

# INPLASY

## Meta-analysis of the pulmonary protective effects of sevoflurane in asian adult cardiac surgery with cardiopulmonary bypass

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### ADMINISTRATIVE INFORMATION

**Support** - Tianjin Key Medical Discipline(Specialty) Construction Project (NO.TJYXZDXK-042A).

**Review Stage at time of this submission** - Preliminary searches.

**Conflicts of interest** - None declared.

**INPLASY registration number:** INPLASY2023120122

**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 31 December 2023 and was last updated on 31 December 2023.

### INTRODUCTION

**Review question / Objective** To compare the effects of total intravenous anesthesia (TIVA) and sevoflurane anesthesia on postoperative lung function during cardiopulmonary bypass in adult cardiac surgery. The study of choice was RCT.

**Condition being studied** Pulmonary dysfunction post-cardiac surgery under cardiopulmonary bypass (CPB) is a common clinical issue, leading to prolonged postoperative intubation and ICU stays, with CPB being a significant contributing factor. Sevoflurane, a volatile fluorinated inhalation anesthetic, is widely used clinically due to its effective anesthesia with minimal adverse reactions. Recent animal and clinical trials both domestically and internationally have indicated that the use of sevoflurane during CPB not only achieves effective anesthesia but also mitigates lung injury. However, this topic remains

controversial and lacks sufficient evidence-based medical proof. This article conducts a meta-analysis of past domestic and international research to evaluate the impact of sevoflurane on the lungs during CPB, thereby better guiding its clinical application.

### METHODS

**Participant or population** Encompassing 440 patients, with 220 in the sevoflurane group and 220 in the total intravenous anesthesia (TIVA) group.

**Intervention** The experimental group receiving intermittent or continuous sevoflurane during CPB.

**Comparator** Control group receiving total intravenous anesthesia (TIVA) or not using volatile anesthetic gases.

**Study designs to be included** RCT.

**Eligibility criteria** (1) Inclusion Criteria: ① Clinical Randomized Control Trials (RCT); ② Study subjects being adult cardiac surgery patients under CPB; ③ Control group receiving total intravenous anesthesia (TIVA) or not using volatile anesthetic gases, with the experimental group receiving intermittent or continuous sevoflurane during CPB; ④ Articles must be publicly published and the full text available; ⑤ At least one of the following six experimental measurement indicators should be included: interleukin-6 (IL-6), IL-8, tumor necrosis factor-alpha (TNF- $\alpha$ ), oxygenation index (OI), alveolar-arterial oxygen tension difference P (A-a) O<sub>2</sub>, and postoperative intubation time.

**Information sources** Cochrane Library, Embase, PubMed, Google Scholar, CNKI, Wanfang, and VIP.

**Main outcome(s)** The results showed that the use of sevoflurane during CPB significantly reduced the concentrations of interleukin (IL)-6 ( $P=0.005$ ) and IL-8 ( $P=0.01$ ) in the patients' blood compared to the TIVA group, and reduced the postoperative intubation time ( $P<0.001$ ). However, there were no statistically significant differences between the two groups in the concentration of tumor necrosis factor-alpha (TNF- $\alpha$ ) ( $P=0.19$ ), alveolar-arterial oxygen tension difference P (A-a) O<sub>2</sub> ( $P=0.68$ ), and oxygenation index OI ( $P=0.31$ ).

**Quality assessment / Risk of bias analysis** Cochrane risk bias assessment tool.

**Strategy of data synthesis** Statistical analyses were conducted using RevMan 5.3 software for meta-analysis of the measurement data for each indicator. If the data were binary variables, relative risk (RR) and its 95% confidence interval (CI) were used for evaluation. For continuous variables, the standardized mean difference (SMD) and its 95% CI were used. Heterogeneity among the data was assessed using the  $I^2$  statistic. A fixed-effect model was applied for analysis when there was no or little heterogeneity ( $I^2 \leq 50\%$ ). A  $P$ -value of  $<0.05$  was considered statistically significant.

**Subgroup analysis** Subgroup analysis was performed for patients with cardiopulmonary bypass duration less than 90 minutes and those with cardiopulmonary bypass duration greater than or equal to 90 minutes.

**Sensitivity analysis** The sensitivity analysis was carried out in STATA software, and the sensitivity of the article was determined by the change of effect size after deleting one of the articles.

**Country(ies) involved** China;Korea.

**Keywords** cardiopulmonary bypass, cardiac surgery, pulmonary protection, and sevoflurane meta-analysis.

#### **Contributions of each author**

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