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# Dilemmas in the Management of a Severe Case of Peripartum Cardiomyopathy

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## Abstract

**Background:** Peripartum cardiomyopathy (PPCM) is associated with maternal mortality due to heart failure, sudden death or thromboembolism. Recurrence is common, especially with persistent left ventricular dysfunction, hence advice on contraception should be given.

**Case:** A 38-year-old Chinese lady, gravida 4 para 1, developed PPCM in 2008. Despite advice on contraception, she conceived again in 2009 and 2013. For the index pregnancy, she withheld her condition of PPCM until 19+6 weeks. Echocardiography showed LVEF of 14%. Despite the quoted mortality risk of 20% with continuation of pregnancy, she declined termination. Multidisciplinary co-management between obstetric, cardiology and anaesthesia decided on delivery by caesarean section at 32+6 weeks, in view of high maternal risk. Delivery proceeded uneventfully and the baby had no significant complications.

**Conclusion:** The importance of multidisciplinary management in optimizing the care of a patient with complex obstetric risks, and coping with ethical issues of patient autonomy and beneficence are demonstrated.

**Keywords:** Peripartum cardiomyopathy; High risk obstetrics; Persistent left ventricular dysfunction; Contraception; Termination of pregnancy

## Introduction

Peripartum cardiomyopathy (PPCM) is defined by the 2010 European Society of Cardiology (ESC) Working Group as an idiopathic cardiomyopathy characterized by development of heart failure toward the end of pregnancy or in the months following delivery, absence of another identifiable cause, and left ventricular (LV) systolic dysfunction with a LV ejection fraction (LVEF) less than 45%.

It exemplifies a unique aspect of obstetric biology, in which pregnancy results in the development of cardiomyopathy, and can alter the course and prognosis of the condition. Maternal mortality has been reported up to 10% within 2 years, due to heart failure, sudden death, or thromboembolism.

Data on obstetric and fetal outcomes are limited, but caesarean delivery, preterm birth, growth restriction, stillbirth, and neonatal death have been described. It is recommended that women with a history of PPCM receive counseling regarding the risk of recurrence in subsequent pregnancies.

Patients with persistent LV dysfunction or LVEF  $\leq$  25% at diagnosis should be advised to avoid subsequent pregnancies due to substantially higher risks of heart failure and death [1].

## Case Presentation

Our patient, a 38-year-old Chinese female, gravida 4 para 1, developed peripartum cardiomyopathy in 2008. Additional obstetric co-morbidities include advanced maternal age, obesity (body mass index [BMI] 42.4 kg/m<sup>2</sup>), and gestational diabetes mellitus (GDM) [1,2].

Serial echocardiograms showed persistent LV dysfunction [3]. Despite advice against subsequent pregnancy, she went on to conceive in 2009, which was terminated shortly after she presented with decompensated cardiac failure. The index pregnancy is in 2013. **Table 1** summarizes her clinical course.

## Discussion

This case illustrates challenges ranging from maternal obstetric and cardiovascular risks to issues of poor patient adherence to treatment and follow-up.

## Medical Issues

The principal issue was PPCM complicated by persistent LV dysfunction, increasing risks of recurrence and complications, namely thromboembolism, sudden death, and heart failure.

This patient had the following poor prognostic factors: absence of recovery of LV function, age>35 years, LVEF<25%, and multiparity. Moreover, she had a high BMI and GDM.

Being non-compliant to advice such as termination of pregnancy and early admission was a significant additional risk factor for adverse outcomes [4-6]. In addition, she only

revealed her diagnosis of PPCM at 19+6 weeks gestation, close to the legal limit for pregnancy termination in Singapore at 24 weeks.

Fortunately there was no significant fetal or neonatal morbidity other than iatrogenic prematurity for maternal indications, pre-empted by antenatal corticosteroids [7].

**Table 1** Patient's clinical course, LVEF, and management from diagnosis of PPCM to present.

Dates	Clinical Course
Sep-08	Emergency caesarean for failed induction of labour
Jan-09	LVEF 20%. Diagnosed with PPCM after extensive workup for dyspnoea including investigations for pulmonary embolism
Mar-09	Decompensated cardiac failure due to PPCM. Found to be pregnant.
Jun-09	LVEF 25%. Bisoprolol 1.25 mg, gradually increased to 2.5 mg then 5 mg every morning (OM), Digoxin 62.5 mcg OM, Enalapril 2.5 mg twice daily (BD), Frusemide 20 mg OM, Lovastatin 10 mg OM, Spironolactone 12.5 mg OM
Jul-09	Terminated pregnancy on medical advice
Nov-09	LVEF 28%. Poor compliance to medications
May-10	LVEF 17%, multiple fixed thrombi. Warfarin 2 mg, increased to 4 mg, with bridging Enoxaparin 100 mg BD×1 week
Nov-10	LVEF 28%. Warfarin stopped
May-12	LVEF 20-25%, regional wall motion abnormalities (RMWA), dilated LV. Bisoprolol and Enalapril restarted
Sep-12	Defaulted subsequent follow-up appointments
8 <sup>+6</sup> weeks Jul-13	Booking visit for index pregnancy
19 <sup>+6</sup> weeks	Revealed diagnosis of PPCM to medical team. LVEF 14%. Despite quoted maternal mortality risk of 20%, declined termination. Also declined admission at 24 weeks. Hydralazine given, planned for close follow-up with high-risk obstetric and cardiac joint clinic (CJC) teams
25 <sup>+4</sup> weeks	Decision for preterm delivery by lower section caesarean section (LSCS). Steroid therapy completed at 27 weeks, weekly follow-ups arranged.
28 <sup>+6</sup> weeks	Asymptomatic, LVEF 17%. Enoxaparin 40 mg daily.
29 <sup>+4</sup> weeks	Oral glucose tolerance test (OGTT): fasting glucose 5.3 mmol/L, 2 hour glucose 7.8 mmol/L. Counseled on GDM. Dietitian referral and instructions on glucose monitoring provided.
30 <sup>+4</sup> weeks	Non-compliant to glucose monitoring. Normal fetal growth parameters. Elective LSCS and tubal ligation scheduled at 32 <sup>+6</sup> weeks with admission at 32 <sup>+3</sup> weeks for pre-operative optimization.
32 <sup>+0</sup> weeks	Multidisciplinary team meeting involving obstetrics, cardiology, cardiothoracic surgery, and anaesthesia to discuss perioperative plan.
32 <sup>+6</sup> weeks Jan-14	Baby delivered by LSCS. Birth weight 2055 g, APGAR scores 4 (1 min) and 8 (5 mins) - sent to neonatal intensive care unit (ICU). Patient stable - sent to surgical ICU then general ward. Discharged 4 days later with Bisoprolol 1.25 mg OM, Enalapril 2.5 mg BD, Enoxaparin 40 mg OM×5 weeks. Follow-up appointments to repeat OGTT and with Cardiology.
Feb-14 Mar-14	Followed-up with Cardiology. Did not attend subsequently
May-14	Repeat OGTT: fasting glucose 6.0 mmol/L, 2 hour glucose 9.7 mmol/L. Impaired glucose tolerance. Defaulted subsequent appointments.
Apr-16	Last seen by cardiology in April 2016. Asymptomatic. Latest echocardiogram in March 2016 – only echocardiogram since delivery: LVEF 15-20%, severely dilated LV cavity, RWMAs. Atorvastatin 40 mg ON, Bisoprolol 2.5 mg OM, Frusemide 20 mg OM, Spironolactone 12.5 mg OM, Valsartan 40 mg BD. Declined automatic implantable cardiac defibrillator (AICD) for low LVEF.

## Differential diagnoses

At the patient's initial presentation in 2009, she was investigated for alternative causes of her progressive dyspnoea including pulmonary embolism. In the index pregnancy, she was asymptomatic.

## Multidisciplinary management

The patient was managed by a multi-disciplinary team comprising a high risk obstetric team, cardiology, and meetings held with neonatology and anaesthesia to optimize the timing and mode of delivery, and decide on a joint perioperative plan to ensure maternal and fetal well-being.

## Timing and mode of delivery

Current literature advises prompt delivery for maternal indications in PPCM patients with advanced heart failure, with caesarean as the preferred mode for patients requiring pharmacological or mechanical circulatory support [8]. The ESC advised that early delivery is not required in stable maternal and fetal conditions, but gestational age, fetal status, and the potential cardiovascular impact of continuing pregnancy should be considered. Although our patient remained hemodynamically stable and fetal growth was not compromised, the decision to deliver early and by caesarean section was based on her poor LVEF of 14% when she first revealed her diagnosis of PPCM to the medical team, and remaining low at 17% in the third trimester [9,10]. This put her at a significant risk of cardiovascular deterioration should pregnancy continue to term. Compared to very preterm infants (<32 weeks), poor neonatal outcomes in moderate and late preterm infants are uncommon, given access to intensive neonatal facilities. Hence delivery at 32 weeks was chosen to balance acceptable fetal outcomes with the risk of worsening maternal outcome. In addition to patient's advanced heart failure, the patient's previous caesarean section for failed induction of labour in 2008 was another consideration for choosing caesarean section as the mode of delivery.

## Medical therapies

The treatment of PPCM is similar to other types of heart failure, with the exception of drugs that have risks of fetal teratogenicity such as angiotensin-converting enzyme inhibitors (ACEI), angiotensin II receptor blockers (ARB), aldosterone antagonists, and warfarin. Hydralazine was started when the patient revealed her diagnosis of PPCM as a vasodilator to reduce afterload and improve cardiac output [11]. Hydralazine was chosen as ACEI and ARBs are contraindicated in pregnancy, and hydralazine has been shown to be safe for both mother and fetus in pregnancy. Anticoagulation was given to decrease the risk of thromboembolism secondary to severe LV systolic dysfunction, which promotes stasis of blood, as well as the hypercoagulable state of pregnancy itself. Enoxaparin was chosen because of convenience in dosing compared to unfractionated heparin, and decreased fetal risks compared to warfarin. After delivery, the patient was discharged with standard classes of

medications used in heart failure, namely an ACEI and a beta blocker [12].

## Other therapies

In view of her advanced and persistent heart failure, other options for the patient would have included device therapy such as an internal cardiac defibrillator (ICD) or cardiac resynchronization therapy, although specific indications for their use have not been established for PPCM [1]. She declined an ICD in April 2016. Mechanical circulatory support with a ventricular assist device has also been described in PPCM patients. Although cardiac transplantation is a potential option in refractory heart failure, PPCM patients have increased risk of graft failure and worse long-term survival compared to other transplant patients [13]. Additionally, a pilot study showed that PPCM patients on bromocriptine – which blocks prolactin release – in addition to standard therapy had significantly greater increases in LVEF than those on standard therapy alone. However larger trials are needed to assess its safety and efficacy. The use of bromocriptine is not currently practiced in Singapore, and was not used as part of this patient's therapy. Nevertheless, bromocriptine is used widely elsewhere such as in Latin America.

## Prognosis

The patient's long-term prognosis remains guarded because of persistent LV dysfunction. Death up to nine years<sup>2</sup> postpartum has been reported among such patients [14,15].

## Ethical issues

The core ethical dilemma is balancing patient autonomy and beneficence. Contraception and termination of pregnancy has widespread ethical implications. However, advice on both was incontrovertible in view of the patient's exceptionally high cardiac risk. Despite re-iteration of the 20% risk of mortality, the patient was adamant on keeping the pregnancy [14]. The teams supported the patient's decision by focusing on close antenatal follow-up. In terms of patient adherence, although repeatedly reminded of the high risks and strong suggestion to admit at 24 weeks, the patient's autonomy was respected and instead weekly follow-ups were arranged.

## Conclusion

This case illustrates the importance of multidisciplinary co-management and frequent antenatal follow-up in obstetric patients with complex co-morbidities, especially in high-risk situations. The interplay of ethical issues additionally increases the complexity of management. Despite our patient having multiple obstetric risks and poor compliance to medical advice and treatment, the multidisciplinary care received managed to achieve favourable perinatal outcomes for both mother and fetus [15].

We emphasize that PPCM patients, particularly those with persistent LV dysfunction, are at risk for recurrence and complications in subsequent pregnancies. The use of a registry

for PPCM patients, such as the one established by the European Society of Cardiology with close liaison between cardiologists and obstetricians would augment multidisciplinary team management in optimizing outcomes in a complex case with high risks of failure, as well as for instituting appropriate post-partum follow-up and pre-pregnancy counseling in subsequent pregnancies. Further research should also be conducted on the use of device therapy, mechanical circulatory support, cardiac transplantation, and bromocriptine in the management of PPCM.

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