Introduction

- Obesity is a risk factor for more postoperative pulmonary complications, cardiovascular events, infection, slow healing, and nerve injury following general endotracheal anesthesia, which are associated with increased medical costs.
- Physiologically, patients with obesity have a greater thoracic wall wall and abdominal fat mass causing decreased lung functional residual capacity and lung compliance and therefore have a higher risk for intraoperative atelectasis which must be considered when administering general endotracheal anesthesia.
- It is suggested that high PEEP may improve lung compliance and prevent alveolar collapse and atelectasis postoperatively, however it is controversial whether high PEEP is more protective than low PEEP.

**Purpose:** to determine whether low or high intraoperative PEEP combined with low tidal volume reduces postoperative pulmonary complications in patients with obesity undergoing general endotracheal anesthesia.

Methods

- **Search:**
  - We searched the MEDLINE (1982 to January 2021), CENTRAL (1993 to January 2021), EMBASE (1975 to January 2021), CINAHL (1995 to January 2021). The original search was performed in January 2021.

- **Study inclusion**
  - We included studies that met the following criteria: (1) 18 years or older patients with obesity defined as BMI >30kg/m²; (2) mechanical ventilation under general endotracheal anesthesia; (3) low tidal volume of 6-8 ml/kg of predicted body weight; (4) laparoscopic or laparotomy surgeries.
  - The primary outcome was the incidence of postoperative pulmonary complications which include respiratory failure, acute respiratory distress syndrome, bronchospasm, new pulmonary infiltrates on radiographs, pulmonary infection, pneumonitis, pleural effusion, atelectasis, cardiopulmonary edema, and pneumothorax.
  - **Outcome measures:**
    - Secondary outcomes included extra-pulmonary complications (such as systemic inflammatory response, sepsis, septic shock, extrapulmonary infection, coma, acute myocardial infarction, acute kidney failure, ileus, bowel obstruction, transaminist) intraoperative hypotension, administration of vasoactive medications, hospital free days at postoperative day 90, and mortality during hospital stay.
  - **Statistical analysis:**
    - Statistical analysis was conducted using Cochrane RevMan Review Manager version 5.4.

- **Our random effects analysis did not show a statistically significant difference between the two groups (RR 2.21, 95% CI 0.41-11.83; P value 0.35; I²=53%) in terms of postoperative pulmonary complications (Figure 1).**

- The analysis of three studies for intraoperative hypotension (MAP <65) showed a significant difference between the two groups (RR 1.84, 95% CI 1.56-2.17; P value 0.001; I²=0%) (Figure 2).

- **Hospital mortality:** not analyzed since only one of the four final articles for meta-analysis (Bluth 2019) provided this data.

Results

- Figure 1. Forest plot for postoperative pulmonary complications across four studies.
- Figure 2. Forest plot for intraoperative hypotension across three studies.

Discussion & Conclusion

- Lack of robust evidence to determine the risk of postoperative pulmonary complications between low PEEP and high PEEP.
- All trials were performed within the last five years indicating that our scientific community only recently started showing interest in the isolated effect of PEEP in patients with obesity.
- Our analysis on the rate of intraoperative hypotension showed that high PEEP is correlated with higher rate of intraoperative hypotension than low PEEP. This finding is consistent with existing literature about PEEP for patients without obesity.

Our study demonstrates the necessity of future trials that compare the safety of low and high PEEP in order to establish a standard mechanical ventilation protocol for patients with obesity.

References


Jae Y. Choi, Miriam Al-Saedy, Brian Carlson

Elson S. Floyd College of Medicine