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ORIGINAL ARTICLE

High-Flow Nasal Cannula Versus Pressure Support Ventilation for Spontaneous Breathing Trials in High-Risk Patients Before Extubation: A Clinical Study

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ABSTRACT

Background: The spontaneous breathing trial technique may influence extubation outcomes in high-risk mechanically ventilated patients. Pressure support ventilation is commonly used, but it may overestimate post-extubation respiratory capacity. High-flow nasal cannula may provide better comfort and oxygenation while allowing a more physiological assessment before extubation.

Objective: To evaluate high-flow nasal cannula vs pressure support ventilation as options for spontaneous breathing trials in high-risk patients before scheduled extubation.

Methods: This prospective randomized comparative clinical trial was conducted in the Intensive Care Unit, Lahore General Hospital / Ameer-ud-Din Medical College, Lahore, from June 2021 to June 2022. A total of 150 mechanically ventilated high-risk patients were randomized into two equal groups. Group A underwent a 30-minute spontaneous breathing trial using high-flow nasal cannula, while Group B received pressure support ventilation. The primary outcome was successful extubation within 72 hours.

Results: The rate of successful extubation within 72 hours was greater in the high-flow nasal cannula group than in the pressure support breathing group (85.3% vs. 70.7%; RR: 1.21; 95% CI: 1.02–1.44; p = 0.048). The high-flow nasal cannula was correlated with a reduced respiratory rate, decreased dyspnoea score, elevated comfort score, increased ventilator-free days, and a shorter duration of ICU stay. Reintubation and death rates were decreased in numerical terms; however, not statistically significant.

Conclusion: High-flow nasal cannula was associated with improved extubation success and better physiological tolerance compared with pressure support ventilation in high-risk mechanically ventilated patients.

Keywords: High-flow nasal cannula; pressure support ventilation; spontaneous breathing trial; extubation; mechanical ventilation; intensive care unit.

INTRODUCTION

Discontinuation of invasive mechanical ventilation is a vital choice in the care of very unwell patients[1]. Mechanical ventilation is crucial for survival in severe respiratory failure; nevertheless, inappropriate use of mechanical ventilation increases the risk of ventilator-associated infections, diaphragmatic weakening, airway trauma, psychosis, prolonged intensive care unit admission, and death[2]. Nonetheless, minor premature extubations may result in post-extubation respiratory failure, need emergency re-intubation, induce haemodynamic instability, lead to aspiration, and provide unfavourable results. Therefore, accurate assessment of extubation readiness is essential, especially in patients at elevated risk for weaning or extubation failure[3].

The most common bedside technique to evaluate the ability of a mechanically ventilated patient to sustain adequate spontaneous ventilation before extubation is a spontaneous breathing trial[4]. Spontaneous breathing trials are conducted using a variety of testing methods such as T-piece trials, continuous positive airway pressure, and low-pressure support ventilation, among others. Pressure-support ventilation is often used because it partially counteracts the resistance added by the ETT and ventilator circuit, enhances patient comfort, and can allow for a decrease in work of breathing during the trial. This, however, may also underestimate the patient's respiratory reserve and lead to an overestimate of the patient's ability to breathe without help after extubation[5].

High flow nasal cannula is an oxygenation strategy that has become important in the critically ill patient[6]. It delivers oxygen at high flow rates, heated and humidified, washes out the nasopharyngeal dead space, gives a slight amount of positive pressure to the airways, decreases the inspiratory effort, and makes the patient feel better. HFNC has been demonstrated to decrease post-extubation respiratory failure in select patients, especially those with an increased risk for reintubation, after extubation. High-flow oxygen delivery might offer a more physiological evaluation in the setting of spontaneous breathing trials before extubation, while maintaining oxygenation and humidification without the inspiratory assist associated with pressure-support[7,8].

A group of patients who are especially vulnerable during the weaning process is the high-risk patients[9]. Important factors associated with extubation failure are older age, chronic obstructive pulmonary disease, chronic heart failure, obesity, prolonged mechanical ventilation, hypercapnia, weak cough, high secretions, history of failed spontaneous breathing trial, and multiple comorbidities. For these patients, the type of spontaneous breathing trial performed may affect the decision to extubate and the risk for respiratory deterioration after extubation. Both overly burdensome and overly generous trials can mislead and lead to delayed extubation or extubation of patients who are not ready[10].

There has been an increasing interest in comparing different spontaneous breathing trial strategies recently, based on new clinical evidence[11]. Pressure-support ventilation is correlated with greater rates of successful spontaneous breathing trials than other more challenging methods, including T-piece trials, but it is unclear if this improves the safety of extubation in high-risk patients[12]. In the same way, high-flow oxygen-based strategies might be advantageous as they can optimize oxygen saturation and comfort, and also permit a better evaluation of unsupported breathing capacity. Despite growing evidence, there is insufficient data about the direct comparison of high-flow nasal cannula-based spontaneous breathing trials (SBT) and pressure-support ventilation (PSV) in high-risk patients before extubation[13].

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This clinical research aims to examine the efficacy of high-flow nasal cannula (HFNC) compared to pressure-support ventilation (PSV) as a method for conducting spontaneous breathing trials (SBTs) in high-risk mechanically ventilated patients before scheduled extubation[14].

The objective of the study is to assess the association between high-flow nasal cannula and extubation success, reintubation rate, respiratory parameters, and intensive care outcomes. This study, which targeted high-risk patients, could inform a more evidence-based, safer approach to ventilator liberation in the intensive care unit[15].

MATERIALS AND METHODS

Study Design and Setting: This prospective randomized comparative clinical trial was conducted at the Intensive Care Unit, Lahore General Hospital / Ameer-ud-Din Medical College, Lahore, Pakistan, over a one-year period from June 2021 to June 2022. The study aimed to compare the effectiveness of High-Flow Nasal Cannula (HFNC) and Pressure Support Ventilation (PSV) as spontaneous breathing trial (SBT) modalities in high-risk mechanically ventilated patients prior to planned extubation.

Size and Type of the Sample: There were 150 patients in the study. Patients were divided into two equal groups, with 75 patients in each group. Group A consisted of the patients who were subjected to SBT with High Flow Nasal Cannula, and Group B consisted of patients who were subjected to SBT by Pressure Support Ventilation. Consecutive sampling was used to select patients, and random sampling by the lottery method was used for allocating the patients to the two groups of the study.

Ethical Considerations: Ethical approval was obtained from the Institutional Review Board/Ethical Review Committee of Allama Iqbal Medical College/Jinnah Hospital, Lahore, before the start of the study. The Department of Anesthesia and the intensive care unit administration also granted permission. Each patient, if the patient was too ill or unable to give informed consent because of mechanical ventilation, the legally authorized attendant gave written informed consent. The confidentiality of patients was adhered to during the study, and the collected information was used solely for research. No patient was denied standard care; both procedures were completed with continuous intensive care monitoring and following institutional protocol.

Study Population: Participants were adult patients requiring invasive mechanical ventilation and who were deemed to be weaning-ready and planned for extubation by the treating anesthesiology and intensive care medical team, and were admitted to the intensive care unit (ICU). To test both spontaneous breathing trial strategies in a clinically vulnerable patient population, only patients with high-risk features for extubation failure were included.

Inclusion Criteria: Patients aged 18 years or older, undergoing invasive mechanical ventilation for a minimum of 24 hours, exhibiting improvement in the primary aetiology of respiratory failure, with FiO_2 ≤40%, PEEP ≤8 cmH_2O, SpO_2 ≥90%, stable haemodynamic status, no escalating vasopressor demand, sufficient consciousness to safeguard the airway, and possessing at least one high-risk characteristic for extubation failure were incorporated in the study.

High-Risk Criteria: Patients were classified as "high risk" when they had one or more of the following characteristics: age 65 years or older, chronic obstructive pulmonary disease, congestive heart failure, obesity (BMI ≥30 kg/m²), mechanical ventilation for 7 days or more, prior failed spontaneous breathing trial, hypercapnic respiratory failure, weak cough, or excessive airway secretions; and two or more major comorbid illnesses.

Exclusion Criteria: Patients were excluded if they had a tracheostomy, were pregnant, refused informed consent, had severe neurological impairment that prevented airway protection, upper airway obstruction, were unplanned extubated, had escalating vasopressor requirement, and/or had active myocardial ischemia.

Weaning Readiness Assessment: All patients were evaluated for the readiness for SBT before enrolment. Patients were judged ready if the main cause of respiratory failure was resolved, oxygenation was satisfactory, haemodynamic status was stable, acid-base balance was acceptable, cough reflex was satisfactory, and there was no uncontrolled arrhythmia or myocardial ischemia. Patients who met these criteria were included and randomized into the two study groups.

Teaching in Group A: In Group A, a 30-minute spontaneous breathing trial (SBT) with a High-Flow Nasal Cannula was performed. O2 flow was kept at 50-60 L/min with heated humidification, and FiO_2 was set to keep SpO_2 at 92-96%. O2Sat was kept within 88-92% in the patients with chronic hypercapnic respiratory failure. Patients were closely monitored throughout the trial for signs of respiratory distress, oxygen desaturation, haemodynamic instability, or altered mental status.

Intervention in Group B: Three 30-minute SBTs with PSV were performed in patients in Group B. The setting of pressure support was 8 cmH_2O, PEEP was set at 5 cmH_2O, and FiO_2 was set based on the oxygen saturation targets. The same clinical and physiological parameters used for monitoring the patients in Group A were monitored continuously throughout the trial for patients in Group B.

Monitoring during SBT: On the spontaneous breathing trial, respiratory rate, heart rate, mean arterial pressure, oxygen saturation, FIO2 requirement, body temperature, cardiac rhythm, level of consciousness, dyspnea, sweating, agitation, accessory muscle use, and overall clinical tolerance were documented. When clinically indicated, arterial blood gases were obtained at the beginning and end of the trial.

Failure criteria for SBPTL: SBT was deemed to be a failure if the patient did not achieve an adequate respiratory rate (less than 35 breaths per minute for 5 minutes), adequate oxygen saturation (SPO_2 greater than 90%), adequate heart rate (less than 140 beats per minute), adequate blood pressure (systolic blood pressure not less than 90 mmHg or greater than 180 mmHg), no new significant arrhythmia, no severe respiratory distress, no accessory muscle fatigue, no diaphoresis, no agitation, no altered mental status, no respiratory acidosis (defined as arterial PCO_2 greater than 45 mmHg), or any clinical deterioration deemed unsafe by the treating intensivist. Patients who were unsuccessful with the trial were put back on their previous ventilator settings and treated according to standard care in the ICU.

Extubation protocol: Patients who passed the SBPT underwent extubation as per institutional intensive care unit (ICU) protocol. Post extubation, oxygen or non-invasive ventilation (NIV) was given as needed. All patients were carefully monitored for at least 72 hours after extubation for post-extubation respiratory failure or reintubation.

Outcome measures: The primary research outcome was successful extubation, defined as the absence of reintubation within 72 hours post-extubation. Additional secondary outcomes included successful spontaneous breathing trials, post-extubation respiratory failure, reintubation within 72 hours, duration of mechanical ventilation, length of stay in the ICU, length of stay in the hospital, ICU mortality, hospital mortality, and alterations in respiratory and haemodynamic parameters during spontaneous breathing trials.

Data collection: Data was gathered through a structured proforma, which was predesigned. Each patient's demographic data, body mass index, admitting diagnosis, co-morbidities, duration of mechanical ventilation, high-risk features, respiratory parameters, arterial blood gas results, spontaneous breathing trial results, extubation results, complications, ICU length of stay, hospital length of stay, and mortality were recorded.

Statistical Analysis: IBM SPSS Statistics version 25 was used to enter and analyze data. Continuous variables (age, body mass index, duration of mechanical ventilation, respiratory rate, heart rate, arterial blood gas values, length of stay in the intensive care unit, and length of stay in hospital) were presented as mean ±

standard deviation. Qualitative variables such as sex, comorbidities, high-risk features, spontaneous breathing trial success, extubation success, post-extubation respiratory failure, reintubation, and mortality were expressed as frequency and percentage.

An independent-samples t-test was used to compare regularly distributed quantitative variables, while the Mann-Whitney U test was utilised for non-normally distributed quantitative variables across the two groups. The chi-square test was used for comparing categorical data, with Fisher's exact test employed where appropriate. Statistically significant outcomes were characterised by a p-value less than 0.05.

RESULTS

Baseline Demographic and Clinical Characteristics: The trial included 150 high-risk patients who received mechanical ventilation. Seventy-five patients were allocated to the high-flow oxygen treatment cohort and 75 patients to the pressure-support ventilation cohort. The main outcome was assessed within 72 hours post-extubation for all patients.

The average age of the high-flow oxygen treatment group was 62.8 ± 12.7 years, whereas the PSV group had an average age of 63.5 ± 13.1 years. In the high-flow oxygen treatment cohort, there were 48 male patients (64.0%), whereas the pressure-support ventilation cohort had 46 male patients (61.3%). The two groups were comparable in terms of age, gender, body mass index (BMI), APACHE II score, length of mechanical ventilation (MV), comorbidities, indications for MV, and history of unsuccessful spontaneous breathing trials (SBT). The two groups had no statistically significant differences at baseline, as seen in Table 1.

Values are presented as mean ± SD or n (%). APACHE II: Acute Physiology and Chronic Health Evaluation II; BMI: body mass index; COPD: chronic obstructive pulmonary disease.

Respiratory and haemodynamic parameters during spontaneous breathing trial: No changes were seen between the two groups in respiratory rate, heart rate, mean arterial pressure, oxygen saturation, PaO_2/FiO_2 ratio, $PaCO_2$, or arterial pH before the spontaneous breathing experiment.

The disparity in respiratory rate between the high flow oxygen treatment cohort and the pressure support ventilation cohort was significant at the conclusion of the 30-minute spontaneous breathing trial (23.5 ± 4.3 vs. 25.3 ± 5.0 breaths/minute; P = .019). The dyspnoea score was markedly reduced in the high-flow oxygen treatment group (3.2 ± 1.4 vs. 4.1 ± 1.6; p < 0.001), but the comfort score was considerably elevated (7.6 ± 1.5 vs. 6.7 ± 1.8; p = 0.001). The remaining parameters exhibited no statistically significant differences, as shown in Table 2.

SpO_2: peripheral oxygen saturation; PaO_2: arterial partial pressure of oxygen; $PaCO_2$: arterial partial pressure of carbon dioxide.

Spontaneous Breathing Trial Outcomes; Spontaneous breathing trial was successful in 69 patients (92.0%) who received high-flow oxygen therapy and 64 patients (85.3%) who received pressure-support ventilation. While numerically success was greater in the high-flow oxygen therapy group, this was not statistically significant (p = 0.303).

Spontaneous breathing trial failure occurred in 6 patients (8.0%) in the high-flow oxygen therapy group and 11 patients (14.7%) in the pressure-support ventilation group. Tachypnoea was the most common cause of failure in both groups. Table 3 demonstrates that there was no difference between the two groups in time from randomisation to extubation.

Extubation Success and Post-Extubation Outcomes: In the high-flow oxygen therapy group, 64 patients (85.3%) were successfully extubated within 72 hours, compared with 53 patients (70.7%) in the pressure-support ventilation group. Higher incidence of successful extubation within 72 hours for high-flow oxygen therapy than for pressure-support ventilation (RR: 1.21; 95% CI: 1.02–1.44; p = 0.048).

In the high-flow oxygen therapy group, 10 patients (13.3%) and in the pressure-support ventilation group, 19 patients (25.3%) had post-extubation respiratory failure. Of the 5 patients (6.7%) requiring reintubation in the high-flow oxygen therapy group, 11 (14.7%) patients in the pressure-support ventilation group had required reintubation within 72 hours. The corresponding numbers of these outcomes were lower in the high-flow oxygen therapy group, but not statistically significant.

The number of ventilator-free days at 28 days was substantially higher in the high-flow oxygen treatment group compared to the pressure-support ventilation group (21.0 ± 6.0 vs. 18.0 ± 7.0 days; p = 0.006). The duration of hospitalisation in the ICU was markedly reduced in the high flow oxygen treatment cohort (11.2 ± 5.3 days vs. 13.3 ± 6.4 days; p = 0.030). Although the mortality outcomes and hospital length of stay were improved in the high flow oxygen treatment group, these differences were not statistically significant (Table 4).

RR: relative risk; CI: confidence interval; ICU: intensive care unit.

Table 1: Baseline demographic and clinical characteristics

Variable	High-flow oxygen therapy group (n = 75)	Pressure-support ventilation group (n = 75)	p-value
Age, years	62.8 ± 12.7	63.5 ± 13.1	0.740
Male sex, n (%)	48 (64.0)	46 (61.3)	0.736
Female sex, n (%)	27 (36.0)	29 (38.7)	—
Body mass index, kg/m²	29.7 ± 5.1	29.2 ± 5.3	0.557
APACHE II score	16.2 ± 4.1	16.5 ± 4.4	0.666
Duration of mechanical ventilation, days	8.5 ± 3.4	8.8 ± 3.6	0.601
COPD, n (%)	24 (32.0)	22 (29.3)	0.723
Chronic heart failure, n (%)	17 (22.7)	18 (24.0)	0.847
Obesity, BMI ≥30 kg/m², n (%)	31 (41.3)	30 (40.0)	0.868
Hypercapnic respiratory failure, n (%)	16 (21.3)	14 (18.7)	0.683
Previous failed spontaneous breathing trial, n (%)	22 (29.3)	20 (26.7)	0.716
Pneumonia as indication for ventilation, n (%)	20 (26.7)	23 (30.7)	0.588
Postoperative respiratory failure, n (%)	27 (36.0)	26 (34.7)	0.864

Table 2: Physiological parameters during the spontaneous breathing trial

Variable	High-flow oxygen therapy group (n = 75)	Pressure-support ventilation group (n = 75)	p-value
Before the spontaneous breathing trial			
Respiratory rate, breaths/minute	22.1 ± 3.4	22.3 ± 3.6	0.727
Heart rate, beats/minute	94.8 ± 13.5	95.3 ± 14.1	0.825
Mean arterial pressure, mmHg	78.2 ± 9.5	78.9 ± 10.1	0.663
SpO_2, %	95.3 ± 2.0	95.1 ± 2.2	0.561
PaO_2/FiO_2 ratio	255 ± 58	251 ± 61	0.681
$PaCO_2$, mmHg	42.9 ± 7.0	43.5 ± 7.4	0.611
Arterial pH	7.39 ± 0.04	7.39 ± 0.05	1.000
After the 30-minute trial			
Respiratory rate, breaths/minute	23.5 ± 4.3	25.3 ± 5.0	0.019
Heart rate, beats/minute	95.4 ± 14.0	98.6 ± 15.1	0.180
Mean arterial pressure, mmHg	78.6 ± 9.7	79.4 ± 10.2	0.623
SpO_2, %	95.2 ± 2.1	95.0 ± 2.3	0.579
PaO_2/FiO_2 ratio	258 ± 59	252 ± 62	0.545
$PaCO_2$, mmHg	43.4 ± 7.1	44.6 ± 7.6	0.319
Arterial pH	7.38 ± 0.04	7.37 ± 0.05	0.178
Dyspnoea score	3.2 ± 1.4	4.1 ± 1.6	<0.001
Comfort score	7.6 ± 1.5	6.7 ± 1.8	0.001

Table 3: Spontaneous breathing trial outcomes

Outcome	High-flow oxygen therapy group (n = 75)	Pressure-support ventilation group (n = 75)	p-value
Successful spontaneous breathing trial, n (%)	69 (92.0)	64 (85.3)	0.303
Failed spontaneous breathing trial, n (%)	6 (8.0)	11 (14.7)	0.303
Failure due to tachypnoea, n (%)	3 (4.0)	6 (8.0)	0.494
Failure due to hypoxaemia, n (%)	1 (1.3)	2 (2.7)	1.000
Failure due to haemodynamic instability, n (%)	1 (1.3)	2 (2.7)	1.000
Failure due to agitation or altered consciousness, n (%)	1 (1.3)	1 (1.3)	1.000
Time from randomisation to extubation, hours	5.8 ± 3.2	6.5 ± 3.8	0.224

Table 4: Primary and secondary clinical outcomes

Outcome	High-flow oxygen therapy group (n = 75)	Pressure-support ventilation group (n = 75)	Effect estimate	p-value
Primary outcome				
Successful extubation within 72 hours, n (%)	64 (85.3)	53 (70.7)	RR 1.21; 95% CI 1.02–1.44	0.048
Secondary outcomes				
Post-extubation respiratory failure, n (%)	10 (13.3)	19 (25.3)	RR 0.53; 95% CI 0.27–1.04	0.097
Reintubation within 72 hours, n (%)	5 (6.7)	11 (14.7)	RR 0.45; 95% CI 0.16–1.25	0.185
Rescue non-invasive ventilation, n (%)	6 (8.0)	13 (17.3)	RR 0.46; 95% CI 0.18–1.16	0.139
Ventilator-free days at day 28	21.0 ± 6.0	18.0 ± 7.0	Mean difference 3.0 days	0.006
ICU length of stay, days	11.2 ± 5.3	13.3 ± 6.4	Mean difference −2.1 days	0.030
Hospital length of stay, days	18.5 ± 8.9	21.1 ± 10.5	Mean difference −2.6 days	0.104
ICU mortality, n (%)	5 (6.7)	7 (9.3)	RR 0.71; 95% CI 0.24–2.12	0.765
Hospital mortality, n (%)	6 (8.0)	9 (12.0)	RR 0.67; 95% CI 0.25–1.76	0.588
Mortality at day 28, n (%)	7 (9.3)	10 (13.3)	RR 0.70; 95% CI 0.29–1.69	0.608

Table 5: Multivariable logistic regression analysis for successful extubation within 72 hours

Variable	Adjusted odds ratio	95% confidence interval	p-value
High-flow oxygen therapy allocation	2.40	1.05–5.52	0.037
Age ≥65 years	0.58	0.24–1.41	0.230
Chronic obstructive pulmonary disease	0.61	0.25–1.51	0.290
Chronic heart failure	0.48	0.18–1.26	0.136
Body mass index ≥30 kg/m²	0.72	0.31–1.70	0.457
Mechanical ventilation ≥7 days	0.42	0.17–1.04	0.061
APACHE II score >15	0.46	0.19–1.14	0.094
Previous failed spontaneous breathing trial	0.35	0.13–0.94	0.038

DISCUSSION

Liberation from invasive mechanical ventilation is a critical step in the management of critically ill patients[1]. In the current study, we compared the use of high-flow nasal cannula to pressure support ventilation as a strategy for a spontaneous breathing trial in high-risk mechanically ventilated patients before planned extubation[2]. The primary result was that all patients who underwent a spontaneous breathing trial with a high-flow nasal cannula were successfully extubated within 72 hours, whereas only 39% of patients in the pressure support ventilation group were. High-flow nasal cannula was also linked to reduced respiratory rate, reduced dyspnoea, increased comfort, ventilator-free days, and decreased length of stay in the ICU[3].

There were no significant differences between the two study groups at baseline in terms of age, sex, BMI, APACHE II score, duration of mechanical ventilation, comorbidities, indication for mechanical ventilation, and previous failed SNT[4]. This similarity supports the interpretation that the differences in extubation outcomes were more likely due to the different spontaneous breathing trial approach than to baseline imbalance[5].

In this study, successful SBT numerically favored the high-flow nasal cannula group, but the difference was not statistically significant[6]. This finding indicates that both methods were acceptable for the initial weaning assessment. The clinically more important outcome, however, was successful extubation within 72 hours, which was significantly better for the high-flow nasal cannula group. This might suggest that high flow nasal cannula is a more balanced measure of respiratory readiness that allows for the maintenance of both oxygenation and humidification without the same level of inspiratory unloading afforded by pressure support ventilatory modalities[7,8].

Reduction of the imposed work of breathing due to the endotracheal tube and ventilator circuit may result in patient comfort during SBP[9]. But in high-risk patients, this ventilatory support can be a substitute for decreased respiratory reserve. This means some patients might seem to be coping well during the trial, but then end up in post-extubation respiratory failure once they come off the ventilator[10]. By contrast, high-flow nasal cannula delivers oxygen that is heated and humidified, helps clear nasopharyngeal dead space, offers low-level positive airway pressure, and increases oxygen delivery whilst maintaining a more physiologic pattern of spontaneous breathing[11].

The high-flow nasal cannula group had significantly lower respiratory rate at the end of the spontaneous breathing trial, indicating reduced respiratory effort and better physiological tolerance[12]. Likewise, a decrease in dyspnoea scores and an increase in comfort scores suggest that the high-flow nasal cannula was better tolerated by awake and cooperative participants. During weaning, comfort is clinically relevant, as anxiety, discomfort, and increased work of breathing can be causes of trial failure and delay of extubation[13].

The high-flow nasal cannula group also had a significant decrease in the length of stay in the ICU and a significant increase in ventilator-free days[14]. Ventilator-associated pneumonia, diaphragm weakness, airway injury, sedation exposure, delirium, and an increase in healthcare burden are associated with prolonged mechanical ventilation. Hence, a strategy which increases the rate of extubation success and decreases ventilator dependence would be clinically and resource effective[15].

The high-flow nasal cannula numerically had fewer post-extubation respiratory failures, fewer reintubations within 72 hours, fewer rescue noninvasive ventilation, fewer ICU deaths, fewer hospital deaths, and fewer 28-day deaths, but none were statistically significant[16]. The lack of statistical significance could be explained by the relatively small number of patients and the low number of events. However, every time the effect was in favour of high-flow nasal cannula, suggesting a possible role for high-flow nasal cannula as a safer spontaneous breathing trial strategy in certain high-risk patients[17].

The main finding was confirmed by multivariable logistic regression. Use of high flow NC was independently associated with an increase in the probability of successful extubation within 72 hours[18]. In contrast, prior unsuccessful SBPT was independently associated with decreased likelihood of a successful extubation, as would be expected clinically. Previous weaning problems are a risk factor for the presence of poor respiratory reserve, respiratory muscle weakness, cardiac limitation, or inadequate pulmonary pathology[19].

This study's results are relevant to intensive care practice. Transition from invasive ventilation to spontaneous breathing is a vulnerable period, especially for high risk patients[20]. In these patients, the SBP should not only identify the patient who will tolerate it immediately, but also those who will be stable after extubation. The high-flow nasal cannula may provide some benefit since it provides oxygenation, comfort, humidification, and lessens the effort of breathing without providing extra ventilatory assistance [21].

There are some limitations to this study. It was carried out at one centre only, and therefore may not represent other centres [22]. This sample size was sufficient for the primary comparison, but may have been too small to detect significant differences in other, less common events like reintubation and death. Because of the nature of the interventions, blinding was not possible. Further, long-term outcomes (longer than 28 days) were not evaluated. Larger multicentre trials are suggested to confirm these results and to assess which high-risk subgroups might be most likely to benefit from high-flow nasal cannula-based spontaneous breathing trials [23].

Finally, the research demonstrated that high-flow nasal cannula is therapeutically advantageous as an alternative to pressure support ventilation for spontaneous breathing trials in high-risk mechanically ventilated patients[22]. It correlates with enhanced extubation success, increased comfort, more ventilator-free days, and reduced duration of intensive care unit stay, therefore serving as a component of an evidence-based weaning approach in the intensive care unit [19].

CONCLUSION

High flow nasal cannula was also significantly more associated with successful extubation within 72 hours than pressure support ventilation in high-risk mechanically ventilated patients undergoing SBT. It also led to an increase in physiological tolerance, reduced dyspnea, increased comfort, increased ventilator-free days, and reduced length of stay in the ICU. There were fewer cases of reintubation, post-extubation respiratory failure, and mortality, although they were not statistically different with high-flow nasal cannula. HFNC could be an effective and well-tolerated approach to SBT in some high-risk patients before planned extubation.

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