A randomized controlled trial comparing of volume controlled and pressure-regulated volume controlled ventilation in patients undergoing laparoscopic gynecological surgery under general anesthesia

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Background

Raised intra-abdominal pressure by pneumoperitoneum and alteration in patient's position (Trendelenburg) during Laparoscopic gynecologic surgery can cause a significant increase peak airway pressure (PIP) [1]. The conventional volume controlled ventilation(VCV) mode is generally preferred as it is familiar to anesthesiologists. However, previous studies [2, 3] have shown that VCV tends to create more peak airway pressure compared with pressure controlled ventilation (PCV) during laparoscopic surgery. This effect might be due to decelerating inspiratory flow pattern that provide a more homogenous gas distribution, reduce peak airway pressure and improve gas exchange. Pressure-regulated volume control (PRVC) is a mode of ventilation that combines the advantages of decelerating inspiratory flow pattern of PCV mode with the ease of using the VCV mode [4]. Thus PRVC could be beneficial in this type of surgery.

Objective

To compare peak airway pressure between VCV mode and PRVC mode in patients undergoing laparoscopic gynecological surgery under general anesthesia.

Methods

This study was a randomized controlled trial. The inclusion criteria were the ASA I or II patients undergoing laparoscopic gynecological surgery under general anesthesia. The exclusion criteria were patients with underlying cardiac, pulmonary, hepatorenal, or neuromuscular disease, patients with body mass index (BMI) > 30 kg/m2. They were randomly assigned by computer-generated random sequence into two group to receive volume controlled ventilator mode (group VCV) or use pressure regulated volume controlled ventilator mode (group PRVC). Peak airway pressure were measured at 10 min after induction and 30, 60, and 120 after Trendelenburg positioning. Hemodynamics parameters were also recorded.

Results

Thirty-two women were included in this study with 16 patients per group. The patient demographic data were comparable between the groups .There were significant differences in peak airway pressure at 30, 60, and 120 minutes after Trendelenburg positioning. The dynamic compliance in the PRVC group tended to be better than in the VCV group, but was not significantly different statistically.

Table 2. Peak airway pressure

	VCV group (n = 16)	PRVC group (n = 16)	p-value
Peak airway pressure (cmH2O)			
10 min	15.5 ± 2.40	13.8 ± 3.86	0.19
30 min	27.1 ± 5.36	22.8 ± 5.65	0.02*
60 min	27.0 ± 4.08	22.3 ± 3.73	0.001*
120 min	27.2 ± 5.37	22.4 ± 4.27	0.02*

Discussion

In this study, PRVC is beneficial in maintaining adequate ventilation with lower peak airway pressure compared with VCV. Limited data are available for studies of PRVC in the operating theatre. Aloka Samantaray [5] demonstrated that PRVC may be superior to PCV mode in post-cardiac surgical patients by reducing intrapulmonary shunts and improving oxygenation after cardiopulmonary bypass-induced perfusion mismatch. Joanna M Dion, et al.[6] found that PCV-VG and PC ventilation could provide lower peak airway pressure and higher compliance compared with VCV group during laparoscopic-assisted bariatric surgery. Laparoscopic procedures can cause abrupt changes in intra-abdominal pressure which affect patient's airway resistance and lung compliance. Although PRVC and PC ventilation modes have the same decelerating inspiratory flow, PRVC is an easier mode of ventilation as it offers adjustment of inspiratory pressure from breath to breath base on compliance calculation from the pressure plateau to target a set tidal volume.

Conclusion

PRVC might be a suitable mode of ventilation for patients undergoing laparoscopic gynecologic surgery under general anesthesia due to its lower peak airway pressure which might reduce risk of lung injury compared with VCV.

References

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