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Efficacy and Safety of Ginseng-containing Injections on Postoperative Cognitive Dysfunction: A Systematic Review and Meta-Analysis

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ADMINISTRATIVE INFORMATION

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Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 31 July 2024 and was last updated on 31 July 2024.

INTRODUCTION

Review question / Objective To evaluate the effectiveness and safety of ginseng-containing traditional Chinese medicine injections in preventing POCD.

Condition being studied Shenmai Injection (SMI) and Shenfu Injection (SFI), as traditional Chinese medicine injections containing ginseng, have been approved by the National Drug Administration for marketing and are listed as national protected varieties of Chinese medicine. Experimental studies have shown that SMI can inhibit the expression of oxidative stress and autophagy related proteins, while SFI can improve glucose uptake and mitochondrial function, improve brain microcirculation, and alleviate inflammatory damage. Observational studies have shown that both have certain advantages and potential in improving neural function defects and promoting the repair and regeneration of injured nerves. Currently, they have been widely introduced for the prevention of POCD. However, there is still a lack of reliable clinical evidence for its prevention of POCD. Therefore, we conducted a meta-analysis to evaluate the effectiveness and safety of ginseng-containing traditional Chinese medicine injections in preventing POCD. The primary outcome was postoperative Mini-mental State Examination (MMSE) score and POCD incidence, while secondary outcomes included postoperative serum S100 β Protein concentration, postoperative consciousness recovery time, and incidence of postoperative adverse reactions.

METHODS

Search strategy We searched a total of seven databases, PubMed, Embase, Web of Science, CNKI, Wanfang, VIP, and CBM.

Participant or population Patients undergoing general anesthesia surgery, regardless of race, age, gender, type of surgery.

Intervention SMI or SFI while undergoing conventional surgical treatment.

Comparator Normal saline (NS) or Glucose (GS) or blank control while receiving conventional surgical treatment.

Study designs to be included Randomised controlled trial (RCTs).

Eligibility criteria Inclusion criteria
Type of study (S): Randomised controlled trial (RCTs);
Type of participant (P): Patients undergoing general anesthesia surgery, regardless of race, age, gender, type of surgery;
Intervention (I): SMI or SFI while undergoing conventional surgical treatment.
Control (C): Normal saline (NS) or Glucose (GS) or blank control while receiving conventional surgical treatment.
Outcome measures (O): Mini-mental State Examination (MMSE) score and incidence of POCD were selected as the primary outcomes, and secondary outcomes included serum S100β protein concentration, postoperative time to recovery of consciousness.
Exclusion criteria
(1) Patients with preoperative cognitive impairment;
(2) Studies that did not use MMSE scores for cognitive scoring;
(3) Types of articles: Basic research literature such as reviews, comments, empirical studies, and mechanisms; Clinical research literature on non randomized controlled trials; Literature on intervention measures other than ginseng-containing injection; Literature with incorrect or incomplete data; Duplicate literature.

Information sources We searched a total of seven databases, PubMed, Embase, Web of Science, CNKI, Wanfang, VIP, and CBM.

Main outcome(s) Current evidence suggests that Ginseng-containing injections improve postoperative MMSE scores, reduce the incidence of POCD, and decrease postoperative serum S100β protein concentration and consciousness recovery time.

Quality assessment / Risk of bias analysis The quality of the included studies was evaluated for methodological quality based on the Cochrane Risk of Bias Assessment Tool. The evaluation included seven items: random sequence generation, allocation sequence concealment, blinding of investigators and subjects, blinding of outcome assessment, completeness of outcome data, selective reporting of findings and other biases. Each risk of bias was categorised into three levels of "low risk", "unclear" and "high risk". The literature evaluation was conducted independently by two evaluators (QQL and WJP), who checked each other's results after completion. The third reviewer (GMS) was consulted in case of disputes.

Strategy of data synthesis Statistical processing was performed using Review Manager 5.4 software. Continuous variables were analysed using mean differences (MDs) or standardised mean differences (SMDs) and 95% confidence intervals (CIs). Relative risks (RRs) and 95% CIs were used for dichotomous data. Heterogeneity was analysed using the Q test and I2 statistics. If $P > 0.10$ or $I2 < 50\%$, a fixed-effects model was used; otherwise, a random-effects model was selected. Sensitivity analyses and subgroup analyses were performed to assess the stability of the results and to detect potential sources of heterogeneity. Publication bias was assessed using funnel plots. Differences were considered statistically significant when $P < 0.05$.

Subgroup analysis Due to the same frequency of administration, we conducted a subgroup analysis based on the dosage of SMI and SFI (Fig. 9, 10). The analysis results of the SFI group showed a dosage of 60mL (RR = 0.28, 95% CI 0.14 to 0.53, $P < 0.001$), and a dosage of 50mL (RR = 0.50, 95% CI 0.29 to 0.84, $P < 0.05$), the administration of 0.6mL/kg (RR = 0.36, 95% CI 0.20 to 0.64, $P < 0.001$). The results appeared to indicate that the 60 mL dose of medication reduced the incidence of POCD most significantly.
In the SFI group, the analysis of the results of different doses showed that 100 mL of dosage (RR = 0.52, 95% CI 0.34 to 0.81, $P < 0.05$), 50 mL of dosage (RR = 0.64, 95% CI 0.41 to 0.99, $P < 0.05$), 40 mL of dosage (RR = 0.17, 95% CI 0.04 to 0.68, $P < 0.05$), 1.5 mL/kg of dosing (RR = 0.36, 95% CI 0.17 to 0.74, $P < 0.05$), the results were seemed to indicate that the dose of 40 mL of dosing reduced the incidence of POCD the most significantly, and due to the small sample size, these results should be interpreted with caution.

Sensitivity analysis We performed sensitivity analyses by removing each included study to check the stability of the results.

Country(ies) involved China.

Keywords Postoperative Cognitive Dysfunction, Mini-mental State Examination, Ginseng-containing injection, meta-analysis, Traditional Chinese medicine.

Contributions of each author

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