The Journal of Obstetrics and Gynecology of India (September–October 2022) 72(5):377–381
https://doi.org/10.1007/s13224-022-01621-2

MINI REVIEW ARTICLE

Peripartum Cardiomyopathy

Laxmi Shrikhande[1] · Aditya Shrikhande[1] · Bhushan Shrikhande[1]

Received: 23 August 2021 / Accepted: 11 January 2022 / Published online: 2 June 2022

Abstract
Peripartum cardiomyopathy (PPCM) is a rare cause of heart failure (HF) that affects women late in pregnancy or in the early puerperium. There are several definitions for PPCM. While there are numerous potential mechanisms for Peripartum (post-partum) cardiomyopathy, its exact cause remains unknown[1], but the etiopathogenesis is likely to be multifactorial. PPCM is uncommon before 36 weeks of pregnancy, and afflicted women generally present during the first month after delivery. PPCM should be differentiated from pre-existing cardiomyopathy, undiagnosed congenital heart disease, pre-existing valvular heart disease, myocardial infarction, pulmonary embolism and diastolic heart failure due to hypertensive heart disease. The principles for treating acute HF caused by PPCM are the same as those for acute HF caused by any other cause with some limitations during pregnancy. Prompt treatment is critical. There is no necessity for an early delivery unless the maternal or foetal health has deteriorated. In women who present with advanced HF with haemodynamic instability, urgent delivery, regardless of gestation, may be considered. Because women with PPCM have a significant chance of relapse in subsequent pregnancies, they need comprehensive contraceptive counselling. In general, the prognosis is good, with more than half of the patients regaining LV function spontaneously within six months of giving birth. Our aim is to put forth an in-depth review of the Peripartum Cardiomyopathy in contemporary practice.

Keywords Peripartum cardiomyopathy · Heart failure · LV function · Cardiac MRI

Introduction

Peripartum Cardiomyopathy (PPCM) is a rare cause of heart failure (HF) that affects women late in pregnancy or in the early puerperium. There are several definitions for PPCM, as follows:

- AHA Scientific Statement on contemporary definitions and classifications of the cardiomyopathies defines PPCM as a rare and dilated acquired primary cardiomyopathy with associated LV dysfunction and heart failure presenting in the third trimester of pregnancy or within five months post-partum, and whose diagnosis requires a high index of suspicion.
- European Society of Cardiology on the classification of cardiomyopathies defines PPCM as a non-familial, non-genetic form of dilated cardiomyopathy associated with the following characteristics:

  (a) Development of heart failure (HF) toward the end of pregnancy or within five months following delivery.
  (b) Absence of another identifiable cause for the HF.
  (c) Left ventricular (LV) systolic dysfunction with an LV ejection fraction (LVEF) of <45%. The LV may or may not be dilated.

- Heart Failure Association of the European Society of Cardiology Working Group on PPCM 2010 defines PPCM as an idiopathic cardiomyopathy presenting with heart failure secondary to left ventricular systolic dysfunction towards the end of pregnancy or in the months following delivery, where no other apparent cause of heart failure is found. It is a diagnosis of exclusion. The left ventricle may not be dilated but the ejection fraction is nearly always reduced to below 45%.

✉ Laxmi Shrikhande
shrikhandedrlaxmi@gmail.com

[1] Shrikhande Hospital and Research Centre Pvt Ltd., 34/2 Abhyankar Road, Dhantoli,, Nagpur, Maharashtra 440012, India

Risk factors for the development of PPCM include maternal age over 30, African descent, multiparity, twin pregnancy, hypertension, preeclampsia, smoking, maternal cocaine abuse, extended tocolytic therapy and malnutrition.

Discussion

Pathophysiology

While there are numerous potential mechanisms for Peripartum (post-partum) Cardiomyopathy, its exact cause remains unknown [1], but the etiopathogenesis is likely to be multifactorial. The timing of presentation during late pregnancy and post-partum period is suggestive of potential hormonal pathogenesis.

Presentation of Peripartum Cardiomyopathy

Timing of Presentation

PPCM is uncommon before 36 weeks of pregnancy, and afflicted women generally present during the first month after delivery.

Symptoms and Signs

The symptoms of PPCM are similar to those of other types of systolic HF caused by cardiomyopathy. Dyspnoea is the most prevalent symptom, but cough, orthopnoea, paroxysmal nocturnal dyspnoea, pedal oedema, and haemoptysis are also common. Since symptoms including nonspecific tiredness, shortness of breath, and pedal oedema are similar to those seen in normal pregnancy, an early detection may be delayed.

There may be signs and symptoms of systemic or pulmonary thromboembolism. Thromboembolism rates have varied in case studies, and more data are needed to estimate the risk of this complication. LV thrombus is a cause of concern for PPCM patients with left ventricular ejection fraction (LVEF) of <35%.

The severity of symptoms in patients suffering from PPCM can be classified according to the New York Heart Association (NYHA) system as follows:

- Class I—Cardiac disease with no symptoms and no limitations in ordinary physical activity
- Class II—Mild symptoms and slight limitation of ordinary physical activity
- Class III—Significant limitation in activities due to symptoms, that is, symptoms with minimal exertion. Comfortable only at rest.
- Class IV—Symptoms at rest

Evaluation of Peripartum Cardiomyopathy

Three clinical criteria are used to diagnose PPCM: the onset of heart failure (HF) at the end of pregnancy or shortly after birth, the lack of another identifiable cause of HF, and left ventricular (LV) systolic dysfunction with an LV ejection fraction (LVEF) of <45 %.

The diagnostic work-up for PPCM begins with a review of the patient's medical history to determine the development of HF symptoms, followed by clinical examination and echocardiography to confirm systolic HF and LV dysfunction, respectively. Additional diagnostics, such as a chest X-ray, can rule out other aetiologies of HF symptoms, such as severe anaemia, thyroid, or liver illness; an ECG can rule out coronary artery disease or thrombosis. When echocardiography is inconclusive, other diagnostic tests such as cardiac MRI and right ventricular biopsy are beneficial for individuals with ventricular tachycardia or who are resistant to therapy.

Electrocardiogram (ECG)

Although ECG abnormalities are detected in up to 50% of PPCM patients, a normal ECG does not rule out PPCM [2].

B-Type Natriuretic Peptide (BNP)

When the diagnosis of HF is unclear, measuring plasma BNP or N-terminal proBNP (NT-proBNP) is recommended. BNP and NT-proBNP levels in women with PPCM are generally greater than those found in healthy women during pregnancy or post-partum.

Chest X-ray

The cardiac silhouette is generally enlarged on chest radiographs, with indication of pulmonary venous congestion and/or interstitial oedema, as well as pleural effusion on rare occasions. However, a chest radiograph is not required to make a diagnosis of HF or PPCM.

Echocardiography

Echocardiography usually shows a global decline in LV systolic function, with an LVEF, almost invariably, of <45 %. The LV is commonly dilated, but not always. Left atrial enlargement, LV or left atrial thrombus, dilated right ventricle, right ventricular hypokinesis, mitral and tricuspid regurgitation, and small pericardial effusion are all potential echocardiographic findings.

Cardiac magnetic resonance imaging (CMR).

Although CMR is not usually necessary to diagnose PPCM, it can be useful in assessing LV systolic function and LV volume as a complement to echocardiography. However, CMR's role in PPCM is currently limited and its significance is still being investigated.

Cardiac Catheterization and Invasive Haemodynamic Monitoring

Physical examination and Doppler echocardiography are typically enough to determine cardiac pressures; thus, right heart catheterization is rarely required.

Haemodynamic data should be evaluated in light of anticipated changes during pregnancy, such as an increase in cardiac output by 50% at 28 weeks and a decrease in systemic vascular resistance (SVR) (mean 850 dynes/sec/cm^{-5}). Filling pressures can differentiate PPCM from preeclampsia, with preeclampsia having lower filling pressures and PPCM having greater filling pressures. Both disorders may result in a lower cardiac output and a greater SVR than predicted.

Differential diagnosis

Differential diagnoses of PPCM include [3]

1. **Pre-existing cardiomyopathy:** Idiopathic dilated cardiomyopathy, familial dilated cardiomyopathy, and HIV/AIDS cardiomyopathy are examples of cardiomyopathies that might be revealed during pregnancy. Heart failure is more likely to appear antepartum in individuals with a pre-existing cardiomyopathy, as opposed to PPCM, which most often manifests post-partum. Furthermore, cardiomyopathy caused by HIV/AIDS frequently manifests without ventricular dilatation.
2. **Undiagnosed congenital heart disease:** Certain congenital heart defects such as bicuspid valve disease, atrial septal defects, ventricular septal defects, and patent ductus arteriosus may manifest initially during pregnancy. These lesions can be distinguished from PPCM as they most frequently present during the second trimester. Echocardiography is also helpful in characterising these lesions.
3. **Pre-existing valvular heart disease:** Pre-existing valvular heart disease that has been unmasked by pregnancy usually manifest in the prenatal period, as opposed to PPCM, which often manifests after delivery. Physical examination and echocardiography are also helpful in characterising these lesions.
4. **Myocardial infarction:** It is rare and can be distinguished from PPCM through clinical manifestations such as angina chest pain, electrocardiogram changes, elevations in cardiac biomarkers, and regional wall motion abnormalities on echocardiography.
5. **Pulmonary embolism:** The occurrence of dyspnoea without signs of heart failure suggests pulmonary embolism rather than PPCM. CT pulmonary angiography can be used to detect a pulmonary embolus.
6. **Diastolic heart failure due to hypertensive heart disease:** A past history of severe hypertension and consistent results on echocardiography lend support to this diagnosis as opposed to PPCM.

Management of Peripartum Cardiomyopathy

The principles for treating acute HF caused by PPCM are the same as those for acute HF caused by any other cause with the following limitations during pregnancy:

- Angiotensin-converting enzyme-inhibitors and angiotensin-II receptor blockers are contraindicated because of significant renal toxicity (I-C).
- Hydralazine and long-acting nitrates are thought to be safe in patients with PPCM.
- β-Blockers (β-1-selective drugs) are recommended. There is no evidence that they are teratogenic. Non-selective beta blockers should be avoided as β-2 receptor blockage might theoretically have an anti-tocolytic effect.
- Diuretics (furosemide and hydrochlorothiazide) should be used with caution since they can reduce placental blood flow.
- Unfractionated or low-molecular-weight heparin can be utilised for therapeutic anticoagulation if needed.
- Prompt treatment is critical. If necessary, non-invasive ventilation with a positive end-expiratory pressure of 5–7.5 cm of water should be used to attain an arterial oxygen saturation of ≥ 95 %. When there is congestion and volume overload, intravenous diuretics should be administered, with an initial bolus of furosemide 20–40 mg IV. Intravenous nitrate (e.g., nitro-glycerine starting at 10–20 up to 200 g/min) is indicated in patients with a systolic blood pressure (SBP) >110 mmHg, but it should be used with caution in those with SBP between 90 and 110 mmHg.

Patients with a low output state, as evidenced by signs of hypoperfusion (cold, clammy skin, vasoconstriction, acidosis, renal impairment, liver dysfunction, and impaired mental condition), as well as those with congestion that persists despite the use of vasodilators and/or diuretics, should be considered as candidates for inotropic agents. When inotropic agents (dobutamine and levosimendan) are required,

they should be given as quickly as possible and stopped as soon as sufficient organ perfusion is regained and/or congestion is relieved.

There is no proper data [4] on the use of ICD devices in this patient group, and hence, specific indications for ICD treatment have not been developed for PPCM.

Timing and mode of delivery

Randomized trials and large cohort studies do not yet address the timing and mode of delivery in PPCM. There is no necessity for an early delivery unless the maternal or foetal health has deteriorated. In women who present with advanced HF with haemodynamic instability, urgent delivery, regardless of gestation, may be considered.

Because women with PPCM have a significant chance of relapse in subsequent pregnancies, they need comprehensive contraceptive counselling. If the patient's LVEF is <25% upon diagnosis or the LVEF has not normalised, a second pregnancy should be avoided.

New therapeutic strategies

Bromocriptine

Bromocriptine might be a novel disease-specific therapy for PPCM. Positive effects were seen in a randomised pilot study of individuals with newly diagnosed PPCM who presented within 4 weeks of delivery.

Intravenous immune globulin

In patients with myocarditis or recent-onset dilated cardiomyopathy, intravenous immune globulin (IVIG) has been attempted, but no convincing evidence of therapeutic benefit has been found.

Immunosuppressive agents

For PPCM, immunosuppressive agents are not indicated. Although an observational research found immunosuppressive treatment to be effective in individuals with PPCM and biopsy-proven myocarditis, its effectiveness is not conclusively known.

Prognosis

Unfortunately, there is no data on prognosis of PPCM in Indian women.

Presence of the following features foreshadows a poor prognosis:

- Left ventricular ejection fraction $\leq 30\%$
- Fractional shortening < 20 %and an LV end-diastolic dimension ≥ 6 cm
- Raised cardiac troponin T
- Antenatal presentation
- Right ventricular dysfunction [5]

Conclusion

Diagnosing and treating Peripartum Cardiomyopathy is still a challenge. Prior definitions, which emphasised stringent time frames and echocardiographic cut-offs for diagnosis, are likely to have resulted in the disease being missed in women. Its pathogenesis is unknown. The development of heart failure symptoms in the final month of pregnancy or within five months after delivery is the cornerstone of PPCM diagnosis. Heart failure (HF) caused by PPCM is managed similarly to HF caused by other causes that occur during pregnancy, with extra attention being paid to specific concerns during pregnancy, such as foetal risk of medications. A positive prognosis is predicted by a baseline LVEF of greater than 30%, a larger LV end-diastolic diameter, and a lower fractional shortening. The prognosis is good, with more than half of patients regaining LV function spontaneously within six months of giving birth.

Funding Not applicable.

Declaration

Conflict of interest The authors declare that they have no conflict of interest.

References

1. Regitz-Zagrosek V, Roos-Hesselink JW, Bauersachs J, et al. ESC Scientific Document Group, ESC Guidelines for the

management of cardiovascular diseases during pregnancy: the task force for the management of cardiovascular diseases during pregnancy of the European Society of Cardiology (ESC). Eur Heart J. 2018;39(34):3165–241.
2. Honigberg MC, Elkayam U, Rajagopalan N, Investigators IPAC, et al. Electrocardiographic findings in peripartum cardiomyopathy. Clin Cardiol. 2019;42(5):524–9.
3. Bauersachs J, Arrigo M, Hilfiker-Kleiner D, et al. Current management of patients with severe acute peripartum cardiomyopathy: practical guidance from the Heart Failure Association of the European Society of Cardiology Study Group on peripartum cardiomyopathy. Eur J Heart Fail. 2016;18(9):1096–105.
4. Pillarisetti J, Kondur A, Alani A et al. Peripartum cardiomyopathy: predictors of recovery and current state of implantable cardioverter-defibrillator use. J Am Coll Cardiol. 2014;63(25 Pt A):2831–9.
5. Blauwet LA, Delgado-Montero A, Ryo K, Investigators IPAC, et al. Right ventricular function in peripartum cardiomyopathy at presentation is associated with subsequent left ventricular recovery and clinical outcomes. Circ Heart Fail. 2016;9(5):e002756.