INPLASY PROTOCOL

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Risk factors of postinduction hypotension in adult surgical patients undergoing general anesthesia, a systematic review and meta-analysis from observational studies

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Review question / Objective: **To figure out the risk factors of postinduction hypotension in adult surgical patients indergoing general anesthesia.**
Condition being studied: **Postinduction hypotension is so prevalent worldwide in all hospitals, as most of the surgical patients undergo general anesthesia, and the hypotension can lead to adverse outcomes including myocardial or renal ischemia. How to prevent or decrease postinduction hypotension is a big issue in the clinic, but nowadays the risk factors of postinduction hypotension are not clear, which make it difficult and not feasible for the prevention in clinical anesthesia.**

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 28 May 2021 and was last updated on 28 May 2021 (registration number INPLASY202150098).

INTRODUCTION

Review question / Objective: **To figure out the risk factors of postinduction hypotension in adult surgical patients indergoing general anesthesia.**

Rationale: **Intraoperative hypotension is an inadvertent event during surgery and anesthesia, it can cause adverse outcomes including myocardial or renal ischemia, and lead to postoperative morbidity and mortality. Intraoperative hypotension is very prevalent during the induction of**

general anesthesia, which is called Postinduction hypotension (PIH), or postintubation hypotension. PIH results from the inhibition on heart function and the vasodilatation by general anesthetic agents, and commonly occurs 5-10 min after the induction of general anesthesia. During this period, surgical stimulus is absent, the anesthesiologists are often distracted by ventilator adjustment, anesthesia recording, and placement of the patients, so that PIH can be easily neglected and cannot be managed in time, which might result in adverse outcomes. Thus, early prediction before the induction of general anesthesia is of great value to reduce the incidence of PIH or prevent PIH. An early study showed that the risk factors of PIH were age>50 years, ASA III, baseline MAP <70 mmHg, administration of propofol and high dosage of fentanyl for the induction. But this study excluded patients with ASA above class III, emergency operation, and patients with lower baseline MAP. Since then, more and more studies investigated the risk factors or predictors of PIH, due to the variations of patients age, ASA classification, comorbidities, medications, or general anesthetic agents for the induction in different studies, the risk factors or predictors of PIH varied too much among the studies; furthermore, some studies were of small sample size. So, till now, the results from one single study was less powerful and less persuasive to instruct us to predict PIH in the clinic. Thus, we conducted a systematic review and meta-analysis from the studies published for the past 3 decades, tried to figure out the risk factors and predictors of PIH in adult patients undergoing all types of surgeries under general anesthesia.

Condition being studied: Postinduction hypotension is so prevalent worldwide in all hospitals, as most of the surgical patients undergo general anesthesia, and the hypotension can lead to adverse outcomes including myocardial or renal ischemia. How to prevent or decrease postinduction hypotension is a big issue in the clinic, but nowadays the risk factors of postinduction hypotension are not clear, which make it difficult and not feasible for the prevention in clinical anesthesia.

METHODS

Search strategy: A systematic literature search was performed up to May 2021 in the PubMed, Cochrane library, Embase databases, and Web of Science. The key items included postinduction, postintubation, hypotension, risk factor, predictor, adult patients, general anesthesia, surgery.

Participant or population: The participants were adult patients undergoing all types of surgeries under general anesthesia, pediatric patients were not included.

Intervention: General anesthesia.

Comparator: None.

Study designs to be included: Primary observational studies.

Eligibility criteria: Studies examining the relationship between the risk factors (exposures) and PIH(outcome) in the operating theater,; observational primary studies published in peer-review English journals; enough data available to do the analyses (ie, pre-calculated OR, or continuous data).

Information sources: A systematic literature search was performed up to May 2021 in the PubMed, Cochrane library, Embase databases, and Web of Science. The key items included postinduction, postintubation, hypotension, risk factor, predictor, adult patients, general anesthesia, surgery. The reference lists of the included studies were checked for potentially eligible articles.

Main outcome(s): The main outcomes of interest were the risk factors of postinduction hypotension, including the characteristics of patients (age, sex, ASA classification,BMI, baseline blood pressure, HR, blood volume, autonomous nervous function), comorbidities(hypertension, heart disease, lung disease, Diabetes, renal

disease, cerebral disease), long-term medications, and administration of general anesthetic agents.

Additional outcome(s): None.

Data management: The literature search, data selection and extraction were conducted by at least two authors independently according to the predefined inclusion and exclusion criteria, any discrepancies resolved by consensus with a senior researcher. The extracted variables included the first author, publication year, country, study design, sample size of groups, age of patients, risk factors of association. Our preference for measure of association was the binary data needed to calculate an OR, if not available, we extracted the reported OR with 95% CI (preferably unadjusted), or from continuous variables, we calculated SMD with 95% CI then transformed them to OR.

Quality assessment / Risk of bias analysis: The quality of the included studies was judged by the Newcastle-Ottawa Scale(NOS), the highest score was 9 stars, a study with a NOS score ≥ 7 stars was identified as a high-quality study, and if the NOS score was less than 7 stars, the study was excluded.

Strategy of data synthesis: For each risk factor, we did a Meta-analysis from at least three independent studies. The main outcome of the meta-analysis was the pooled OR of each risk factor. An OR greater than 1 indicated the factor was associated with increased likelihood of developing PIH, whereas an OR less than 1 indicated decreased likelihood of PIH. The 95% CI and the P value was estimated as well. The Chi-square test and I2 value were used to assess the level of between-study heterogeneity, a random effect model was used for heterogeneity (P< 0.1 or I2≥ 50%), and a fixed effect model was used for homogeneity (P≥0.1 or I2< 50%). Sensitivity analyses was performed to explore the source and size of heterogeneity among the studies when necessary. Publication bias was evaluated by the Egger test, and P ≥ 0.05 represented no statistical significance in publication bias. Statistical significance was set at P < 0.05(two-tailed) and the analyses were done with STATA software 12.0. Trial sequential analysis (TSA) was conducted using TSA 0.9.5.5 Beta software (www.ctu.dk/tsa); the required information size (RIS) was estimated using 0.05 for type 1 error, 0.20 for type 2 error in the meta-analysis.

Subgroup analysis: Two groups: patients developing postinduction hypotension and patients not developing postinduction hypotension.

Sensitivity analysis: Sensitivity analyses was performed to explore the source and size of heterogeneity among the studies when necessary.

Language: The citations were restricted to clinical studies and published in English.

Country(ies) involved: China.

Other relevant information: None.

Keywords: Postinduction hypotension, risk factors, adult surgical patients.

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