Peripartum Cardiomyopathy and Myocardial Recovery

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Background: Peripartum cardiomyopathy (PPCM) is a myocardial disease of pregnancy in which heart failure develops during the last month of pregnancy or up to five months post-delivery with no identified cause. Recovery of the myocardium is anticipated and variable factors are implicated.

Objective: To evaluate the time of diagnosis in PPCM and how it could affect myocardial recovery.

Design: A Prospective Clinical Study.

Setting: Salmaniya Medical Complex, Bahrain.

Method: Patients who fulfilled the criteria for PPCM were prospectively recruited from 1 January 2014 to 31 December 2014. Follow-up was extended until June 2016.

Personal characteristics, clinical, biochemical and echocardiographic data were documented. All patients had clinical assessment and echocardiogram at six months post-delivery.

Result: Four females suffering from PPCM were included in the study. Two (50%) had complete recovery of their left ventricular (LV) function after six months. The time of presentation and diagnosis was at early postpartum period. The recovered myocardium was assessed further with dobutamine stress echocardiography (DSE) that confirmed normal contractile reserve. The two recovered patients reconceived with no relapse. On the other hand, the other two (50%) non-recovered females had their diagnosis made either at antepartum or late postpartum period.

Conclusion: Recovery of PPCM might be related to the early postpartum diagnosis. Having high clinical suspicion for diagnosis might help to improve the outcome. Timely instituted therapy might aid in LV recovery.

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Peripartum cardiomyopathy (PPCM) is a pregnancy-related myocardial disease characterized by the development of heart failure due to left ventricular (LV) dysfunction without an underlying cause during the last month of pregnancy and up to five months postdelivery[1,2]. It carries considerable morbidity and mortality risk for the mother and fetus; however, recovery of the myocardium is possible[1-5]. Several risk factors have been implicated in the recovery and the risk of relapse, such as certain ethnic groups and LV dimension assessed by echocardiography at the time of diagnosis[6-9]. The characteristics of this disease in our community are yet to be known.

The aim of this study is to present four cases of PPCM with different outcomes regarding LV function recovery.

METHOD

All patients diagnosed with PPCM were included in the study from 1 January 2014 to 31 December 2014. Informed consent was obtained from all the patients. Patients with defined etiology of heart failure or known to have cardiomyopathy were excluded. Initial personal characteristics, clinical features, echocardiography and laboratory data were documented on a predesigned data sheet.

The cases were followed up until June 2016. At six months post-delivery, the patients' clinical improvements were assessed, and the recovery of myocardium on echocardiography study was documented. Recovery of the myocardium was defined by documenting the LV ejection fraction on transthoracic echocardiography (TTE) to be ≥ 54%. Patients with recovered myocardium had DSE to confirm their recovery and the risk of relapse in subsequent pregnancies. The myocardial recovery was compared to the time of diagnosis to explore any existing relation.

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RESULT

CASE 1

A twenty-one-year-old primigravida with no significant past medical history presented with dyspnea one-day post-cesarean section delivery. She complained of orthopnea and a productive cough of frothy secretions. Her pregnancy and delivery were uneventful. On examination, she was found to be tachycardic; her heart rate (HR) was 140 beats per minute (bpm) and her blood pressure (BP) approached 90/60 mmHg. Cardiovascular examination revealed soft heart sounds with S3 gallop. Her lungs were congested with bilateral soft crepitations up to the mid zones. Mechanical ventilation, inotropic support, and an intravenous diuretic were initiated. Results of her electrocardiogram (ECG), transthoracic echocardiography (TTE) and laboratory investigations for cardiac markers are summarized in table 1. The diagnosis of PPCM was entertained after exclusion of other causes, such as metabolic and autoimmune related or valvular heart disease. Because of progressive improvement in hemodynamics, further anti-failure medications (captopril and bisoprolol) were gradually introduced and up-titrated. The patient was discharged on comprehensive anti-failure medications. Despite the initial challenges, LV function became normal on repeated TTE at six months post-delivery. A dobutamine stress echocardiography test was performed; it showed a normal contractile reserve of LV. She became pregnant again with no recurrence of PPCM.

CASE 2

A twenty-two-year-old primigravida female presented in labor pain with rapidly progressive shortness of breath for one day. Her pregnancy was uneventful; she had no significant past medical history. The heart rate was 130 bpm, and BP was 180/120 mmHg. The patient was treated as a possible case of pre-eclampsia and proceeded to undergo a cesarean section. However, during surgery, she desaturated further and was intubated, despite having her blood pressure controlled with medications. Chest examination was consistent with pulmonary edema. Diagnosis of PPCM was made based on her reduced LV systolic function and exclusion of other heart failure causes, see table 1. Mechanical ventilation, intravenous diuretics, and nitroglycerin were initially started. Perindopril, spironolactone, and carvedilol were titrated in the following days. The patient recovered within five days. The LV recovered completely after six months. Dobutamine stress echocardiography demonstrated LV recovery and normal contractile reserve during stress. That kept her at lower risk for recurrence of PPCM in future pregnancies. She became pregnant again with no recurrence of PPCM.

CASE 3

A twenty-two-year-old female presented four months after delivery with a history of progressive exertional dyspnea, New York Heart Class III-IV. Her shortness of breath was provoked by lying flat and breastfeeding. She denied a history of chest pain. Her pregnancy and delivery were uneventful, and she was not known to have any significant past medical conditions. The heart rate was regular at 110 bpm, and her BP was 120/70 mmHg. Cardiovascular examination revealed normal heart sounds with S3 gallop, and her chest was positive for basal crepitations. She had elevated jugular venous pressure. The rest of the examination was unremarkable. Her TTE showed dilated LV with severely reduced systolic function, see table 1. Thyroid function was normal and autoimmune screen was negative. Based on her presentation time of heart failure four-months after delivery and the absence of other causes of heart failure, she was diagnosed as PPCM. The patient was admitted to the coronary care unit, and anti-failure medications were initiated. She improved clinically and stabilized within three days. Her six-month TTE showed persistence of LV dysfunction despite being compliant with the treatment. The risks of future pregnancies and the high risk of morbidity and mortality were discussed with the patient.

CASE 4

A forty-one-year-old senior gravida presented with shortness of breath and palpitations during her last month of pregnancy. Palpitations were regular but fast. She denied history of chest pain. The heart rate was 160 bpm and regular. Cardiovascular examination revealed a soft S1 with S2 and a systolic murmur of mitral regurgitation. Chest examination revealed pulmonary edema. Obstetric history was positive for a pregnancy three years ago without complications. Her ECG showed supraventricular tachycardia. Her TTE revealed evidence of severe LV systolic dysfunction with severe global hypokinesia, severe mitral regurgitation and an increase of right ventricular systolic pressure, see table 1. Digoxin failed to control her heart rate; therefore, amiodarone was used with intravenous diuretics. The patient's condition was stabilized enough to undergo a cesarean section after three days. Ramipril, carvedilol, and spironolactone were given and up-titrated. Diagnosis of PPCM was made based on the absence of other causes of heart failure. She responded well to anti-failure medications, but unfortunately, her LV did not recover after six months follow-up TTE. Risk of mortality and morbidity in the future pregnancies and need to continue on anti-failure medications were discussed with the patient and spouse.

Table 1: Clinical Data of Four PPCM

	Case			
	1	2	3	4
Age	21	22	26	42
BMI	24.4	22.6	51.6	32
Pregnancy Status	Primigravida	Primigravida	Primigravida	Multigravida
Delivery Type	Cesarean section	Cesarean section	Cesarean section	Cesarean section
Time from delivery-diagnosis	1 day	1 day	131 days	-3 days
ECG Rhythm	ST	ST	ST	SVT
ECG Heart Rate (bpm)	142	122	110	160
QRS Duration (msec)	69	75	116	87
Troponin hs I	9	3	0.4	2.6
LVIDD (mm)	54	53	65	63
LVIDS (mm)	46	32	57	58
EF (%)	20	40	31	25
LVIDD (mm) (6m)	40	51	68	68
LVIDS (mm) (6m)	30	33	58	58
EF (%) (6m)	68	65	30	30
Medications	BB, ACEi, Furosemide, Digoxin	BB, ARBs, Furosemide, Spironolactone	BB, ACEi, Furosemide, Spironolactone	BB, ACEi, Furosemide, Digoxin, Amiodarone

BMI: body mass index, **troponin I hs:** troponin I high sensitivity, **LVIDD:** left ventricle inter diameter in diastole, **LVIDS:** left ventricle inter diameter in systole, **EF:** ejection fraction, **ST:** sinus tachycardia, **SVT:** supra ventricular tachycardia, **BB:** B blockers, **ACEi:** angiotensin-converting enzyme inhibitor, **ARB:** angiotensin receptor blockers.

DISCUSSION

Two had persistent LV dysfunction and two-showed complete recovery. The latter proceeded with their pregnancies after a negative dobutamine stress echocardiogram. Their pregnancies were uneventful. A patient's desire to become pregnant is often intense and can overshadow the impending risk. Predictors of recovery post-PPCM were diverse[1-5]. Some were related to echocardiographic characteristics such as LV dimensions, right ventricular function or global longitudinal strain[6,7]. Others were linked to race and ethnicity, while few addressed the role of neurohormones[8,9]. In a retrospective analysis of 71 Chinese women with PPCM, Brain Natriuretic Peptide (BNP) of > 1860 pg/ml was one of the independent prognostic factors for predicting persistent LV dysfunction[8]. Delayed diagnosis is associated with delayed recovery.

The time of diagnosis was observed to influence the outcome in PPCM[10,11]. Antepartum diagnosis is related to worse outcomes[10]. Early presentation might represent more severe diseases or undiagnosed PPCM from previous pregnancies. The limited therapeutic options that can enhance myocardial recovery during pregnancy are another explanation for the negative outcomes during this period. The failing heart misses the window of time when escalated therapy is most needed.

While early postpartum diagnosis is one of the predictors of improvement, presentation beyond six weeks postpartum is related to the worst outcomes. Among the two recovered patients, normalization of their LV was related to their early postpartum diagnosis. Initially, grave presentation did not preclude full myocardial recovery.

The patients diagnosed at antepartum and late postpartum had persistent LV dysfunction. Well-timed therapy, especially ACE inhibition, is known to improve outcomes[12]. Soon after delivery, elevated serum levels of Relaxin-2 in PPCM women were associated with myocardial recovery at two months. In patients with heart failure, a single 48-hour infusion of Relaxin relieved the symptoms[13]. Substantial evidence points to the time of diagnosis and the outcomes in patients with PPCM. Is it the influence of early treatment during the golden period or the specific neurohormonal milieu that determines myocardial recovery, which is yet to be revealed through further research?

CONCLUSION

Recovery of the myocardium in patients with PPCM can reduce the risk of relapse in subsequent pregnancy. Diverse prognostic markers were identified. Early diagnosis and rapid administration of comprehensive therapy can hasten myocardial recovery and outlook. Awareness should be stressed among obstetricians to suspect PPCM and to consult the cardiologist once this diagnosis is anticipated.

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