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Original Research

Comparative study between bilevel non- invasive ventilation versus conventional oxygen therapy in management of acute cardiogenic pulmonary edema

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ABSTRACT:
Background: Acute cardiogenic pulmonary oedema is a common medical emergency. The present study was conducted to compare bilevel non- invasive ventilation versus conventional oxygen therapy in management of acute cardiogenic pulmonary edema. **Materials & Methods:** 104 patients of cardiogenic pulmonary edema of both genders were divided into 2 groups of 52 each. Group I were randomly assigned conventional oxygen therapy and group II into non-invasive pressure support ventilation (NIPSV). Physiological measurements were obtained in baseline, 15 mins, 30 mins and 60 mins. **Results:** The mean fraction of inspired oxygen was 0.46, 0.54. 0.60 and 0.65 in group I and 0.47, 0.66, 0.63 and 0.60 at baseline, 15 minutes, 30 minutes and 60 minutes respectively. Mean blood pressure (mm Hg) was 118, 106, 104 and 102 in group I and 122, 108, 104 and 102 in group II at baseline, 15 minutes, 30 minutes and 60 minutes respectively. The mean respiratory rate (breaths/min) was 35.4, 34.2, 30.6 and 26.4 in group I and 39.0, 28.4, 25.2 and 24.2 in group II at baseline, 15 minutes, 30 minutes and 60 minutes respectively. The mean heart rate (beats/min) was 107.6, 104.4, 98.2 and 96.0 in group I and 113.0, 10.2.0, 99.4 and 90.5 in group II at baseline, 15 minutes, 30 minutes and 60 minutes respectively. The difference was significant (P< 0.05). **Conclusion:** NIPSV was superior as compared to conventional oxygen therapy in patients with acute cardiogenic edema.
Key words: cardiogenic edema, conventional oxygen therapy, ventilation

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INTRODUCTION

Acute cardiogenic pulmonary oedema is a common medical emergency. The majority of patients with acute pulmonary oedema will improve with oxygen and pharmacological therapy. However, assisted ventilation may be needed in patients with severe cardiogenic pulmonary oedema who remain hypoxaemic and in respiratory distress despite conventional medical therapy.[1]

Non-invasive ventilation (NIV) refers to the provision of mechanical respiratory support using techniques that do not bypass the upper airway.[2] NIV is now the recommended first-line method of ventilator support in selected patients with acute respiratory failure (ARF) of various origins, including hypercapnic patients with exacerbations of chronic obstructive pulmonary disease (COPD), cardiogenic pulmonary edema (CPE), or immunosuppression, and it has also been suggested as a tool to prevent post-extubation ARF in selected cohorts of critically ill patients.[3]

Several studies have shown that continuous positive airway pressure (CPAP) is effective in this setting, through improvement in gas exchange and decrease in the need for intubation. CPAP is usually obtained with a hermetic nasal or face mask that has an expiratory

valve to maintain a positive pressure at the end of expiration.[4] With this modality, patients do not receive any assistance with respiration. A novel approach to oxygen and ventilation therapy is high-flow nasal cannula oxygen, which delivers oxygenated air up to 60 L/min. High-flow nasal cannula is reported to achieve FiO2 ranging from 21% to 100%. The flow levels are high enough to generate positive airway pressure, potentially decreasing entrapment of ambient air and providing support to reduce the work of breathing.[5] The present study was conducted to compare bilevel non- invasive ventilation versus conventional oxygen therapy in management of acute cardiogenic pulmonary edema.

MATERIALS & METHODS

The present study comprised of 104 patients of cardiogenic pulmonary edema of both genders. They were enrolled and their written consent was obtained. Data pertaining to their age, gender and name, etc. was recorded. Patients were divided into 2 groups of 52 each. Group I were randomly assigned conventional oxygen therapy and group II into non-invasive pressure support ventilation (NIPSV) supplied by a standard ventilator through a face mask, with adjustment of tidal volume and pressure support in addition to a positive end-expiratory pressure of 5 cm water. Physiological measurements were obtained in baseline, 15 mins, 30 mins and 60 mins. The main endpoints were intubation rate and resolution time. Analyses were by intention to treat. Results thus obtained were assessed statistically. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Groups	Group I	Group II
Method	Conventional oxygen therapy	NIPSV
M:F	32:20	24:28

Table I shows that group I had 32 males and 20 females and group II had 24 males and 28 females.

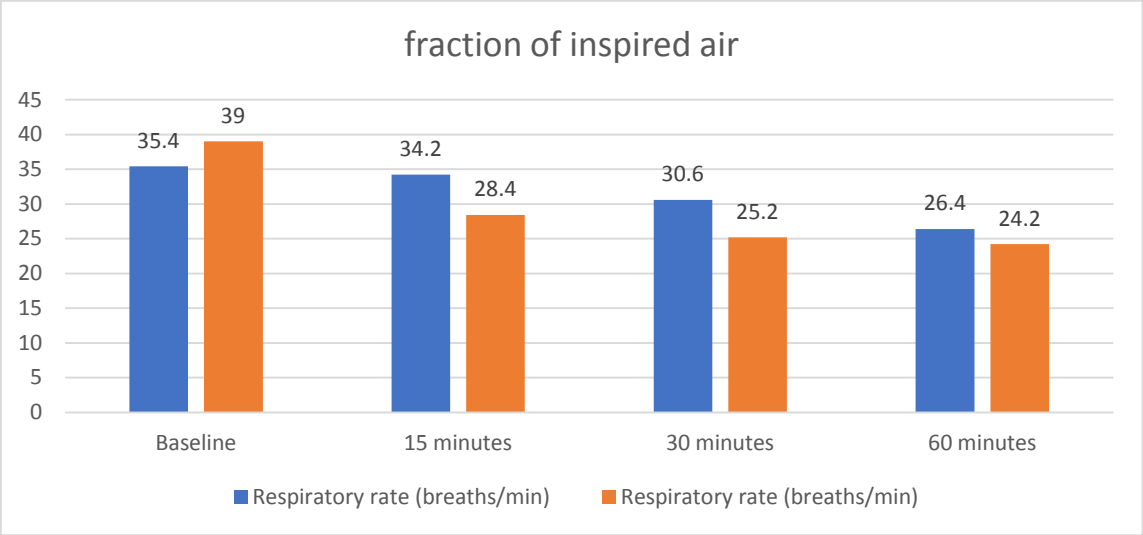
Table II Physiological measurements between both groups

Parameters	Groups	Baseline	15 minutes	30 minutes	60 minutes	P value
Fraction of inspired oxygen	Group I	0.46	0.54	0.60	0.65	0.05
	Group II	0.47	0.66	0.63	0.60	
Mean blood pressure (mm Hg)	Group I	118	106	104	102	0.04
	Group II	122	108	104	100	
Respiratory rate (breaths/min)	Group I	35.4	34.2	30.6	26.4	0.01
	Group II	39.0	28.4	25.2	24.2	
Heart rate (beats/min)	Group I	107.6	104.4	98.2	96.0	0.03
	Group II	113.0	102.0	99.4	90.5	

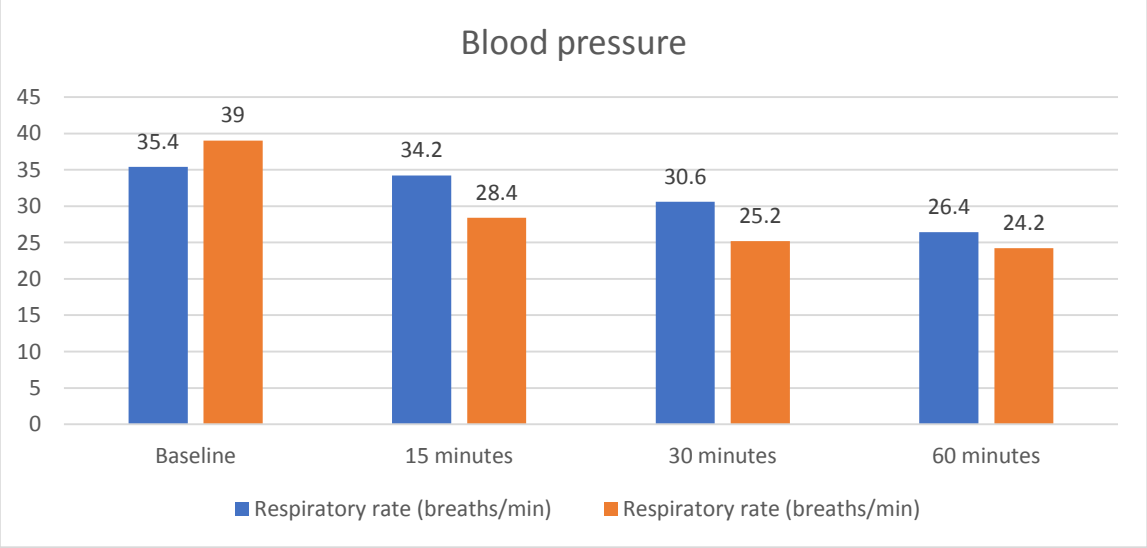
Table II, graph I, II, III shows that mean fraction of inspired oxygen was 0.46, 0.54. 0.60 and 0.65 in group I and 0.47, 0.66, 0.63 and 0.60 at baseline, 15 minutes, 30 minutes and 60 minutes respectively. Mean blood pressure (mm Hg) was 118, 106, 104 and 102 in group I and 122, 108, 104 and 102 in group II at baseline, 15 minutes, 30 minutes and 60 minutes respectively.

The mean respiratory rate (breaths/min) was 35.4, 34.2, 30.6 and 26.4 in group I and 39.0, 28.4, 25.2 and 24.2 in group II at baseline, 15 minutes, 30 minutes and 60 minutes respectively. The mean heart rate (beats/min) was 107.6, 104.4, 98.2 and 96.0 in group I and 113.0, 10.2.0, 99.4 and 90.5 in group II at baseline, 15 minutes, 30 minutes and 60 minutes respectively. The difference was significant ($P< 0.05$).

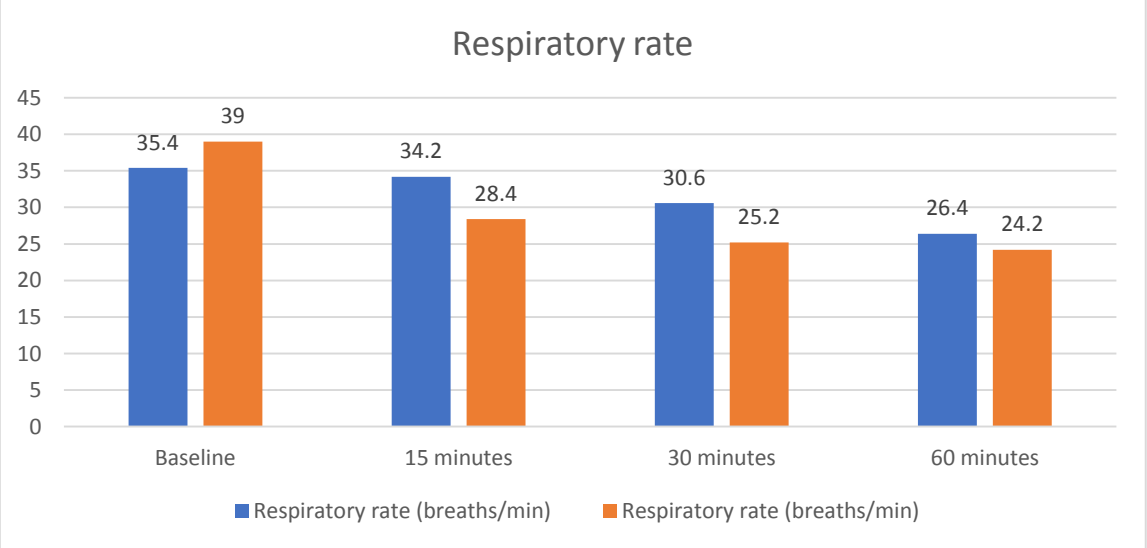
Graph I Fracture of inspired oxygen



Graph II Blood pressure



Graph III Respiratory rate



DISCUSSION

Non-invasive continuous positive airway pressure (CPAP) ventilation can improve gas exchange, decrease respiratory and heart rate, reduce the need for invasive ventilation and reduce hospital mortality.[6] Non-invasive bi-level positive airway pressure (BiPAP) ventilation delivers positive airway pressure at two different levels during inspiration and expiration, and can decrease inspiratory work of breathing more than CPAP can alone.[7] Studies evaluating BiPAP in acute cardiogenic pulmonary oedema have shown that it improves gas exchange and reduces the need for invasive ventilation in patients with hypercapnic respiratory failure compared with conventional medical therapy. However, none of these studies demonstrated a reduction in hospital mortality.[8] Furthermore, the results of one of the earlier studies suggested that BiPAP compared with CPAP might increase the risk for new onset acute myocardial infarction in patients with acute cardiogenic pulmonary oedema.[9] The present study was conducted to compare bilevel non-invasive ventilation versus conventional oxygen therapy in management of acute cardiogenic pulmonary edema.

In present study, group I had 32 males and 20 females and group II had 24 males and 28 females. Ho et al[10] included randomized controlled studies comparing CPAP and BiPAP treatment in patients with cardiogenic pulmonary oedema. Seven randomized controlled studies, including a total of 290 patients with cardiogenic pulmonary oedema, were considered. The hospital mortality and risk for requiring invasive ventilation were not significantly different between patients treated with CPAP and those treated with BiPAP. Stratifying studies that used either fixed or titrated pressure during BiPAP treatment and studies involving patients with or without hypercapnia did not change the results. The duration of non-invasive ventilation required until the pulmonary oedema resolved and length of hospital stay were also not significantly different between the two groups. Based on the limited data available, there was an insignificant trend toward an increase in new onset acute myocardial infarction in patients treated with BiPAP.

We observed that mean fraction of inspired oxygen was 0.46, 0.54. 0.60 and 0.65 in group I and 0.47, 0.66, 0.63 and 0.60 at baseline, 15 minutes, 30 minutes and 60 minutes respectively. Mean blood pressure (mm Hg) was 118, 106, 104 and 102 in group I and 122, 108, 104 and 102 in group II at baseline, 15 minutes, 30 minutes and 60 minutes respectively. Masip et al[11] in their study 40 patients were randomly assigned conventional oxygen therapy or NIPSV supplied by a standard ventilator through a face mask, with adjustment of tidal volume and pressure support in addition to a positive end-expiratory pressure of 5 cm water. Three patients were withdrawn on the basis of clinical and chest radiography results. Endotracheal intubation was required in one (5%) of 19 patients assigned NIPSV and in six (33%) of 18 assigned conventional oxygen therapy (p=0·037). Resolution time (defined as a clinical improvement with oxygen saturation of 96% or more and respiratory rate less than 30 breaths/min) was significantly shorter in the NIPSV group 30 vs 105 min. NIPSV led to a rapid improvement in oxygenation in the first 2 hours. There were no differences in hospital length of stay or mortality.

We observed that the mean respiratory rate (breaths/min) was 35.4, 34.2, 30.6 and 26.4 in group I and 39.0, 28.4, 25.2 and 24.2 in group II at baseline, 15 minutes, 30 minutes and 60 minutes respectively. The mean heart rate (beats/min) was 107.6, 104.4, 98.2 and 96.0 in group I and 113.0, 10.2.0, 99.4 and 90.5 in group II at baseline, 15 minutes, 30 minutes and 60 minutes respectively. Makdee et al[12] compared high-flow nasal cannula with conventional oxygen therapy in emergency department (ED) patients with cardiogenic pulmonary edema. They enrolled 128 participants (65 in the conventional oxygen therapy and 63 in the high-flow nasal cannula groups). Baseline high-flow nasal cannula and conventional oxygen therapy mean respiratory rates were 28.7 breaths/min (SD 3.2) and 28.6 breaths/min (SD 3.5). Mean respiratory rates at 60 minutes postintervention were lower in the high-flow nasal cannula group (21.8 versus 25.1 breaths/min). No significant differences were found in the admission rate, ED and hospital lengths of stay, non-invasive ventilation, intubation, or mortality.

CONCLUSION

Authors found that NIPSV was superior as compared to conventional oxygen therapy in patients with acute cardiogenic edema.

REFERENCES

1. Kernick J, Magarey J. What is the evidence for the use of high flow nasal cannula oxygen in adult participants admitted to critical care units? a systematic review. Aust Crit Care. 2010;23:53-70.
2. Roca O, Riera J, Torres F, et al. High-flow oxygen therapy in acute respiratory failure. Respir Care. 2010;55:408-413.
3. Dysart K, Miller TL, Wolfson MR, et al. Research in high flow therapy: mechanisms of action. Respir Med. 2009;103:1400-1405.
4. Gotera C, Díaz Lobato S, Pinto T, et al. Clinical evidence on high flow oxygen therapy and active humidification in adults. Rev Port Pneumol. 2013;19:217-227.
5. Groves N, Tobin A. High flow nasal oxygen generates positive airway pressure in adult volunteers. Aust Crit Care. 2007;20:126-131.
6. Parke R, McGuinness S, Eccleston M. Nasal high-flow therapy delivers low-level positive airway pressure. Br J Anaesth. 2009;103:886-890.
7. Sztrymf B, Messika J, Bertrand F, et al. Beneficial effects of humidified high flow nasal oxygen in critical care participants: a prospective pilot study. Intensive Care Med. 2011;37:1780-1786.

8. Sztrymf B, Messika J, Mayot T, et al. Impact of high-flow nasal cannula oxygen therapy on intensive care unit participants with acute respiratory failure: a prospective observational study. J Crit Care. 2012;27; 324-313.
9. Schwabbauer N, Berg B, Blumenstock G, et al. Nasal high-flow oxygen therapy in participants with hypoxic respiratory failure: effect on functional and subjective respiratory parameters compared to conventional oxygen therapy and non-invasive ventilation (NIV). BMC Anesthesiol. 2014;14:66.
10. Ho KM, Wong K. A comparison of continuous and bi-level positive airway pressure non-invasive ventilation in patients with acute cardiogenic pulmonary oedema: a meta-analysis. Critical care. 2006 Apr;10(2):1-8.
11. Masip J, Betbesé AJ, Páez J, Vecilla F, Cañizares R, Padró J, Paz MA, de Otero J, Ballús J. Non-invasive pressure support ventilation versus conventional oxygen therapy in acute cardiogenic pulmonary oedema: a randomised trial. The Lancet. 2000 Dec 23;356(9248):2126-32.
12. Makdee O, Monsomboon A, Surabenjawong U, Praphruetkit N, Chaisirin W, Chakorn T, Permpikul C, Thiravit P, Nakornchai T. High-flow nasal cannula versus conventional oxygen therapy in emergency department patients with cardiogenic pulmonary edema: a randomized controlled trial. Annals of emergency medicine. 2017 Oct 1;70(4):465-72.