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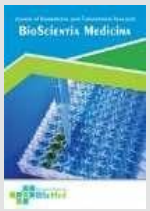

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Tracheostomy as an Effort to Help Weaning Ventilated Obese Patient: A Case Report

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A B S T R A C T

Background: The prevalence of tracheostomy in the ICU was performed in 10%-15% of patients. Tracheostomy is performed in patients with prolonged intubation. The most compelling indications for tracheostomy are acute respiratory failure with prolonged or expected prolonged duration of mechanical ventilation and failure to wean from a mechanical ventilator. **Case presentation**: A 60-year-old female patient came to the emergency room of Dr. M. Djamil General Hospital with decreased consciousness 2 days before admission. Vital signs showed Sopor consciousness, RR: 30 x/min, and BMI: 39 kg/m^2. Thorax examination of bronchovesicular breath sounds, rhonchi +/+, wheezing +/+. The patient was intubated and put on a ventilator, and admitted to the ICU. A tracheostomy on day 5 was performed on the patient. The patient was able to be weaned from the ventilator and then admitted to the neurology ward on day 18. **Conclusion:** Tracheostomy can help weaning patients from mechanical ventilation. In this case, a severely obese patient can be weaned from the ventilator with a tracheostomy.

1. Introduction

Obesity is a pathological excess of adipose tissue, and obesity is associated with an increased incidence of metabolic and chronic diseases that can increase morbidity and health burden, such as diabetes, cardiovascular disease, and cancer. Obesity in adults in 2015 reached 12% of the overall adult population. In developed countries, the highest prevalence of obesity is in women aged 60 to 64.[1]

Invasive mechanical ventilation (IMV) with an endotracheal tube can have several complications, one of which can lead to ventilator-associated pneumonia and the occurrence of other ventilator-associated complications, including ventilator-induced lung injury, muscle atrophy, diaphragm dysfunction, tracheal stenosis, and high sedative requirements.[2]

The prevalence of tracheostomy in the ICU was performed in 10%-15% of patients. This procedure involves inserting a percutaneous or surgical tube in the anterior neck into the airway. A tracheostomy is usually performed to remove airway obstruction and facilitate weaning from mechanical ventilation. In addition, a tracheostomy can reduce the need for sedation, improve airway safety and patient comfort, reduce the length of hospital stay, and lower the cost of care.[3]

Tracheostomy is performed in patients with prolonged intubation. The most compelling indications

for tracheostomy are acute respiratory failure with prolonged or expected prolonged duration of mechanical ventilation and failure to wean from a mechanical ventilator. Tracheostomy may reduce risks such as ventilator-associated pneumonia and damage to the larynx and trachea. Tracheostomy can also facilitate patient recovery as it allows patent airway access and is more effective in clearing secretions, reducing the work of breathing, and improving patient comfort.[2]

2. Case Presentation

A 60-year-old female patient was admitted to the emergency room of Dr. M. Djamil General Hospital with decreased consciousness 2 days before admission. Decreased consciousness occurred when the patient was admitted to the referral hospital on day 2 with initial complaints of shortness of breath. Shortness of breath is affected by activity. The cough has been aggravated since 2 days ago. Fever has been present since 2 days ago. The patient was known to have heart swelling and was routinely seen by a cardiologist and a pulmonologist. The history of DM is still being determined. A history of hypertension exists but is not routinely controlled.

Vital signs examination in the emergency room showed a sopor mental status, blood pressure: 105/57 mmHg, HR: 112 x/min, RR: 30 x/min, temperature: 37.4°C, body weight 100 kg, height 160 cm, BMI: 39 kg/m^2. Thorax examination of bronchovesicular breath sounds, rhonchi +/+, wheezing +/+, supple abdomen, and both extremities appear edematous.

The patient was admitted to the ICU intubated and ventilated. The patient was diagnosed with decreased consciousness ec Sepsis Associated Encephalopathy dd/suspect stroke, respiratory failure, sepsis, chronic heart failure, impaired hepatic function, acute kidney injury stage II, diabetes mellitus type II, and severe obesity. The patient was then given therapy in the ICU consisting of ampicillin sulbactam 3x3 grams (IV), levofloxacin 1x750 grams (IV), aminophylline drip 2 ampoules in 30 cc D5% at a rate of 4.2 cc/hour (IV), nairet 3x0.3 cc (SC), omeprazole 120 mg/24 hours (IV), paracetamol 1 gram/kp (IV), methylprednisolone 2x125 mg (IV), spironolactone 1x25 mg (PO), candesartan 1x16 mg (PO).

On hospital day 5, the patient was consulted by ENT, and a tracheostomy procedure was performed. The patient did not breathe adequately on the 6th day of hospitalization. The patient's vital signs were obtained under the influence of drugs consciousness, BP: 129/50 mmHg, HR: 112 x/I, RR on a ventilator, T: 36.5°C. In the Colli region, the tracheotomy was installed well; the air supply was smooth. The patient underwent a repeat AGD examination with the results of PH: 7.39, PCO_2: 65 mmHg, PaO_2: 114 mmHg, BE: 15 mmol/L, HCO_3: 39.7 mmol/L, saturation: 98,1 %.

The condition of vital signs and laboratory results was relatively stable until treatment day 17, with improvement in consciousness starting to appear since treatment day 15. The patient did not appear congested on treatment day 17, The patient's vital signs were found to be apathetic, BP: 130/74 mmHg, HR: 99 x/I, RR on a ventilator, T: 36.5°C, GIT: NGT (+), residue (-), GUT: Catheter (+), urine (+). In the Colli region, the tracheotomy was installed well; the airway was smooth. Laboratory examination obtained HB: 11.6 g/dL, leucocytes: 12360/mm^3, platelets: 18800 /mm^3, albumin: 2.9 mg/dL, Ur/Cr: 26/0.5 mg/dL, GDS: 139 mg/dL, Na/K/Cl: 140/3.8/101 mmol/L, Ca: 9.1 mmol/L, GDS: 139 mg/dL. The patient was diagnosed with decreased consciousness ec SAE dd/suspect stroke, type 2 respiratory failure, sepsis ec CAP, CHF, impaired hepatic function, stage II AKI, acute respiratory failure, type 2 DM, and severe obesity. The patient received cefepime 3x2 grams (IV), amikacin 1x2 grams (IV), nairet: 4x0.3 cc (SC), respar 1x5000 IU (IV), ranitidine 2x50 mg (IV), spironolactone 1x5 mg (PO), N- acetylcysteine 3x400 mg (PO), fluconazole 3x450 mg (PO), ventolin inhalation 4x, flumucyl 2x, Pulmicort 3x. The patient responded well to ventilator weaning.

On the 18th day of care, the patient starts breathing adequately. The patient's vital signs were found to be components consciousness, BP: 130/60 mmHg, HR: 110 x/I, RR: 20 x/I on T-Piece, T: 36.5°C, GIT: NGT (+), residue (-), GUT: Catheter (+), urine (+).

In the Colli region, the tracheotomy was installed well; the air supply was smooth. AGD examination results obtained PH: 7.44, PCO_2: 58 mmHg, PaO_2: 92 mmHg, BE: 14.9 mmol/L, HCO_3: 38.9 mmol/L, saturation: 97%. The patient was then planned to move to the neurology ward.

3. Discussion

A 60-year-old female patient was admitted to the intensive care unit of Dr. M. Djamil General Hospital with decreased consciousness ec Sepsis Associated Encephalopathy dd/suspect stroke, respiratory failure, sepsis, chronic heart failure, impaired hepatic function, acute kidney injury stage II, diabetes mellitus type II, severe obesity. The patient was intubated and on a mechanical ventilator. After 5 days on the ventilator, the patient was challenged to wean the ventilator. In addition to the primary pulmonary disease in the patient, namely chronic obstructive pulmonary disease, the patient is also severe obesity; this is also one of the factors in terms of difficulty in reducing ventilator assistance because the breathing pattern is still not good and tidal volume has not been achieved. Therefore, an early tracheostomy was performed on the patient.

Obesity is one of the risk factors for increasing morbidity and reduced healing duration, especially in patients with infected wounds, bleeding, and long operation times. Previous studies have shown increased mortality, complication rates, and higher tracheotomy operation times in obese patients..[4] Studies have shown that 8% to 13% of patients who are attached to a ventilator especially with acute respiratory failure with complication and fail to wean off the ventilator end up undergoing tracheotomy. Studies show that 54.9% of patients who underwent tracheotomy were successfully weaned off the mechanical ventilator.[5]

The main indications for tracheostomy in the ICU are prolonged intubation and challenging to weaning. Most patients who require tracheostomy are admitted to the intensive care unit (ICU) with diagnoses of acute or chronic diseases that are also factors in reducing ventilator support, such as acute respiratory failure, coma, neuromuscular disease, or trauma.[6]

Tracheostomy, according to its timing, is divided into three-time categories: early, which is performed on days 0 to 3 post-intubation; middle, which is performed on days 4 to 7; and late, which is performed on days >7 post-intubation. Open or percutaneous techniques can perform tracheostomy.[7] The Hyde study concluded that patients who underwent early tracheostomy had shorter ICU length of stay, efficient ventilator days and a reduced risk of ventilator associated pneumonia.[7]

Bedside tracheostomy procedures are performed mainly in patients with neurological disorders or trauma injuries but can be performed in other cases in the intensive care setting. In these case scenarios, the length of intubation gives us a vantage point in deciding on the absolute indication to perform a tracheostomy so that a patent airway is better maintained and safer.[8]

In an intensive care setting, there are five main indications for performing a tracheostomy: (1) Obstructed airway, such as by a tumor, foreign body, inhalation trauma, laryngeal stenosis, or infection, (2) In patients with prolonged intubation and patients who are difficult to wean from a ventilator or patients with chronic neuromuscular disease or degenerative disease, (3) To prevent airway damage with a prolonged trans laryngeal endotracheal tube, (4) To prevent aspiration in high-risk patients, (5) To improve airway patency and optimize clearance of pulmonary secretions.[9,10]

Obesity affects lung volume, resulting in a restrictive pattern characterized by a decrease in functional residual capacity (FRC) and expiratory reserve volume. A more significant decrease in FRC and expiratory reserve volume is observed at increasing body mass index and is accompanied by a decrease in total lung capacity and vital capacity, but not inspiratory capacity and residual volume. The ratio between forced expiratory volume during the first second and forced vital capacity (forced expiratory volume during the first second/forced vital capacity)

was maintained.[1] Obesity is a risk factor for prolonged intubation and have many complication. tracheostomy-related complications after both percutaneous and open tracheostomy was usually occurred in patient with obesity.[12,13]

Weaning is gradual and systematic. This process includes trials of increasing periods of unassisted breathing (weaning trials) based on the protocol, usually starting with a 30-minute spontaneous breathing trial (SBT); if the patient can, the duration will usually be increased to about 2 hours per day. In the intervals between SBTs, all patients are mechanically ventilated in an assisted controlled mode to recover from the forced work of breathing during the SBT. Weaning programs in terms of mechanical ventilators and overall should be considered, including nutritional setting adequately, supportive physiotherapy, and adequate therapy for comorbidities.[11]

The patient was then ventilated and tried to breathe room air for 30 minutes through a T-piece with oxygen to ensure adequate oxygenation ($SpO_2 \geq 92\%$). The first SBT was performed under the supervision of a respiratory therapist, and vital signs were continuously monitored to detect respiratory distress immediately. another artery BGA was performed at the end of SBT and, if possible, in case of early termination of SBT due to respiratory distress.[11]

In the ventilator weaning process, end-of-process patients are classified into two categories: patients with successful weaning and patients with unsuccessful weaning. Successful weaning is breathing spontaneously for more than 7 days without clinical or laboratory signs or problems suggestive of chronic ventilatory insufficiency. Unsuccessful weaning was defined as death during weaning or transition to permanent non-invasive or invasive mechanical ventilation due to chronic ventilatory insufficiency resulting from the patient's inability to wean. Chronic ventilatory insufficiency is defined as recurrent hypercapnia during daily weaning trials, which prevents prolongation of spontaneous respiration or hypercapnia occurring within 7 days after weaning is completed, which requires the resumption of mechanical ventilation.[11]

Tracheostomy has more benefits compared to an endotracheal tube. A tracheostomy cannula has a larger inner diameter. It is less susceptible to obstruction due to secretions, so it can reduce inspiratory and expiratory resistive load when compared to an endotracheal tube. Tracheostomy can also increase expiratory flow, thus minimizing intrinsic positive end-expiratory pressure (PEEPi). These two factors should reduce the work of breathing. However, short-term physiological studies have shown conflicting evidence on mechanics without explicit dyssynchrony analysis, especially in patients with COPD and bronchiectasis.[6]

Studies show that a predictor of successful weaning and decannulation is increasing the diaphragm's force-generating capacity. An observational study of 49 patients reported that one of the predictors of successful weaning was the ability to increase peak cough flow significantly more than 160 L/min. In a retrospective study of 129 patients in a Dutch medical-surgical ICU, patients with neurosurgical or cardiopulmonary primary pathology were statistically more likely to have a shorter weaning time (3-7 days) when compared to medical (9 days) or surgical (8 days) patients. An observational study of 25 patients compared T-piece ventilation and continuous positive pressure ventilation during weaning and found that T-piece ventilation had a shorter weaning time and resulted in optimal central arterial and venous oxygenation.[3]

4. Conclusion

Tracheostomy can help weaning patients from mechanical ventilation. Tracheostomy may improve patient safety and comfort adequately, reduce sedation, reduce length of stay in intensive care, and reduce overall care costs. In this case, a severely obese patient can be weaned from the ventilator with a tracheostomy.

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