INPLASY PROTOCOL

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Network Meta-analysis of the effects of different stimulation methods of transcranial direct current stimulation on dysphagia after stroke

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Review question / Objective: **To evaluate the therapeutic effect of different stimulation methods of transcranial direct current stimulation (tDCS) on dysphagia after stroke.**
Condition being studied: **According to statistics, only 60% of stroke patients can survive, and 37%-78% of the survivors will be accompanied by dysphagia, known as Post stroke dysphagia (PSD). Although most PSD improves spontaneously, 11 to 50% of patients develop long-term disability. As a Noninvasive brain stimulation (NIBS) technique, transcranial direct current stimulation (tDCS) has the advantages of safety, tolerability and Noninvasive. At present, it is widely used in the treatment of dysfunction caused by various neurological injuries.The meta-analysis results of Sarah Marchina et al. proved that tDCS has a significant effect on PSD. However, the comparison of the therapeutic effects of different stimulation methods is still controversial. Therefore, it is necessary and practical significance to evaluate the therapeutic effects of different stimulation methods of tDCS for PSD.**

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 29 August 2022 and was last updated on 29 August 2022 (registration number INPLASY202280105).

INTRODUCTION

Review question / Objective: **To evaluate the therapeutic effect of different stimulation methods of transcranial direct current stimulation (tDCS) on dysphagia after stroke .**

Rationale: **By searching CNKI,VIP, WanFang Data, CBM, PubMed, Embase and Cochrane Library, randomized controlled trials (RCTS) on the application of tDCS in the treatment of dysphagia after stroke were collected. The retrieval period is from database construction to May 2022. Then,**

professional statistical software was selected for data analysis of the selected literature information. We used Review Manager 5.4 and Stata 14.2 to analyze the outcome indicators of the included literature.

Condition being studied: According to statistics, only 60% of stroke patients can survive, and 37%-78% of the survivors will be accompanied by dysphagia, known as Post stroke dysphagia (PSD). Although most PSD improves spontaneously, 11 to 50% of patients develop long-term disability. As a Noninvasive brain stimulation (NIBS) technique, transcranial direct current stimulation (tDCS) has the advantages of safety, tolerability and Noninvasive. At present, it is widely used in the treatment of dysfunction caused by various neurological injuries.The meta-analysis results of Sarah Marchina et al. proved that tDCS has a significant effect on PSD. However, the comparison of the therapeutic effects of different stimulation methods is still controversial. Therefore, it is necessary and practical significance to evaluate the therapeutic effects of different stimulation methods of tDCS for PSD.

METHODS

Search strategy: By searching CNKI,VIP, WanFang Data, CBM, PubMed, Embase and Cochrane Library, randomized controlled trials (RCTS) on the application of tDCS in the treatment of dysphagia after stroke were collected. The retrieval period is from database construction to May 2022.The English search terms include stroke, cerebrovascular accident, deglutition disorder, dysphagia, transcranial direct current stimulation. Taking PubMed as an example, the retrieval formula is: ("stroke"[MeSH Terms] OR "stroke"[All Fields] OR "strokes"[All Fields] OR "stroke s"[All Fields]) AND ("deglutition disorders"[MeSH Terms] OR ("deglutition"[All Fields] AND "disorders"[All Fields]) OR "deglutition disorders"[All Fields] OR "dysphagia"[All Fields] OR "dysphagias"[All Fields]) AND ("transcranial direct current stimulation"[MeSH Terms] OR ("transcranial"[All Fields] AND "direct"[All Fields] AND "current"[All Fields] AND "stimulation"[All Fields]) OR "transcranial direct current stimulation"[All Fields] OR "tdcs"[All Fields]).

Participant or population: It meets the diagnostic criteria for stroke established by the Fourth National Conference on Cerebrovascular Diseases or is diagnosed as stroke by CT or MRI and has dysphagia determined by at least one examination, such as Kuwada drinking test, electronic fiber laryngoscopy (FEES), and swallowing angiography examination (VFSS).

Intervention: The intervention group received tDCS on the basis of the treatment group.

Comparator: The control group received routine swallowing training and/or sham anodic tDCS, neuromuscular electrical stimulation (NMES) and electro-acupuncture.

Study designs to be included: Stata 14.2 and Review Manager 5.4 software were used for meta-analysis of the included literatures. Standardized mean differenc (SMD) and 95% confidence interval (CI) were used to analyze the results because the data type of the MMASA, DOSS and other scales on the improvement of swallowing function score was continuous variable. The effective rate of swallowing function was a dichotomous variable, so the results were analyzed by odds ratio (OR) and 95% confidence interval (CI).

Eligibility criteria: Patients, control measures and intervention measures as described above;Exclusion criteria① non-Chinese and English documents; ② the anodic stimulation site of tDCS was not the cerebral cortex area; (3) the retrieved duplicated literature; (4) Non-randomized controlled trials, such as conference papers, application guidelines, reviews, systematic reviews and unrelated studies; ⑤ There were multiple variables between the control group and the experimental

group; ⑥ Dysphagia caused by other diseases, such as brain trauma, Parkinson's disease; ⑦ data results are incomplete or do not meet the inclusion criteria.

Information sources: In this study, two reviewers searched and screened the literature according to the search terms, read the title and abstract of the literature, and independently verified the literature data. If the results of literature screening and basic data are different, a third party should be sought for assistance.

Main outcome(s): A total of 31 literatures were included, involving four kinds of stimulation methods. The results of traditional Meta-analysis showed that after sensitivity analysis, the therapeutic effect of the four stimulation methods combined with conventional swallowing training was better than that of conventional swallowing training alone(P unaffected side (SUCRA=61.7) > alternate stimulation (SUCRA=51.2) > affected side (SUCRA=48.2). In terms of swallowing efficiency, traditional Meta-analysis showed that tDCS could effectively improve swallowing function (P affected side(SUCRA=63.6).

Additional outcome(s): In terms of improvement in swallowing scores,the efficacy of four stimulation methods combined with conventional swallowing treatment was better than that of conventional swallowing treatment alone, and there was no significant difference among other stimulation methods. Two closed loops were formed in the study, and the inconsistency between the studies was not significant by node-splitting method node splitting method and loop inconsistency detection .The SUCRA value of bilateral anode simultaneous stimulation tDCS stimulated both cerebral hemispheres was the highest, followed by the stimulation of healthy cerebral hemispheres, alternating stimulation of both cerebral hemispheres, and stimulation of affected cerebral hemispheres. In the ranking probability, the probability of the optimal effect of bilateral anode simultaneous stimulation is the largest. In terms of swallowing efficiency,compared with conventional swallowing treatment alone, tDCS stimulation of the affected side combined with conventional swallowing treatment was more effective in improving swallowing function, while alternating stimulation combined with conventional swallowing treatment was not statistically significant compared with conventional treatment alone or stimulation of the affected side.

Quality assessment / Risk of bias analysis: Review Manager 5.4 software provided by the Cochrane Collaboration was used to evaluate the quality of the included literature. Software for randomized controlled trials of bias the content of risk assessment, including the generation of random sequence, the distribution of the stochastic solution to hide, for the research object, and intervention implementer blind, and the result evaluation is blind, and the integrity of the end index data, the possibility of selective reports the results of the study and other aspects of the bias source seven aspects. Each item was evaluated as "low risk", "high risk" and "unclear".

Strategy of data synthesis: Standardized mean differenc (SMD) and 95% confidence interval (CI) were used to analyze the results because the data type of the MMASA, DOSS and other scales on the improvement of swallowing function score was continuous variable. The effective rate of swallowing function was a dichotomous variable, so the results were analyzed by odds ratio (OR) and 95% confidence interval (CI).In traditional meta-analysis, I2 was used to judge the heterogeneity. If I2≤50% and P≥0.05, there was no significant heterogeneity, and the effect size was combined with the fixed-effect model. If I2>50% or P<0.05, the heterogeneity is large, and the random effect model should be used to combine the effect size.Firstly,inconsistencies should be checked. If the test results show that P≥0.05, it indicates that the inconsistency model of the study is not

significant, and the consistency model should be used to analyze the results. If P<0.05, it indicates that the inconsistency model is significant and the consistency model cannot be used. Secondly, loop inconsistency test was used to determine direct and indirect evidence and Inconsistency factors (IF) and 95% confidence interval (CI). If the 95%CI includes 0, it means that the ring inconsistency is not significant. IF the 95%CI does not include 0 or the IF value is large, it indicates that there is a certain degree of inconsistency in the rings, so the interpretation of the results needs to be cautious.

Subgroup analysis: Since only one outcome index, efficiency rate, was reported in the 4 literatures, and the data were dichotomous variables, in order to ensure the comprehensiveness of the research results, we divided the swallowing function score improvement group and the swallowing function effective group.The two groups were grouped according to the four stimulation methods.

Sensitivity analysis: In the group with improved swallowing scores, sensitivity analyses were performed one by one.After excluding 3 articles, the difference was statistically significant.The reason may be caused by different scoring standards. In these 3 studies, the higher the average score, the worse the swallowing function, and vice versa. In other literatures, the standard of swallowing function is that the higher the average value, the better the swallowing function, and vice versa.

Country(ies) involved: The study authors are all from China.

Keywords: stroke; dysphagia;transcranial direct current stimulation;stimulation methods; Network Meta-analysis.

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