



ORIGINAL RESEARCH PAPER

Anaesthesiology

A PROSPECTIVE AND RANDOMIZED STUDY FOR EVALUATING THE EFFECTIVENESS AND SAFETY OF TWO STRATEGIES, PRESSURE SUPPORT VENTILATION (PSV) AND ' T'- PIECE VENTILATION FOR WEANING ADULT PATIENTS FROM MECHANICAL VENTILATOR

KEY WORDS: Upper abdominal surgeries, Mechanical ventilator, Pressure support ventilation, T piece

Dr. A. Gopinath MD, Assistant Professor Of Anesthesiology, Institute Of Obstetrics And Gynaecology, Egmore, chennai-600008.

Dr. C. Kalaiyarasi* MD, Assistant Professor Of Anesthesiology, Institute Of Obstetrics And Gynaecology, Egmore, chennai-600008. *Corresponding Author

ABSTRACT

AIM OF STUDY: This study evaluates the effectiveness and safety of two strategies, Pressure support ventilation (PSV) and T piece ventilation for weaning adult patients who require elective post operative mechanical ventilation for at least 12 hours, measuring weaning success and other clinically important outcomes.

MATERIALS & METHODS: In our study 60 subjects was chosen (Group A-Weaning from mechanical ventilation after PSV & Group B- Weaning from mechanical ventilation after T Piece ventilation)

RESULTS: Mean heart rate was lower, Mean systolic blood pressure was lower, Mean diastolic blood pressure was lower, Mean SPO2 was better, Mean ETCO2 was lower, Mean PH was better, Mean PaO2 was higher, Mean PaCO2 was lower, Mean duration of Mechanical ventilation was lower, Reintubation was lower in PSV group, than T piece group which was statistically significant.

CONCLUSION : I conclude that weaning the patients from mechanical ventilator who have undergone upper abdominal surgeries can be done by Pressure support ventilation or by T piece with O2-6L/min. Considering the better hemodynamic stability, gas analysis, less duration of mechanical ventilation, lesser incidence of reintubation, I conclude pressure support ventilation is superior in weaning the patient from mechanical ventilator than T-piece ventilation

INTRODUCTION

This study evaluates the effectiveness and safety of two strategies, Pressure support ventilation (PSV) and T piece ventilation for weaning adult patients who require elective post operative mechanical ventilation for at least 12 hours, measuring weaning success and other clinically important outcomes.

Advantages of Pressure support ventilation (PSV)

- 1) Augments the patients **spontaneous Tidal Volume**
 - 2) **Decreases patient Work of Breathing by overcoming the resistance of the artificial airway, vent circuit and demand valves**
 - 3) Prevents respiratory **muscle atrophy**
 - 4) Facilitates **weaning**
 - 5) Improves **patient comfort** and reduces need for sedation
- May be applied in any mode that allows spontaneous breathing

MATERIALS & METHODS

In our study 60 subjects was chosen (Group A-Weaning from mechanical ventilation after PSV & Group B- Weaning from mechanical ventilation after T Piece ventilation)

INCLUSION CRITERIA:

- Age : 18 years to 60 yrs
- ASA : I,II,III
- Abdominal surgery cases
- Post op cases not extubated on table
- Patients require post op invasive ventilation atleast for 12 hrs
- Who have given valid informed consent.

EXCLUSION CRITERIA:

- Not satisfying inclusion criteria.
- Patients with difficult airway
- Lack of written informed consent
- Pregnant female
- Bleeding disorder
- Poor lung compliance such as pulmonary fibrosis
- Patient refusal.
- Patients with severe cardiovascular ,respiratory, renal, hepatic diseases.
- Post-Cardiac arrest patients

Materials:

- Mechanical ventilator
- T-Piece circuit

- ABG Analyser
- Monitors – ECG, NIBP, SPO2, EtCO2.

STUDY OUTCOME MEASURES:

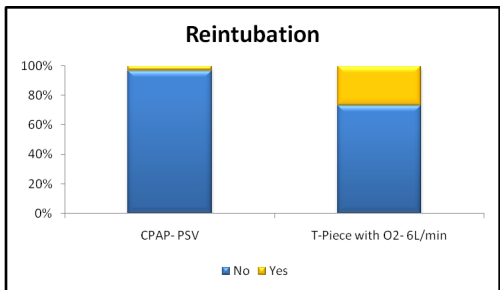
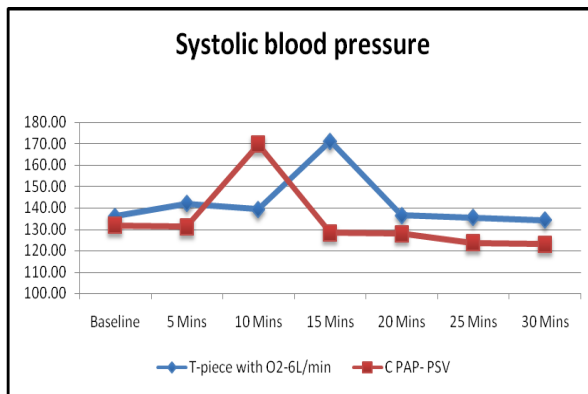
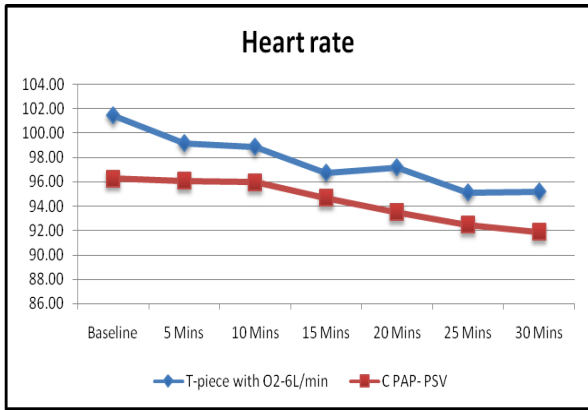
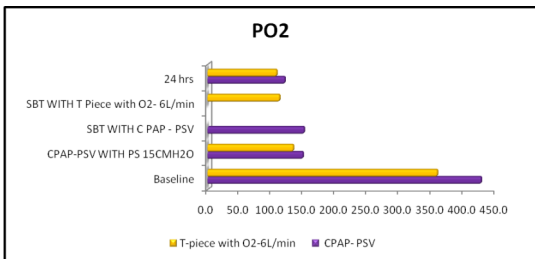
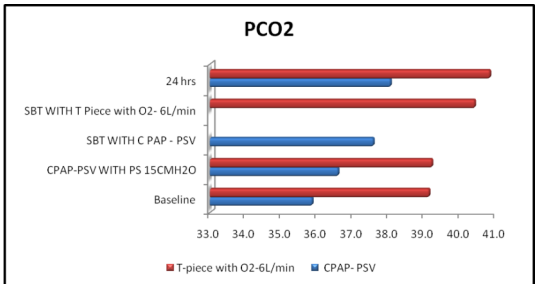
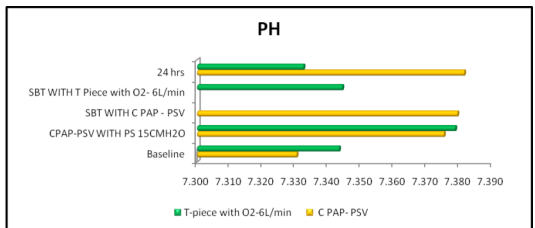
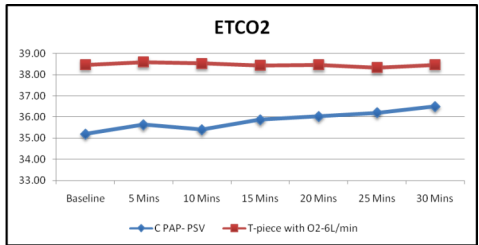
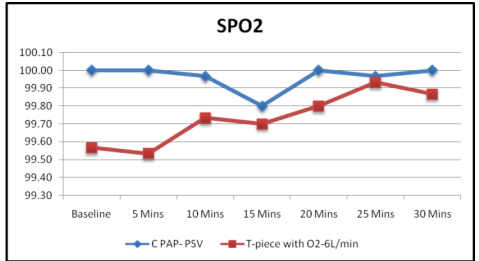
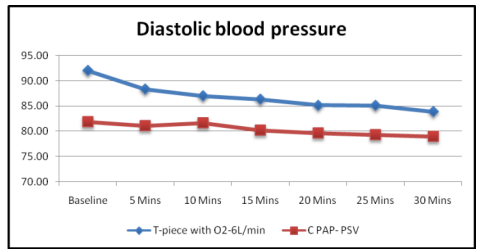
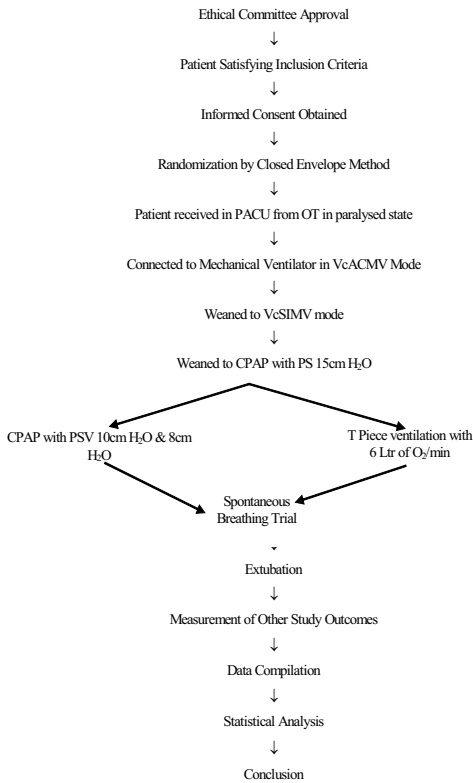
- Successful spontaneous breathing trial
- Successful extubation
- Extubation failure
- Inspired oxygen fraction (FIO2)
- Partial arterial oxygen pressure (PaO2)
- CO2 pressure arterial (PaCO2)
- Length of PACU stay

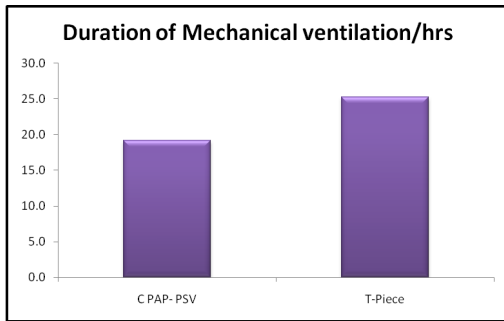
METHODOLOGY OF STUDY

- This study was done at the Institute of Anaesthesiology and critical care, Madras Medical College between March to September 2017. The aim of this study is to evaluate the effectiveness and safety of two strategies, pressure support ventilation (PSV) and spontaneous breathing trial with T piece, for weaning adult patients undergone upper abdominal surgeries who required post operative elective mechanical ventilation for at least 12 hours, measuring weaning success and other clinically important outcomes. Patients were excluded if they have difficult airway, Pregnant female, Bleeding disorder, Poor lung compliance such as pulmonary fibrosis, Patients with severe cardiovascular, respiratory, renal, hepatic diseases, Post-Cardiac arrest patients. Patients were randomly allocated according to the computer generated sequence into two equal groups. There were no difference between Group A(PSV= 30 patients) and the group B(T-piece =30 patients) before connecting the patient to mechanical ventilator. Patients in both the groups connected to mechanical ventilator were in assisted controlled mode of ventilation (Volume control) with Fio2-100% in a paralysed state after receiving from operation theatre. Baseline HR, SBP, DBP, ETCO2, SPO2 monitored. Baseline ABG sent. Analgesia with elastomeric continuous epidural infusion pump 5ml/hr (0.125 % Bupivacaine and 1mcg of Fentanyl)started. Patient weaned to VcSIMV mode of ventilation when patient improved and started taking some spontaneous breathing efforts. When patient is taking spontaneous breathing at a regular interval with a normal rate, patients were weaned to CPAP-PSV mode of ventilation with PS-15cm H2O.
- Then, first group of patients are maintained in CPAP-PSV mode, but Pressure support is decreased gradually from 15cmH2O to 12cmH2O, then 10cmH2O, again to 8 cmH2O, patient observed Spontaneous breathing trial with CPAP-PSV

mode with pressure support of 8cmH₂O, analysed with hemodynamic monitoring and ABG, patient is extubated.

- In the second group , patients changed from CPAP-PSV with Pressure support 15cm H₂O to Spontaneous breathing trial with T-Piece with 6 Litres of O₂/min, then the patient observed analysed with hemodynamic monitoring and ABG, patient is extubated.
- Both the groups were compared





STATISTICS

Descriptive Statistics

Group A- CPAP-PSV

	N	Minimum	Maximum	Mean	Std. Deviation
FIO2 SBT WITH C PAP - PSV	30	40.0	40.0	40.000	0.0000
PH SBT WITH C PAP - PSV	30	7.361	7.450	7.41947	.034567
PCO2 SBT WITH C PAP - PSV	30	37.1	44.86	41.567	4.7324
PO2 SBT WITH C PAP - PSV	30	125	193	150.43	9.195

Group B - T-Piece with O2- 6L/min

	N	Minimum	Maximum	Mean	Std. Deviation
FIO2 SBT WITH T Piece with O2- 6L/min	30	28.00	28.00	28.0000	0.00000
PH SBT WITH T Piece with O2- 6L/min	30	7.322	7.432	7.36940	12.16714
PCO2 SBT WITH T Piece with O2- 6L/min	30	33.40	49.10	46.4033	9.67665
PO2 SBT WITH T Piece with O2- 6L/min	30	82	126	112.07	16.858

DISCUSSION

A prospective randomised controlled study to compare the efficacy and safety of Weaning of adult patients by T piece ventilation and pressure support ventilation in PACU who have undergone elective upper abdominal surgeries

CPAP-PSV :

It is **PEEP** applied to the airway of the *Spontaneously breathing* patients. Pressure support ventilation is used to reduce the elastic and non elastic airflow resistance, to augment the spontaneous tidal volume. Resulting spontaneous tidal volume is directly proportional to the pressure support level. It helps in improving oxygenation in patients with refractory hypoxemia and a low FRC. CPAP settings are adjusted to provide the better oxygenation with the lowest positive pressure and the lowest FIO2

Advantages :

- Ventilator can monitor the patient's breathing and activate an alarm if something undesirable occurs

T-piece with O2- 6L/min

T-piece assist in weaning a patient from ventilator. T Piece deliver humidified oxygen to a long term ventilated patient who is being weaned from ventilator. In T piece inhaled gas is delivered at a high flow rate

In our study the demographic profile was comparable with the respective mean age, body weight and ASA physical status. Patients were randomised into two groups, group-A weaned and extubated after CPAP-PSV and group-B weaned and extubated after T-piece with O2-6L/min. Hemodynamic parameters like heart rate, systolic, diastolic blood pressure, EtCO2, ABG, time to wean, extubation failure, Reintubation, were monitored.

1. Patients in group-A have a stable heart rate compared with group – B having increased in heart rate in the process of weaning and observation during post extubation period for 24 hrs. This difference in diastolic blood or 24 hrs. This difference in heart rate between the two groups was statistically significant(p<0.05).
2. Patients in group-A have a normal range of systolic blood pressure compared with group-B having increased systolic blood pressure during weaning from ventilator and observation during post extubation period for 24 hrs. This difference in systolic blood pressure between the two groups was statistically significant(p<0.05).
3. Patients in group-A have a normal range of diastolic blood pressure compared with group-B having increased diastolic blood pressure during weaning from ventilator and observation during extubation period for 24 hrs. This difference in systolic blood pressure between the two groups was statistically significant(p<0.05).
4. Patients in group-A have a good saturation (>99%)compared with group-B having low saturation (<99%) during weaning from ventilator and observation during post extubation period for 24 hrs. This difference in saturation between the two groups was statistically significant(p<0.05).
5. Patients in group-A have a normal range of ETCO2 compared with group-B having increased ETCO2 during weaning from ventilator and observation during post extubation period for 24 hrs. This difference in ETCO2 between the two groups was statistically significant(p<0.05).
6. Patients in group-A have a less spontaneous breathing trial failure compared with group-B having high spontaneous breathing trial failure during weaning from ventilator . This difference in spontaneous breathing trial failure between the two groups was statistically significant(p<0.05).
7. Patients in group-A have a normal range of PH compared with group-B moving towards acidotic side during weaning from ventilator and observation during post extubation period for 24 hrs. The results were Mean PH in group A was 7.41947 with SD of 0.034567 and in group B mean PH was 7.36940 with SD of 12.09 which was found to be statistically significant.This difference in PH between the two groups was statistically significant(p<0.05)
8. Patients in group-A have a normal range of PaO2 compared with group-B having decreased PaO2 during weaning from ventilator and observation during post extubation period for 24 hrs. The results were Mean PaO2 in group A was 150.43 with SD of 9.195and in group B mean PaO2 was 112.07 with SD of 16.858 which was found to be statistically significant. This difference in PaO2 between the two groups was statistically significant(p<0.05)
9. Patients in group-A have a normal range of PaCO2 compared with group-B having increased PaCO2 during weaning from ventilator and observation during post extubation period for 24 hrs. The results were Mean PaCO2 in group A was 41.5667 with SD of 4.7324and in group B mean PaCO2 was 46.4033 with SD of 9.67665 which was found to be statistically significant This difference in PaCO2 between the two groups was statistically significant(p<0.05)
10. Patients in group-A have less duration of mechanical ventilation and had early extubation compared with group-B having increased duration of mechanical ventilation and delayed extubation. The results were Mean duration of MV in group A was 19.2 hours with SD of 9.67665 and in group B mean PH was 25.3 hours SD of 18.100 which was found to be statistically significant. This difference in duration of mechanical ventilation between the two groups was statistically significant(p<0.05)

11. Patients in group-A have a very less incidence of Reintubation compared with group-B having increased incidence of Reintubation during post extubation period for 24 hrs. The results were Mean reintubation in group A was 3.3% with SD 3.561 and in group B mean reitubation was 26.6% with SD 17.2234 which was found to be statistically significant This difference in Reintubation between the two groups was statistically significant($p < 0.05$)

CONCLUSION

From my study, I conclude that weaning the patients from mechanical ventilator who have undergone upper abdominal surgeries can be done by Pressure support ventilation or by T piece with O_2 -6L/min. Considering the better hemodynamic stability, gas analysis, less duration of mechanical ventilation, lesser incidence of reintubation, I conclude pressure support ventilation is superior in weaning the patient from mechanical ventilator than T-piece ventilation

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