

Case Report

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Management of Ventilation Disorders in Patients Post-op Laparotomy Exploration Diaphragm Rupture: Case Report**Zahrul Insan Sismayadi¹, Etika Emaliyawati²**¹Faculty of Nursing, Universitas Padjadjaran, Indonesia²Departement Emergency and Critical Care, Faculty of Nursing, Universitas Padjadjaran, Indonesia**ARTICLE INFO****Article history:**

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Email of Author:

zahrul17001@mail.unpad.ac.id

Corresponding Author:

Etika Emaliyawati

Website:[https://jurnal.unpad.ac.id/
pacnj/](https://jurnal.unpad.ac.id/pacnj/)

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E-ISSN: [2715-6060](https://doi.org/10.2715/6060)**ABSTRACT**

A diaphragmatic rupture, which can also be called a diaphragmatic tear, is a tear that occurs in the diaphragm. The muscles at the base of the thoracic cavity play an important role when breathing. The purpose of this study is to present a nursing care plan with a focus on handling ventilation disorders in patients with diaphragmatic rupture so that it can become nursing implications in the prevention and complications of diaphragmatic rupture. Researchers used the case report method which was obtained in November 2022 in the General Intensive Care Unit Room at General Hospital, Bandung City. Discussion: In the post-laparotomy exploration of a diaphragm rupture, the researcher took the respiration monitoring intervention as one of the interventions for diagnosing spontaneous ventilation disorders. With ventilation management, the patient gets improvement, although little by little, hemodynamics are relatively normal. However, some vital signs are still abnormal, and blood gas analysis results are still not average when interpreted. The ventilator still uses the control mode. Conclusion: The results of the criteria showed that progress is still 50-50 for patient safety with impaired ventilation in patients with diaphragmatic rupture, but there are positive developments even if only little by little.

Introduction

Diaphragm rupture is a tear that occurs in the diaphragm, the diaphragm has an important function in the respiratory tract (Sejati, 2022). The diaphragm will rupture when there is trauma either acceleration-deceleration with very high energy caused by increased intra-abdominal pressure (Amaliah, 2020). Diaphragmatic rupture is a major challenge for nursing professionals as one of the critical or emergency diagnoses due to clinical signs that are different from outpatients (Balde, 2016).

The prevalence of diaphragmatic tears can be caused by blunt or puncture trauma and appears in 5% of cases of blunt trauma to the thoracoabdomen (Kishore et al., 2018). The incidence of diaphragm rupture is 0.8-5.8% in blunt trauma, 2.5-5% in abdominal blunt trauma and 1.5% in thoracic blunt trauma (Kishore et al., 2018). Diaphragmatic rupture can cause life-threatening complications, namely death if not treated quickly and appropriately (Nguyen et al., 2017). The most common injuries were 68.5% left-sided, 24.2% right-sided, 1.5% bilateral ruptures, 0.9% pericardial ruptures, and 4.9% unclassified (Rashid et al., 2009). Acquired diaphragmatic hernias are rare. Diaphragmatic rupture due to thoracoabdominal trauma occurs in approximately 0.8 to 3.6% of cases, with a relatively low incidence of subsequent herniation. The number of patients affected by ADH from other causes is not documented and is most often recorded in case studies (Speellar et al., 2022). From the prevalence mentioned above, thoracic trauma often occurs in people who have a medical diagnosis of diaphragmatic rupture.

Signs and symptoms that appear in this diaphragm rupture are pain in the chest and abdomen, experiencing respiratory distress, and when a tear occurs, surgery is needed to repair it (Sejati, 2022). According to Galletti et al. (2020) symptoms of diaphragm rupture are pain, coughing, and shortness of breath when lying in bed. Then if there is herniation of the abdominal organs, signs and symptoms such as bowel obstruction or sepsis may appear. Then the patient may hear chest noise and have shoulder or

epigastric pain. One of the signs and symptoms of diaphragm rupture is experiencing respiratory distress in patients.

Then complications in diaphragm rupture can occur traumatic diaphragmatic hernia, where organs such as the stomach can enter the thoracic cavity and can be ischaemic (Sejati, 2022). Incorrect interpretation of x-rays often leads to errors in diagnosis. In developing countries the diagnosis of diaphragmatic rupture is often missed. The diagnosis of diaphragmatic rupture is rarely associated with haemothorax without rib fracture or thoracoabdominal injury following blunt trauma (Koerniawan et al., 2020). Late diagnosis will increase morbidity and mortality in patients (Amaliah, 2020). One of the nursing diagnoses that can arise in patients who experience diaphragmatic rupture is ventilation disorders (PPNI, 2018).

The best management for patients diagnosed with diaphragm rupture is to perform surgery and none of the patients have been able to recover completely after being diagnosed with diaphragm rupture. This occurs due to the pressure difference between the abdominal and thoracic cavities. Laparotomy and thoracotomy are the best treatments for now (Balde, 2016). Until now there has been no research that can explain the best course of action for patients diagnosed with diaphragmatic rupture.

A nursing care plan is a formal process that includes the correct identification of existing needs, as well as potential needs or risks (Cárdenas-Valladolid et al., 2018; Patiraki et al., 2017). This study will present a nursing care plan with a focus on managing ventilation disorders in patients with diaphragmatic rupture so that it can be a nursing implication in the prevention and complications of diaphragmatic rupture.

Method

This research uses a case report design. Case report is a research by examining a problem through a case consisting of a single unit or unit. In this study, data collection was carried out in

November 2022 in the General Intensive Care Unit B Room of General Hospital, Bandung City.

Data collection techniques in this study were primary and secondary data. Primary data comes from the physical examination of the patient while secondary data comes from the patient's family and the patient's medical record. Consent with the patient using informed consent signed by the patient's family. Narrative analysis was used to analyse the data that had been obtained.

Results

Patient Information: A 19-year-old male was admitted to the general intensive care unit B of Hospital Bandung after abdominal surgery with a medical diagnosis of Post Laparotomy Exploration Diaphragm Rupture day one postoperatively. The patient entered through the Emergency Department of Hospital Bandung delivered by ambulance with complaints of shortness of breath, bleeding in the abdomen, moderate to severe pain. The client was an earthquake victim in the Cianjur area on 21 November 2022. Then the client was operated on at 03.40 WIB on 22 November 2022, the action performed was exploratory laparotomy. The operation was completed at 05.15 WIB. With a medical diagnosis of Post Laparotomy Exploration Diaphragm Rupture. At the time of assessment, it was found that the patient looked weak, the client was attached to the IV line on the right and left hands, attached OPA (yellow), attached ETT (endotracheal tube), NGT, attached close suction, attached ventilator, Urine Catheter, Drain, and Monitoring tools.

ECG picture Sinus Rhythm-Tacycardia, Blood Pressure Systole 120-154 mmHg, Blood Pressure Diastole 60-97 mmHg, Mean Arterial Pressure 70-114 mmHg, Heart Rate 90-105 x/min, attached ventilator with volume control mode: Respiration Rate Setting/Actual: 12-16/12-

16 x/min, Tidal Volume Setting/Actual: 400/376-443 ml, Minute Volume: 3.75-7.0, PEEP: 5 mbar, FiO₂/Flow: 60%, Peak: 23-25 mbar, Oxygen Saturation: 95-100%. Laboratory results showed Haemoglobin values: 11.2 gr/dL, Haematocrit: 34.7%, Leukocytes: 24,950 gr/dL, Platelets: 218,000 mm³, Blood Sugar: 144 mg/dL, Sodium: 131 mEq/L, Potassium: 5.0 mEq/L, Chloride 100 mEq/L. Blood Gas Analysis values pH: 7.330, PaCO₂: 31.1 mmHg, pO₂ 158.8 mmHg, and HCO₃: 16.5 mmol/L with Blood Gas Analysis interpretation: Partially compensated metabolic acidosis.

For ventilation problems, the patient was given fentanyl 100 mcg via IV line at a dose of 25 mcg/hour, midazolam 15 mg via IV line at a dose of 3 mcg/6 hours, and rocuronium 50 mcg via IV line at a dose of 30 mg/hour.

Nursing Intervention: One of the nursing interventions with a nursing diagnosis of impaired spontaneous ventilation that refers to the Nursing Intervention Classification (NIC) is monitoring respiration for diagnoses of impaired spontaneous ventilation including 1) give semi fowler position; 2) identify the fatigue of the breathing muscles; 3) maintain airway patency; 4) monitor respiration and oxygen status; 5) Monitor PCO₂ and PO₂; 6) monitor AGD results; 7) monitor the results of thoracic photographs; 8) drug collaboration midazolam 15 mg and rocuronium 50 mg. On the second day of treatment, the diagnosis of spontaneous ventilation disorder with response: GCS under the influence of drugs, Heart Rate: 103-110 x/min, PaO₂ value: 57.0 mmHg (high), PO₂: 167.7 mmHg (high), pH: 7.230 (low), ECG sinus tachycardia, Patient is still using ventilator Mode Pressure Control with a value of 20, Respiration Rate setting/actual: 20/20 x/min, actual tidal volume: 401-445 ml, actual minute volume: 7.8-8.8 mbar, inspiration : expiration = 1:1.5, PEEP: 5 mbar, FiO₂/Flow: 60%, Peak: 25.

	Results	
Day 1	<p>After the intervention intervention, on the first day, evaluation of recovery for the diagnosis of spontaneous ventilation disorders with response: GCS under the influence of drugs, Heart Rate: 90-113 x/min, PaO₂ Value: 31.1 mmHg (low), PO₂: 158, 8 mmHg (high), pH: 7.221 (low), HCO₃: 25.1 mmol/L, ECG sinus rhythm - tachycardia, Ventilator Pressure Control Mode with 16, Respiratory Rate Setting/actual: 12/16 x/min, volume actual tidal: 376-443 ml, actual minute volume: 6.2-6.9 mbar, inspiration : expiration = 1:1.5, PEEP: 5 mbar, FiO₂/flow: 60%, peak: 23-25 mbar, the problem of spontaneous ventilation disorders has not been resolved.</p>	<p>setting/actual: 16/16 x/min, actual tidal volume: 410-430 ml, actual minute volume: 6.4-6.9 mbar, inspiration : expiration = 1:1.5, PEEP: 5 mbar, FiO₂/Flow: 60%, peak: 25, the nursing problem of impaired spontaneous ventilation has not been resolved.</p>
Day 2	<p>On the second day, evaluate recovery for the diagnosis of spontaneous ventilation disorders with response: GCS under the influence of drugs, Heart Rate: 103-110 x/min, PaO₂ value: 57.0 mmHg (high), PO₂: 167.7 mmHg (high) , pH: 7.233 (low), HCO₃: 25.5 mmol/L, tachycardia ECG sinus rhythm picture, Ventilator Pressure Control Mode with 20, Respiratory Rate Setting/actual: 20/20 x/min, actual tidal volume: 401-445 ml, actual minute volume: 7.8-8.8 mbar, inspiratory : expiration = 1:1.5, PEEP: 5 mbar, FiO₂/flow: 60%, peak: 25 mbar, problem of impaired spontaneous ventilation has not been resolved.</p>	<p>Discussion</p> <p>In the case of post laparotomy exploration of diaphragm rupture, the researcher took the respiration monitoring intervention as one of the interventions from the diagnosis of spontaneous ventilation disorders. The best treatment for this case is surgery, the aim is to repair the injury to the diaphragm area and return the ruptured abdominal organs back to their proper place (Galletti et al., 2020). According to Gao et al. (2018) the injury will be repaired during surgery and organ removal is performed to remove dead tissue and cover the rupture. Surgery is very important as diaphragm adhesions and atrophy occur simultaneously. Stitches will inevitably be involved in abdominal organ repair. Other injuries may also pose a risk of more rapid bleeding and prompt and appropriate treatment such as haemothorax.</p> <p>After surgery in the operating theatre, the patient is then transferred to the intensive care unit to receive intensive care. One of them is monitoring respiration, respiration symptoms often occur in patients who experience spontaneous ventilation disorders, therefore patients in conditions of diaphragm rupture must be installed with a ventilator. According to research by Bastian and Emaliyawati (2016) that patients in a critical condition with a ventilator installed get experiences such as: (1) the hope of living life has disappeared; (2) already on the verge of death; (3) suction procedures between comfortable and uncomfortable; (4) the presence of loved ones and loved ones in continuing life; (5) see illness as a destiny from God; (6) experience low self-image (7) facilitators in religion are very important; and (8) want to be treated by skilled health workers. Therefore, in</p>
Day 3	<p>Nursing evaluation results are based on patient responses. After nursing interventions, the results of nursing evaluation on day three, for diagnoses of spontaneous ventilation disorders with responses: GCS under the influence of drugs, Heart Rate: 102-114 x/min, PaO₂ value: 48.8 mmHg (high), PO₂: 122.4 mmHg (high), pH: 7.340 (low), HCO₃: 26.6 mmol/L, Blood Gas Analysis Interpretation: partially compensated respiratory acidosis, sinus tachycardia ECG picture, ventilator Pressure Control Mode with 16, Repiration Rate</p>	

monitoring respiration, nurses must consider the safety and comfort of the patient.

In general, the advice needed in patients with ventilation disorders is the installation of endotracheal intubation and the use of mechanical ventilators that are adjusted to the severity of abdominal organ herniation. When installing a ventilator, avoid using ventilation with manual bagging because the stomach and intestinal organs will be distended by the air created by bagging and can result in pressure on the lung cavity and intratoracal organs (Putra et al., 2016). At the first time of ventilator installation, haemodynamic signs in the patient should also be monitored, especially respiration rate and oxygen saturation.

In this case, the patient was given midazolam and rocuronium, this drug is a class of sedation drugs that provide drowsiness and relax the patient's muscles so that the patient does not rebel when the ventilator is installed. Midazolam is given to Intensive Care Unit patients who are fitted with a breathing apparatus or ventilator, midazolam can be given through a vein or into the muscle (intramuscular), there are side effects received by patients when given midazolam including a decrease in the level of patient anxiety seen from a decrease in blood pressure (Matana et al., 2013).

The administration of Rocuronium drug collaboration in this case is also useful to facilitate endotracheal intubation, relax muscles, and facilitate mechanical ventilation in intensive care. The administration of rocuronium must be consulted with a doctor and pharmacist before use, because the dose of administration varies from individual to individual, depending on the severity of the disease suffered by the patient (Amaliah, 2020). Therefore, the use of sedation drugs is very important in patients who use ventilators, the patient's anxiety can decrease and provide a drowsy effect.

Conclusion

The results of the criteria showed that progress is still 50-50 for patient safety with impaired ventilation in patients with

diaphragmatic rupture, but there are positive developments even if only little by little.

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