Peer-reviewed version available at *Geriatrics* **2019**, *4*, 68; doi:10.3390/geriatrics4040068

An Overview of Systematic Reviews and Meta analyses on Acupuncture for Post-acute Stroke Dysphagia

Zi-Yu Tian[1, 2], Xing Liao[3 *], Ying Gao[2], Shi-Bing Liang[1, 4], Chong-Yang Zhang[2], De-Hao Xu[2], Jian-Ping Liu[1] and Nicola Robinson[1, 5 *]

1. Centre for Evidence Based Chinese Medicine, Beijing University of Chinese Medicine, Beijing, China
2. Dongzhimen Hospital, Beijing University of Chinese Medicine, Beijing, China
3. Center of Evidence Based Traditional Chinese Medicine, Institute of Basic Research In Clinical Medicine, China Academy of Chinese Medical Sciences, Beijing, China
4. Shanxi University of Chinese Medicine, Shanxi, China
5. School of Health and Social Care, London South Bank University, London, United Kingdom

* Corresponding authors: nicky.robinson@lsbu.ac.uk; okfrom2008@hotmail.com.

Abstract:

Background: Many randomized controlled trials (RCTs) and systematic reviews (SRs) on acupuncture treatment for post-acute stroke dysphagia have been published. Due to conflicting results an overview of SRs to summarize and assess the quality of this evidence to determine whether acupuncture is effective for this disease was conducted.

Methods: Seven databases were searched for SRs and/or Meta-analysis of RCTs and quasi-RCTs on acupuncture for post-acute stroke dysphagia. Two authors independently identified SRs and meta-analyses, collected data to assess the quality of included SRs and meta analyses according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and the revised Assessment of Multiple Systematic Reviews (AMSTAR 2).

Results: 31 SRs were identified. Quality of 22 SRs was critically low, 5 SRs were low, and 4 Cochrane SRs were moderate when evaluated by AMSTAR2. 17 SRs reported 85.2-96.3% items of PRISMA. Five SRs included explanatory RCTs, 16 SRs included pragmatic RCTs, and 10 SRs included both.

Conclusion: Currently evidence on the effectiveness of acupuncture on post-acute stroke dysphagia is low quality. Type of study appeared to have no direct influence on the result, but the primary outcome measures showed a relationship with the quality of SRs. High quality trials with large sample sizes should be the focus of future research.

Keywords: Acupuncture; dysphagia; post-acute stroke; overview; systematic reviews; meta-analyses; rehabilitation

PROSPERO REGISTRATION NUMBER: CRD42019134163

Peer-reviewed version available at Geriatrics 2019, 4, 68; doi:10.3390/geriatrics4040068

1. Introduction

Stroke is considered to be one of the leading causes of adult mortality and disability [1], and the lifetime risk of stroke occurs in approximately 25% of adults over 25 years old [2]. Dysphagia is a common complication that occurs in 37% to 78% of stroke survivors who experience various problems such as eating slowly, having difficulty swallowing when drinking water, and these issues are often accompanied with a speech disorder[3] (which can occur alone or after pseudobulbar paralysis). Additionally, pneumonia, chest infection or even death may occur as a result of dysphagia [3,4]. Due to the lack of direct treatment available for post-acute stroke dysphagia (surgery or medicine), early screening for these patients is recommended to prevent the subsequent development of pneumonia, chest infection or death after stroke [5]. Screening methods cannot work alone, it depends on the accuracy and reliability of the equipment and the experience of doctors, but there is still a need to integrate care management approaches [6]. A recent study showed that an increased risk of pneumonia of post-acute stroke dysphagia was associated with failures in dysphagia screening after an acute stroke [7], this means potential further and increasing costs for dysphagia care and rehabilitation after stroke.

Under these circumstances, patients experiencing dysphagia after a stroke may seek a complementary medicine approach. As a widely used therapy in China for post-acute stroke rehabilitation, acupuncture is used in routine clinical practice for post-acute stroke dysphagia. Many clinical randomized controlled trials (RCTs) of acupuncture for post-acute stroke dysphagia have been published. Additionally, there are more than 20 Systematic reviews (SRs) and meta analyses of RCTs published on acupuncture treatment for this disease. There is no doubt that SRs and meta- analyses are considered to be the gold standard to assess the effects of healthcare interventions. The

current SRs on acupuncture for dysphagia after stroke show different and conflicting results. A Cochrane review published in 2016 [8] showed that acupuncture could improve swallowing function as measured by drinking test. Another Cochrane review in 2012 [9] reported that acupuncture can reduce the prevalence of dysphagia, alleviate clinical symptoms such as difficulty swallowing and meanwhile improve the life quality of the patients. However the latest updated Cochrane review on swallowing therapy, which included an analysis of acupuncture failed to show the improvement of swallowing ability, although heterogeneity was high [10]. Overviews of SRs and meta analyses can be performed to synthesize these studies to determine whether acupuncture is an effective treatment, thus it is necessary to conduct an overview focusing on the SRs and meta analyses of acupuncture for dysphagia after stroke.

2. Methods

The protocol for this study has been registered (PROSPERO registration number: CRD42019134163) and the full protocol published in the European Journal of Integrative Medicine [11].

2.1 Eligibility criteria

As RCTs are considered to provide the gold standard to assess the effects of healthcare interventions, we included SRs and meta analyses of RCTs or quasi-RCTs on patients who received acupuncture treatment for post-acute stroke dysphagia based on the framework of patients/ interventions/ comparison-outcomes-study design (PICOS)[12]. The interventions included acupuncture /electro acupuncture alone or combined with other treatments (including placebo, routine therapy, western medicine or rehabilitation training). Comparison treatments were defined as sham-acupuncture, herbal, routine therapy, western medicine or rehabilitation training. The primary outcomes were objective, effect-related outcomes such as: fiberoptic

Peer-reviewed version available at Geriatrics 2019, 4, 68; doi:10.3390/geriatrics4040068

endoscopic examination of swallowing (FEES) or a video fluoroscopic swallowing study (VFSS) which can assess the swallowing ability. Secondary outcomes included death or water swallow test.

2.2 Search strategy for identification of SRs and meta analyses

A total of 7 electronic databases of published SRs and meta analyses were searched (from their inception to May 27th 2019): PubMed, EMBASE, Cochrane library, China National Knowledge Infrastructure (CNKI), Wanfang Database, Sino-Med Database (including China Biology Medicine disc, CBM) and China Science Technology Journal Database (VIP).

2.3 Study selection

Two reviewers respectively identified studies according to the eligibility criteria by screening abstracts, their titles and their full text (See Figure1 in the protocol [11]). Any disagreements were resolved through discussion and consultation with a third author.

2.4 Data extraction and synthesis

Two reviewers respectively extracted the information of included SRs and meta analyses according to the predefined Excel data extraction tables. Any disagreements were resolved through discussion and consultation with a third author. Data synthesis was not performed due to plural data and heterogeneous outcomes, the same evidence being included multiple times, and any updated SRs and meta-analyses were also identified.

2.5 Quality assessment

Two authors separately evaluated the quality of included SRs by using the Assessment of Multiple Systematic Reviews 2 (AMSTAR2) [12], which is used to assess the SRs irrespective of whether they are RCTs or non-RCTs. Any discrepancies in the ratings of the 16 items of AMSTAR 2 were resolved by

discussion and adjudicated by a third author. Meanwhile, included SRs and meta analyses were also assessed by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement [13]. Any discrepancies between the two authors on the 27 items of PRISMA were resolved by discussion or judged by a third author. All included SRs used the Grading of Recommendations Assessment, Development and Evaluation (GRADE), the Cochrane risk of bias tool or Jadad score as a quality assessment tool, and for most included SRs the Efficacy rate (ER) was used as the outcome but the concept of ER was different among these studies, and most studies did not clarify the definition of ER, we did not assess the quality of this evidence by GRADE.

3. Results

3.1 Selection of the systematic reviews and meta analyses

The search identified 382 articles, including 12 from PubMed, 60 from VIP, 31 from EMBASE, 15 from the Cochrane Library, 31 from CNKI, 111 from Sino-Med and 122 from WanFang Database. After 153 duplicate records were removed, the titles and abstracts of the remaining 229 records were reviewed. Of these, 189 records were removed after screening titles and abstracts as they were irrelevant, 7 SRs not relevant to post-acute stroke dysphagia, 15 SRs not relevant to acupuncture and a further 8 SRs were duplications. A total of 40 potentially relevant articles were downloaded for full-text screening. Subsequently 9 studies were excluded, and the reasons for exclusion were as follows: 1 SR included observational studies, 2 articles were conference abstracts,1 SR unable to get the full text, 4 studies were not SRs, and 1 article was a duplicate. Finally, 31 studies were included in our study [8-10,14-41]. The study flow chart is shown in Figure 1.

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 12 October 2019 doi:10.20944/preprints201910.0135.v1

Peer-reviewed version available at Geriatrics 2019, 4, 68; doi:10.3390/geriatrics4040068

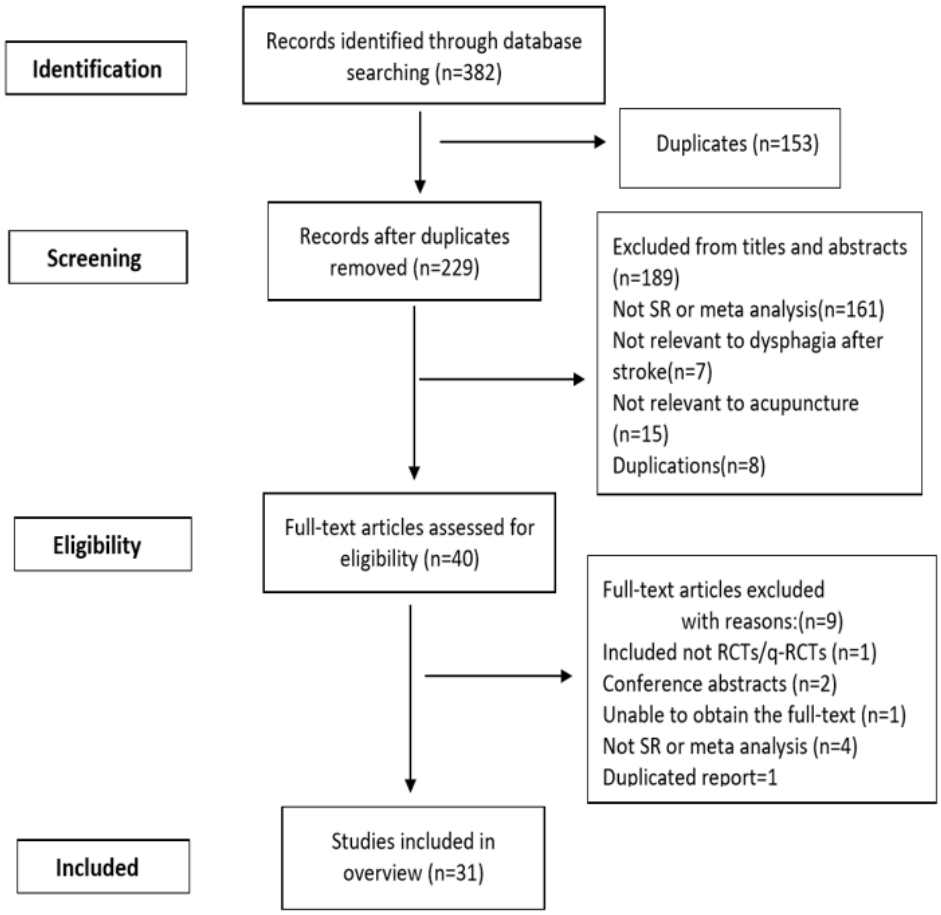

Figure 1: Flow diagram of literature selection

3.2 Characteristics of systematic reviews

A total of 31 studies were published between 2006 and 2019 [8-10,14-41], 9 SRs [8-10,36-41] were published in English-language journals, and the remaining 22 [14-35] were in the Chinese-language. Four of the 31 SRs were Cochrane reviews [8-10,41], 21 were journal articles [14-27,29-30,36-40],1 was conference paper [28] and 5 were theses (3 Masters and 2 PhDs degrees) [31-35]. The first authors of 29 SRs [8,14-41] were from China including one [39] from Hong Kong, and the first author of the other two studies were from UK [10] and Sri Lanka [9] but with the same corresponding author from UK. Only 4 [8-10,41] SRs published on Cochrane listed the evidence-based medicine background of co-authors, the remaining 27[14-40] were unclear, and the number of co-authors ranged from 1 to 9, we were unable to get this information from the 5 [31-35] theses. As for the

Peer-reviewed version available at Geriatrics 2019, 4, 68; doi:10.3390/geriatrics4040068

included study type, 6 [16-17,20-21,30,34] SRs included RCTs or quasi-RCTs, 25 [8-10,14-15,18-19,22-29,31-33,35-41] SRs only included RCTs. The range of primary studies included in each SR varied from 1 to 72, and number of participants ranged from 431 to 6134. Three SRs just reported the number of included primary studies, but did not report the number of participants [8,27,31]. It was not possible to obtain available information on the ages of dysphagia patients in each SR. Regarding the types of intervention, 5 SRs [9-10, 20,25,40] included acupuncture treatment alone, 14 SRs [8, 19,21-24,26-28,33,36,38,41] included acupuncture combined with other therapies (including rehabilitation or swallowing training, medicine, baseline treatment), 13 SRs [14-15,16-18,29-32,34-35,37,39] included both acupuncture treatment and acupuncture treatment combined with other therapies (including rehabilitation or swallowing training, medicine, baseline treatment). As for the control group, 24 studies [14-15,17-18,20-21,23-27,28-30,32-41] compared acupuncture with rehabilitation training, medicine or conventional treatment, there were no limitations on treatment of the control group in 2 studies [16, 31], 2 Cochrane studies used no treatment, acupuncture on different points or sham acupuncture as their control group [9-10], while both rehabilitation training or medicine alone or plus routine or sham acupuncture were used as control treatments in the other 3 studies [8,19,22]. Primary outcomes were heterogeneous being defined differently in all included SRs. Efficacy rate (ER) and water swallow test (WST) were used frequently. Video fluoroscopic swallowing study (VFSS), standardized swallowing assessment (SSA), fiber optic endoscopic examination of swallowing (FEES), swallowing function assessment (SFA), death or dependency were also used as primary outcomes. All studies used a quality assessment tool, only 2 Cochrane SRs [8,10] used Grades of Recommendation, Assessment, Development and Evaluation (GRADE) to evaluate the quality of the evidence. 20 SRs [9,14,16-17,19-20,24-26,28-37,41] used Cochrane risk of bias tool, 6 SRs[15,18,21-22,27,38]

used Jadad score, 1SR [23] used both Cochrane risk of bias tool and Jadad score, 1 SR [39] used Cochrane risk of bias tool and Physiotherapy Evidence Database (PEDro) scale and only one SR [40] used Consolidated Standards of Reporting Trials (CONSORT) and the Revised STandards for Reporting Interventions in Clinical Trials of Acupuncture (STRICTA) checklist to evaluate the included RCTs.

A total of 10 SRs [10,23, 30-32,33,35,36-37,40] mentioned adverse events, while only 5 SRs [10,31,36-37,40] reported adverse events that were associated with acupuncture, and 4 studies[23,30,32,35] reported pain, ecchymosis and haematoma during the process or at the site of needling, while the other SR [33] reported the pain occurred after electro acupuncture. These data may suggest that acupuncture rarely caused serious side effects, and that acupuncture could be considered as safe for the treatment of post-acute stroke dysphagia. All included SRs, concluded that there was very low to low quality evidence on the effectiveness of acupuncture treatment on post-acute stroke dysphagia, there is still a need for high quality trials with large sample sizes. Table 1 lists the characteristics of these included SRs.

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 12 October 2019 doi:10.20944/preprints201910.0135.v1

Peer-reviewed version available at *Geriatrics* **2019**, *4*, 68; doi:10.3390/geriatrics4040068

Table 1：Characteristics of systematic reviews

SRs	Country (First author)	No. of primary studies（patients）	Age	Adverse effects	Study types	Intervention measures		Primary outcome(s)	Evidence quality evaluation tool	Main conclusions
						Treatment group	Control group			
1 Zhang Y 2017	China	12/824	Not mentioned	No	RCT	1*, 2*	3*	ER/WST	Cochrane risk of bias tool	Electro acupuncture was an effective treatment for post stroke dysphagia but still need more high quality RCTs to support this conclusion.
2 Meng D 2016	China	48/4785	Not Mentioned	No	RCT	1, 2	3	ER/WST/SSA	Jadad score	Both acupuncture treatment and acupuncture combined with swallowing function rehabilitation training are more effective in treating post stroke dysphagia(compared to other therapies).
3 Liao MX 2017	China	42/3268	Not Mentioned	No	RCT/ q-RCT	1, 2	no limitation	ER/WST	Cochrane risk of bias tool	Jin's three-needle alone or combined with other therapies can effectively improve the efficacy of pseudo-bulbar paralysis after stroke, but more RCTs

Peer-reviewed version available at *Geriatrics* **2019**, *4*, 68; doi:10.3390/geriatrics4040068

										with high-quality and large-sample size are needed.
4	Zhu Y 2012	China	7/701	Not Mentioned	No	RCT/ q-RCT	1, 2	3	ER/SFA	Cochrane risk of bias tool+Jadad score	Acupuncture can effectively improve the efficacy of pseudo-bulbar paralysis after stroke, but more RCTs with high-quality and large-sample size are needed.
5	Hu TJ 2015	China	17/1158	Not Mentioned	No	RCT	1, 2	3	ER	Jadad score	Acupuncture with points on neck was an effective treatment for post stroke dysphagia but more high quality RCTs to support this conclusion is still needed.
6	Chen J 2015	China	8/766	49-78yrs	No	RCT	2	3 or 4*	ER	Cochrane risk of bias tool	Acupuncture combined with conventional therapy (swallowing function training, medical treatment) benefits swallowing function recovery on patients with dysphagia after stroke. The evaluation of the timing, treatment, and concurrent treatment of dysphagia after stroke still

Peer-reviewed version available at *Geriatrics* **2019**, *4*, 68; doi:10.3390/geriatrics4040068

										requires well designed RCTs with large-scale and high-quality.
7	He J 2009	China	37/3697	Not mentioned	No	RCT/ q-RCT	1	3	ER	Cochrane risk of bias tool	The therapeutic effect of acupoint stimulating therapy on post stroke dysphagia is better than that the control group, but more well designed randomized, , are needed to support this conclusion.
8	Yuan ML 2011	China	13/962	Not mentioned	No	RCT/ q-RCT	2	3	ER	Jadad score	Acupuncture combined with rehabilitation training is beneficial to the recovery of swallowing function for patients with post stroke dysphagia. However, more well-designed RCTs are needed to support this conclusion.
9	Tang Q 2019	China	22/1987	46-76yrs	No	RCT	2	3 or 4	ER/VFSS/SFA /WST	Jadad score	Acupuncture combined with rehabilitation training is effective for post stroke dysphagia and the combined effect is better than rehabilitation training alone.

Peer-reviewed version available at *Geriatrics* **2019**, *4*, 68; doi:10.3390/geriatrics4040068

										However, due to the small size and low quality of included RCTs, well designed RCTs with large-scale and high-quality are still required.
10	Tang XR 2019	China	16/1780	Not mentioned	pain, ecchymo-sis and haemat-oma	RCT	2	3	ER/WST/ SSA	Cochrane risk of bias tool + Jadad score	Acupuncture combined with rehabilitation therapy was an effective treatment for post stroke dysphagia but still need more high quality RCTs to support this conclusion.
11	Shi L 2018	China	12/1015	38-78yrs	No	RCT	2	3	ER/WST	Cochrane risk of bias tool	Acupuncture combined with rehabilitation training increased the efficacy and reduced the degree of dysphagia in post stroke patients but still more high quality RCTs needed to support this conclusion.
12	Xu MH 2017	China	11/907	Not mentioned	No	RCT	1	3	ER/ SSA	Cochrane risk of bias tool	Acupuncture therapy had better effects on post stroke dysphagia.
13	Li S 2011	China	7/1187	Not mentioned	No	RCT	2	3	ER	Cochrane risk of bias tool	Acupuncture therapy for pseudobulbar palsy is effective, but more

										high-quality RCTs are required to support this conclusion.
14 Wang C 2017	China	32/NR	Not mentioned	No	RCT	2	3	ER	Jadad score	Acupuncture treatment for post stroke dysphagia shows better clinical efficacy. Multi-center and large-sample RCTs are still needed to support this conclusion.
15 Tian Y 2014	China	15/1229	Not mentioned	No	RCT	2	3	ER/WST/ VFSS	Cochrane risk of bias tool	Acupuncture combined with swallowing training has obvious effect for post stroke dysphagia. The swallowing function of patients improved more obviously than that of the control group at the same time.
16 Yu C 2016	China	9/577	Not mentioned	No	RCT	1, 2	3	ER/WST	Cochrane risk of bias tool	Acupuncture was efficacious in treating post stroke dysphagia, but still high-quality and large-sample-size RCTs are required to support this conclusion.
17 Wang	China	7/506	Not	Subcutan	RCT/	1, 2	3	ER,VFSS,	Cochrane risk of	A reliable conclusion cannot

LP 2006			mentioned	-eous hemorrha -ge at local point	q-RC T			death	bias tool	be drawn from the present data because of the low methodological quality, especially because of the lack of data on long-term outcomes , A tendency that acupuncture can improve dysphagia after stroke in short -term with no adverse effect id demonstrated. Therefore, it is necessary to conduct more multi-central RCTs with high quality in future.
18 Li JP 2016	China	47/NR	Not mentioned	Mention-ed	RCT	1, 2	no limitation	ER/WST	Cochrane risk of bias tool	Jin's three-needle was more effective than other therapies for post stroke dysphagia.
19 Liu H 2016	China	14/1155	Not mentioned	Subcutan -eous hemorrha -ge at local point	RCT	1, 2	3	ER/WST/VFS S	Cochrane risk of bias tool	Conventional treatment plus acupuncture was more effective for some outcomes than conventional treatment alone, but RCTs with higher quality in the future may produce new evidence.
20 Huang	China	12/1172	Not	pain	RCT	2	3	ER/WST/	Cochrane risk of	Acupuncture and

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 12 October 2019 doi:10.20944/preprints201910.0135.v1

Peer-reviewed version available at *Geriatrics* **2019**, *4*, 68; doi:10.3390/geriatrics4040068

WX 2016			mentioned	occurred after electro-acupuncture				VFSS	bias tool	moxibustion can improve the swallowing function of patients with post stroke dysphagia (better than rehabilitation training alone).
21 Chen YY 2018	China	4/425	Not mentioned	No	RCT/q-RCT	1, 2	3	WST	Cochrane risk of bias tool	Compared with the conventional rehabilitation treatment group, the acupuncture treatment group had better improvements for post stroke dysphagia according to the WST, but still requires high-quality and large-sample-size RCTs to support this conclusion.
22 Xiang YX 2015	China	17/1440	40-85yrs	Subcutan-eous hemorrha-ge at local point	RCT	1, 2	3	ER/WST/SSA/VFSS	Cochrane risk of bias tool	Acupuncture combined with drugs is better than simple drugs assessed by VFSS scores. Acupuncture combined with drugs and rehabilitation training is better than drugs combined with rehabilitation assessed by SSA and VFSS scores. Acupuncture has a positive effect on improving the WST,

Peer-reviewed version available at *Geriatrics* **2019**, *4*, 68; doi:10.3390/geriatrics4040068

											SSA and VFSS score. However, it has not been proven that acupuncture combined with drugs and rehabilitation training can reduce the incidence of aspiration pneumonia. Acupuncture combined with rehabilitation is better than rehabilitation training alone but acupuncture and rehabilitation training have the same effect on the treatment of patients with post stroke dysphagia. However, the long-term effect of acupuncture on post stroke dysphagia is better than rehabilitation training.
23	Li LX 2019	China	17/1479	27-78yrs	Mention-ed	RCT	2	3	ER,SFA,IA,QOL	Cochrane risk of bias tool	Acupuncture combined with swallowing training can improve the ER, SFA and IAs of daily life in patients with post stroke dysphagia compared with swallowing training alone. However,

Peer-reviewed version available at *Geriatrics* **2019**, *4*, 68; doi:10.3390/geriatrics4040068

										further RCTs with large sample sizes and high quality are required to support this conclusion.
24 Ye QP 2017	China	71/6010	42-82yrs	Mention-ed	RCT	1, 2	3	WST,SSA,ER	Cochrane risk of bias tool	Acupuncture was better than conventional therapies in terms of efficacy rate of post stroke dysphagia. However, further RCTs with large sample sizes and high quality are required to support this conclusion.
25 Long YB 2012	China	72/6134	Not mentioned	No	RCT	2	3	ER	Jadad score	Acupuncture may be beneficial in rehabilitation of patients with post stroke dysphagia. Further high-quality RCTs are still needed.
26 S.Y. Wong 2012	China (Hong Kong)	9/783	40-88yrs	No	RCT	1, 2	3	SSA/VFSS/FEES	Cochrane risk of bias tool, PEDro scale	Definitive conclusions on acupuncture with conventional rehabilitation therapy for post stroke dysphagia cannot be made due to the low quality evidence, but this

Peer-reviewed version available at Geriatrics 2019, 4, 68; doi:10.3390/geriatrics4040068

											combination approach appears to be promising. We recommend that acupuncture may still be used as combination use by qualified practitioners as it is relatively safe without much negative effect
27	Li LX 2018	China	29/2190	Not mentioned	Mention-ed	RCT	1	3	WST,KSA, FDS,VFSS, CSA	CONSORT, STRICTA	Acupuncture is an effective and safe alternative therapy for treatment to post-stroke dysphagia, although the beneficial effect from acupuncture is possibly overvalued due to the low methodology quality of the included RCTs. More high-quality and large-scale research studies are needed.
28	Xie Y 2008	China	1/66	No Limitation	No	RCT	2	3	resolution of dysphagia (defined as recovery of normal	Cochrane risk of bias tool	There is not enough evidence to make any conclusion about the therapeutic effect of acupuncture for dysphagia

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 12 October 2019 doi:10.20944/preprints201910.0135.v1

Peer-reviewed version available at *Geriatrics* **2019**, *4*, 68; doi:10.3390/geriatrics4040068

									feeding, which includes solid food and water, but does not include pureed food)	after acute stroke. High quality and large scale randomized controlled trials are needed
29	Yang A 2016	China	4/NR	24-95	No	RCT	2	3+4	Death or dependency at the end of follow-up	GRADE	From the available evidence, acupuncture may have beneficial effects on improving dependency, global neurological deficiency, and some specific neurological impairments for people with stroke in the convalescent stage, with no obvious serious adverse events. However, most included trials were of inadequate quality and size. There is, therefore, inadequate evidence to draw any conclusions about its routine use. Rigorously designed, randomized, multi-centre,

Peer-reviewed version available at *Geriatrics* **2019**, *4*, 68; doi:10.3390/geriatrics4040068

											large sample trials of acupuncture for stroke are needed to further assess its effects.
30 PM	Bath 2018	UK	11/998	mean 67.8yrs	Mentioned	RCT	1	4	Death or dependency/disability	GRADE	Moderate and low quality evidence suggests that swallowing therapy did not have a significant effect on the outcomes of death or dependency/disability, case fatality at the end of the trial, or penetration aspiration score. However, swallowing therapy may have reduced length of hospital stay, dysphagia, and chest infections, and may have improved swallowing ability. However, these results are based on evidence of variable quality, involving a variety of interventions (including acupuncture). Further high-quality trials are needed to test whether

										specific interventions are effective.
31 Geeganage C 2012	Sri Lanka	4/256	average age of patients across the studies was 71 years	No	RCT	1	4	Death or dependency, or death or disability	Cochrane risk of bias tool	Acupuncture and behavioural therapy may reduce dysphagia, although the effective components for each remain unclear. Further research is needed to discover which components of swallowing therapy, including acupuncture, are beneficial.

Notes:
RCTs:Randomized controlled trials
q-RCTs: quasi-RCTs
SRs: Systematic reviews
PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses
AMSTAR: Assessment of Multiple Systematic Reviews
PICOS: Patients/ interventions/ comparison-outcomes-study design
PICO:Patient, intervention, control group and outcome
Intervention measures: Treatment group: 1*= acupuncture/electroacupuncture alone
2*=acupuncture/electroacupuncture combined with other therapies
Control group: 3*= rehabilitation / swallowing training, medicine or baseline treatment

4*= acupuncture on different points, sham acupuncture or no treatment
VFSS: Video fluoroscopic swallowing study
GRADE: Grading of Recommendations Assessment, Development and Evaluation
ER: Efficacy rate
WST: Water swallow test
SSA: Standardized swallowing assessment
SFA: Swallowing function assessment
CONSORT: Consolidated Standards of Reporting Trials
STRICTA: Revised STandards for Reporting Interventions in Clinical Trials of Acupuncture
FEES: Fiberoptic endoscopic examination of swallowing
PEDro: Physiotherapy Evidence Database
IA: individual activity
QOL : Quality of life
KSA: Kubota Toshio's Swallowing Ability Assessment
FDS: Fujishima Ichiro' s Dysphagia Scale
CSA: Clinical symptoms assessment

Peer-reviewed version available at Geriatrics 2019, 4, 68; doi:10.3390/geriatrics4040068

3.3 Quality of the systematic reviews

3.3.1 Methodological quality of AMSTAR2

The overall quality of 22 SRs [14-35] (71%) were rated critically low, 5 SRs [36-40] (16.1%) were low, while 4 Cochrane SRs [8-10,41] (12.9%) were moderate. Only 7 SRs [8-10,36,38,40-41] (22.6%) reported over half of the 16 items on AMSTAR 2, while the remaining 23 SRs [14-35,37] (77.4%) reported just less than 8 items on AMSTAR 2. The components of PICO (patient, intervention, control group and outcome) for item 1 in research questions and inclusion criteria were well reported in 27 SRs [8-10,16-17,19-23,25-41] (87.1%), but no SR mentioned the time frame for follow-up. Only 4 Cochrane SRs [8-10,41] (12.9%) reported the predefined protocol (critical item 2), but there were no SRs that provided reasons for including only RCTs (item 3). The 4 Cochrane SRs [8-10,41] (12.9%) provided a systematic searching strategy, while the remaining 27 SRs [14-40] (87.1%) just achieved the partial searching on databases (item 4). As for item 5 and item 6, most of SRs identified eligible studies and extracted data by two reviewers (respectively 67.7%[8-10,14,17,19,22-24,26,28-29,32-33,35-41],80.6%[8-10,14,16-20,22-24,26,28,30-41]). Only the 4 Cochrane SRs[8-10,41] (12.9%) provided a list of all excluded studies, while other SRs [14-40] (87.1%) provided none or just part of potentially relevant full-text excluded studies (item 7). No SRs described PICOS on the included RCTs at length, as there was no SR reported the timeframe for follow-up (item 8). Although all the studies used Jadad score or Cochrane risk of bias tool to evaluate the quality of evidence, just 20 SRs [8-10,14-15,17-18,20,23-27,29,31-35,41] (64.5%) assessed the overall risk of bias (item 9). Just 1 Cochrane SR [10] (3.2%) reported the source of funding (item 10). Two SRs [39,41] did not conduct meta analysis, only 7 SRs [8-10,36-38,40] (22.6%) combined RCTs results using appropriate techniques and investigated the causes of heterogeneity on item 11. For the assessment of the impact of risk of bias of individual studies on the results of the data synthesis, item 12, the results were the same as that of item 11. But 13 SRs [8-10,14,18,20,23,26,36-38,40-41] (41.9%) took the risk of bias into

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 12 October 2019 doi:10.20944/preprints201910.0135.v1

Peer-reviewed version available at Geriatrics 2019, 4, 68; doi:10.3390/geriatrics4040068

consideration when discussing the results of the SRs (item 13). 12 SRs [8-10,14,18,21,25,36,38-41] (38.7%) showed no significant heterogeneity in the results or investigated the source of heterogeneity in the results and discussed their effect on the results of the study (item 14). 24 SRs [8-10,14-15,17-24,26-29,31-36,40] (77.4%) showed the results of publication bias (small study bias) with funnel plot in detail. 17 SRs [9,14-16,19-24,26,28-29,36-38,40] (54.8%) reported the conflict of interest. The AMSTAR 2 checklist is listed in Table 2 and assessment results of the AMSTAR 2 are provided in Table 3 , Figure 2 and Figure 3 .(Table 2 :AMSTAR 2 checklist; Table 3: Methodological quality assessment by AMSTAR 2)

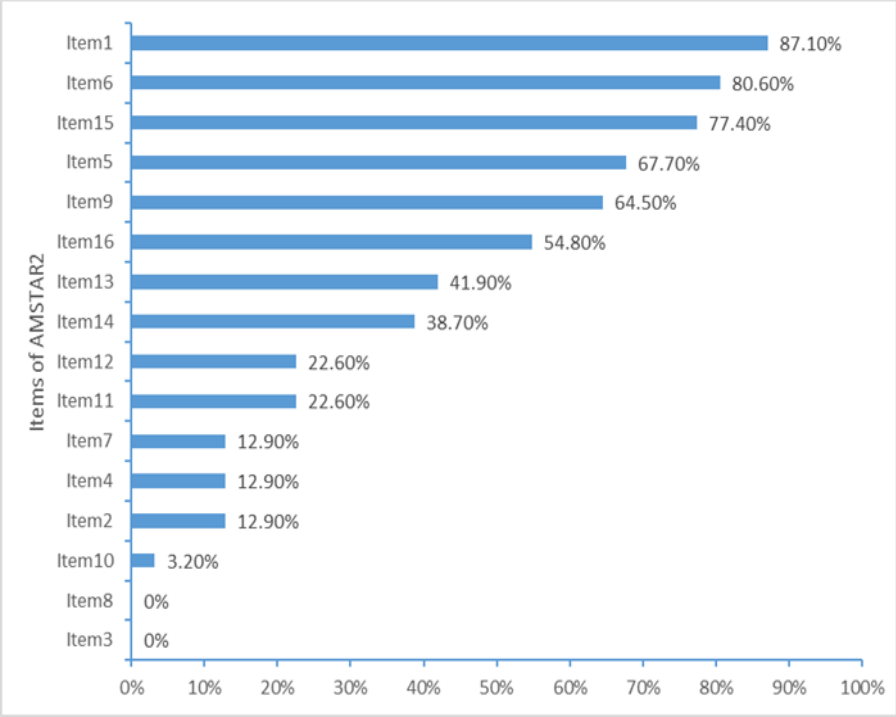

Figure 2:Percentage of YES for each item of AMSTAR 2

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 12 October 2019 doi:10.20944/preprints201910.0135.v1

Peer-reviewed version available at Geriatrics 2019, 4, 68; doi:10.3390/geriatrics4040068

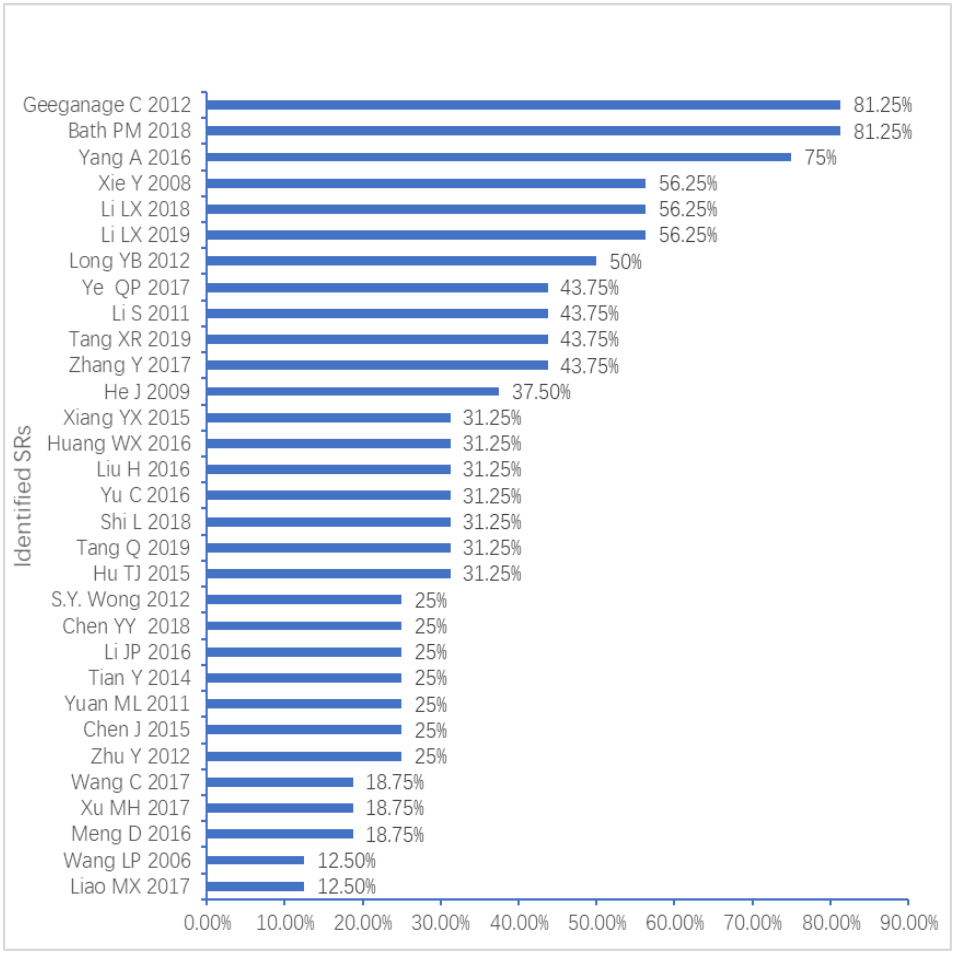

Figure3:Percentage of Yes for each identified SRs assessed by AMSTAR 2

3.3.2 Reporting quality of PRISMA

No SR reported all 27 items of PRISMA, 3 SRs [25,38-39] (9.7%) reported 40-51.9% items of PRISMA,11 SRs [15,17-18,20-21,24,26-27,29-30,37] (35.5%) reported 66.7-85% items and 17 SRs [8-10,14,16,19,22-23,28,31-36,40-41] (54.8%) reported 85.2-96.3% items. The majority of SRs [8-10,14-23,25-31,34-41] (90.3%) identified the report as a SR, meta-analysis, or both in the title. All studies provided structured summary, but just 4 Cochrane SRs [8-10,41] (12.9%) registered their protocol. For items 3, 6, 7, 24, 26 all 100% reported on the 31 included SRs. Item 3 describes the rationale of the studies in introduction section, item 6 focuses on eligibility criteria of the studies including the characteristics of studies and reporting (e.g., language limitation, grey literature or publication status), providing a rationale at the same time. Item 7 describes the process of searching the databases with date, while item 24 and item 26 contains a summary of current

Peer-reviewed version available at *Geriatrics* **2019**, *4*, 68; doi:10.3390/geriatrics4040068

evidence in discussion section and interpretation of the study results for clinical practice or research in the future in the concluding section. As for the PICO which should be contained in the objectives, 25 SRs [8-10,14-35] (80.6%) gave an explicit statement in the introduction or eligibility criteria section. 4 Cochrane SRs[8-10,41] provided the protocol, and 2 SRs [37,40] (19.4% in total) indicated predefined protocol, but just one provided an address that could be accessed. In the methods section, 18 SRs [8-10,14,16,19-20,22,27-28,30-33,35-36,40-41] (58%) provided searching strategy of at least one database. 23 SRs [8-10,14,18-19,22-24,27-29,31-41] (74.2%) reported the process for selecting studies and 27 SRs [8-10,14,16-20,22-28,31-41] (87.1%) stated the process for data extraction. 19 SRs [8-10,16,18-19,22,24,26-27,31-34,36,38-41] (61.3%) stated data items and 23 SRs [8-10,14,16-17,20,22-24,28,30-41] (74.2%) reported the assessment of risk bias of individual studies, 28 SRs [8-10,14-19,21-36,38,40-41] (90.3%) summarized the outcome measures and the same percentage of SRs reported [8-10,14-25,27-36,38,40-41] the method of synthesizing the results. 22 SRs [8-10,14,17-23,26,28-32,35-36,38,40-41] (71%) assessed other bias like publication biases, and 23 SRs[8-10,14-15,17-19,22-23,26,28,30-38,40-41] (74.2%) conducted sensitivity or subgroup analyses, but only the 4 Cochrane SRs[8-10,41]provided predefined additional analyses. In the results section, 29 SRs [8-10,14-16,18-29,31-41] (93.5%) gave information on the study selection, only 1 SR [25] (3%) did not list the characteristics of included RCTs, 21 SRs [8-10,14,16-17,22-23,28,30-41] (67.7%) presented information of data on risk of bias of included stuies. One SR [39] (3%) did not list all outcomes of each study. Apart from 2 SRs[39-40] that did not conduct meta analysis, 29 SRs [8-10,14-38,41] (93.57%) provided results of each meta-analysis with confidence intervals. 22 SRs [8-10,14,17-23,26,28-32,35-36,38,40-41] (71%) reported results of publication risk of bias across studies, and 21 SRs [8-10,16-20,23,26-27,30-38,41] (67.7%) conducted sensitivity or subgroup analyses. In conclusion section 20 SRs[8-10,14-16,21-22,28-29,31-38,40-41] (64.5%) mentioned limitations of the study, whereas summary of evidence and conclusions were

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 12 October 2019 doi:10.20944/preprints201910.0135.v1

Peer-reviewed version available at Geriatrics 2019, 4, 68; doi:10.3390/geriatrics4040068

100% reported. Finally, 14 SRs[14-16,19-24,26,28-29,36-37] (45.2%) reported sources of funding for the SRs. The PRISMA checklist and assessment results of the PRISMA are presented in Table 4 and Table 5. (Table 4: PRISMA checklist Table 5: Reporting quality assessment by PRISMA)

3.4 Comparison types of acupuncture

In all 31 SRs, 5 SRs [9-10, 20,25,40] included explanatory RCTs, 13 SRs [8, 19,21-24,26-28,33,36,38,41] included pragmatic RCTs, and 13 SRs [14-18,29-32,34-35,37,39] included both explanatory RCTs and pragmatic RCTs, comparisons types of the 18 SRs[8-10,19,20-28,33,36,38,40-41] were summarized as follows.

3.4.1 Explanatory RCTs

Acupuncture versus no treatment / sham acupuncture / routine acupuncture

Two Cochrane SRs used no treatment, acupuncture on different points or sham acupuncture as their control group [9-10], data from four studies in one SR[9] showed a reduction in dysphagia by end of trial (t = 4; n = 256; OR =0.24; 95% CI [0.13, 0.46]; P < 0.0001; I^2 = 0%) , there was no difference in swallow scores between treatment and control groups. However, significant heterogeneity was noted (t = 3; n = 256; MD =-0.41; 95% CI [-1.53, 0.72]; I^2 = 91%; P < 0.0001) for swallow scores in acupuncture studies. Subgroup analysis in another Cochrane SR[10] showed that acupuncture (OR =0.31; 95% CI [0.20, 0.49]; 676 participants; 8 studies; I^2 = 0%; P < 0.00001) reduced dysphagia at end of trial. However, these findings may be due to chance, given that testing for subgroup differences did not yield significant results. Acupuncture did not reduce swallowing ability (SMD =-0.55; 95% CI [-1.20, 0.11]; 496 participants; 6 studies; I^2 = 91%; P = 0.10).

Acupuncture versus rehabilitation training / western medicine / routine therapy

Three SRs[20,25,40] compared acupuncture alone with rehabilitation training /

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 12 October 2019 doi:10.20944/preprints201910.0135.v1

Peer-reviewed version available at Geriatrics 2019, 4, 68; doi:10.3390/geriatrics4040068

conventional therapy, one SR[20] showed that ER and overall recovery rate in acupuncture group were higher than rehabilitation training or routine therapy (RR =1.38; 95%CI[1. 28, 1.49]; P<0.01; RR =2. 56; 95%CI[2. 15, 3. 04] P<0. 01. 37 studies; 3697 participants); ER in acupuncture group was higher than other therapies in one SR[25] (OR(Total)=3.97; 95%CI[2.73, 5.67]; P =0.25; I^2=9%; 907 participants; 11 studies) ; Acupuncture treatment provided a higher ER compared with rehabilitation training / routine medicine ([RR=1.33; 95% CI[1.25 , 1.43])[40].

3.4.2 Pragmatic RCTs

Acupuncture plus baseline treatment / medicine / rehabilitation training versus baseline treatment / medicine / rehabilitation training

One Cochrane SR[8] showed that acupuncture plus baseline treatment for people with convalescent phase stroke, can improve the dependency (nine trials; 616 participants; MD=9.19; 95%CI[4.34, 14.05]; GRADE very low), global neurological deficiency (7 trials; 543 participants; OR=3.89; 95% CI [1.78, 8.49]; GRADE low), and specific neurological impairments including motor function measured (4 trials; 245 participants; MD =6.16; 95% CI[4.20, 8.11]; GRADE low), cognitive function (5 trials; 278 participants; MD =2.54; 95% CI [0.03, 5.05]; GRADE very low) and swallowing function (2 trials; 200 participants; MD =-1.11, 95% CI[-2.08, -0.14]; GRADE very low), relieved depression (6 trials; 552 participants; MD=-2.58; 95% CI [-3.28, -1.87]; GRADE very low), and pain (two trials; 118 participants; MD= -2.88; 95% CI [-3.68, -2.09]; GRADE low), another Cochrane SR[41] just included one trial of 66 participants and demonstrated that the acupuncture group showed no statistically significant differences when compared with baseline group. The relative risk of recovery was 1.61 with a 95%CI of 0.73 to 3.58. One SR[19] compared different stage of stroke, for stroke in the convalescent phase, the

ER for acupuncture plus baseline treatment group was higher than the baseline control group [RR=1.45; 95%CI[1.16, 1.80]; P=0.001; 8 studies;766 participants), but there was no difference at the acute stage.

Nine SRs[21-24,28,33,36,38]compared acupuncture plus rehabilitation training with rehabilitation alone. Four SRs[21,27,33,36]showed that acupuncture can improve ER(P＜0.01. OR =3.84; 95% CI [2.91, 5.05]; P ＜0.00001. RR =1.26; 95% CI [1.19, 1.34]; P<0.001; 14 studies. RR=1.26; 95% CI [1.11, 1.43]; P ＜0.00001; 12 studies; 1172 participants), and the other four SRs[22-24, 28,38] defined ER as the improvement of VFSS,SSA and WST score demonstrating that acupuncture can improve ER (OR=3.66; 95%CI[2.66, 5.05]; P<0.00001; 17 studies. RR=1.22; 95%CI[1.16，1.28]; P＜0.01; 16 studies;1780 participants. OR =3.80; P <0.00001; 95%CI[2.58, 5.60]; 12 studies; 1012 participants. OR=2.9; 95%CI[2.16, 3.91]; P=1.00; 15 studies; 1229 participants. OR=5.17, 95% CI [4.18, 6.38]; p<0.00001; 32 studies;6134 participants). When compared to drugs, one SR[26] showed that the ER and the overall recovery rate for acupuncture combined with drugs was higher than drugs alone (RR=1. 73, 95%CI [1. 37, 2. 20] ; RR=3. 30, 95%CI [2. 07, 5. 25], 7 studies, 1187 participants).

4. Discussion

This overview summarizes the evidence on the effectiveness of acupuncture for post-acute stroke dysphagia. Of the 31SRs and meta-analyses identified, most were of critically low quality assessed by AMSTAR2, and almost half of them reported 85.2-96.3% items of PRISMA. Due to the very low to low quality of evidence, and insufficient data provided by these SRs and meta-analyses, there is still no decisive conclusion on the effectiveness of acupuncture for post-acute stroke dysphagia.

Most SRs and meta-analyses included in this overview ignored the need to register the protocol, and no SRs and meta-analyses provided an explanation for including only RCTs, future studies should pay attention to these two items in AMSTAR 2. The included 31 SRs and meta analyses in this overview were published between 2006 and 2019, 9 SRs [9,17,20-21,26,30,38-39,41] were published before 2012 and 7 SRs [10,22-24,34,36, 40] were published between 2018 and 2019. However the PRISMA was published in 2009[13] and the AMSTAR 2 was updated in 2017[12]. Many journals require authors to cite the PRISMA statement when submitting a systematic review and meta-analysis. This may be one of the reasons that the most of the SRs were critically low as assessed by AMSTAR 2. Also many ?? included trials were conducted prior to the development and use of these two quality assessment tools. As 15 SRs[8,14-16,18-19,25,27-29,31-33,35,37] were published between 2013 and 2017, the increasing number of SRs focusing on the acupuncture for post-acute stroke dysphagia not only indicates the interest and concern regarding effectiveness of acupuncture in this area, but also means that SRs are widely used to assess the therapeutic effect based on the original studies. However, the quality of current SRs were low. As we know, AMSTAR is a quality assessment tool used just for SRs of RCTs, while AMSTAR 2 is an update of AMSTAR, which can be used to appraise SRs of intervention trials including both RCTs and NRCTs [12]. We can see from the 16 items of AMSTAR 2 and 27 items of PRISMA, some items are mutually complementary. PRISMA emphasizes the structure of the SR, while AMSTAR 2 concerns more with the details of methodology used for included original studies in the SR, especially the risk of bias (including additional bias). Item 27 in the PRISMA checklist stresses the importance of funding for the SR and availability of other support (e.g., supply of data), while AMSTAR 2 emphasizes the funding source of original studies, both of quality measures take potential conflict of interest into account, but only AMSTAR 2 specifically lists the item of conflict of interest. So, the combined

use of the two tools can provide an overall assessment of the quality of SRs that focus on healthcare interventions. Future SRs should conduct and report the SRs according to these two tools.

The overall quality of the 4 Cochrane SRs [8-10,41] were assessed as moderate by AMSTAR 2, and these SRs reported more than 90% items of PRISMA. But the result of these 4 SRs were still inconsistent. One of the Cochrane SRs [41] only included one trial of 66 participants, and compared a routine treatment combined with acupuncture with routine treatment alone, but the statistical significance about primary outcome of feeding was not reported, the relative risk (RR) of recovery was 1.61 with a 95% confidence interval (CI) [0.73 ,3.58]. One of the SRs[8] which included three RCTs showed that acupuncture was superior to no acupuncture in the terms of improving swallowing function as measured by drinking test (mean difference (MD)= -1.11, 95% CI[-2.08, -0.14]; participants = 200; studies = 2; I^2 = 96%;), and the difference of another included study was also significant (odd ratio (OR)= 95.29, 95% CI [10.93 ,830.86]). However, the opposite result was reported in 2012[9], comparing to sham acupuncture or no acupuncture, there was no difference in swallowing scores between treatment and acupuncture groups. But the heterogeneity was significant (t = 3; n = 256; MD= -0.41; 95% CI [-1.53 , 0.72]; I2 = 91%; P < 0.0001), and the updated Cochrane SR [10] supported the result that acupuncture did not improve swallowing ability (SMD -0.55, 95% CI -1.20 to 0.11; 496 participants; 6 studies; I^2 = 91%; P = 0.10), still with significant heterogeneity, but acupuncture can reduce the number of participants with dysphagia at end of trial (OR= 0.31, 95% CI [0.20 , 0.49]; 676 participants; 8 studies; I^2 = 0%; P < 0.00001).Therefore, the quality of included RCTs was also another reason that influenced the quality of SRs.

Peer-reviewed version available at Geriatrics 2019, 4, 68; doi:10.3390/geriatrics4040068

Apart from the methodological problems of the included RCTs, there was diversity in the selection of primary outcomes. Effective rate (ER) and water swallow test were the most frequently used measures to assess the effectiveness of acupuncture on post-acute stroke dysphagia, but the concept of ER was different among these studies, and most studies did not clarify the definition of ER. Just six SRs [22-24, 28,38,40] reported the definition of ER: effective rate= (‘recovery’ + ‘markedly improved’ + ‘improved’) /total number of patients, and ‘recovery’ meant totally cure, ‘markedly improved’ represented nearly complete resolution of dysphagia, while ‘improved’ represented partial resolution of dysphagia, one of SR[40] used the change of water swallow score to assess the resolution of dysphagia, but we did obtain information from one author regarding how they assessed the resolution of dysphagia. This would have exaggerated the efficiency of the intervention to some extent, and future research should provide clear definitions of objective primary outcomes. Besides, just three SRs [8,19,41] mentioned the different stage of stroke, and only one SR [40] used CONSORT and STRICTA checklist to evaluate the included RCTs, these studies provide insufficient information on what and how acupuncture was delivered. These were important factors that may influence the effective of acupuncture but data was unavailable from the original RCTs.

Due to the same evidence being included multiple times in different SRs, and there were updated SRs and meta-analyses as well, data synthesis was not appropriate. Although, the method used for this overview was performed according to the criteria for conducting overviews of SRs and meta analyses given in the Cochrane Handbook of Systematic Reviews of Interventions[42], it still has some limitations, as there are no clear standards for conducting an overview of systematic reviews and meta-analyses. Additionally, some relevant SRs and meta analyses may not have been included in the databases that were searched. Stroke was defined as a Mesh word, and acupuncture,

Peer-reviewed version available at Geriatrics 2019, 4, 68; doi:10.3390/geriatrics4040068

dysphagia were used as key words in title and abstract. This overview may have missed some stroke relevant studies that did not list the acupuncture as treatment or dysphagia as symptom in the title or abstract.

5. Conclusion

Currently there is very low to low quality evidence on the effectiveness of acupuncture treatment for post-acute stroke dysphagia. Clinical RCTs with high quality and large sample size are needed as well as SRs and meta-analyses with high quality. Although the evidence was insufficient to provide definitive conclusions on the effectiveness of acupuncture for post-acute stroke dysphagia, there are preliminary indications that it may improve symptoms associated with dysphagia.

Supplementary Materials:

Table 2: AMSTAR 2 checklist

Table 3: Methodological quality assessment by AMSTAR 2

Table 4: PRISMA checklist

Table 5: Reporting quality assessment by PRISMA

Figure 4: Search strategy in PubMed

Funding:

This work was funded by National Natural Science Foundation of China (grant number 81774159) and NR is supported by the Overseas Expertise Project in Beijing University of Chinese Medicine, Ministry of Education of China (grant number MS20180009).

Author Contributions:

Thanks to all authors in this study. NR conceptualized the study, XL and NR designed the study and organized the team. ZYT and XL designed the

Peer-reviewed version available at Geriatrics 2019, 4, 68; doi:10.3390/geriatrics4040068

literature search, developed and refined the study protocol. JPL provided methodological help and YG gave clinical suggestions. CYZ and DHX conducted study selection and data extraction, ZYT and SBL finished evidence quality assessment. ZYT completed the report writing and analysis. NR and XL drafted the publication and all authors were asked to comment and revise. All authors have read and approved this manuscript.

Conflicts of interest

The authors declare they have no conflict of interests to declare.

References:

1. GBD 2016 Stroke Collaborators. Global, regional, and national burden of stroke, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. The Lancet Neurology,18(5) (2019) 439-458.
2. GBD 2016 Causes of Death Collaborators. Global, regional, and national age-sex specific mortality for 264 causes of death,1980–2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet 2017; 390: 1151–210.
3. Martino R, Foley N, Bhogal S, Diamant N, Speechley M, Teasell R. Dysphagia after stroke: incidence, diagnosis, and pulmonary complications. Stroke. 2005; 36:2756–2763.
4. Arnold M, Liesirova K, Broeg-Morvay A, Meisterernst J, Schlager M, Mono ML, et al. Dysphagia in acute stroke: incidence, burden and impact on clinical outcome. PLoS One. 2016; 11: e0148424.
5. Powers WJ, Rabinstein AA, Ackerson T, et al. on behalf of the American Heart Association Stroke Council. 2018 Guidelines for the early management of patients with acute ischemic stroke: a guideline for healthcare professionals from the American Heart Association/American Stroke Association. Stroke. 2018;49:e46–e110.

6. Smith EE, Kent DM, Bulsara KR, et al. Effect of Dysphagia Screening Strategies on Clinical Outcomes After Stroke: A Systematic Review for the 2018 Guidelines for the Early Management of Patients With Acute Ischemic Stroke. Stroke. 2018 Mar;49(3): e123-e128.
7. Ouyang M, Boaden E, Arima H, Lavados PM, et al. Dysphagia screening and risks of pneumonia and adverse outcomes after acute stroke: An international multicenter study. Int J Stroke. 2019 Jun 21:1747493019858778. doi: 10.1177/1747493019858778.
8. Yang A, Wu HM, Tang JL, Xu L, Yang M,Liu GJ. Acupuncture for stroke rehabilitation (Review). Cochrane Database Syst Rev. 2016, Issue 8. Art. No. : CD004131. DOI: 10.1002/14651858.CD004131.pub3.
9. Geeganage, C., et al., Interventions for dysphagia and nutritional support in acute and subacute stroke. Cochrane Database of Systematic Reviews, 2012.10: p.CD000323.
10. Bath PM, Lee HS, Everton LF. Swallowing therapy for dysphagia in acute and subacute stroke. Cochrane Database Syst Rev. 2018 Oct 30;10:CD000323.
11. Z.Y Tian, Xing Liao, Ying Gao, et al., An overview of systematic reviews and meta-analyses of acupuncture for dysphagia post-acute stroke: A protocol. European Journal of Integrative Medicine. Volume 30, September 2019, 100947. https://doi.org/10.1016/j.eujim.2019.100947
12. B.J. Shea, B. C. Reeves, G. Wells，et al. “AMSTAR2: A critical appraisal tool for systematic reviews that include randomized or non-randomized studies of healthcare interventions, or both,”BMJ, vol.358,2017.
13. Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. BMJ 2009; 339: b2535, doi: 10.1136/bmj. b2535.
14. Yi Zhang, XiaHui Zhang, Zhihong Chen, et al., Meta-analysis of randomized controlled trials on electro-acupuncture in the treatment of

dysphagia after Stroke [J]. Journal of Clinical Acupuncture and Moxibustion, 2017. 33(8): 75-79.

15. Dan Meng, Yibing Shang, Yuanfeng Fu, et al., Clinical Literature Study of Acupuncture and Moxibustion in the Treatment of Post stroke Dysphagia based on Meta-Analysis. Chinese Medicine Modern Distance Education of China, 2016. 14(16): 148-152.
16. Muxi Liao, Lijun Huang, Fangxi Ceng, et al., A meta-analysis of Jin's three acupuncture in the treatment of pseudobulbar palsy after stroke. Li Shizhen Medicine and Materia Medical Research, 28(12): 3023-3030.
17. Yuan Zhu, Lixin Fu, Sheng Li, et al., Systematic review of acupuncture for dysphagia caused by pseudobulbar palsy after stroke. Shandong Journal of Traditional Chinese Medicine, 2012. 31(10): 741-745.
18. Tianjun Hu, Xiulian Wang, Jie Yu, et al., A meta-analysis of the effect of nape acupuncture on post-acute-stroke dysphagia in domestic literature. Shanghai Journal of Acupuncture and Moxibustion, 2015. 34(12): 1250-1254.
19. Jie Chen, Weixiong Liang, Qiong Liu, et al., Systematic review of the efficacy and safety of acupuncture for treating dysphagia after stroke. Journal of Guangzhou University of Traditional Chinese Medicine 2015. 32(04): 607-614.
20. Jing He, Min Zheng, Chengqi He, et al., Systematic review of acupoint stimulating therapy for deglutition disorders after apoplexy. Chinese Acupuncture &Moxibustion, 2009. 29(01): 66-71.
21. Menglang Yuan, Zheng Yang, Jinhai Guo, et al., A meta-analysis of the clinical effect of acupuncture combined with rehabilitation training on dysphagia after stroke. China Journal of rehabilitation medicine, 2011. 26(05): 467-470.
22. Qiang Tang, Xiaoqian Zhao, Luwen Zhu, Systematic review and meta-analysis of the effect of acupuncture combined with rehabilitation

training on dysphagia after stroke. West China Medical Journal, 2019. 34(05): 531-538.

23. Xiaorong Tang, Lin Wang, Peidong Huang, et al., Meta-analysis of acupuncture combined with rehabilitation therapy for dysphagia after stroke. Journal of Guangzhou University of Traditional Chinese Medicine, 2019. 36(04): 514-520.
24. Lin Shi, Acupuncture combined with rehabilitation training on treatment of post-acute-stroke dysphagia: an evidence-based medicine study. Journal of Clinical Acupuncture and Moxibustion, 2018. 34(07): 62-66.
25. Minghua Xu, Meta-analysis of effect of acupuncture on dysphagia after stroke. Journal of Medical Science Yanbian University, 2017,40(02):113-115.
26. Sheng Li, Lixin Fu, Xiaodong Huang, et al., Systematic review of acupuncture for treatment of pseudobulbar palsy due to stroke. Journal of Clinical Acupuncture and Moxibustion 2011. 27(01): 1-6.
27. C Wang, T Chai, W Wang, Q Xiang. The efficacy of acupuncture for post-acute-stroke dysphagia: a systematic review and meta-analysis. Guiding Journal of Traditional Chinese Medicine and Pharmacy, 2017. 23(19): 72-76.
28. Y Tian, A meta-analysis of acupuncture combined with swallowing training on the treatment of dysphagia after stroke. Zhong Hua Zhong Yi Yao, 2014:616
29. C Yu, B Shen, S Xu, Systematic review of acupuncture-moxibustion for deglutition disorders after cerebral stroke. Shanghai Journal of Acupuncture and Moxibustion, 2016. 35(09): 1126-1129.
30. Liping Wang, Yue Xie, Systematic review on acupuncture and moxibustion for treatment of dysphagia after stroke. Chinese Acupuncture and Moxibustion, 2006(02):141-146.

31. Junping Li, Systematic review of randomized controlled trials of Jin's three acupuncture therapy in the treatment of stroke [D]. Guangzhou University of Chinese Medicine,2016.
32. Huan Liu, Effect evaluation of acupuncture on dysphagia after apoplexy [D]. Chengdu University of Chinese Medicine,2016.
33. Weixin Huang, The literature study and clinical research on acupuncture treatment combined with rehabilitation training of dysphagia after stroke[D]. Guangzhou University of Chinese Medicine,2016.
34. Yingyin Chen. Meta-analysis of acupuncture treatment for dysphagia after stroke [D]. Changchun University of Chinese Medicine, 2018.
35. Yunxia Xiang. Acupuncture for dysphagia after stroke: a systematic review [D]. Chengdu University of Chinese Medicine, 2015.
36. Li, L.X., K. Deng, Acupuncture combined with swallowing training for post-acute stroke dysphagia: a meta-analysis of randomized controlled trials. Acupuncture Med, 2019. 37(2): p. 81-90.
37. Ye, Q., et al., Systematic review on acupuncture for treatment of dysphagia after stroke. Evidence-Based Complementary and Alternative Medicine, 2017. 2017: p. 1-18.
38. Long, Y. and X. Wu, A meta-Analysis of the efficacy of acupuncture for dysphagia after stroke. Acupuncture in Medicine, 2012. 30(4): p. 291-297.
39. Wong, I.S.Y., K.F. Ng and H.W.H. Tsang, Acupuncture for dysphagia following stroke: A systematic review. European Journal of Integrative Medicine, 2012. 4(2): p. e141-e150.
40. Li, L.X,K. Deng and Y. Qu, Acupuncture treatment for post-acute-stroke dysphagia: an update meta-analysis of randomized controlled trials. Chinese Journal of Integrative Medicine, 2018. 24(9): p. 686-695.
41. Xie Y, Wang L,He J, Wu T, Acupuncture for dysphagia in acute stroke. Cochrane Database of Systematic Reviews, 2008(3): p. CD006076.
42. Becker LA, Oxman AD. Chapter 22: Overviews of reviews. In: Higgins JPT,

Green S, editors. Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0. The Cochrane Collaboration; 2011. http://handbook. cochrane.org/chapter_22/22_overviews_of_reviews.htm(accessed 27 Feb 2015).