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Case Report

Managing Acute Lung Edema during Hyperglycemic Crises: Prioritizing Fluid Reduction or Blood Sugar Control in Non-Specialist Settings

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ABSTRACT

Background: Emergency admissions acute lung oedema and hyperglycemic crisis still very common and challenging. Both conditions are emergencies, where delay in treatment will cause increased morbidity and mortality. This report will discuss the case of a 62-year-old woman with acute lung oedema and hyperglycemia, as well as her emergency management. **Case Summary:** A 62-year-old woman present with severe shortness of breath since 2 hours before admission. The patient has a history of hypertension, diabetes mellitus, and heart disease and has not recently taken medication regularly. Physical examination revealed blood pressure: 260/132 mmHg, and SpO2: 86% Room Air. Thorax examination revealed vesicular sounds +/+, wheezing +/+, and full rhonki +/+ throughout the lung fields. Laboratory examination showed a blood sugar value of 539mg/dL. Chest X-ray shows cardiomegaly and pulmonary edema. Our patient was diagnosed with Acute Lung Oedema, hyperglycemia crisis, Hypertensive emergency. **Conclusion:** Management of patients with hyperglycemia and acute lung oedema is carried out simultaneously by the respective recommendations given. However, the rehydration volume in this case needs to be modified and it is important to provide fluid resuscitation conservatively. Hemodynamic assessments need to be carried out to ensure adequate fluid administration so as not to cause overhydration.

Highlights:

1. This case underscores the challenge of managing hyperglycemic crisis alongside acute lung edema, emphasizing the importance of conservative, hemodynamically guided fluid resuscitation to balance rehydration needs with pulmonary safety.

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Introduction

The hyperglycemic crisis is an extreme metabolic disorder that can result in shock, coma, or death, so this condition is an emergency and requires fast and appropriate management. Important components of hyperglycemic crisis management include coordination of fluid resuscitation, insulin therapy, and electrolyte replacement as well as continuous patient monitoring using available laboratory equipment to predict resolution of the hyperglycemic crisis.[3]

Acute lung oedema (ALO) appears as a condition with acute respiratory failure, characterized by worsening hypoxemia, difficulty breathing, and increased respiratory effort. The cause can be a heart-related problem, called cardiogenic pulmonary edema, which inhibits proper blood flow from the lungs, or a non-heart-related problem, called Noncardiogenic Pulmonary Edema, which is caused by damage to lung tissue.[4]

The majority of patients with ALO can experience a variety of symptoms, ranging from temporary breathing difficulties to severe respiratory failure. The disease continues to be a leading cause of death in critically ill patients, with mortality rates reaching 60% in certain groups and remaining around 40% overall. Management of pulmonary edema aims to increase oxygenation, maintain ideal blood pressure in vital organs, and reduce extracellular fluid volume.[5]

Both hyperglycemia and acute lung oedema are emergencies, where delay in treatment will result in a poor prognosis. In daily practice, when encountering a case of acute lung oedema in hyperglycemia, as a general practitioner it is necessary to determine which treatment to carry out first to overcome the emergency in that case. This report will discuss the case of a 62-year-old woman with acute lung oedema and hyperglycemia, as well as her emergency management.

Case Presentation

A 62-year-old woman came to the Emergency Room present severe shortness of breath. The patient's family said the patient began complaining of shortness of breath 2 hours before going to the emergency room, the shortness of breath suddenly felt after the patient left the bathroom. Patients usually feel tired quickly, if they walk about 5 meters the patient is tired and shaking. When sleeping the patient uses 2 pillows and sometimes wakes up because of shortness of breath. The patient's family said the patient had a history of hypertension, diabetes mellitus, and heart disease. The patient has regular check-ups but recently the patient's medication has run out and he hasn't been able to get control again. The patient usually takes amlodipine, candesartan, and other drugs that are not remembered by the patient's family.

Physical examination revealed blood pressure: 260/132 mmHg, pulse: 136 bpm, RR: 30 breaths per minute, temperature: 36.8 C, SpO2: 86% room air after being given 15 liters of oxygen per minute, saturation increased to 96%. Head-to-toe examination showed anemic conjunctiva, no increase in JVP, and thorax examination revealed vesicular sounds +/+, wheezing +/+, and rhonchi +/+ full throughout the lung fields. The single 1st and 2nd heart sounds were regular, there were no murmurs or gallops, the abdomen was within normal limits, the acral upper and lower extremities were warm, there was no edema, and capillary refill time < 2 seconds.

Table 1. Blood Examination Results

Parameter	Result	Value
Leukocytes	15.9	10^3
Hemoglobin	8.4	g/Dl
Random blood sugar	539	mg/dL
Ureum	112	mg/dL
Creatinin	5.1	mg/dL
Natrium	141	Mmol/L
Kalium	4.3	Mmol/L
Chlorida	105	Mmol/L

Tabel 2. Urine Examination Results

Parameter	Result	Normal Value
Clor	Clear yellow	Clear yellow
Blood	Negative	Negative
Bilirubin	Negative	Negative
Urobilinogen	Negative	Negative
Ketones	Negative	Negative
Glucose	+3	Negative
Protein	+2	Negative
Nitrite	Negative	Negative
Leukocytes	Negative	Negative
pH	7	
SG	1.015	
Epithelium	0-2	
Erythrocytes	0-2	Negative
Leukocytes	1-2	Negative
Cylinder	Negative	Negative
Bacteria	Negative	Negative
Crystal	Negative	Negative

Laboratory examination revealed moderate anemia with a hemoglobin level of 8.4 mg/dL and leukocytosis, there was decreased kidney function with a serum creatinine level of 5.1mg/dL and increased blood sugar with a blood sugar level of 539mg/dL and normal serum electrolytes, and urinalysis tests with results. Ketones (negative), glucose (+3), protein (+2).

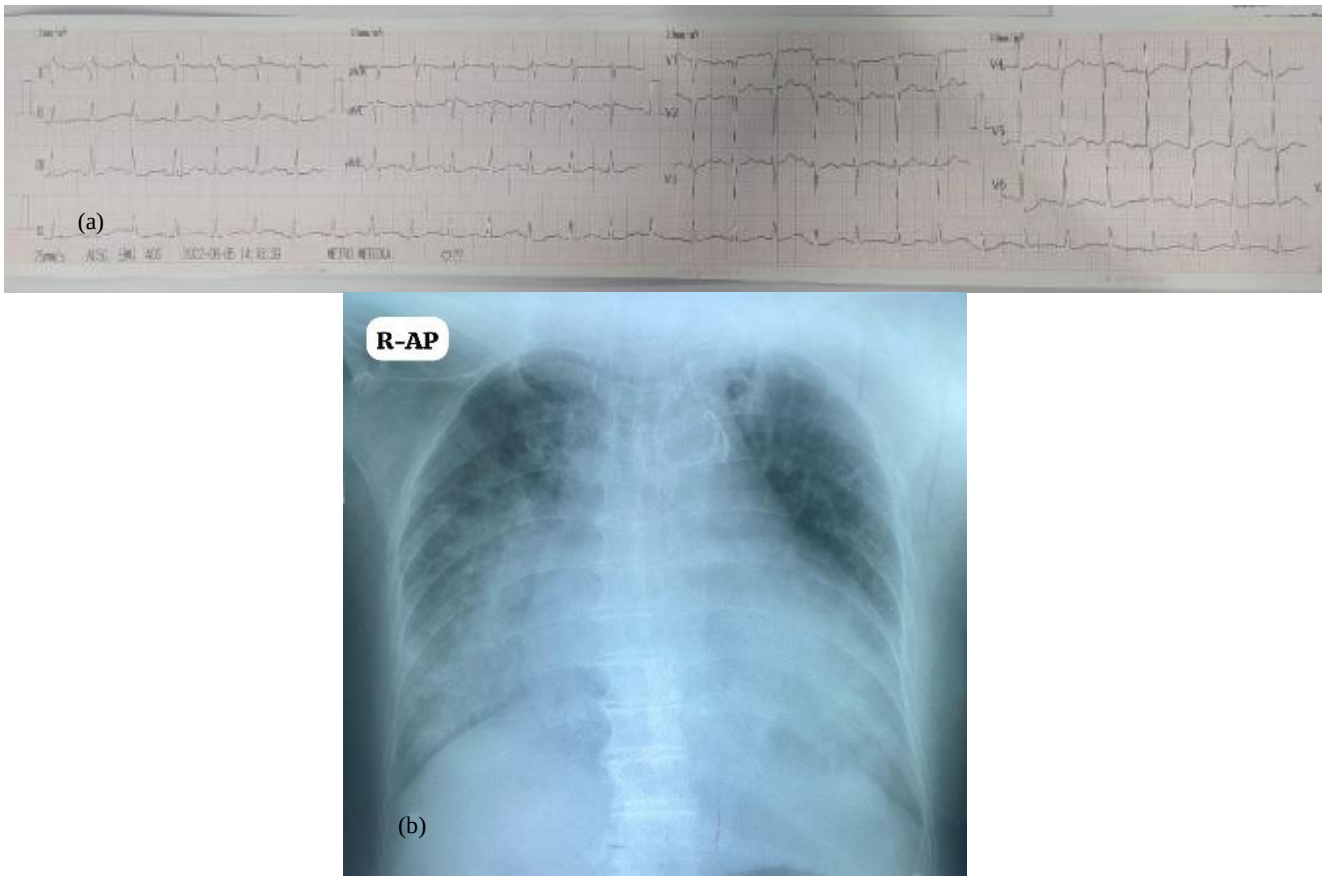

Figure 1. EKG (a) and Chest x-ray (b)

ECG examination showed sinus tachycardia, with heart rate 115 bpm, normal axis, normal P wave, PR interval 0.12 s, QRS duration 0.10 s, pathological Q wave I, aVL, V1, V2. Chest x-ray shows increased pulmonary vascular patterns, blunt costophrenic sinuses, and heart with enlarged size and shape with a cardio thoracic ratio of 55% with the impression of cardiomegaly and pulmonary edema and minimal bilateral pleural effusion.

Based on the history, physical examination, and supporting examinations, the patient was diagnosed with Acute Lung Oedema, Hyperglycemic crisis, Hypertension emergency, chronic kidney disease, and moderate anemia.

We give the patient oxygen with NRM 15 liters per minute, loading NaCl 500 ml and then infusion of NaCl 0.9% 8 dpm, loading furosemide 40 mg IV, followed by drip furosemide 5 mg/hour, ISDN 5 mg sublingual, cefoperazone 1 gram IV.

During observation, after loading NaCL 0.9% 500 ml the patient's blood sugar became 599 mg/dL, and an insulin drip of 5 units/hour was given. In the first hour, the patient's blood sugar decreased to 471mg/dL so the insulin drip was reduced to 4

units/hour. Then, 1 hour later the blood sugar was 361 mg/dL, so the insulin drip was reduced to 3 units/hour. Another hour later the blood sugar was 218 mg/dL so the insulin drip was reduced to 1 unit/hour and a subcutaneous injection of Lantus 1x12 units was added. Another hour later the blood sugar was normal, the insulin drip was stopped and novorapid 3x4 units subcutaneously was added.

During observation, blood pressure decreased to 200/100 mmHg, so this patient we given candesartan 8mg as additional therapies.

Discussion

Both hyperglycemia and acute pulmonary edema are common and potentially fatal cases encountered in the emergency department that require immediate treatment[6]. Diuretics are indicated for patients with acute pulmonary edema with evidence of fluid overload. Loop diuretics such as furosemide reduce preload, and can be administered by intravenous administration. Intravenous furosemide dosage ranges from 40-80 mg. After the bolus, an intravenous drip infusion may be considered, starting at a rate of 5–10 mg per hour[7,8]. We have given the patient loading furosemide 40 mg IV and continued with drip furosemide 5 mg/hour according to these recommendations.

However, our patient also had a hyperglycemic crisis with very high sugar levels reaching 599 mg/dl. Fluid therapy is the main thing in the management of hyperglycemic crises. The initial fluid management protocol is based on the 2009 ADA (The American Diabetes Association) guidelines which recommend giving a bolus of 0.9% IV sodium chloride at a rate of 15-20 mL/kg per hour, approximately 1 to 1.5 L/hour, then continuing 4-10 ml/kgBW/hour for the next few hours. Ideally, 50% of the total body fluid deficit should be replaced in the first 8 hours and the remaining 50% in the next 24 hours[3,9]. We have given the patient a 500ml NaCl loading and continued with a maintenance 0.9% NaCl infusion of 8 dpm.

In patients with hyperglycemic crises with cardiogenic pulmonary edema, the rate and volume of fluid rehydration need to be modified. Fluid resuscitation needs to be done conservatively and closely monitored because this patient is very sensitive to volume resuscitation. Careful hemodynamic assessment and clinical signs of fluid overload are necessary to ensure adequate fluid administration and not cause overhydration.[10,11]

To further treat hyperglycemia, insulin needs to be added intravenously, an hour or two after rehydration begins. Insulin is currently recommended as a continuous infusion at a rate of 0.1 units/kg/hour without a loading dose.

Administration of loading doses of insulin has been associated with an increased risk of cerebral edema and worsening of shock. Therefore, loading doses of insulin should be avoided at the start of therapy. Continuous intravenous insulin regimens are then preferred over subcutaneous insulin for the overall management of hyperglycemic crises because of short half-life, rapid onset, and easy titration[12]. Our patients were given insulin drip of 5 units/hour without using an insulin loading dose, in accordance with the latest recommendations.

Conclusion

Management of patients with hyperglycemia and acute pulmonary edema is carried out simultaneously by the respective recommendations given. The volume of rehydration fluid administration needs to be changed and conservative fluid resuscitation is essential. Hemodynamic assessments need to be carried out to ensure adequate fluid administration so as not to cause overhydration.

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There is no conflict of interest.

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