International Platform of Registered Systematic Review and Meta-analysis Protocols

INPLASY

INPLASY202410068

doi: 10.37766/inplasy2024.1.0068

Received: 17 January 2024

Published: 17 January 2024

Corresponding author:
Hai-Yan Yin

haiyanyin1867@126.com

Author Affiliation:
Jinan University.

Driving pressure-guided ventilation and postoperative pulmonary complications in surgical patients: a meta-analysis of randomized controlled trials

Gu, WJ[1]; Cen, Y[2]; Zhao, FZ[3]; Wang, HJ[4]; Yin, HY[5]; Zheng, XF[6].

ADMINISTRATIVE INFORMATION

Support - None.

Review Stage at time of this submission - Data analysis.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202410068

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 17 January 2024 and was last updated on 17 January 2024.

INTRODUCTION

Review question / Objective Is driving pressure-guided ventilation associated with a lower risk of postoperative pulmonary complications in surgical patients?

Rationale Postoperative pulmonary complications (PPCs) remains common and have substantial adverse effects on patients. Multiple perioperative interventions have been used to prevent PPCs, with one approach being a lung protective ventilation strategy involving low tide volume, positive end-expiratory pressure (PEEP), and recruitment maneuver. While the benefits of low tidal volume in preventing PPCs are acknowledged, the optimal PEEP level remains debated. A meta-analysis of individual patient data has suggested that intraoperative high driving pressure and changes in the level of PEEP increasing driving pressure are associated with more PPCs. However, the role of ventilation based on driving pressure has not been well established. A previous meta-analysis found that driving pressure-guided ventilation could decrease mortality and improve oxygenation index in mechanically ventilated patients, but this primarily involved individuals with acute respiratory distress syndrome (ARDS) rather than surgical cases and did not assess PPCs. Another two meta-analyses evaluated the effects of individualized PEEP guided by respiratory mechanics (including driving pressure) for preventing PPCs. However, they did not solely assessed the exclusive impact of driving pressure-guided ventilation on PPCs. Recently, numerous studies have assessed the effect of driving pressure-guided ventilation on PPCs, with inconsistent results.

Condition being studied Postoperative pulmonary complications in surgical patients.

METHODS

Search strategy We searched PubMed, Embase, and the Cochrane Central Register of Controlled Trials from inception to January 1, 2024. The search strategy included keywords and medical subject heading terms for driving pressure and postoperative pulmonary complications, combined with sensitive filters to identify RCTs. We also examined the reference lists of relevant reviews and included studies for additional studies.

Participant or population Adult patients undergoing surgery, regardless of surgical type (including emergent or elective cardiothoracic and non-cardiothoracic surgery).

Intervention Driving pressure-guided ventilation, involving low tide volume, titrated PEEP, and with or without recruitment maneuver.

Comparator Conventional protective ventilation, involving low tide volume, fixed PEEP, and with or without recruitment maneuver.

Study designs to be included Randomized controlled trials.

Eligibility criteria Studies were considered eligible if they met the following criteria: (1) Design: RCTs; (2) Population: adult patients undergoing surgery, regardless of surgical type (including emergent or elective cardiothoracic and non-cardiothoracic surgery); (3) Intervention: driving pressure-guided ventilation, involving low tide volume, titrated PEEP, and with or without recruitment maneuver; (4) Comparison: conventional protective ventilation, involving low tide volume, fixed PEEP, and with or without recruitment maneuver; and (5) Outcome: availability of data on PPCs.

Information sources PubMed, Embase, and the Cochrane Central Register of Controlled Trials.

Main outcome(s) A composite of postoperative pulmonary complications.

Additional outcome(s) Pneumonia, atelectasis, and ARDS.

Data management Two reviewers independently extracted data using a standardized data extraction sheet. We extracted the following information, including study characteristics, study population, ventilation parameters, and study outcomes.

Quality assessment / Risk of bias analysis We assessed the risk of bias using the Cochrane risk of bias assessment tool 2 (RoB 2).

Strategy of data synthesis Due to the disparity in the incidence of PPCs, the association was assessed separately in cardiothoracic surgery and non-cardiothoracic surgery. We performed meta-analyses to calculate risk ratios (RRs) and confidence intervals (CIs) using the Mantel-Haenszel statistical method with a random-effects model. To assess statistical heterogeneity across studies, we applied Cochran's Q test and quantified it using I2 statistic. Publication bias for outcomes with at least 10 trials was assessed by visually inspecting funnel plots and conducting the Egger test. All meta-analyses were performed using Revman version 5.3 (Cochrane Collaboration). All tests were two-tailed, and statistical significance was set at $P<0.05$.

Subgroup analysis Not Applicable.

Sensitivity analysis Not Applicable.

Language restriction None.

Country(ies) involved China.

Other relevant information We rated the certainty of evidence as high, moderate, low, or very low for the outcomes by using the GRADE (Grading of Recommendations Assessment, Development, and Evaluation) framework. For the primary outcome of PPCs, we used trial sequential analysis to assess the risk of random errors arising from repetitive testing.

Keywords riving pressure; mechanical ventilation; surgery; postoperative pulmonary complications; meta-analysis.

Dissemination plans The manuscript will be published in a peer-reviewed journal.

Contributions of each author

Author 1 - Wan-Jie Gu - Conception and design of the work; acquisition and analysis of data for the work; drafting the work; and final approval of the version to be published.
Email: wanjiegu@hotmail.com
Author 2 - Yun Cen - Conception and design of the work; acquisition and analysis of data for the work; revising it critically for important intellectual

content; and final approval of the version to be published.
Email: cenyun2022@jnu.edu.cn
Author 3 - Feng-Zhi Zhao - Interpretation of data for the work; revising it critically for important intellectual content; and final approval of the version to be published.
Email: 358099920@qq.com
Author 4 - Hua-Jun Wang - Interpretation of data for the work; revising it critically for important intellectual content; and final approval of the version to be published.
Email: whj323@126.com
Author 5 - Hai-Yan Yin - Conception and design of the work; interpretation of data for the work; revising it critically for important intellectual content; and final approval of the version to be published.
Email: haiyanyin1867@126.com
Author 6 - Xiao-Fei Zheng - Conception and design of the work; interpretation of data for the work; revising it critically for important intellectual content; and final approval of the version to be published.
Email: zhengxiaofei12@163.com