Peripartum Cardiomyopathy

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Normal Cardiac Changes During Pregnancy

• Total blood volume increases by > 40%
• Heart rate increases from an average of 75bpm before pregnancy to around 90 beats/min in the third trimester
• Labor—these changes further increase and then return to normal by about 6 weeks after delivery
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Percentage of change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac output</td>
<td>40–50% Increase</td>
</tr>
<tr>
<td>Stroke volume</td>
<td>30% Increase</td>
</tr>
<tr>
<td>Heart rate</td>
<td>15–25% Increase</td>
</tr>
<tr>
<td>Intravascular volume</td>
<td>45% Increase</td>
</tr>
<tr>
<td>Systemic vascular resistance</td>
<td>20% Decrease</td>
</tr>
<tr>
<td>Systolic BP</td>
<td>Minimal</td>
</tr>
<tr>
<td>Diastolic BP</td>
<td>20% Decrease at mid-pregnancy</td>
</tr>
<tr>
<td></td>
<td>Pre-pregnant values at term</td>
</tr>
<tr>
<td>CVP</td>
<td>Unchanged</td>
</tr>
<tr>
<td>$O_2$ consumption</td>
<td>30–40% Increase</td>
</tr>
</tbody>
</table>
Peripartum Cardiomyopathy (PPCM)

- Dilated cardiomyopathy
Criteria

1) the development of HF in the last month of pregnancy or within 5 months of delivery
2) the absence of a determinable etiology for HF
3) the absence of demonstrable heart disease before the last month of pregnancy
4) left ventricular (LV) systolic dysfunction demonstrated by echocardiography with left ventricular ejection fraction (LVEF) < 45%, fractional shortening < 30%, or both.
Figure 1: Time of Diagnosis of PPCM in 123 Patients

Red bars represent 23 patients with diagnosis before the last month of pregnancy. Green bars represent 100 patients diagnosed in the last month of pregnancy or the 5-month postpartum. PP = postpartum; PPCM = peripartum cardiomyopathy. Adapted from Elkayam et al. (8).
PPCM

- PPCM is a diagnosis of exclusion, and other causes of cardiac dysfunction should be ruled out.
PPCM

- Incidence: 1: 1500 to 1:3000 pregnancies in the US
- 1: 1000 live births in South Africa
- 1: 300 live births in Haiti
- Many signs and symptoms of normal pregnancy mimic HF leading to delays in diagnosis
- BNP markedly elevated in PPCM
Etiology

- Etiology: unknown
  - prior viral illness
  - abnormal immune response
  - coronary artery spasm
  - small vessel disease
  - defective antioxidant defences
  - role of genetics
  - ? role of prolactin
Risk Factors

- older maternal age ( > 30 years )
- African-American
- h/o HTN or pre-eclampsia
- multiple gestation
- multiparous
- DM
- smoking
- tocolytic
- toxins (cocaine)
n

Palpitations, tachycardia

High blood pressure
Evaluation

- Complete history and physical
- Any prior h/o heart disease
- Identify other causes or precipitants of heart failure
- Define symptom severity e.g. NYHA class, orthopnea, PND
Evaluation

- Labs - CBC, LFTs, TSH, troponin and BNP, and ? HIV, ANA
- CXR - cardiomegaly and pulm. edema
- CTA chest to r/o PE---differential diagnosis
- ECG - arrhythmias, heart attack
- Echocardiogram - LVEF, valves, congenital heart disease
- Cardiac catheterization - CAD, spontaneous coronary artery dissection (SCAD)
ngiotensin-converting enzyme; and PPCM, peripartum cardiomyopathy.
Management

• In patients with LV dysfunction, ACE inhibitors or ARBs should be substituted with isosorbide dinitrate-hydralazine combination.
• Because no information is available regarding the safety of carvedilol during pregnancy, the use of metoprolol may be considered instead.
Risk Category Drugs

- Furosemide---Category C
- Nitroglycerin---Category B
- Nitroprusside---Category C
- Dopamine (risk category C), dobutamine (risk category B), milrinone (risk category C)
- Organic nitrates and hydralazine (both risk category C)
- Metoprolol tartrate is preferred beta blocker
- Digoxin, Spironolactone---Category C
Prognosis

- LV function (EF > 50%) recovers in 50% of women at 6 months
- Most recovery within 2 to 6 months of diagnosis
- Lower recovery in African-Americans
Predictors of LV recovery

- LV diastolic dimension (< 5.5 to 6.0 cm)
- LVEF > 30 to 35% at the time of diagnosis
- Lack of troponin elevation
- Lower level of plasma BNP
- Absence of LV thrombus
- Breast-feeding
- Diagnosis after the delivery
- Non-African American ethnicity
Subsequent Pregnancies

• Advise against it with LVEF < 25% at diagnosis or where LVEF has not normalized
Is LV recovery related to medical therapy?

- Not clear
**Figure 3** Pattern of Recovery of Left Ventricular Function in 40 Patients With PPCM

There was a significant increase in left ventricular ejection fraction (LVEF) between time of diagnosis and 6 months (*p < 0.0001), with only a small and statistically insignificant further increase after 6 months. F/U = follow-up. Adapted from Elkayam et al. (8).
Mode of Delivery---if diagnosed during pregnancy

- OB and cardiology discussion
- Hemodynamic monitoring
- Assisted second stage with vaginal delivery
Complications----25%

- Severe HF
- Cardiogenic shock
- Cardiopulmonary arrest secondary to HF or arrhythmias
- Thromboembolic complications
- Death
Thromboembolism

- Increased incidence of thromboembolism
- LV thrombus occurs in 10 to 20% of patients
- Anticoagulation recommended from the time of the diagnosis until LV function recovers (LVEF > 35%).
• Mortality rates---up to 20%
• Rate of cardiac transplantation— 5 to 10%
• LVAD
Figure 5  Timing of Mortality After Diagnosis in Patients With PPCM

PPCM = peripartum cardiomyopathy. Data derived from Whitehead et al. (74).
Subsequent Pregnancies

- Risk for recurrence about 30%
- Increased mortality risk
- Further decrease in LVEF
- Risk greater when EF is low before subsequent pregnancy----i.e. those who have persistent LV dysfunction
- Patients should be advised on the risk of subsequent pregnancy and on the safest and most effective contraceptive method by both their cardiologists and obstetricians .
- Patients who decide to become pregnant again should undergo baseline echocardiography before or early in pregnancy, as well as determination of serum BNP level
Subsequent Pregnancies

- Repeat echocardiography during the early second and third trimesters, during the last gestational month, and early after delivery and at any time if new symptoms of HF develop.
- Repeat of BNP levels should be helpful in differentiating between HF-like symptoms associated with normal pregnancy.
- Early termination of an unintentional pregnancy should be considered to prevent worsening of LV function and potential maternal mortality, especially in patients with persistent LV dysfunction.
Figure 6: Incidence of Maternal Complications Associated With Subsequent Pregnancy in Women With PPCM

*Red bars* represent women with recovered left ventricular (LV) function before subsequent pregnancy; *green bars* represent women with persistent LV dysfunction. HF = heart failure; LVEF = left ventricular ejection fraction. Data derived from Elkayam et al. (76).
Should Drug Therapy Be Stopped in Women with PPCM after Recovery?

- Limited long-term data in PPCM
- If discontinuation is desired do so gradually and with repeat ECHO
- Annual ECHO?
- If LVEF recovers—medical therapy for at least a year
PPCM

- Diagnosis of exclusion
- Can occur earlier in pregnancy
- LVEF should be reduced or LV dilated
- A/w high mortality
- Physical exam important
- BNP, troponin
- ECHO
- 30% risk of recurrence
- Prepregnancy counselling