ORIGINAL RESEARCH

Outcome variables of pressure control ventilation versus volume control ventilation

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Received: 19 May, 2023 Accepted: 23 June, 2023

INTRODUCTION

19% of fatalities among children under five are caused by pneumonia.[1] Due to respiratory failure, a significant portion of these pneumonia patients need mechanical ventilation. Additionally, children in ventilated PICUs might have extremely significant death rates; Lee et al. recently observed that 56% of the ventilated children died [2,3]. Hence An crucial part of managing children in a paediatric critical care unit is mechanical ventilation.The preferred method of ventilation in children is not well covered in the literature. The majority of current practises and viewpoints were historically drawn from studies of adults.[4] Pressure controlled ventilation (PCV) is preferred by paediatric intensivists globally.

OBJECTIVES

To compare outcome variables of pressure control ventilation versus volume control ventilation

MATERIAL & METHODS

The current study was in a 60 bedded pediatric ward with 10 bedded pediatric ICU and 10 bedded neonatal ICU. Randomisation was done by allocation of patients in two groups, with 65 participants in each group . one group will receive volume control ventilation and another group will receive pressure control ventilation . Patients 3 months to 12 years requiring mechanical ventilation and patient relatives giving consent for the trial were included in this study. Inability to wean from experimental strategies (e.g. nitric oxide), severe chronic respiratory disease, morbid obesity, lack of commitment to life support and less than 12 hours of ventilation were excluded from the study.

Statistical data entry was done in excel sheet and analysis was done using STATA 12 statistical software. Statistical Analysis was reported using number and percentages for categorical variables. Mean and standard deviation for the continuous variables. All patients were subjected to standard treatment and interventional protocols. Consent was taken from the relatives before enrolling the patient for the study.

INTERVENTIONS

The guidelines which was followed while ventilating a patient are as follows

a) Choose the Mode-Control every breath if plan for heavy sedation and muscle relaxation. Whenever a breath is supported by the ventilator, regardless of the mode, the limit of the support is determined by : • Volume limited: - preset tidal volume; • Pressure limited:- preset PIP.
b) Fi02-start at 100% and quickly wean down to a level < or 60%(to avoid O2 toxicity) depending on O2 requirement. 60% may be a starting point.
c) I:E ratio – normally set at 1:2-1:3. Higher inspiratory times may be needed to improve oxygenation in difficult situations (inverse ratio ventilation), increasing the risk of air leak. Lower rate and higher expiratory time-1:3-1:4 may be needed in asthma to allow proper expiration due to expiratory obstruction.
d) Trigger Sensitivity- set at 0 to 2. Setting above zero is too sensitive; triggered breath from ventilator will be too frequent while too negative a setting will increase work for patient to trigger a ventilator breath.

e) Volume Limited-Tidal Volume – 6 ml/kg with a goal to get to 4-6 ml/kg. If leak present around ET tube, set initial tidal volume to 8ml/kg. These lung-protective strategies recruit atelactetic areas while preventing over distention of normal lung parenchyma.

f) At any point of time during the hospital stay if the treating physician decided to change the mode of ventilation thereby changing the arm to which the patient was randomised , this will be treated as treatment failure . The outcomes will be analysed both by intention to treat and per protocol method .

The findings were recorded in the proforma and tabulated in the master chart. The results were analyzed and discussed in detail. All statistical analysis was done by statistical software SPSS 20.

RESULTS

Table 1: Demographic Profile

GROUP		VC	PC	P value
Age		32.24 +/- 38.16	37.36 +/- 39.27	0.73
Gender	Male	32	31	0.71
	Female	30	30	

The mean age of patients enrolled for Group VC is 32.24 +/- 38.16 months and for group PC is 37.36 +/- 39.27 months . There was no significant difference between the age of patients enrolled for the study as the P value was 0.733.Similarly,there were 32 males in group VC and 31 males in group PC, 30 females in group VC and 30 females in group PC. There was no significant difference between the no of male and female patients enrolled for the study as the P value was 0.713. Hence the two groups are comparable in terms of age and gender.

Table 2: Outcome variables of pressure control ventilation versus volume control ventilation

Outcome	VC	PC	P value
LENGTH OF STAY	6.87 +/- 3.62	6.73 +/- 3.18	0.98
DURATION OF VENTILATION	6.29 +/- 3.15	6.85 +/- 2.67	0.43
PEAK AIRWAY PRESSURE	21.9 +/- 2.12	19.34 +/- 1.81	0.001
PCO2	33.64 +/- 6.17	35.70 +/- 8.19	0.117
PaO2 /FiO2 ratio	96.01 +/- 15.51	84.31 +/- 15.69	0.002
MORTALITY	56/62	51/61	0.26
SHOCK	48/62	42/61	0.28
VAP	39/62	34/61	0.007

There was no significant difference between the length of stay, mean duration of ventilation, PCO2 values, mortality rates, incidence of shock in the two groups . The P peak, the PaO2 /FiO2 ratio, incidence of VAP in VC group was significantly higher than in PC group

DISCUSSION

Results showed that mean duration of stay in group VC was 6.87 +/- 3.62 days and in PC group was6.73 +/- 3.18 days .The mean duration of ventilation in VC group was 6.29 +/- 3.15 days and in PC group was 6.85 +/- 2.67 days . The mean P peak in the VC group was 21.9 +/- 2.12 cm H2O and in the PC group was 19.34 +/- 1.81 cm H2O .The P peak in VC group is significantly higher than P peak in PC group. The mean PCO2 was 33.64 +/- 6.17 in VC group and 35.70 +/- 8.19 in PC group. The mean PaO2 /FiO2 ratio in VC group is 96.01 +/- 15.51 and in PC group is 84.31 +/- 15.69 . There were 56 mortalities out of the 62 ventilated cases in VC group and 51 motalities out of the 61 ventilated cases in PC group. There were 48 cases of shock out of the 62 cases in VC group and 42 cases of shock out of the 61 cases in PC group. There were 39 cases of VAP out of the 62 cases in VC group and 34 cases of VAP out of the 61 cases in PC group.There was no significant difference between the length of stay, mean duration of ventilation, PCO2 values, mortality rates, incidence of shock in the two groups. However the P peak, the PaO2 /FiO2 ratio, incidence of VAP in VC group was significantly higher than in PC group.

In a study conducted by Sarkar C etal[5] it was found that SIMV – VC mode improves oxygenation in the form of better PaO2/FiO2 ratio and SIMV –PC mode maintains lower airway pressure.

In a study conducted by Wang YP etal[6], the infants were divided into two groups according to the OLV pattern: group G (n=30, receiving PCV-VG) and group V (n=28, receiving VCV). Mean arterial pressure (MAP), heart rate (HR), maximum inspiratory pressure (P_{peak}), mean airway pressure (P_{mean}), dynamic compliance (Cdyn), partial arterial pressure of oxygen (PaO_2) was measured and compared between these two groups 10 min before OLV (T1), 30 min after the onset of OLV (T2) and 15 min after OLV (T3). Result showed that group G had significantly higher $PaO_2$and C_{dyn} (both $P<0.05$) and significantly lower P_{peak} and P_{mean} (both $P<0.05$) in T2. The incidence of hypoxemia was significantly higher in group V than in group G ($P<0.05$), while the

difference in the incidence of hypotension was not statistically significant (P>0.05).

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