Peripartum cardiomyopathy and massive transfusion due to postpartum hemorrhage: was it associated with each other?

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Abstract

Background: Peripartum cardiomyopathy (PPCM) is a potentially life-threatening pregnancy-associated disease marked by left ventricular dysfunction and heart failure (HF). Clinical findings of HF are often masked by the normal physiological changes seen in pregnancy, making the diagnosis challenging. Furthermore, postpartum hemorrhage followed by massive blood transfusion may mask the diagnosis of PPCM or worsen the decompensated HF.

Case Description: We report a 35-year-old postpartum gemelli woman with a history of massive postpartum hemorrhage due to atonia uteri and Disseminated Intravascular Coagulation, complain of shortness of breath and fever. The patient received a massive blood transfusion for her massive postpartum hemorrhage. Physical examination revealed tachypnea and bilateral rales at lung bases. Chest radiographs showed cardiomegaly, right pleural effusion, and early lung edema. The echocardiography showed a decrease in left ventricular systolic function with ejection fraction of 41%, diastolic dysfunction, and global hypokinetic. She was diagnosed with PPCM, acute lung edema, pleural effusion, and pneumonia. Patient was treated with Furosemide continuous pump, Spironolactone, Bisoprolol, Valsartan. Her dyspnea greatly decrased with diuresis and antibiotic. She was discharged with HF medication continued.

Discussion: Women with PPCM typically present with symptoms of HF and signs of congestion. History of massive blood transfusion at first can mask the diagnosis of PPCM due to the possibility of Transfusion Associated Circulatory Overload, which also has signs of congestion. Massive blood transfusion can increase preload and may worsen the decompensated HF.

Conclusion: The presence of massive transfusion in a patient with PPCM can be challenging in diagnosing PPCM itself and the unpredictable course of decompensated HF in peripartum mothers. Due to its high mortality rate without proper treatment, prompt investigation is essential in improving maternal survival.

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Keywords: Peripartum cardiomyopathy, postpartum hemorrhage, massive transfusion, heart failure, pregnancy

Introduction

Peripartum cardiomyopathy (PPCM) is a possible life-threatening pregnancy-associated condition characterized by left ventricular (LV) dysfunction and heart failure (HF). Clinical findings of HF are sometimes obscured by normal physiological observed during pregnancy that renders the diagnosis complicated. Furthermore, postpartum hemorrhage followed by massive blood transfusion may mask the diagnosis of PPCM or worsen the decompensated HF The Risk factors for PPCM include multiparity, black ethnicity, older maternal age, preeclampsia, and gestational hypertension [1]. A case-control study in the United States showed that African American women had a 15.7-fold higher relative risk of PPCM than non – African Americans [2]. The prevalence of PPCM among black women was four times that of white women (1:1087 versus 1:4266), and the 5-year follow-up fatality risk was almost four times greater (24% versus 6%) [3]. The incidence of PPCM was 1 in 1741 deliveries in South Korea. There were 1.384.449 deliveries in South Korea between 2010 and 2012, despite removing 20.102 patients with previous suspected HF. Of these, 795 cases had codes that were specified as PPCM [4].

Case Illustration

A 35-year-old multigravida ($G_4P_3A_0$) Indonesian female referred to the Emergency Room (ER) by local midwifery and about giving birth to her twin pregnancy. The first baby was born spontaneously in her house one hour before admission. She had massive and continued bleeding during delayed the second child labor. The patient was observed to be lethargic during the ER examination and had blood pressure (BP) 100/60 mmHg, heart rate 100 beats per minute, respiratory rate of 24 breaths per minute, and oxygen saturation of 95%. Hemoglobin from complete blood count shows 10.5 g/dL. The gynecology examination was found uterine portio rupture and active bleeding with three tampons attached. The second child was born in hospital. She lost 750 ml of blood during labor and still had active bleeding because of uterine atony and Disseminated Intravascular Coagulation (DIC). The blood pressure decrease to 90/50 mmHg, a pulse rate of 144 beats per minute, and the patient became agitated. She was given 3000 ml of ringer lactate, four bags of whole blood transfusion, and 1000 cc of HES solution. After the initial fluid resuscitation, there was

no sign of shortness of breath; however, the patient was still agitated and disoriented. The patient was then scheduled for a histerectomy right away.

During the hysterectomy, there was ongoing massive bleeding. She had a transfusion of 750 ml of whole blood and 1000 ml of normal saline. After the hysterectomy, the bleeding from vagina and drain was still active (900 ml). Hemoglobin count showed 8 g/dL. The obstetrician decided to reopen 3 hours after. After surgery, in the Intensive care unit (ICU), the patient got five bags of fresh frozen plasma transfusion and five bags of thrombocyte concentrate. The patient was noted to have DIC with Prothrombin time (PT) 16.3 s (10-13 s), International Normalized Ratio (INR) 1.22, Activated Partial Thromboplastin Time (aPTT) 35.5 s (25-35 s), Fibrinogen 319 g/L, D Dimer 7,777 ng/ml FEU. She was then observed in ICU for 6 days and general ward for 9 days and then discharged with no complaint.

Ten days after discharge from the hospital, the patient came to the ER with shortness of breath, fever, and chest pain during cough for five days and worsened in the last two days. The increased short of breathness was associated with physical activity, and orthopnea was noted.

On the ER examination, the patient was observed to be febrile and had a normal BP (120/80mmHg), tachycardia (112 beats per minute), dyspnea (27 breaths per minute), and an oxygen saturation of 95% while receiving oxygen through 3 lpm nasal cannula. Her lungs were noted symmetrically on inspection, dim on percussion in basal inferior, and bilateral rales were found. Her heart rate was regular, without S3 gallop or murmur. Her extremities were non-edematous. Compete blood count shows Hb 9.1 g/dL, White blood cells 19,530 / µL, Thrombocyte 439,000 / µL. Blood gas analysis showed partially compensated respiratory acidosis. An electrocardiogram showed sinus tachycardia with a heart rate of 113 beats per minute with normal frontal axis and clockwise rotation on horizontal axis (figure 1). Chest radiographs showed bilateral pleural effusion, right paracardial infiltrate, and early lung edema (figure 2).

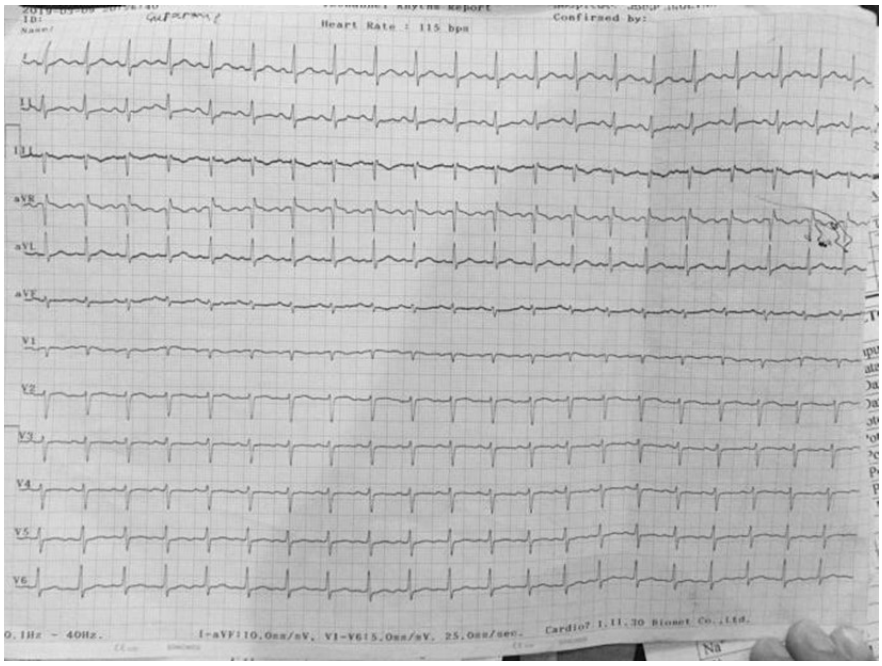

Figure 1: Sinus tachycardia on electrocardiogram.

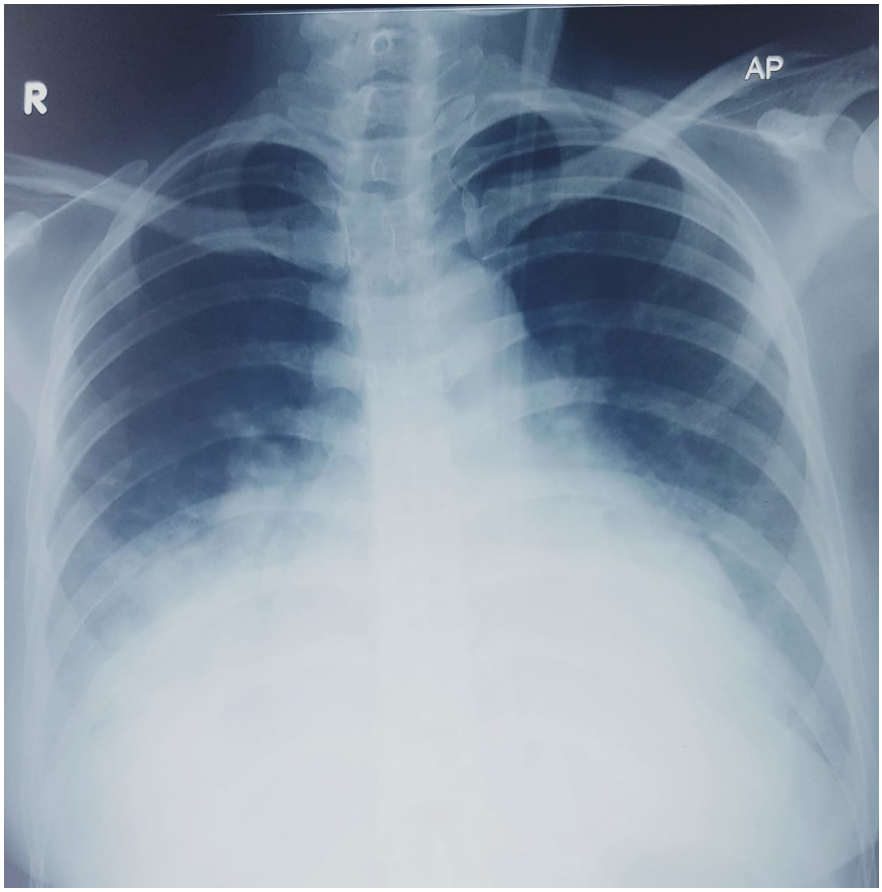

Figure 2: Chest X-Ray on admission showing cardiomegaly, bilateral pleural effusion, right paracardial infiltrate, and early lung edema.

The patient was transferred to the ICU and treated with diuretic Furosemide iv 40 mg initially, antibiotics Ceftriaxone iv 1 gram over 12 hours, and Bromhexin iv 4 mg over 12 hours, Combivent nebulizer 1 unit dose (2.5 ml), and Flixotide 2 mg over 8 hours. The patient was scheduled echocardiogram the day after.

The echocardiogram showed dilated left ventricle with decreased left ventricular ejection fraction of 41%, left ventricular global hypokinetic, and diastolic dysfunction. Normal right ventricle systolic function and low probability of PH were also found on echocardiogram. The patient had electrolyte imbalance hypokalemia potassium of 2.8 mmol/L and hypoalbuminemia 3.3 g/dL.

The patient was diagnosed with Postpartum Cardiomyopathy with Pleural Effusion, Acute Lung edema, and Pneumonia. She was treated in ICU for three days with continuous furosemide pump, Spironolactone 25 mg once daily, Bisoprolol 2.5 mg once daily, Valsartan 80 mg once daily.

The patient's signs and symptoms were significantly improved after 2 days of observation and treatment in the ICU. The patient was then transferred to the ward. Her dyspnea greatly decreased with diuresis and antibiotics administration. She was discharged from the hospital two days later and instructed to take Valsartan 80 mg, Spironolactone 25 mg, Bisoprolol 2.5 mg, and Furosemide 40 mg.

Discussion

Peripartum cardiomyopathy, a disease characterized by left ventricular dysfunction and heart failure, occurs during the last month of pregnancy or the first five months postpartum in the absence of any determinable heart disease. This is a potentially life-threatening disease that develops during the peripartum period and is idiopathic[3]. A higher incidence was correlated with factors such as black race, multiparity, maternal age >30 years, twin pregnancies, history of hypertension, preeclampsia, and eclampsia, although no causal association was identified [3–5]. In this case, the patient is multiparity (G4P3A0), age is 35-year-old and twin pregnancies. There is no history of hypertension and preeclampsia.

The diagnostic criteria used in clinical practice and research, consisting of the classical definition of PPCM and echocardiographic criteria, are as follows: (1) HF development during pregnancy in the last month of or within five months after delivery; (2) LV systolic dysfunction (LV EF $< 45\%$ by echocardiography); (3) no identifiable cause for HF; and (4) no identified heart disease previous to the last month of pregnancy. PPCM diagnosis must meet all four criteria. However, in patients with hemodynamic instability, emergency delivery irrespective of gestational age might be considered [6,7].

PPCM will present after 36 weeks of gestation, and the majority of cases are seen in the first month after delivery. An earlier presentation can occur in patients with underlying cardiac comorbidities as valvular or ischemic cardiomyopathy. Presentation of PPCM can vary depending on the degree of the disease at the moment of presentation. Symptoms related to heart failure and related to pregnancy are paroxysmal nocturnal dyspnea, pedal edema, orthopnea, and dyspnea on exertion. Other symptoms included dry cough, palpitations, an increase of abdominal girth, lightheadedness, and chest pain. Findings in the physical exam like jugular venous distentions, displaced apical impulse, third heart sound, and mitral regurgitation murmurs are common [8].

Postpartum hemorrhage (PPH) is the world's leading source of maternal morbidity and mortality. Several population-based trials have studied the epidemiology of massive transfusion for PPH. That is a four-fold occurrence recorded between 2012 and 2013 in the United Kingdom (23 per 100,000 deliveries), while the one-and-a-half times the recorded occurrence for New York state between 1998 and 2007 (60 per 100,000 deliveries). Uterine atony has become the leading cause of PPH with massive transfusion. One-fourth of all women who obtained massive transfusion performed hysterectomy to reduce bleeding[9]. Abrupting the placenta, uterine arterial embolization, and peripartum hysterectomy are related to blood loss during delivery. In these cases, massive transfusion or fluid resuscitation is typically needed in such circumstances, and such conditions may lead to HF at the time of delivery. Therefore, it is also not unexpected that an improvement in conditions correlated with peripartum hemorrhage in PPCM patients [4].

Senanayake et al. present a case of a 33-year-old Lankan primigravida giving birth to a caesarian section delivery at 38 weeks of gestation, a preliminary diagnosis of appendicitis. Immediate laparotomy revealed generalized oozing from the peritoneum contributing to hemoperitoneum and hemorrhage of the intestines. Her laboratory findings revealed microangiopathic hemolytic anemia and thrombocytopenia. It was diagnosed with thrombocytopenic purpura. After a stable recovery, on the 16th postoperative day, she was released from the hospital, but 12 hours later, she was readmitted from an acute-onset, gradually deteriorating shortness of breath. Echocardiography has confirmed peripartum cardiomyopathy. She was treated with a bromocriptine and heart failure regimen [10].

PPCM that may be correlated with anaphylaxis and epinephrine administration has never been published. Yesiler et al. reported a PPCM patient presented with pulmonary edema with anaphylaxis and epinephrine administration following blood transfusion [11].

Bosch et al. reported a case of a 27-year-old gravida 1 that was admitted to hospital at a 39+1 weeks of gestation with preeclampsia. Her blood pressure was 140/95 mmHg; postpartum, she had a blood loss of 1200 ml caused by an atonic uterus. She was provided blood transfusion with a cumulative blood loss of 3000 ml. Postoperatively acute respiratory failure was developed. She had a diagnosis of postpartum lung

edema correlated with preeclampsia and probably a sulprostone effect. She recovered quickly and returned to the maternity ward two days later. However, five days later, the patient developed dyspnoea. She was referred to the ICU with a diagnosis of severe HF The chest X-ray revealed symptoms of pulmonary edema. Echocardiography revealed a dilated left ventricle with normal valves. The diagnosis of peripartum cardiomyopathy was rendered on the basic history, physical examination, and further examination. The sodium and fluid limitations, ACE inhibitor, and low-dose β-receptor antagonists were used in the treatment. She was discharged in eight days. The left ventricular ejection fraction was measured between 40 and 45%. The echocardiography revealed a normal right and left ventricular function with no valve anomalies seven weeks postpartum. The woman would like to get pregnant again [12].

Massive transfusion is defined as the transfusion of 10 units of packed red blood cells (PRBCs) within 24 hours. Massive transfusion is an effective life-saving treatment for patients with massive acute blood loss. Massive transfusion has been utilized in many healthcare environments, including obstetrics, gastroenterology, trauma, and surgery. Complications include hypothermia, acid/base derangements, electrolyte imbalance (hypocalcemia, hypomagnesemia, hypokalemia, hyperkalemia), citrate toxicity as well as severe lung damage associated with transfusion.[13,14]. Mild hypothermia (33.8C) is well tolerated and offers significant benefits, especially after cardiac arrest. However, more severe hypothermia might result in peripheral vasoconstriction, metabolic acidosis, cardiac failure, decreased citrate metabolism, decreased drug clearance and synthesis of acute phase proteins, and reduced tissue oxygen delivery by moving the Bohr curve to the left, and infection [15]. Hypocalcemia results in hypotension, small pulse pressure, flat ST-segments, and prolonged QT intervals on the ECG, which can contribute to myocardial depression that manifests earlier than hypocalcemia coagulopathy [14]. There is 250 mg of iron per unit of red cells. As the body has no successful iron excretion process other than by blood loss, the body is at risk for iron accumulation with the exposure of liver, heart, pancreas, and endocrine organ deposition due to recurring transfusions (e.g. sickle cell disease, beta Thalassemia, or myelodysplasia). It eventually results in cirrhosis, cardiomyopathy, diabetes, arthritis, and testicular failure. The use of repeated venesection or iron chelation therapy with deferoxamine can postpone or prevent the onset of iron overload in susceptible patients [15]

Monitoring before and 24 hours after delivery tracking is critical because it is the period of the most prominent hemodynamic changes. Understanding physiological hemodynamic changes during pregnancy are of considerable significance for the interpretation of hemodynamic parameters of PPCM. Autotransfusion due to uterine contractions and fluid postpartum fluid changes can alter the condition of patients with PPCM, augment the fluid load, and cause acute heart decomposition. PPCM shows reduced cardiac output and increased right and left heart filling [7].

Effective management of PPCM reduces mortality and improves the percentage of women who recover their left ventricular function entirely. Outcomes for subsequent pregnancies are better in women who have completely recovered cardiac function after PPCM. However, recurrence of cardiac failure is common in subsequent pregnancies [10].

Conclusion

The presence of massive transfusion in a patient with PPCM can be challenging in diagnosing PPCM itself and unpredictable course of decompensated HF in peripartum mothers. Due to its high mortality rate without proper treatment, prompt investigation is essential in improving maternal survival.

Consent for publication: Written informed consent was obtained from the patient for publication of this case report and accompanying images.

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