



Case Report : Diagnosis and Management of Peripartum Cardiomyopathy

Sidhi Laksono Purwowiyoto^{1,2*}, Veronica Nadya Puteri Nandifa³

¹Department of Cardiology and Vascular Medicine, Diagram Heart Hospital, Cinere, Depok

²Department of Cardiology and Vascular Medicine, Faculty of Medicine Universitas Muhammadiyah Prof Dr Hamka, Tangerang, Indonesia

³Department of Emergency Medicine, Diagram Heart Hospital, Cinere, Depok

Correspondence author: sidhilaksono@uhamka.ac.id

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ABSTRACT

Introduction: Peripartum cardiomyopathy (PPCM) is generally viewed as a diagnosis of exclusion in women presenting with heart failure and systolic dysfunction of unclear identifiable etiology. Etiology of PPCM is not fully understood and multifactorial. The purpose of this case is to review the diagnosis and management of PPCM based on our experience in managing a 31 years old woman with PPCM.

Case: A 31 year old woman presented with dyspnea persisting for two days, exacerbated over the last 24 hours. She gave birth to her third child seven months ago. Patient had been experiencing dyspnea for 4 months earlier but sought no medical help. Upon physical examination, hemodynamic was stable, wet rales were noted in two thirds of the lung fields. Echocardiography revealed dilated left ventricle with eccentric hypertrophy and reduced ejection fraction (18%). Treatment was initiated with furosemide IV to resolve dyspnea, then Ramipril, bisoprolol, forxiga and spironolactone was given as heart failure therapy.

Discussion: PPCM should be suspected in any peripartum women presenting with symptoms and signs of heart failure. Careful history taking and diagnostic testing especially echocardiography is important to help physicians determine the diagnosis.

Conclusion: Treatment with medication adjusted for pregnancy and lactation may prevent adverse outcome, improve clinical symptoms and improve the overall cardiac functions. Long term follow up is important for patients with PPCM, since the optimal duration of medications after recovery is still unknown.

Introduction

Peripartum cardiomyopathy (PPCM) is a rare, idiopathic, life threatening cardiomyopathy, characterized by acute or slowly progressing left ventricular dysfunction late in pregnancy, during

delivery, or in the first postpartum months in women with no previously known cardiac disease.(Davis et al., 2020; Honigberg & Givertz, 2019; Sliwa et al., 2021) PPCM is generally viewed as diagnosis of exclusion in women presenting

with heart failure and systolic dysfunction of unclear identifiable etiology. (Honigberg & Givertz, 2019; Sliwa et al., 2021)

Global estimates of the incidence of PPCM vary by regions, as high as 1 in 10 deliveries in Nigeria, 1 in 300 deliveries in Haiti, to as low as 1 in 20,000 deliveries in Japan. In the US the reported incidence ranges from one in 1000 to one in 4000. (Davis et al., 2020) A recent study using the US Nationwide Inpatient Sample found that its incidence increased from one in 1181 live births in 2004 to one in 849 live births in 2011. Proposed reasons for this increase are rising rates of advanced maternal age, pre-eclampsia, and multiple gestation, increasing prevalence of cardiovascular risk factors such as hypertension, diabetes, and obesity among women of reproductive age; and increased recognition of PPCM. (Honigberg & Givertz, 2019) Risk factors associated with PPCM are African ancestry, preeclampsia and hypertension, multiparity, multigestational pregnancy, older maternal age >30 years, obesity, prolonged use of tocolytics. (Davis et al., 2020; Ziccardi & Siddique, 2023) Genetics also plays a role in the development of PPCM. The most notable example is mutation in the sarcomeric gene titin (TTN). Reports also suggest that a number of PPCM patients have a positive degree family history for

heart failure and cardiomyopathy. (Davis et al., 2020; Ziccardi & Siddique, 2023)

Etiology of PPCM is not fully understood and multifactorial. Suggested mechanisms for PPCM are nutritional deficiencies, viral myocarditis, autoimmune process, hemodynamic stress of pregnancy, and the role of 16-kDa prolactin fragment as a vasculotoxic and pro-apoptotic agent. (Davis et al., 2020) The "two hit" model is considered as PPCM pathogenesis, where a vascular insult caused by antivasular or hormonal effects of late pregnancy and the early postpartum period induces cardiomyopathy in women with an underlying predisposition. (Honigberg & Givertz, 2019)

Clinical progression varies, where end-stage heart failure may occur within days and spontaneous recovery may also be seen. (Iorgoveanu et al., 2021) Women often present with non-specific symptoms of heart failure late in pregnancy, during delivery or in the postpartum months. Distinguishing signs and symptoms of PPCM from the spectrum of normal pregnancy or common fatigue post-delivery is challenging. A substantial proportion of women that present postpartum have few physical signs despite substantial cardiac dysfunction. (Davis et al., 2020) Therefore it is important to recognize signs and symptoms of PPCM, provide early diagnosis and treatment to prevent further

deterioration and to preserve heart function in women suspected with PPCM. The purpose of this case is to review the diagnosis and management PPCM based on our experience in managing 31 years old woman with PPCM.

Case

A 31-year-old female patient referred to our Emergency Department with a chief complaint of dyspnea persisting for two days, exacerbated over the last 24 hours. Dyspnea present with sudden onset and worsened with physical activities. Patient

had experienced dyspnea over the past four months during activities and resolved at rest but seek no medical help. She gave birth to her third child seven months ago. She had no pre-existing cardiac disease, exposure to cardio toxic agents nor family history of pregnancy related heart disease. Hypertension was identified as a risk factor for heart disease.

Upon physical examination, the patient appeared dyspneic with stable hemodynamic with blood pressure of 135/80 mmHg and heart rate of 92 beats per minute, respiratory rate of 24 breaths per



Figure 1. Chest X-ray showing

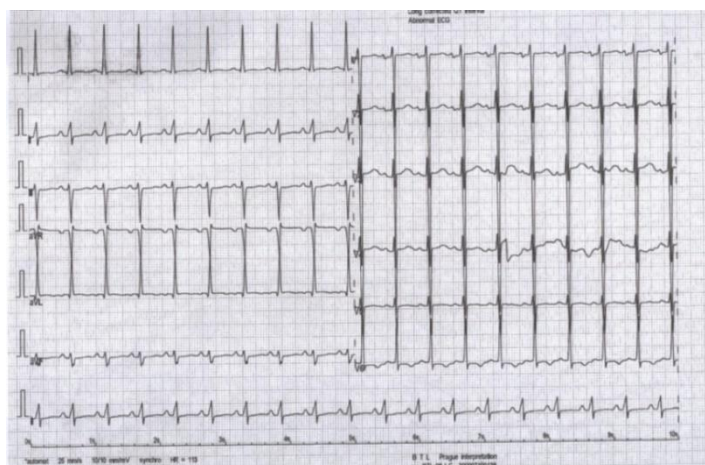


Figure 2. ECG showing sinus tachycardia with 100 beats per minute, T wave inversion at V6.

minute, temperature of 36.8 degrees celsius, and oxygen saturation of 98% on room air. Physical examination revealed wet rales in two thirds of the lung fields with no wheezing. The abdomen was supple, and there was no edema in the extremities. Echocardiography revealed dilated left ventricle with eccentric hypertrophy and severe left ventricular (LV) dysfunction with 18% Ejection Fraction. The LV end systolic diameter and diastolic diameters were pathologically enlarged of 53 mm (35-52 mm) and 58 mm (<30 mm) respectively. Further investigations included Troponin I HS level of 37.3, and Potassium level of 3.3 mmol/L. Electrocardiogram (ECG) shows tachycardia 100 beats per minute with inverted T in V6. Chest X-ray showed cardiomegaly (**Figure 1.** and **Figure 2.**)

Patient was diagnosed with Acute Decompensated Heart Failure with Dilated Cardiomyopathy and Hypertensive Heart Disease, possibly Pregnancy-Associated Cardiomyopathy. We initiated the treatment with Furosemide drip at 5 mg/hour as well as heart failure medication such as Spironolactone 25mg, Forxiga 10 mg, Concor 1.25 mg, Ramipril 2.5 mg. We also gave KSR tablets to correct the mild hypokalemia. Improvement was seen with relieve of dyspnea. Patient then moved to inpatient ward for further monitoring. We recommended patient to stop breastfeed until completion of the heart failure therapy.

Discussion

Cardiovascular conditions associated with pregnancy have major morbidity and mortality amongst the general. PPCM has been the leading cause of non-obstetric maternal mortality.(Davis et al., 2020; Sliwa et al., 2021) PPCM is defined as new-onset heart failure occurring during the last month of gestation to the first five months following delivery with no determinable cause. Our patient presents after 7 months of pregnancy, with notable experience of dyspnea since 4 months postpartum. Upon physical examinations we also found wet rales in two thirds of lung field with no leg edema. Women with PPCM typically present with symptoms of congestion, including dyspnea on exertion, orthopnea, paroxysmal nocturnal dyspnea, jugular venous distention, displaced apical impulse, presence of S3, pansystolic murmur consistent with functional mitral regurgitation, pulmonary rales and edema of the lower extremities (Akbar et al., 2019). Less commonly, women present with cardiogenic shock that requires inotropic or mechanical circulatory support. Uncommon presentations are symptomatic or severe arrhythmias, arterial thromboembolism causing neurological deficits. (Davis et al., 2020; Honigberg & Givertz, 2019; Iorgoveanu et al., 2021)

Electrocardiogram (ECG) is widely available, powerful diagnostic tool for patient with potentially cardiac related complaint, particularly in patients suspected with PPCM. At time of diagnosis the ECG is abnormal in almost all women with PPCM (almost 50% had significant electrocardiogram abnormality such as Q-wave abnormality, ST segment depression, T-wave inversion, bundle branch block, second or third degree AV block, frequent ectopy, brady- or tachyarrhythmia. But normal ECG does not rule out PPCM.(Cooney et al., 2022; Davis et al., 2020; Sliwa et al., 2021) Our patient's ECG shows tachycardia 100 beats per minute with inverted T in V6. A prolonged QTc and sinus tachycardia at baseline were independent predictors of poor outcome in PPCM at 6 months and 12 months respectively. In which were associated with increased risk of death or readmission to hospital. (Cooney et al., 2022; Hoevelmann et al., 2019)

Chest X-ray role in diagnosis of PPCM is to identify alternative cause of breathlessness or hypoxia.¹ PPCM can produce normal chest X-ray, but commonly showing cardiomegaly as we see in our patient due to predominantly LV enlargement, features of pulmonary congestion, pleural effusion and interstitial infiltrates.(Hilfiker-Kleiner et al., 2012; Sliwa et al., 2021) Our patient

echocardiography shows left ventricle with eccentric hypertrophy and severe left ventricular (LV) dysfunction with 18% Ejection Fraction. Echocardiography should be performed in any case suspected for PPCM as the main diagnostic modality to confirm the presence of cardiac dysfunction and quantify severity.(Davis et al., 2020; Sliwa et al., 2021) Echocardiography may demonstrate LV and RV dilatation or dysfunction, functional mitral or tricuspid regurgitation, pulmonary hypertension, and left or biatrial enlargement.(Davis et al., 2020) It also can be used to exclude other alternative cause of heart failure such as congenital heart disease, primary valvular disease, inherited or acquired cardiomyopathy.(Sliwa et al., 2021)

Delayed presentation to healthcare services makes most cases difficult to predict if there are any significant reduction in heart function. Delays in diagnosis also associated with increased incidence of preventable complications and worse outcomes as well as lower rates of recovery.(Cooney et al., 2022; Davis et al., 2020) With the known EF of 18%, immediate actions are needed to prevent further deterioration and to preserve the remaining function. We initiated therapy with IV furosemide, dyspnea was relieved and improvement in rales was noted. For maintenance we prescribed diuretics

furosemide IV drip 5mg/hour, overlapping with intermittent furosemide 2x40 mg on the next day. ACE inhibitors, beta blockers and potassium sparing diuretics were given as a standard heart failure treatment. We gave the patient KSR tablets for 3 days to treat the mild hypokalemia.

We also gave SGLT-2 inhibitor as the new pillars in HF therapy.(DeSa & Gong, 2021) SGLT2i previously known as diabetes therapy has several cardioprotective effects through several mechanism including improvement in ventricular loading secondary to reductions in preload (mediated by osmotic diuresis and natriuresis) and afterload (lowering of arterial pressure and stiffness), providing alternative cardiac energy supply in the form of cardiac ketones, direct inhibition of the sodium/hydrogen (Na^+/H) exchanger in the myocardium (leading to reduction in or reversing of cardiac injury, hypertrophy, fibrosis, remodeling, and systolic dysfunction), reduction in LV mass and improvement in diastolic function through inhibition of cardiac fibrosis, improvement in endothelial dysfunction and stimulation of increased glucagon secretion (improving cardiac performance by either increasing cardiac index and fuel availability or decreasing peripheral vascular resistance).(Lam et al., 2019)

Recent research has introduced bromocriptine as an additional therapy for

PPCM and administering bromocriptine should always be accompanied by anticoagulation treatment at least at prophylactic dose to reduce thromboembolic risk.(Davis et al., 2020; Laksono et al., 2021; Sliwa et al., 2021). Bromocriptine is a dopamine agonist that inhibits the release of prolactin. By reducing prolactin, the formation of proapoptotic 16-kDa from prolactin can be prevented, consequently inhibiting the progression of PPCM.(Hilfiker-Kleiner et al., 2012) In this patient, we did not administer bromocriptine considering that the patient has been 7 months postpartum, suggesting that her prolactin serum has decreased compared to the beginning of the postpartum period.

Patient's child has slowly been weaned from breast milk, started receiving complementary foods (MP-ASI) and has been drinking formula milk, so we encouraged patients to stop breastfeeding for a while in order to safely administer heart failure medications. Preventing lactation may be considered in patients with severe heart failure to avoid high metabolic demand of lactation and breastfeeding and enable safe treatment with heart failure drugs. (Sliwa et al., 2021) However the decision whether to breastfeed in PPCM in women with moderate LV dysfunction must consider the benefit of breastfeeding for the infant and the safety of PPCM medications

during lactation. Beta blockers, Ace inhibitor enalapril and captopril, as well as spironolactone are compatible with breastfeeding. Loop diuretics can be used during lactation but over diuresis may lead to decreased milk production. (Davis et al., 2020)

There are several predictors for PPCM prognosis, LV size > 6 cm and an EF <30% at the time of diagnosis are important predictors for left ventricle recovery. LVEF <30% was associated with lower rates of recovery and increased risk of adverse events.(Cooney et al., 2022; Davis et al., 2020; Sliwa et al., 2021) However PPCM is also associated with higher rate of recovery compared to other forms of HF with reduced LVEF, 50-80% of women with PPCM recover to normal range left ventricular systolic function (LVEF \geq 50%), with most of this recovery occurring within the first six months. Meanwhile delayed recovery may occur up to 2 years following diagnosis.(Honigberg & Givertz, 2019; Sliwa et al., 2021) About fifty percent of patient experience improvement with standard medical treatment for heart failure. 25% develop chronic HF, while the rest succumb to the disease during its course. Our patient was stable after being treated for 3 days in a regular ward and discharged in a stable condition. At the 1-month follow-up in the outpatient clinic after hospitalization,

the patient had no complaints and could engage in activities with some limitations.

Patients are advised to avoid further pregnancies if their EF remains low during monitoring. If a patient wishes to become pregnant again, they should wait at least 5 years until their EF can return to normal. After recovery, optimal duration of medication treatment is unknown. Medications have to be weaned gradually with close observation to prevent deterioration in LV function.(Kearney et al., 2018; Sliwa et al., 2021) ARNI or ACEi, Beta blockers, and MRA should be given in guideline based dosages and not discontinued during the first year after complete recovery of LV function.(Davis et al., 2020) Stepwise discontinuation of the therapy might be considered. Diuretics should be tapered if patient no longer have symptoms and signs of congestion.(Davis et al., 2020)

Conclusion

Peripartum cardiomyopathy is a rare, idiopathic, life threatening cardiomyopathy. PPCM should be suspected in any peripartum women presenting with symptoms and signs of heart failure. Careful history taking and supporting examinations are important to help physicians determine the diagnosis. Echocardiography is crucial in PPCM in order to evaluate cardiac functions and rule

out other cause of cardiomyopathy. Early management and prompt treatment with medications adjusted for pregnancy and lactation may prevent adverse outcome, improve clinical symptoms and improve the overall cardiac functions. Long term follow up is important for patients with PPCM, since the optimal duration of medications after recovery is still unknown.

References

- Akbar, A., Ata Ur-Rehman, H. M., Tameez Ud Din, A., & Malik, A. (2019). Peripartum Cardiomyopathy During Puerperium Co-existing with Pre-eclampsia and Complicated by Acute Renal Failure: A Case Report. *Cureus*, *11*(12), e6319. <https://doi.org/10.7759/cureus.6319>
- Cooney, R., Scott, J. R., Mahowald, M., Langen, E., Sharma, G., Kao, D. P., & Davis, M. B. (2022). Heart rate as an early predictor of severe cardiomyopathy and increased mortality in peripartum cardiomyopathy. *Clinical Cardiology*, *45*(2), 205–213. <https://doi.org/10.1002/clc.23782>
- Davis, M. B., Arany, Z., McNamara, D. M., Goland, S., & Elkayam, U. (2020). Peripartum Cardiomyopathy: JACC State of the art Review. *Journal of the American College of Cardiology*, *75*(2), 207–221. <https://doi.org/10.1016/j.jacc.2019.11.014>
- DeSa, T., & Gong, T. (2021). SGLT2 inhibitors: a new pillar of the heart failure regimen. *Reviews in Cardiovascular Medicine*, *22*(4), 1253. <https://doi.org/10.31083/j.rcm2204133>
- Hilfiker-Kleiner, D., Struman, I., Hoch, M., Podewski, E., & Sliwa, K. (2012). 16-kDa Prolactin and Bromocriptine in Postpartum Cardiomyopathy. *Current Heart Failure Reports*, *9*(3), 174–182. <https://doi.org/10.1007/s11897-012-0095-7>
- Hoevelmann, J., Viljoen, C. A., Manning, K., Baard, J., Hahnle, L., Ntsekhe, M., Bauersachs, J., & Sliwa, K. (2019). The prognostic significance of the 12-lead ECG in peripartum cardiomyopathy. *International Journal of Cardiology*, *276*, 177–184. <https://doi.org/10.1016/j.ijcard.2018.11.008>
- Honigberg, M. C., & Givertz, M. M. (2019). Peripartum Cardiomyopathy. *BMJ*, k5287. <https://doi.org/10.1136/bmj.k5287>
- Iorgoveanu, C., Zaghloul, A., & Ashwath, M. (2021). Peripartum cardiomyopathy: a review. *Heart Failure Reviews*, *26*(6), 1287–1296. <https://doi.org/10.1007/s10741-020-10061-x>

- Kearney, L., Wright, P., Fhadil, S., & Thomas, M. (2018). Postpartum Cardiomyopathy and Considerations for Breastfeeding. *Cardiac Failure Review*, 4(2), 112. <https://doi.org/10.15420/cfr.2018.21.2>
- Laksono, S., Prawara, A. S., & Halomoan, R. (2021). Diagnosis and Management of Severe Peripartum Cardiomyopathy. *Indonesian Journal of Obstetrics and Gynecology*, 215–218. <https://doi.org/10.32771/inajog.v9i4.1459>
- Lam, C. S. P., Chandramouli, C., Ahooja, V., & Verma, S. (2019). SGLT-2 Inhibitors in Heart Failure: Current Management, Unmet Needs, and Therapeutic Prospects. *Journal of the American Heart Association*, 8(20). <https://doi.org/10.1161/JAHA.119.013389>
- Sliwa, K., Bauersachs, J., Arany, Z., Spracklen, T. F., & Hilfiker-Kleiner, D. (2021). Peripartum cardiomyopathy: from genetics to management. *European Heart Journal*, 42(32), 3094–3102. <https://doi.org/10.1093/eurheartj/ehab458>
- Ziccardi, M. R., & Siddique, M. S. (2023). Peripartum Cardiomyopathy. In *StatPearls [Internet]*. StatPearls Publishing.