeSH descriptor: [Muscle Hypertonia] explode all trees 537

(15) 13 or 14 2471

(16) 15 and 12 16.

B. Korean Journals for Oriental Medicine Included the Following

Korean Journal of Acupuncture,

Korean Journal of Oriental Physiology & Pathology,

The Korea Journal of Herbology,

Journal of Pharmacopuncture,

Korean Journal for Oriental Preventive Medical Society,

Journal of Korean Acupuncture and Moxibustion Medicine Society (The Acupuncture),

The Journal of Korean Oriental Internal Medicine,

The Journal of Oriental Obstetrics & Gynecology,

The Journal of Pediatrics of Korean Medicine,

The Korean Society of Oriental Neuropsychiatry,

The Journal of Korean Oriental Ophthalmology & Otorhinolaryngology & Dermatology,

The Journal of Korean Medical Classics,

Journal of Korean Medicine,

Journal of Sasang Constitutional Medicine,

Journal of Oriental Rehabilitation Medicine,

Journal of Korean Medicine Research in Daejeon University,

The Journal of The Korea Institute of Oriental Medical Diagnostics,

The Korean Journal of Oriental Medical Prescription,

The Journal of Korean Medical History.

C. Excluded Studies (Author, Year, Title, Journal, Vol., Iss.)

C.1. Publication Excluded after Screening the Title and Abstract ($N = 57$)

(a) Not Related to Acupuncture ($N = 7$)

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Disclosure

Sung Min Lim and Junghee Yoo are first authors.

Conflict of Interests

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

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