



ORIGINAL RESEARCH PAPER

Anaesthesiology

COMPARISON OF REINTUBATION OUTCOME AFTER SPONTANEOUS BREATHING TRIAL WITH T-TUBE AND PRESSURE SUPPORT VENTILATION

KEY WORDS: Mechanical ventilation, PSV, T-Tube

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ABSTRACT

Background- Spontaneous breathing trial is one of the most promising procedure to successfully extubate a patient from mechanical ventilation. Commonly used modalities for weaning are PSV and T-tube. The aim of this study is to compare the re-intubation rates between these two strategies. **Methodology-** This is an observational study done in the Central ICU under Department of Anaesthesiology, Assam medical college and hospital during the time period of June 2021 to May 2022. The study participants were recruited based on inclusion and exclusion criteria. The sample size was calculated to be 66 [33 in each group] taking the reference of C.Subira¹. Demographic details and ASA status was obtained and once patient's clinical condition was improved they were put into spontaneous breathing trial either with T-tube or PSV. Hemodynamic changes were noted and if patients were tolerating the trial, extubation was done and they were observed. Re-intubation rates following 48 hours of extubation were compared between both the groups. Statistical analysis was done with SPSS software. Categorical variables were expressed in terms of numbers and percentages and p value <0.05 was considered statistically significant. **Results-** In our study demographics showed no significant variation. Re-intubation rates were more in T-tube group (24.24%) compared to PSV (12.12%) but was statistically insignificant. **Conclusion-** Our study showed comparable rates of re-intubation between both the groups of T-tube and PSV

INTRODUCTION

Weaning is the process of withdrawing mechanical ventilator support and transferring the work of breathing from the ventilator to the patient. In most cases weaning may be accomplished rapidly from full ventilator support to unassisted spontaneous breathing.²

For successful weaning, more gradual withdrawal from mechanical ventilator support is required. The weaning process depends on the duration the patient has been on mechanical ventilation. If the patient is on mechanical ventilation for a longer period, weaning process should be gradual. Weaning process should be individualized for each patient ranging from days to weeks or even months.

Weaning should be started as soon as the patient fulfills the criteria of weaning trial. Sooner the patient is liberated from the ventilator, lesser are the chances of ventilator associated complications such as ventilator associated pneumonia, ventilator induced lung injury, decreased ICU stay and overall reduced mortality³. A spontaneous breathing trial refers to a patient breathing through the endotracheal tube either without any ventilator support [eg. T- piece] or with minimal ventilator support [eg. low level pressure support, Automated Tube Compensation, CPAP]³.

Once the weaning decision is made patient is attempted with a Spontaneous Breathing Trial with a T tube or pressure support and assessed whether the patient can tolerate it or not.

Even after a successful extubation if patient develops signs of respiratory failure along with hemodynamic changes within 48 hours it is considered as weaning failure and patient will require re-intubation. Common causes of weaning failure are preexisting lung conditions such as COPD, Bronchial Asthma, bronchospasm, retained secretions etc. Hence standard weaning protocols and ventilation strategies always help in attaining good results in weaning.

AIM

To compare the re-intubation rates between PSV and T-tube ventilation in patients during spontaneous breathing trial.

METHODOLOGY

Study Setting

This is a hospital based observational study conducted in Central ICU of department of Anaesthesiology, Assam Medical College and Hospital, Dibrugarh for a period of one year [June 2021 to May 2022]

Sample Size

Considering a 95% Confidence Interval with a margin of error of 20% and taking the findings of the study by C.Subira¹ as a reference, the sample size for the present study was calculated to be 66- [33 in each group, Group PSV and Group TTube].

Approval and Consent

This study was conducted after the approval from Institutional Ethics Committee (H). Written and informed consent was taken from each patient party after explaining the study procedure.

Inclusion Criteria

- Patients who require mechanical ventilation for more than 24 hours
- Age group: 18 -60 years of both genders
- ASA Class I – III

Exclusion Criteria

- Patient parties not willing to give informed consent.
- Pregnant women
- Patients with a bleeding disorder
- Patients with poor lung compliance and chronic heart diseases
- Patients with severe hemodynamic instability and suspected poor prognosis
- Patients not satisfying inclusion criteria.

After obtaining a written informed consent from patient attendant, patient was started on a spontaneous breathing trial with either T-tube or PSV. Discontinuation of mechanical ventilation was considered once patient's clinical condition has improved and has stable hemodynamics. Extubation was done for those patients who tolerated the trial with stable hemodynamics and showed no signs of increased workload of

breathing. Following extubation patients were connected to supplemental oxygen via facemask or nasal prongs. If the patient was not able to maintain spontaneous breathing after extubation and showed signs of respiratory distress like tachypnea, use of accessory muscles, paradoxical muscle movements and diaphoresis with unstable vitals and requires mechanical ventilation again within 48 hours of extubation, it is considered as weaning failure. Thus the reintubation rates [those who failed weaning trial and required reintubation] among both the groups were compared and analysed.

RESULTS

Table 1: Mean Age and Sex distribution

Demographic Profile	PSV		T Piece		p-value
	MEAN	SD	MEAN	SD	
AGE	32.85	9.36	31.33	9.10	0.507
SEX (M/F)	21(63.63)/ 12(36.36)		26(78.78)/7(21.21)		0.289

Student t- test: p value is not significant at 5% level of significance

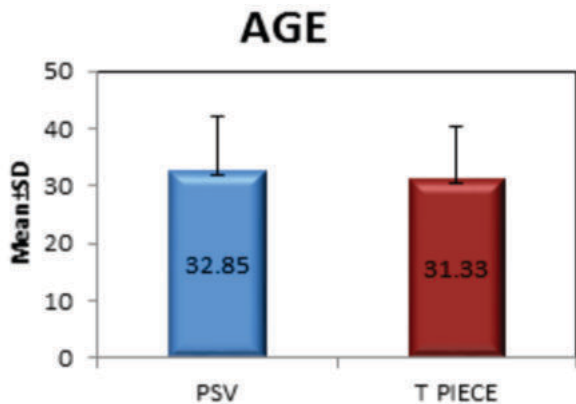


Figure 1: Age wise distribution of patients in both the groups

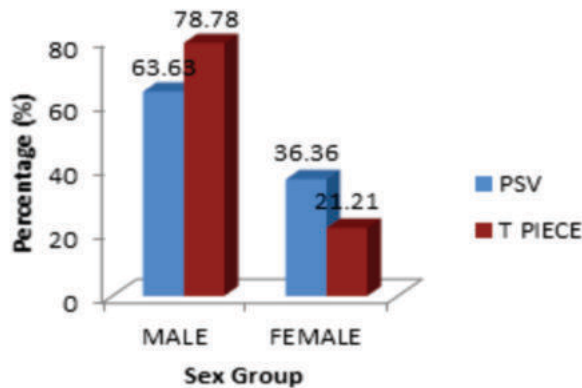


Figure 2: Gender wise distribution of patients in both the groups

This was a hospital based observational study aimed at comparing two strategies in terms of reintubation outcome after 48 hours of extubation. This study was conducted in the Intensive Care Unit [ICU] under the Department of Anesthesiology in Assam Medical College and Hospital during the period from June 2021 to May 2022. The study evaluated comparison of two strategies during a spontaneous breathing trial in terms of reintubation rates and weaning failure. The study included 66 patients irrespective of gender who were admitted in Intensive Care Unit after fulfilling both inclusion and exclusion criteria. A written and informed consent was taken from the patient party after explaining the study.

The mean age of patients in PSV group was 32.85±9.36 years and in T-Tube group 31.33±9.10 years with p value of 0.507 (Statistically insignificant). In this present study 63.63%

of patients were males and 36.36% were females in the PSV group. In T-Tube group 78.78% of patients were males and 21.21% were females which also showed no statistical significance.

Table 2: Comparison of reintubation rates

Reintubation	PSV		T Piece		P-Value
	N	%	N	%	
Present	4	12.12	8	24.24	0.273
Absent	19	57.57	16	48.48	
N/A	10	30.30	9	27.27	

Chi-Square test : p value is not significant (>0.05)

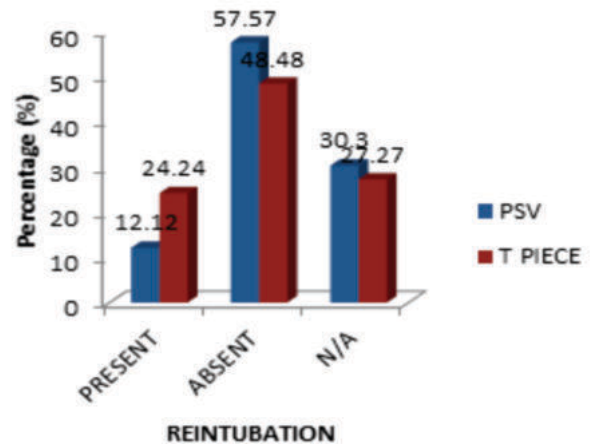


Figure 3: Comparison of reintubation rates

While comparing reintubation, T-tube group had higher reintubation rates (24.24%) than PSV group (12.12%) but was statistically insignificant.

DISCUSSION

Spontaneous Breathing Trials [SBT] are standard of care for assessing the ability of the patient to undergo weaning. The modalities commonly used are Pressure Support Ventilation [PSV], T-tube and CPAP. Once the patient has improved his clinical condition, the decision of weaning can be made and the patient is attempted with a Spontaneous Breathing Trial with a T tube or pressure support and assessed whether the patient can tolerate it or not.

Pressure Support Ventilation lowers the work of spontaneous breathing and augments patients tidal volume. It applies a preset pressure plateau to the patient's airway for the duration of spontaneous breath. The advantages of PSV are increase in spontaneous tidal volume, decrease in spontaneous frequency and decrease in work of breathing. Thus PSV helps in overcoming gas flow resistance when patient is on endotracheal tube as ET tube increases the airway resistance.

In a Spontaneous breathing trial T-tube can lead to increased work of breathing compared to PSV in some patients causing them to fail the trial. Many clinical conditions also leads to weaning failure such as pneumonia, tension pneumothorax, ARDS, COPD etc.

Our present study showed that T-tube group has higher reintubation rates than PSV group during the comparison of reintubation rates between the two groups, but it was statistically insignificant [p value >0.05].

In 2019, C Subira et al¹ had conducted a study on the comparison of the effect of PSV vs T-tube for weaning trials and proved that reintubation rates had no significant differences among both the groups of PSV and T-tube, even though extubation rates were higher in the PSV group compared to T-tube group. In 2020, Zhang et al² did a study on

the comparison of T-piece and pressure support ventilation as spontaneous breathing trials in critically ill patients and found out no statistical significance during the comparison of reintubation rates among both the groups. They also concluded that both the modes are equally good in weaning patients from mechanical ventilation in terms of reintubation. In a study by A. Esteban et al⁶ in 1995 for comparing the outcome following a trial with T-piece and PSV method proved that there were no significant difference in reintubation rates among both the groups.

Contrary to our study, in 2021 Yi Lj et al⁷ did a study after pooling data from several studies to know about the efficacy and safety of 4 different techniques of weaning and reached a conclusion that reintubation rates are higher in T-piece than PSV and CPAP. The study included several trials which were pooled from different databases and many of those trials included had various levels of pressure support and did not specify whether PEEP was added.

CONCLUSION

We did spontaneous breathing trial for weaning from mechanical ventilation using pressure support ventilation or T-tube method and observed the rate of reintubation in the weaned patients. In our study we used both these methods and both have comparable outcomes in terms of reintubation.

So we concluded that after spontaneous breathing trial, reintubation rates are not influenced by the methods like pressure support ventilation or T-tube trial.

Limitations Of The Study

1. Since it is a single centred observational study with marginal sample size, the results may be erratic when extrapolated to a larger population.
2. Our study included only 1 attempt of the Spontaneous Breathing Trial and data were analysed based on that.
3. The study subjects were mostly traumatic brain injury patients and surgical post-operative cases.
4. Patients with heart diseases and lung conditions including COPD were not considered in the study and this might have affected the rates of reintubation.

Funding:

No fundings were received for this study.

Competing Interest:

No Competing interest

Author's Contribution:

All authors in our study contributed to the data collection of the patients.

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