Pediatric One-Lung Ventilation: Influence of Ventilatory Mode and Positive End-Expiratory Pressure

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Abstract

Background: Optimization of ventilatory strategy during one-lung anesthesia is mandatory especially in vulnerable population like pediatric cancer patients. Volume-controlled ventilation (VCV) is a widely used mode, yet pressure-controlled ventilation (PCV) has been proposed to improve arterial oxygenation during OLV in adults. The aim of this study was to assess the pressure controlled ventilation as a tool to improve ventilatory management in pediatric one lung anesthesia and to study its effects on airway pressure, arterial oxygenation and hemodynamics in comparison to conventional volume controlled ventilation. The effect of application of PEEP was also evaluated in the two studied modes.

Methods: In this prospective controlled study, 30 pediatric patients undergoing elective thoracotomy requiring one-lung anesthesia were randomized into two equal groups to undergo either conventional volume control ventilation (VCV group) or pressure control ventilation (PCV group) with standardized anesthesia care. The study was divided into three stages; two-lung ventilation with the chosen mode of ventilation (TLV) in the lateral position. One-lung ventilation, with zero positive end-expiratory pressure (OLV-ZEEP) and the third stage of the study was to add 5cmH2O PEEP to both groups (OLV-PEEP). Peak airway pressure (Ppeak), mean airway pressure (Pmean), plateau pressure (Pplat), expired tidal volume (Vex) and dynamic compliance (Cdyn) were recorded at each stage. Measurement of arterial oxygen tension (Pao2), arterial carbon dioxide tension (Paco2), arterial oxygen saturation (Sao2), pH and hemoglobin (HB). Hemodynamic variables were also recorded.

Results: Lower peak airway pressure in PCV group during OLV was observed compared to VCV group. Ppeak during the two stages of OLV (OLV-ZEEP, OLV-PEEP), showed significantly lower values (22.5±0.9 in PCV, Vs 29.2±2.1 in VCV during OLV-ZEEP) and (22.9±1.6 in PCV, Vs 30.4±1.2 in OLV-PEEP). The same pattern of significant changes was observed as regards Pplat. Improved arterial oxygenation during OLV in PCV group in comparison to VCV group (175.6±28 Vs 123.2±34) was observed. Pao2 values increased significantly after the application of the 5-cmH2O PEEP in the two groups comparably. The decrease in dynamic compliance that occurred after initiation of OLV in the VCV group was significantly greater than that occurred in PCV group during OLV (with or without PEEP).

Conclusion: This study demonstrated a favorable outcome of oxygenation with lower peak and plateau pressures during PCV in pediatric OLV compared to conventional VCV. Better preservation of ventilation perfusion ratio during PCV is suggested evidenced by improved dynamic compliance in PCV compared to VCV and that 5cm H2O PEEP improved oxygenation only in VCV during OLV.

Key Words: One-lung ventilation – Pressure controlled – Volume controlled – Pediatric ventilation – Positive end-expiratory pressure – Oxygenation.

Introduction

ONE-LUNG ventilation (OLV) is the standard practice in thoracic surgery. Maintaining adequate intraoperative oxygenation while ventilating only one lung is still challenging, especially in vulnerable population like pediatric cancer patients. Optimization of ventilatory strategy during one-lung anesthesia is mandatory to avoid hypoxaemia, high airway pressure, barotraumas, atelectasis and the possibility of postoperative acute lung injury (ALI) [1]. Volume-controlled ventilation (VCV) is a widely used mode both intraoperatively and in intensive care units, yet pressure-controlled ventilation (PCV) has been proposed to improve arterial oxygenation during OLV in adults [2]. Utilization of a decelerating inspiratory flow waveform is responsible for improvements in gas exchange during pressure control ventilation for acute lung injury [3,4]. Thus, the decelerating-flow ventilation together with positive end-expiratory pressure (PEEP) would potentially provide better alveolar recruitment [5,6]. Since there are great differences between lung and thorax mechanics between children and adults, results from adults ventilation strategies cannot be directly applied to pediatrics. The lung develops considerably during childhood [7]. The number of alveoli increases approximately 10 times from birth up to the age of 8 yr, after which lung size increases further owing to alveolar growth [8].
Infant’s compliance is much higher than adult’s predominantly because of high thoracic cage’s compliance, this makes the infant lung more vulnerable to pressure increase [9]. Furthermore, functional residual capacity is lower in children than in adults [10].

The aim of this study was to assess the pressure controlled ventilation as a tool to improve ventilatory management in pediatric one lung anesthesia and to study its effects on airway pressure, arterial oxygenation and hemodynamics in comparison to conventional volume controlled ventilation. The effect of application of PEEP was also evaluated in the two studied modes.

**Material and Methods**

**Patients:**

This prospective controlled randomized study had enrolled 30 pediatric patients, ASA status I-III, aged 8-13y undergoing elective thoracotomy requiring one-lung anesthesia. Patients were excluded if they had cardiac, hepatic, renal impairment, potentially increased intracranial pressure or lung bullae. Approval of local hospital ethical committee was obtained together with written parental consent.

**Anesthetic management and stages of the study:**

Anesthetic management and intraoperative care were standardized. All patients were premedicated with oral midazolam 0.5mg/kg in the preoperative holding area. After arrival to OR and placement of standard monitors, pre-oxygenation followed by mask induction using sevoflurane 8% in oxygen (100% O2) if intravenous line (IV) was not available or by propofol 2.5-4mg/kg if IV catheter was in place. Secured IV cannula and administration of Fentanyl 2 µg/kg, atracurium 0.5mg/kg to facilitate intubation. The trachea was intubated with a double lumen endobronchial tube (DLT) using a left-sided Robertshaw tube (FrG 26-28, Rusch®, Kemen, Germany) using the same technique used in adults. Proper tube position was verified by auscultation and re-confirmed after positioning the patient in the lateral position. The lungs of all patients were ventilated with 100% oxygen throughout this study, through the anesthesia machine (Zeus®, Draeger, Luebeck, Germany) in which all hemodynamic and respiratory monitoring were incorporated. All patients were continuously monitored for ECG, pulse oximetry, direct blood pressure measurement, ETco2, inspired and expired tidal volumes, airway pressure and oxygen-agent concentrations. Patients were randomized into a study group by computer randomization (random numbers generated by the Excel computer program, Microsoft, Redmont, WA) to undergo either conventional volume control ventilation (VCV group, n=15) or pressure control ventilation (PCV group, n=15). Patients in VCV group underwent volume controlled two-lung ventilation with tidal volume 8mL/kg and respiratory rate of 15b/min, whereas patients in PCV group underwent pressure control two-lung ventilation with a peak inspiratory pressure (PIP) of 15 cmH2O, respiratory rate 15b/min. After initial setup of both modes, adjustment of the respiratory rate to keep the end-tidal carbon dioxide tension (ETco2) between 35-45mmHg could be done. Radial artery cannulation with a 22G cannula was performed for arterial blood gas (ABG) measurement and direct continuous blood pressure recording. A 5F, 13cm (B-braun) central venous catheter was introduced in the internal jugular vein in the ipsilateral side of operation. Anesthesia was maintained with isoflurane 1-1.5% in 100% oxygen, fentanyl (0.5-1.0 µg/kg/h) and atracurium (0.5mg/kg/h) infusions. IV fluids 4-6ml/kg/h of crystalloids adjusted to keep systemic arterial pressure within ±20% of pre-induction values. A heating mattress (MEDI-THERMTM II, GAYMAR, USA) was placed under the patient to keep the core temperature not less than 36.0ºC, monitored by an oropharyngeal temperature probe. This study was divided into three stages; two-lung ventilation with the chosen mode of ventilation (TLV 1) in the lateral position for all patients. After initiation of one-lung ventilation, ventilation was continued in each group by the same parameters with no positive end expiratory pressure (ZPEEP) (OLV- ZEEP). The third stage of the study was to add 5cmH2O PEEP to the same ventilatory parameters of both groups (OLV- PEEP3).

**Measured and recorded variables:**

Peak airway pressure (Ppeak), mean airway pressure (Pmean), plateau pressure (Pplat), expired tidal volume (Vex) and dynamic compliance (Cdyn) were obtained directly from the ventilator in triplicates and averaged. Heart rate (HR), mean direct arterial pressure (MAP) were monitored continuously and recorded every 15 minutes and during the set time points, central venous pressure (CVP) was measured at end-expiration and recorded at the set time points, arterial blood was sampled and analyzed within 5min (ABL, Radiometer, Copenhagen, Denmark) for measurement of arterial oxygen tension (PaO2), arterial carbon dioxide tension (PaCO2), arterial oxygen saturation (SaO2), pH and hemoglobin (HB) at the same set time points.
Set time points for measurements:

- TLV 1: 20min after turning the patient to the lateral decubitus with the two-lungs ventilated.
- OLV-ZEEP: 20min after initiation of one-lung ventilation with zero end-expiratory pressure.
- OLV- PEEP₅: One-lung ventilation, 20min after adding 5cmH₂O positive end-expiratory pressure
- TLV2: 20min after conversion from OLV to TLV.

All measurements were made after 20min elapsed to allow a steady state to be achieved. Measurements were taken when the surgeons stopped compressing the operative lung. All operations were performed with the same surgical team.

Statistical analysis:

Data were computerized and analyzed using the SPSS (SPSS Inc., Chicago, IL, USA) computer program. Normality of the distribution of data was assessed by the Kolmogorov-Smirnov test. We expressed continuous variables as the mean (SD). Changes in hemodynamic and respiratory parameters during TLV and OLV sequences were analyzed using repeated measures analysis of variance (ANOVA) followed by the Scheffe f-test, as appropriate. Otherwise, normally distributed continuous variables were compared using the Student’s t-test. A p-value of <0.05 was considered significant.

Results

This was a prospective randomized controlled clinical study that was conducted in Children’s Cancer Hospital of Egypt (CCHE) between May 2008 and October 2008. Among the 30 patients initially enrolled, only one case in the VCV group was excluded from the study because of massive blood loss and massive blood transfusion and the need for inotropic support. No other patients encountered any serious complication or arterial hypoxemia (Sao₂ <90%) requiring reinflation of the collapsed lung. Data were normally distributed. Demographic characteristics, sex and ASA distribution, duration of one-lung anesthesia, duration of surgery and the surgical procedure are summarized in Table (1).

| Table (1): Patient characteristics and operative data. |
|-----------------|-----------------|
| Variable         | VCV group (n=14) | PCV group (n=15) |
| Age (yr)         | 10.1±1.2         | 10.4±0.9         |
| Wt (kg)          | 37.4±3.2         | 39.2±2.2         |
| Sex (M/F)        | 8/6              | 10/5             |
| ASA (I/II/III)   | 5/6/3            | 7/6/2            |
| Duration of OLV (min) | 132±38         | 141±28           |
| Duration of surgery (min) | 234±65         | 260±75           |
| Surgical procedure: |                   |                   |
| Mediastinal neuroblastoma excision | 3 | 4 |
| Rhabdomyosarcoma excision | 2 | 0 |
| Metastatectomy | 5 | 6 |
| Lobectomy | 0 | 1 |
| Ewing sarcoma excision | 1 | 2 |
| Lymphoma open biopsy | 3 | 1 |
| Exploratory thoracotomy | 0 | 1 |

Data are mean ± SD, ratio or number.
OLV = One-lung ventilation.
VCV = Volume control ventilation.
PCV = Pressure control ventilation.

The two groups were comparable as regard age, weight, duration of surgery and duration of one-lung ventilation (Table 1). There was no significant difference in expired tidal volume (Vₑₓ), as well as mean airway pressure (Pₘₑᵃⁿ) at all measured time points between the two groups (Table 2). Whereas the peak airway pressure (Ppeak) and the plateau pressure (Pplat) were significantly high during all stages of one-lung ventilation (with and without PEEP) in VCV group compared to two-lung ventilation in the same group (Table 2). (Ppeak; 29.2±2.1 in OLV- ZEEP and 30.4±1.2 in OLV- PEEP₅ Vs 18.8±1.3 in TLV1) (Pplat; 20.8±4.6 in OLV-ZEEP and 21.2±3.5 in OLV-PEEP₅ Vs 14.2±3.1 in TLV 1).

Comparing the Ppeak among the VCV and the PCV groups revealed significant differences during the two stages of OLV (OLV- ZEEP, OLV- PEEP₅), where the PCV group showed significantly lower values (22.5±0.9 in PCV, Vs 29.2±2.1 in VCV during OLV-ZEEP) and (22.9±1.6 in PCV, Vs
30.4±1.2 in OLV-PEEP5) (Fig. 1) (Table 2). The same pattern of changes were observed as regards Pplat, where the PCV group showed significantly lower values during the two stages of OLV compared to VCV group. (16.1±2.8 in PCV, Vs 20.8±4.6 in VCV during OLV-ZEEP) and (17.1±2.9 in PCV, Vs 21.2±3.5 in VCV during OLV-PEEP5) (Table 2).

Table (2): Respiratory variables at different stages of the study.

<table>
<thead>
<tr>
<th>Variable</th>
<th>TLV1</th>
<th>OLV-ZEEP</th>
<th>OLV-PEEP5</th>
<th>TLV2</th>
<th>TLV1</th>
<th>OLV-ZEEP</th>
<th>OLV-PEEP5</th>
<th>TLV2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tidal volume (ml)</td>
<td>292.8±33</td>
<td>287±53.3</td>
<td>289.8±26</td>
<td>290.4±35</td>
<td>287±44</td>
<td>287.5±34.6</td>
<td>267±29.8</td>
<td>288±39.6</td>
</tr>
<tr>
<td>Airway pressures (cm H2O):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ppeak</td>
<td>18.8±1.3</td>
<td>29.2±2.1*</td>
<td>30.4±1.2*</td>
<td>19.2±3.1</td>
<td>19.5±5.1</td>
<td>22.5±0.9†</td>
<td>22.9±1.6†</td>
<td>18.1±4.2</td>
</tr>
<tr>
<td>Pplat</td>
<td>14.2±3.1</td>
<td>20.8±4.6*</td>
<td>21.2±3.5*</td>
<td>15.4±2.1</td>
<td>14.5±3.3</td>
<td>16.1±2.8†</td>
<td>17.1±2.9†</td>
<td>14.4±5.1</td>
</tr>
<tr>
<td>Pmean</td>
<td>6.8±0.8</td>
<td>8.3±2.4</td>
<td>8.4±2</td>
<td>7.3±2</td>
<td>7.9±2.2</td>
<td>8.8±2.7</td>
<td>8.4±3.2</td>
<td>7.8±1.6</td>
</tr>
<tr>
<td>Cdyn (ml/cm H2O)</td>
<td>49.8±6.1</td>
<td>19.2±3.5*</td>
<td>20.5±2.8*</td>
<td>37.7±7.1*</td>
<td>52.9±3.9</td>
<td>28.8±2.1†</td>
<td>29.6±2.0*†</td>
<td>50.7±4.6†</td>
</tr>
</tbody>
</table>

Data are presented as mean ± SD. VCV = Volume control ventilation. PCV = Pressure control ventilation.

Dynamic compliance decreased significantly after initiation of OLV in both groups and nearly returned to the initial values in PCV group after conversion to TLV (Table 2) (Fig. 2). The decrease in dynamic compliance in the VCV group was significantly greater than that occurred in PCV group during OLV (with or without PEEP) (19.2±3.5 in VCV, Vs 28.8±2.1 in PCV during OLV-ZEEP) (20.5±2.8 in VCV Vs 29.6±2.0 in PCV during OLV-PEEP5) (Table 2) (Fig. 2). After conversion to two-lung ventilation the dynamic compliance of the PCV group remained to be higher than the VCV group significantly.

There were significant differences between mean Pao2 values during TLV and OLV (with or without PEEP) in the two groups. After initiation of OLV, the Pao2 decreased significantly in the VCV group (in OLV-ZEEP, 123.2±34 Vs 424.7±26.5 in TLV1) and in the PCV group (in OLV-ZEEP, 175.6±28 Vs 414.8±38.7 in TLV1) yet the Pao2 was significantly higher in the PCV group at OLV-ZEEP compared to VCV group (175.6±28 Vs 123.2±34) (Table 3, Fig. 3). The mean Pao2 values increased significantly after the application of the 5-cm H2O PEEP in the two groups comparably (Table 3).
TLV1 = Two lung ventilation, 20min after turning the patient to the lateral decubitus.
OLV-ZEEP = One-lung ventilation with zero end-expiratory pressure, 20min after initiation.
OLV-PEEP5 = One-lung ventilation, 2min after adding 5cmH2O positive end-expiratory pressure.
TLV2 = Two-lung ventilation, 20min after reconversion from one-lung ventilation.
VCV = Volume control ventilation.
PCV = Pressure control ventilation.

Fig. (2): Mean dynamic compliance in the two groups at different stages of the study.

Fig. (3): Arterial oxygen tension in the two groups at different stages of the study.

### Table (3): Arterial blood gases values in the two groups.

<table>
<thead>
<tr>
<th>Variable</th>
<th>VCV group (n=14)</th>
<th>PCV group (n=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pao2 (mmHg)</td>
<td>424.7±26.5</td>
<td>123.2±34*</td>
</tr>
<tr>
<td>Paco2 (mmHg)</td>
<td>37.5±4.1</td>
<td>39.2±5.8</td>
</tr>
<tr>
<td>Sao2 (%)</td>
<td>99.2±0.8</td>
<td>99.1±0.91</td>
</tr>
<tr>
<td>PH</td>
<td>7.37±0.04</td>
<td>7.38±0.04</td>
</tr>
</tbody>
</table>

Data are presented as mean ± SD.

* p value <0.05 compared with two-lung ventilation in the same group TLV1 (within group comparison).
† p value <0.05 compared with VCV group at the same time point.
There were no significant differences between the two groups as regard \( \text{Paco}_2 \), \( \text{Sao}_2 \) and PH at all stages of the study (Table 3). All hemodynamic variables didn’t differ significantly at any stage of the study (Table 4).

**Discussion**

The main finding in the results of this study was the improved arterial oxygenation during OLV in PCV group when compared to VCV group even before the application of 5cm H\(_2\)O PEEP. Another important finding was the lower peak airway pressure and plateau pressure in PCV group during OLV compared to VCV group. This improvement in oxygenation may be explained by the initial high flow in the PCV mode that may result in initial alveolar overinflation then a more homogeneous distribution of gases inside the alveoli is expected, with a better alveolar recruitment reducing atelectasis. On the other hand high peak and plateau pressures during OLV in VCV group may add to ventilation perfusion mismatch by diverting blood flow to the nondependent nonventilated lung.

These results and the explanation are very similar to those of Al Saady and Bennett, in their study comparing a decelerating flow with a constant flow ventilation pattern where a significant increase in PaO\(_2\) and a reduction in the dead space to tidal volume ratio and in the alveolar-to-arterial oxygenation gradient were found in decelerating flow during ventilation in respiratory failure [11]. Improved arterial oxygenation and lower peak and plateau pressures in PCV group during OLV in this study are also consistent with a previous crossover study in adults comparing PCV to VCV in single lung anesthesia for thoracotomies. They suggested that patients whose \( \text{Pao}_2 \) improved with PCV were generally with an element of restrictive lung disease [2]. Although the results of our study are consistent with the results of another previous study comparing the cardiorespiratory effects of VCV with constant flow (VCV\(_{SQ}\)) and VCV with decelerating flow (VCV\(_{DEC}\)) to PCV, suggesting that VCV\(_{DEC}\) and PCV allowed improved oxygenation, yet Davis and colleagues attributed this to the decelerating flow waveform which resulted in higher mean airway pressure and lower peak airway pressure than that occurred with a square flow waveform in VCV [12]. This explanation doesn’t fit to our results, were the mean airway pressure didn’t show any difference between VCV and PCV groups. More favorably our results coincide with a recent study of Cadi et al., who compared VCV and PCV using two different algorithms during laparoscopic gastric surgery in obese patients. Improved arterial oxygenation was in favor of PCV mode with no difference in the mean airway pressure between the two modes and they explained this by an improvement in the lungs ventilation/perfusion ratio [13]. In a multidisciplinary pediatric intensive care unit (PICU) a retrospective study was conducted in sick children with a varying degree of lung disease comparing conventional VCV (utilizing constant flow pattern) and pressure regulated volume controlled ventilation (PRVCV) (utilizing decelerating flow pattern). They reported that PRVC mode was advantageous in initial stages of ventilation in sick children and resulted in significant improvement of oxygenation with lower mean airway pressure [14]. In contrast to the results of the present study Unzueta and colleagues recently compared PCV with VCV during one-lung ventilation for thoracic surgery in adults using a crossover design and found no differences in Vt and plateau pressures and arterial oxygenation, but only lower peak airway pressure in PCV was reported [15]. However their cases had good overall preoperative respiratory functions. The constant finding in this study and all previously mentioned

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**Table (4): Hemodynamic variables in the two groups.**

<table>
<thead>
<tr>
<th>Variable</th>
<th>VCV group (n=14)</th>
<th>PCV group (n=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TLV1</td>
<td>OLV-ZEEP</td>
</tr>
<tr>
<td>MAP (mmHg)</td>
<td>74.8±6.5</td>
<td>71.8±8.4</td>
</tr>
<tr>
<td>HR (b/min)</td>
<td>98.8±18.4</td>
<td>102.0±9.6</td>
</tr>
<tr>
<td>CVP (cmH(_2)O)</td>
<td>9.5±2.3</td>
<td>10.0±1.5</td>
</tr>
</tbody>
</table>

Data are presented as mean ± SD.

TLV1 = Two lung ventilation, 20min after turning the patient to the lateral decubitus.
OLV-ZEEP = One-lung ventilation with zero end-expiratory pressure, 20min after initiation.
OLV-PEEP = One-lung ventilation, 20min after adding 5cmH\(_2\)O positive end-expiratory pressure.
TLV2 = Two-lung ventilation, 20min after reconversion from one-lung ventilation.

\( \text{MAP} = \text{Mean arterial pressure.} \)
\( \text{HR} = \text{Heart rate.} \)
\( \text{CVP} = \text{Central venous pressure.} \)
\( \text{VCV} = \text{Volume control ventilation.} \)
\( \text{PCV} = \text{Pressure control ventilation.} \)
studies obtained during PCV was lower peak airway pressure and plateau pressure. This allowed the safe use of PEEP in this study for better recruitment of alveoli and carried the beneficial potential of decreased incidence of barotraumas. However the more important determinant of barotraumas is the plateau pressure rather than the peak airway pressure [16]. In this study, the plateau pressure was significantly lower during OLV in PCV group (16.1±2.8 in PCV, Vs 20.8±4.6 in VCV during OLV- ZEEP). Lung protective strategy has recently demonstrated utilizing lower tidal volumes during OLV in order to decrease postoperative lung injury, but this predisposes the dependant lung to atelectasis [17]. In the present study 8ml/kg was used for the tidal volume, assuming that the low airway pressures would allow the use of PEEP for better recruitment. It is speculated that PEEP application to the dependent lung should improve oxygenation by increasing lung volume at end-expiration. This increase in lung volume would increase the lung compliance and decrease the ventilation-perfusion mismatching [18]. Interestingly the use of 5cm H2O PEEP resulted in improved oxygenation significantly in the VCV group only, while the PCV group showed a moderate rise of Pao2 after PEEP application yet, this was insignificant. This could be explained by a higher percentage of alveolar atelectasis and significant ventilation/perfusion mismatch was present in VCV group, which markedly improved after application of PEEP. On the contrary, the decelerating flow pattern in PCV have already reduced the percentage of atelectasis by better alveolar recruitment making PEEP application in PCV group less efficacious. This explanation is also supported by a better dynamic compliance encountered in PCV group during OLV compared to VCV group both before and after PEEP application. (19.2±3.5 in VCV, Vs 28.8±2.1 in PCV during OLV- ZEEP) (20.5±2.8 in VCV Vs 29.6±2.0 in PCV during OLV-PEEP5) (Table 2) (Fig. 2). These results agree with a recent prospective cross-over study of Balick-Weber et al. [19] comparing the effects of pressure-controlled (PC) ventilation on the ventilatory and haemodynamic parameters during laparoscopy procedures with those occurring with VC mode. They reported marked improvement in dynamic compliance after switching from VC to PC mode with decreased Ppeak. A previous study of Fujiwara et al., reported a beneficial effect of 4-cm H2O PEEP applied to the dependant lung in OLV, were Pao2 values increased and shunt fraction decreased [6]. Limitations of the present study were; lack of more invasive hemodynamic monitoring and measurements, it was a single-blinded study, the absence of pre-operative respiratory functions as pneumonectomy was not planned in any of our cases. Moreover the difficulties encountered because of pediatric patients’ cooperation during the pulmonary functions testing.

In conclusion, this study demonstrated a favorable outcome of oxygenation with lower peak and plateau pressures during PCV in pediatric OLV compared to conventional VCV. Better preservation of ventilation perfusion ratio during PCV is suggested evidenced by improved dynamic compliance in PCV compared to VCV and that 5cm H2O PEEP improved oxygenation only in VCV during OLV. Further studies on new ventilatory modes recently launched in anesthesia machine ventilators, which carry the theoretical advantages of both VC and PC ventilation is highly recommended in pediatrics.

References
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