Comparison Of P/F Ratio In Ventilated ARDS Patients Using Driving Pressure Strategy And Conventional Lung-Protective Strategy Method In ICU H. Adam Malik Hospital Medan

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Abstract
Backgrounds: *The progression of ARDS causes significant patient morbidity and mortality, with hypoxia being the basic mechanism of organ failure. Therefore, it is necessary to measure the P/F ratio to identify hypoxia as early as possible.*
Objectives:*To compare the P/F ratio values in ventilated ARDS patients using driving pressure strategy method versus conventional lung-protective strategy in ICU of H. Adam Malik General Hospital Medan.*
Methods:*This study was a randomized controlled trial conducted at ICUH. Haji Adam Malik General Hospital Medan of ventilated ARDS patients who were treated in ICU who met inclusion and exclusion criteria and were selected by consecutive sampling method. The value of the P/F ratio is determined by the driving pressure strategy method and the conventional lung protective strategy method. To analyze the difference in the P/F ratio between two intervention groups, the Mann-Whitney test was used. A confidence interval with an ap value of 0.05 is considered to be significantly significant.*
Results:*The mean value of the P/F ratio in the lung protective group on the first day was 178.18 ± 46.5 and in the Driving pressure group was 164.81 ± 44.5 (p=0.608). On the second day, the mean P/F ratio in the lung protective group was 166.1 ± 30.8 and in the driving pressure group was 169.5 ± 12.8 (p=0.815). On the third day, the mean P/F ratio in the lung protective group was 177.2 ± 27.4 and in the driving pressure group was 175 ± 35 (p=0.726).*
Conclusion:*There was no significant difference found in the P/F ratio value as measured by the lung protective strategy method and the driving pressure strategy method either from the first, second or third day.*

Keywords:*P/F ratio, ARDS, lung protective strategy, driving pressure strategy*

I. INTRODUCTION

Sepsis and septic shock are the leading causes of death in critically ill patients treated in intensive care units (ICU) in the United States. Meta-analytic studies found that the incidence of sepsis in the population ranged from 22-240 cases per 100,000 people and 11 cases of septic shock per 100,000 people, with mortality rates reaching 30% for sepsis, and 80% for septic shock.[1]

In septic patients, microorganisms and their products (especially endotoxins) are highly toxic to the lung parenchyma and are the biggest risk factors for ARDS. The incidence of sepsis causing ARDS (Acute Respiratory Distress Syndrome) ranges from 30-50%. Research shows that the mortality rate ranges between 34.9% and 40% with various degrees of disease severity. In addition, the rate of ARDS resulting in failure of the LPV (Lung Protective Ventilation) strategy ranges from 51.3%-78.5%. ARDS mortality rates disproportionately affect black and Hispanic patients compared with women, with a large burden in low-income patients and patients in developing countries. Morbidity in patients with ARDS remains a concern, with a high incidence of critical illness polyneuropathy, cognitive impairment.[2]

According to the American European Consensus Conference Committee (AECC) guidelines, ARDS exists when the PaO2 /

FiO2 ratio is ≤ 200 mmHg and ALI when the PaO2 / FiO2 ratio is ≤ 300 mmHg.[3] The goal of mechanical ventilation in ARDS cases is to treat hypoxaemia and improve oxygenation. In the management of ARDS, a mechanical ventilation strategy known as lung protective strategies is known, in which low tidal volumes and Positive End Expiratory Pressure (PEEP) are used, as well as Pplat ≤30 cmH2O. This strategy was taken to prevent alveoli overdistention which in turn can cause Ventilator Induced Lung Injury (VILI). Another strategy is to carry out lung recruitment, fluid restriction and even a prone position.[4]

The use of driving pressure (DP) as one of the safe limits to prevent excessive lung expansion causing barotrauma and to adjust the tidal volume given. Evidence from observational studies shows that driving pressure is strongly associated with lung injury and death, irrespective of Positive End Expiratory Pressure (PEEP), tidal volume, or plateau pressure.[5]

Blood gas analysis is a medical examination procedure that aims to measure the amount of oxygen and carbon dioxide in the blood. AGDA can also be used to determine the level of acidity or pH of blood. As blood passes through the lungs, oxygen enters the blood while carbon dioxide is released from the blood cells and out into the lungs. Thus blood gas analysis can determine how well the lungs are working to move oxygen into the blood and remove carbon dioxide from the blood.[6]

Both the American-European Consensus Conference and Berlin definitions require arterial blood gas analysis (AGDA) to measure the degree of hypoxemia. The use of continuous oximetry as an alternative reduces costs and reduces the number of repeated blood draws. Arterial blood gas sampling may also not be available in health facilities with limited resources. To measure oxygen saturation via pulse oximetry, pulse oximetry/FiO2 (SF) ratio can replace PaO2 /FiO2 (P/F) ratio for the diagnosis of ARDS. Rice et al. reported that appropriate measurements of oxygen saturation as measured by pulse oximetry (SpO2) (value <97%) and PaO2 of patients enrolled in one of the ARDS Network clinical trials found that the SF ratio was highly correlated with the P/F ratio. The SF ratio has also been used to identify children with ARDS in place of the P/F ratio in the ALI score of ARDS severity and in place of the P/F ratio in Sequential Organ Failure Assessment scores. Meanwhile, in a single-center study of 102 patients in the ICU, the SF ratio did not always match the P/F ratio and this discrepancy could lead to the identification of ARDS cases through the value of the SF ratio in groups with less severe disease severity.[7]

A study by Amato in 2015 regarding driving pressure (DP) has become an interesting topic in ARDS management. A 2015 study in 3562 ARDS patients showed that a lower variable ΔP on changing ventilator settings was associated with a higher survival rate even though at that time all patients were using lung protective strategies, by limiting VT.[5]

In a study conducted by Santini A, et al in 2017, sixteen patients were randomized to the limited driving pressure group and 15 were randomized to the conventional strategy group. Most of the patients had mild ARDS with a mean arterial oxygen tension/fraction inspired oxygen ratio of 215 (standard deviation [SD] = 95). The results showed no statistically significant difference in the incidence of severe acidosis (pH < -7.10) within 7 days (absolute difference 12.1; 95% CI, 41.5 to 17.3) or until the study was completed. 8 Based on the above background and no research has been conducted regarding the comparison of the use of driving pressure in ARDS patients in the ICU of RSUP H Adam Malik Medan.

II METHOD

This study used a randomized controlled trial to compare the P/F ratio in ARDS patients who were ventilated using the driving pressure strategy method and the conventional lung-protective strategy in the ICU of RSUP H. Adam Malik Medan. The study population was ARDS patients who were ventilated in the ICU of the Central General Hospital H. Adam Malik Medan. The study sample was ARDS patients who were ventilated in the ICU of H. Adam Malik General Hospital Medan who met the inclusion and exclusion criteria. The technique of obtaining samples is by consecutive sampling, namely looking for patients who meet the inclusion and exclusion criteria until the required number of samples is met. Inclusion criteria included ARDS patients requiring mechanical ventilation and age 18-64 years. Exclusion criteria included families refusing to participate in the study, patients with lung malignancies, patients with cardiac disorders, patients with fluid overload. Test dropout criteria included patients who died before 3 days after being ventilated

III RESULTS

This study aims to compare the two methods of using mechanical ventilation, namely the lung protective strategy method with driving pressure in improving lung function in septic patients in the ICU of Adam Malik Haj Center General Hospital Medan. In this study, 22 research samples were obtained that met the inclusion criteria and were not included in the exclusion criteria category.

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Table 3.1 Characteristics of the Research Sample

	N(%)		
	Lung Protection Strategy	***Driving Pressure***	**Total**
Gender			
Man	10 (45.5)	6 (27.3)	16 (72.7)
Woman	1 (4,5)	5 (22.7)	6 (27.3)
***Predicted Body Weight*(kg)**			
41 - 50	1 (4,5)	2 (9)	3 (13,6)
51 - 60	2 (9)	5 (22.7)	7 (31.8)
61 - 70	8 (36.3)	4 (18,2)	12 (54.5)

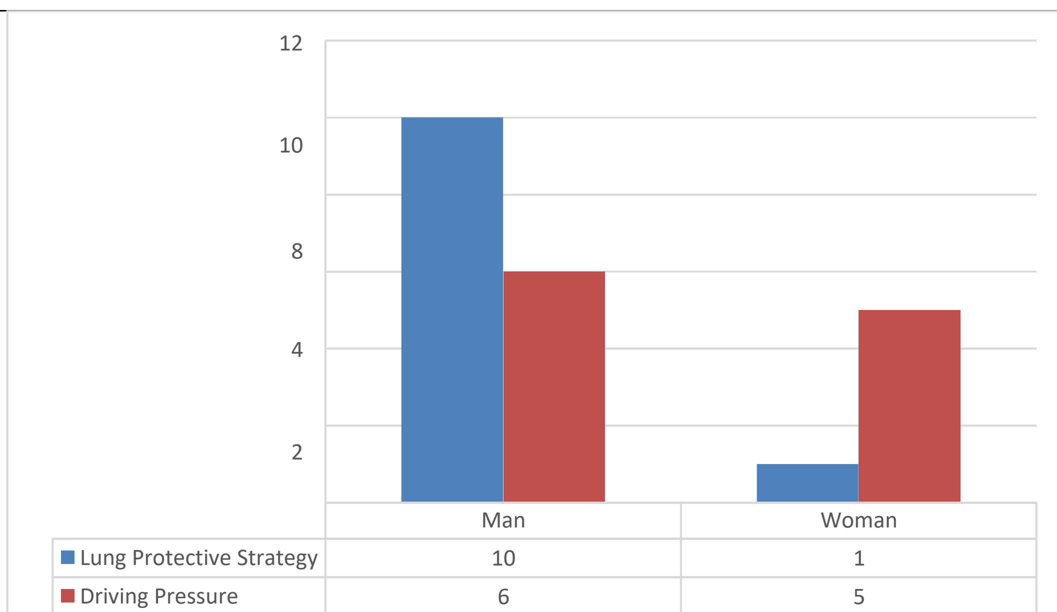

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Figure 3.1. Graph of Research Sample Characteristics based on Gender

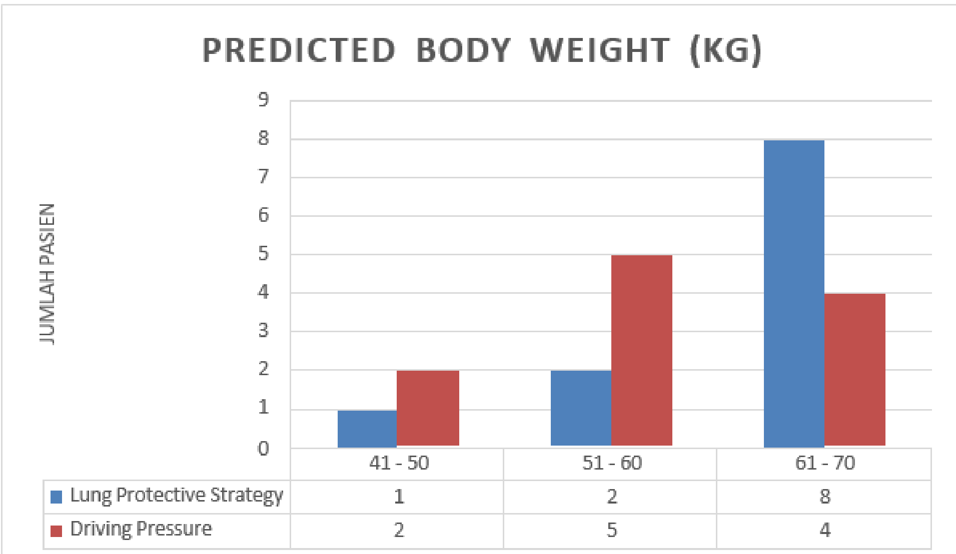

Figure 3.2. Graph of Research Sample Characteristics based on Predicted Body Weight (kg)

Table 3.1 shows that the male sex distribution in this study was 16 (72.7%) and in the lung protective strategy method group 10 (45.4%) and in the driving pressure method group 6 (27.3%). For the female sex, a total of 6 (27.3%) was obtained in the lung protective strategy method group 1 (4.5%) and in the driving pressure method 5 (22.7%). Meanwhile, the characteristics of the sample based on the calculation of the predicted body weight (PBW) were 1 (4.5%) sample with a PBW of 41-50 kg, 2 (9%) with a PBW of 51-60 kg and a total of 8 (36.3%) with a PBW of 61-70 kg in the lung protective strategy group. In the driving pressure method group, there are 2 (9%) samples with PBW 41-50 kg, 5 (22.7%) with PBW 51-60 kg and a number of 4 (18.2%) with PBW 61-70 kg .

Table 3.2 Comparison of the P/F ratio between the Lung protective strategy and Driving Pressure methods

	Lung Protective Strategy		*Driving Pressure*		Test Normality	P value
	Means	SD	Means	SD		
P/F Ratio H1	241.4	76.6	242.1	81.2	0.167*	0.617**
P/F Ratio H2	245	65.2	247	47.3	0.154*	0.337**
P/F Ratio H3	253.6	48.2	200	54.0	0.577*	0.347**

*Saphiro-wilk, ** T Independent

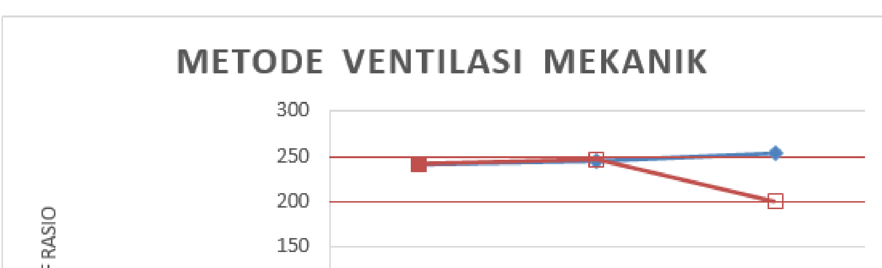

Figure 3.3. Graph of comparison of P/F ratio values between the Lung protective strategy method and Driving Pressure

In the table above, the average value of the P/F ratio for lung protective on the first day is 241.4 ± 76.6 and for Driving pressure, the average is 242.1 ± 81.2 with a normality test with results normally distributed on the first day and with the analysis between the two methods on the first day, the normality test value was 0.167, which means that the results were normal distribution in the sample, and the analysis between the two method groups yielded a P value of 0.617, which means that there was no significant difference between the two method groups. On the second day of data, the P/F ratio in the lung protective strategy group obtained an average value of 245 ± 65.2 and an average driving pressure with an average of 247 ± 47.3, in the normality test for the second day P/F ratio was obtained a value of 0.154 whose results are normally distributed, then a comparison was made between the two method groups which resulted in a P value of 0.337, which meant that there was no difference between the two groups on the second day. On the third day, the lung protective strategy group obtained an average value of 253.6 ± 48.2 and the driving pressure group obtained an average value of 200 ± 54.0 with the normality test on the P/F ratio on the third day. The test results were 0.577, which means that the data is distributed normal, then a comparison test was carried out which obtained a P value of 0.347, which meant that there was no significant difference between the two groups.

IV CONCLUSION

1. After conducting the study, there was no significant difference in the P/F ratio ($p > 0.05$) between ARDS patients after being given mechanical ventilation using lung protective ventilation with driving pressure ventilation.
2. The average value of the P/F ratio on lung protection on the first day was 178.18 ± 46.5, the second day was 166.1 ± 30.8 and the third day was 177.2 ± 27.4
3. The average value of the P/F ratio on Driving pressure on the first day obtained an average of 164.81 ± 44.5, the second day was 169.5 ± 12.8 and the third day was 175 ± 35

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