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Weaning Difficulty in Patient with End Stage Renal Disease Acute with Respiratory Failure due to Pulmonary Edema and Pneumonia

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ABSTRACT

Introduction: End Stage Renal Disease (ESRD) 5D patient have potential to respiratory failure due to excess fluid, thus increasing the incidence of repeated hospital admissions. Deaths were reported in about 15%– 30% cases, where 50%–60% of patients needed respiratory support with mechanical ventilation. About 30%– 40% of patients had complications in the weaning process from mechanical ventilation. Prolonged mechanical ventilation increased mortality and morbidity, the length of stay periods and costs.

Case Report: This case report will discuss the difficult weaning from mechanical ventilation in patients with ESRD 5D who have respiratory failure due to edema pulmonary and pneumonia who were hospitalized at the Intensive Care Unit (ICU) of Hasan Sadikin Hospital - Bandung for 20 days

Conclusion: Weaning difficulty due to accumulation positive fluid balance during hospitalization lead to longer use of mechanical ventilation and pulmonary infection get heavier. A positive cumulative fluid balance could be one factor of weaning difficulty.

Keywords

Respiratory failure, fluid balance, edema pulmonary, pneumonia, ESRD 5D, weaning

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INTRODUCTION

End stage Renal Disease (ESRD) is a progressive and irreversible damage to kidney function, the body is unable to maintain metabolism and fails to maintain fluid and electrolyte balance resulted in increase urea levels. According to KDIGO it is classified as ESRD 5D if glomerular rate <15 ml/min. Patient admitted to hospital for >48 hours potentially caught nosocomial infection. Infection And fluid accumulation is the main cause of death in ESRD patients.[1-7]

Mechanical ventilation can complicate weaning due to various reasons, including weakness muscle, enhancement burden respiration, disturbance drives ventilation, disturbance oxygen carrying capacity, cardiac dysfunction and disturbance of sputum cleaning.[1,6,8]

Other predictor of weaning complication is old age, long mechanical ventilation usage, lung infection or history of chronic obstructive pulmonary disease and positive fluid accumulation balance. Positive fluid balance on ESRD 5D patient will increase risk of death, and complication like pulmonary edema, lung infection will cause disturbance of gas exchange, decline compliance and increasing WOB, exacerbate respiratory failure as well as improve need mechanical ventilation Fluid Restriction done to prevent fluid overloaded.[1,7]

This case report discuss the complication pf mechanical ventilation weaning in ESRD 5D patients who experienced respiratory failure due to pulmonary edema and pneumonia which treated in ICU of Hasan Sadikin Bandung Hospital for 18-20 days. During pulmonary edema and pneumonia were contracted which improved during the process of treatment so weaning from mechanical ventilation could be done. Complications that

lead to prolong use of mechanical ventilation was obtained during the process of weaning. One of the complications that is positive fluid balance during hospitalization

CASE REPORT

A male, 20 years old, came to the Emegency Department of Hasan Sadikin Hospital (RSHS) on March 06th, 2022 with short of breath that happened for 1 week and worsening in 3 days before admitted to Hospital. Short of breath accompanied by productive cough, fever , swelling on both legs and decrease in urine production in 1 month. Patient intubated in resuscitation station.

Patient admitted in ICU already intubated and under sedation. Physical infection showed symmetrical chest movement, rales on both lungs, blood pressure 170/90 mmHg with pulse rate 130-140x/m, electrocardiographic showed sinus tachycardia rhythm, without the aid of drugs for hemodynamics, peripheral oxygen saturation was 78 %. Body temperature 39.8 C. Mode of mechanical ventilation used was the mandatory intermittent pressure support ventilation (PSIMV) 20, respiratory rates (RR) 12, pressure support (PS) 20, positive end expiratory pressure (PEEP) 10, FiO2 80%. Evaluation of arterial gas blood showed: pH 7.335, PCO2 60.5 mmHg, PO2 65.1 mmHg, HCO3 27.4 mmol/L, BE -9.7 mmol/L, SaO2 91.5% and PaO2/FiO2 ratio (P/F) 81. Next, the mode was changed to Mandatory ventilation pressure controlled (PCMV) with PC 20, RR 20, PEEP 10, FiO2 80%, with results from arterial gas blood: pH 7.268, PCO2 26.7 mmHg, PO2 88,5 mmHg, HCO3 34 mmol/L, BE 8,5 mmol/L, SaO2 92,6% with P/F ratio 110. Blood inspection: Hb 6,8 g/dL, ht 18,8 WBC 24.950 /mm3 Platelets 110.000/mm3; urea 293; creatinine serum 21.1;SGOT 35; SGPT 25; Blood Glucose 98; sodium 137; potassium 8.6; chloride 104; magnesium 2.2. Thick cloudy yellow sputum was obtained from the endotracheal tube (ETT).

Description of chest radiograph, lung edema has not improved, right pleura effusion was visible, pneumonia worsening on both lung, cardiomegaly, and no lungs edema.

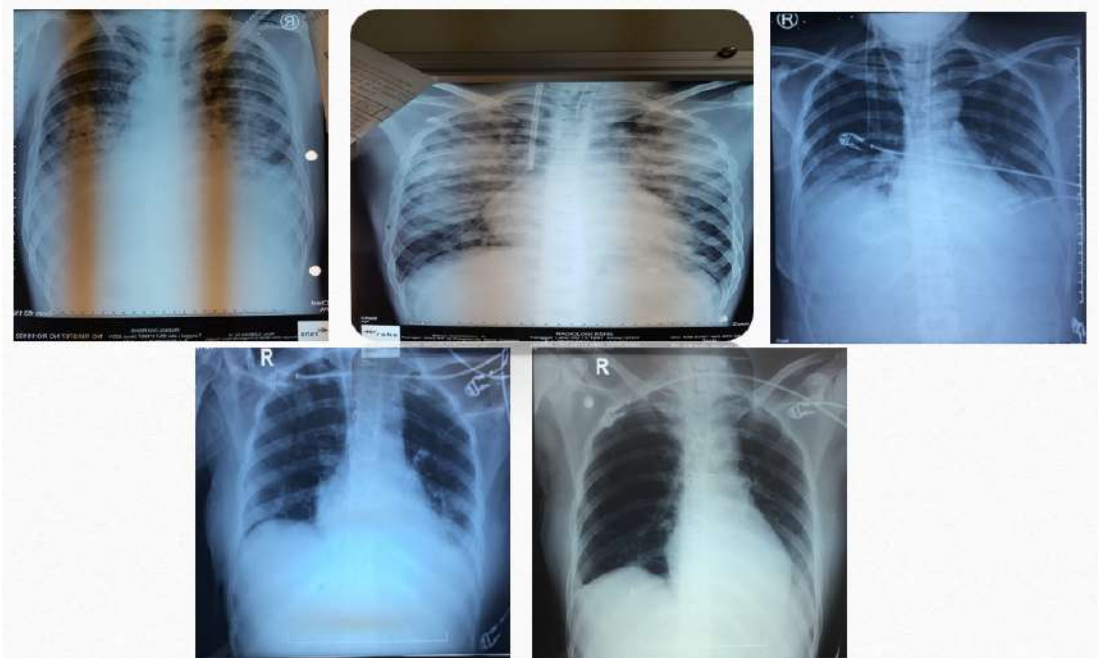

Figure 1 Results in serial inspection of thorax radiology

Development of thorax radiology seen in Fig 1. Evaluation using Clinical Pulmonary Infection score (CPIS) was done with score more than 6. Patient diagnosed with respiratory failure due to acute pulmonary, hospital acquired pneumonia (HAP), and ESRD 5D.

First day Therapy, ceftazidime 2 gr per 24 hours iv, transfusion of 2 bag PRCs, Paracetamol 1 gr IV per 6 hours, Omeprazole 40 mg IV per 12 hours, Nebulizer NaCl 0.9%, N-acetylcysteine 200 mg po per 8 hours,

Fentanyl 25 mcg per hour iv, Ca gluconate 2 gr, D40% 2 fl with insulin 10iu , physiotherapy and planned for installation of central vein catheter, blood gas evaluation and thorax radiology.

Second day of treatment, patient's conciousness still somnolent while using PCMV mode PC 16, PEEP 8, RR 12, FiO2 ventilators 65% with output RR 32 time per minute plateau pressure (PP) 24 mmHg, tidal volume (VT) 315–328 mL, saturation 95%–97%, Rales still presented on both lungs, arterial blood gas evaluation showed: FiO2 0.8, pH 7.327, PO2 122,6 mmHg, PCO2 36.2 mmHg, HCO3 31.9 mmol/L BE 8.4 mmol/L, SaO2 98%, P/F ratio =153. Then the ventilator mode changes to intermittent pressure support mandatory ventilation (PSIMV) PS 12, RR 8, PEEP 10, FiO2 60%, with output RR 22 times per minute plateau pressure (PP) 20–22 mmHg, VT 318–422 mL, saturation 96%–97 %, blood pressure 110–130/75–85 mmHg with a pulse rate of 72–85 times per minute, ECG showed sinus rhythm, temperature 38.6o C, CVP value 17–18 cmHO. blood inspection: Hb 9.1 g/dL, Ht 28.6 AL 8210 /mm3 AT 249.000 /mm 3 . Brownish yellow sputum from the ETT. Thoracic radiology (10/3/2022) showed infiltrate on both lung, has not diminished in comparison with previous Photo, worsened, pulmonary oedema still visible, cardiomegaly without . CPIS score >6. Patient started to have oral support nutrition via NGT Nephrisol 1000 kcal and 75 gr protein.

On fourth day results from sputum culture obtained showed germs Acinetobacter baumanii , which is sensitive to antibiotic Ceftazidime and Tigecyclin , Ceftazidime continued and analgetic Fentanyl was replaced with paracetamol 4x1 gr, iv. Existing therapy that had been previously given is continue. Fluid balance rises significantly sufficient +1988 to +2500, and decreased urine output , thus furosemide 40 mg, iv was given and patient planned to have hemodialysis (HD). Albumin corrected durante HD with 1 fl 25% 100ml Albumin. Support nutrition 1200 kcal with 80 gr protein via NGT. CPIS score 6.

Day 13 of treatment, ventilation mode PS 12, PEEP 8, FIO 2 40% with output RR 20–26 times per minute PP 16–20 mmHg, VT 405–480 mL, saturation 96%–100%, No crackles, hemodynamics improved, temperature 36.6−37.4oC, CVP 17−18 cmHg, blood gas analysis FiO2 0.4 pH 7.51, PO2 137,8 mmHg, PCO 2 3 4,8 mmHg HCO3 29,4 mmol/L BE 4,1 SaO2 98.5 P/F= 344, ventilator settings was changed in accordance to patient's response, PS 8, PEEP 8, FiO2 40%. On observation patient appeared to be uncomfortable, respiratory rate increased and tachycardia, patient couldn't tolerate the change in ventilator settings. Ventilator settings changed back to PS 12, PEEP 8, FIO2 40%. Thorax radiography: improvement in bilateral lung oedeme, improvement bilateral pleural effusion, cardiomegaly. Ceftazidine replaced with Levofloxacin 1x750 mg (according to sputum culture that has been taken previously showed the cultivation of Stenotrophomonas malthophilia).

During treatment given oral fluid input (diet, drink) with about 1200 -1500 mL/24 hours and parenteral fluids (infusions, medications) 800-1000 ml/24 hours with an average output of 500 ml (50-200 mL urine/24 hours) and a trend towards fluid balance become positive. Increased urine production decrease every day helped therapy pharmacological namely : diuretics (furosemide) and action hemodialysis. Furthermore done restriction incoming liquid with a target fluid balance daily negative, with monitor hemodynamics and urine output patient.

DISCUSSION

Patient admitted to the ICU with ESRD 5D diagnosed with respiratory failure due to pulmonary edema and HAP. Chronic Kidney Disease is one of the world's health problems. Kidney has vital function that is for controlling volume and composition of blood chemical. In case of interference function on both kidney, the kidneys will die within 3-4 weeks.[14]

Lung edema is common complications in chronic renal failure. hypoalbuminemia, is characteristics from chronic kidney failure, decrease in plasma oncotic pressure pushed fluid from the pulmonary capillaries. Data from observational studies nearly 30,000 patients with kidney failure treated in ICU from 54 hospitals at 23 country, 5.7% experience acute respiratory failure.[12] Pulmonary oedema is the accumulation of fluid in interstitial and lung alveoulus which happen in a sudden manner. Caused by high intravascular pressure

(cardiogenic lung edema) or because increased permeability of membrane capillary (non-cardiogenic lung edema) which resulted in rapid fluid extravasation fluid in resulting in disruption of air exchange in alveoli and becoming hypoxia.[12]

Intubation for patient in resuscitation station because worsening of respiration (increased RR, bilateral crackles, decreased PaO2/FiO2 81 mmHg) indicating acute respiratory distress. Ventilation supports goal is to correct hypoxemia and elimination of CO2, with supportive method and pharmacological For prevent injury lungs further.[1] Ventilator setup starts with pressure control with PC 20 RR 20 PEEP 8 FiO2 80% then lowered in accordance patient response with a target of tidal volume 6 mL/kg, PP ⩽30 cmH2 O, SpO_2 88%-92%.[4] He got infection symptoms such as fever, worsening breathing, leukocytosis, purulent sputum and culture examination of sputum material showed Acinobacter baumanii, which is assessed with CPIS score >6, indicating the presence of pneumonia. Pneumonia occurring <48 hours after connected with ventilation mechanic including in HAP category. Antibiotic given according to sputum culture and is antibiotics including related Gram negative with sepsis in patients hemodialysis disease end-stage renal disease (ESRD) [5,14] and later discontinued after 7th day of administration, with condition clinical improved and re- culture of negative sputum. Patient with disease baseline (ESRD, pulmonary edema and pneumonia) improved in a manner clinical with need ventilation minimal mechanics, it should be Already fulfil condition for SBT was carried out. SBT was repeated on the day next while analyze other possible factors become reason difficult weaning, among others related with weakness muscles, weights respiration increase, interference drives ventilation, oxygen carrying capacity, dysfunction cardiac, sputum clearance, age further, history prolonged use of a ventilator, having disease lungs obstructive chronic before and what happened accumulation balance positive fluid.[4,5,6]

Fluid overload prone to occurs in ESRD patients thus will had pulmonary edema disturbance impaired gas exchange, shunting and dead space, causing decline compliance and increase work of breathing (WOB). balance fluid positive in patients This got from excessive parenteral input while enteral input (liquid diet) is good. The patient 's urine production is also not reach the target of 0.5-1 ml/kg/hour, only ranging from 50-200 ml per 24 hours so patient This helped diuretic, and done restriction fluid with a target fluid balance daily negative, with monitor hemodynamics and urine output of the patient.[7,8,9,14]

Hemodialysis is a process used in patients with end-stage renal disease or ESRD who require long-term or permanent therapy. Goal done hemodialysis in patients this is to remove toxic nitrogenous substances from the blood and excrete excess water.[13,14] Correction of anemia is carried out For repair oxygen carrying capacity. Albumin is a protein that holds the greatest oncotic pressure to maintain vascular fluid, helps metabolize and transport drugs, is anti-inflammatory, anti-oxidant, acid-base balance, so albumin correction was performed on the patient This moment hemodialysis.[12,13,14]

CONCLUSION

Weaning difficulty due to accumulation positive fluid balance during hospitalization lead to longer use of mechanical ventilation and pulmonary infection get heavier. A positive cumulative fluid balance could be one factor of weaning difficulty.

DECLARATIONS

Ethics approval and consent to participate.

CONSENT FOR PUBLICATION

The Authors agree to publication in Journal of Society Medicine.

COMPETING INTERESTS

None.

AUTHORS' CONTRIBUTIONS

All authors significantly contribute to the work reported, whether in the conception, study design, execution, acquisition of data, analysis, and interpretation, or in all these areas. Contribute to drafting, revising, or critically reviewing the article. Approved the final version to be published, agreed on the journal to be submitted, and agreed to be accountable for all aspects of the work.

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