Update on Peripartum Cardiomyopathy (PPCM) and Hypertrophic Cardiomyopathy (HCM) during pregnancy

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Peripartum cardiomyopathy—definition from the Heart Failure Association of the European Society of Cardiology Working Group 2010:

“Idiopathic cardiomyopathy that presents with congestive heart failure due to LV systolic dysfunction toward the end of pregnancy or in the months after delivery, in the absence of any other cause of congestive heart failure.”

75% of cases occur in the first month post partum

May be caused by myocarditis, but steroids have not had much effect.
Peripartum cardiomyopathy is diagnosed when the following three criteria are met:

1) Heart failure develops in the last month of pregnancy or within 5 months of delivery
2) Ejection fraction by echocardiography is less than 45%.
3) No other cause of congestive heart failure with low ejection fraction can be found.

Circulation 2013
Risk Factors

- Several risk factors are associated with PPCM. These include the following:
  - Older maternal age
  - Multiparity (1 or more prior pregnancies)
  - Multifetal pregnancy (e.g., twins)
  - African descent
  - High blood pressure
  - Prior toxin exposure (e.g., cocaine)
  - Use of certain medications to prevent premature labor
  - Although PPCM is more likely to occur in a woman over the age of 30 who is pregnant with twins and has had prior pregnancies, PPCM can also occur in a young woman who is pregnant with her first child.
• More common in multiparous women
• More common in twin gestation and in pre-eclampsia
• Ranges from 1/15000 to 1/4000 pregnancies in the United States.
• 1/6000 in Japan, 1/1000 in South Africa, 1/350 in Haiti
• Wide age range
• In U.S., African American women have 15.7 times higher risk of PPCM.
Potential causes:

- Heart biopsies have shown inflammation in 10-75% of cases.
- May be caused by prior viral illness or abnormal immune response.
- Antivirals and immunosuppressive drugs do not improve outcome.
- Nutritional deficiencies
- Coronary artery spasm
- Small vessel disease
- Defective antioxidant defenses
- Genetics may play a role
- Circulation 2013
Presentation:

- Class I -- no symptoms
- Class II -- Mild symptoms with extreme exertion
- Class III -- Symptoms occur with minimal exertion
- Class IV -- Symptoms occur at rest
Increased incidence in Nigeria caused by “tradition of ingesting Kanwa (died lake salt) while lying on heated mud beds twice a day for 40 days post partum”. The high salt intake leads to volume overload.

- Must be differentiated from the dyspnea of pregnancy– woman feels she can’t get enough air in or a good deep breath, thought due to progesterone mediated hyperventilation.

- Common symptoms late in pregnancy include cough, orthopnea, PND, fatigue, palpitations, hemoptysis, chest and abdominal pain, sudden edema– but 1/3 of healthy pregnant women may have edema.
Physical examination

- Enlarged heart—lateral displacement of the PMI
- Often an S3 with murmur of mitral and/or tricuspid insufficiency
- ECG may show LVH, ST changes, conduction abnormalities, and arrhythmias.
- Echocardiogram shows enlargement of all four chambers
Onset of PPCM In Relation to Time of Delivery

Percentage of Patients

Months antepartum Months postpartum

Treatment and clinical course

- Clinical course of PPCM shows that 50% of patients have complete or near-complete recovery of cardiac function within the first 6 months post partum.
- Hydralazine and nitrates can be used safely during pregnancy
- ACE inhibitors are contraindicated.
- Diuretics, digoxin, and beta blockers are important.
- Vaginal delivery is preferred, as it is associated with lower rate of complications, third spacing of fluids, etc.
- High risk of thrombotic complications--Anticoagulation with full dose heparin is recommended during pregnancy and at least 6 weeks postpartum if the LVEF is less than 30%, and if evidence of thrombosis, atrial fibrillation, etc. Warfarin can be used postpartum with little affect on newborn coagulation system, even with breastfeeding.
- Consider ICD for those in whom LV function remains less than 35%.
“Recently, investigators have focused on the role of prolactin in PPCM. Prolactin is a hormone released from the pituitary gland late in pregnancy and after delivery that stimulates the production of breast milk. Prolactin, however, may have adverse effects on the heart muscle by limiting its blood supply and causing cell death. Bromocryptine is a medication that inhibits the pituitary secretion of prolactin, and early studies suggest that it may be beneficial in the treatment of PPCM. More research is needed to determine its safety and efficacy.”

Circulation 2013
Repeat pregnancies:

- If LV function normalizes (40-50%), still at least 20% chance that there will be recurrence of PPCM. Maternal mortality rate is still very low.

- Chance of permanent LV dysfunction much higher second time around– close monitoring with echos and stress test pre-pregnancy.

- Dr. Warnes at Mayo recommends against second pregnancy regardless of LV function improvement.

- Retrospective studies have shown maternal mortality rates as high as 19% if LV function did not normalize after first pregnancy.

- Higher rate of premature birth and abortions in women with persistent LV dysfunction.
Peripartum Cardiomyopathy (PPCM)  
(Idiopathic form of left ventricular [LV] systolic dysfunction develops during pregnancy or post-partum)

PERSISTENT LV DYSFUNCTION

- Higher risk of relapse with subsequent pregnancies (SSP)
- ~50% show further deterioration in LV dysfunction
- Increased morbidity and mortality with SSP
- Premature delivery and abortion more common

COMPLETE RECOVERY

- Better prognosis with SSP compared to persistent LV dysfunction
  - ~20% have a relapse
  - Rate of recovery is higher, morbidity and mortality is lower
  - Likely to have a normal pregnancy

Careful and close monitoring recommended
<table>
<thead>
<tr>
<th>Group</th>
<th>Maternal Outcome</th>
<th>Fetal Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No Relapse</td>
<td>Relapse</td>
</tr>
<tr>
<td>Group A</td>
<td>74.4%</td>
<td>23.3%</td>
</tr>
<tr>
<td>Group B</td>
<td>37.5%</td>
<td>54.2%</td>
</tr>
</tbody>
</table>

Cardiomyopathy: Results of a Survey
Values are %. Group A = women with recovered left ventricular function; Group B = women with

From: Risk of Subsequent Pregnancy in Women With a History of Peripartum Cardiomyopathy.

Figure Legend:
Rate of Relapse in 81 Peripartum Cardiomyopathy Patients With 88P According to LVEF Level Before 88P
LVEF = left ventricular ejection fraction; 88P = subsequent pregnancy.

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About 1/500 people have a form of hypertrophic cardiomyopathy, most of whom are asymptomatic. Passed on as autosomal dominant trait—50% chance of passing it on to children.

Systolic anterior motion of the mitral valve (SAM) can also be associated, causing more obstruction. The high velocity flow through the LV outflow tract creates a Bernoulli effect, "sucking" the anterior leaflet of the mitral valve into the outflow tract.

Symptoms may include chest pain, palpitations, lightheadedness, syncope, dyspnea, and edema.
Normal vs. Hypertrophic cardiomyopathy
<table>
<thead>
<tr>
<th>Maneuver</th>
<th>Ventricular Volume</th>
<th>Murmur Intensity</th>
<th>LVOT Gradient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand grip</td>
<td>Increase</td>
<td>Decrease</td>
<td>Decrease</td>
</tr>
<tr>
<td>Valsalva</td>
<td>Decrease</td>
<td>Increase</td>
<td>Increase</td>
</tr>
<tr>
<td>Amyl nitrite</td>
<td>Decrease</td>
<td>Increase</td>
<td>Increase</td>
</tr>
<tr>
<td>Isoproterenol</td>
<td>Decrease</td>
<td>Increase</td>
<td>Increase</td>
</tr>
<tr>
<td>Beta blocker</td>
<td>Increase</td>
<td>Decrease</td>
<td>Decrease</td>
</tr>
<tr>
<td>Phenylephrine</td>
<td>Increase</td>
<td>Decrease</td>
<td>Decrease</td>
</tr>
</tbody>
</table>
Confirming the presence/absence of left ventricular hypertrophy

- Although HCM is typically characterized by asymmetric septal hypertrophy (ASH), almost any myocardial segment may be involved. The following two-dimensional (2D) echocardiographic criteria are used to aid diagnosis:
  - unexplained maximal wall thickness >15 mm in any myocardial segment, or
  - septal/posterior wall thickness ratio >1.3 in normotensive patients, or
  - septal/posterior wall thickness ratio >1.5 in hypertensive patients.\(^2\)
1. Family history of HCM related sudden cardiac death.

2. Unexplained recent syncope.

3. Septal thickness greater than 30mm

4. Nonsustained ventricular tachycardia on a Holter monitor

5. Hypotensive response to exercise.

6. MRA has been used to determine LV mass and myocardial fibrosis—increased sudden death risk, NSVT.

HCM and pregnancy

- Maternal mortality rate with HCM is less than 1%
- Genetic counselling should be offered.
- Maternal morbidity such as atrial fibrillation, syncope, and congestive heart failure seem to occur more frequently in women who have had similar symptoms before pregnancy.
- Risk is higher in patients with significant LVOT obstruction and history of arrhythmias.
- Increase in cardiac output in first two trimesters is due to higher stroke volume; in third trimester the heart rate is increased. LVOT obstruction actually increases despite higher plasma volume, leading to higher risk of CHF.
- Prepregancy risk assessment is helpful.
7.1 Pregnancy/Delivery—Recommendations

Class I

1. In women with HCM who are asymptomatic or whose symptoms are controlled with beta-blocking drugs, the drugs should be continued during pregnancy, but increased surveillance for fetal bradycardia or other complications is warranted (140,447,448). (Level of Evidence: C)

2. For patients (mother or father) with HCM, genetic counseling is indicated before planned conception. (Level of Evidence: C)

3. In women with HCM and resting or provokable LVOT obstruction greater than or equal to 50 mm Hg and/or cardiac symptoms not controlled by medical therapy alone, pregnancy is associated with increased risk, and these patients should be referred to a high-risk obstetrician. (Level of Evidence: C)

4. The diagnosis of HCM among asymptomatic women is not considered a contraindication for pregnancy, but patients should be carefully evaluated in regard to the risk of pregnancy. (Level of Evidence: C)

Class IIa

1. For women with HCM whose symptoms are controlled (mild to moderate), pregnancy is reasonable, but expert maternal/fetal medical specialist care, including cardiovascular and prenatal monitoring, is advised. (Level of Evidence: C)

Class III: Harm

1. For women with advanced heart failure symptoms and HCM, pregnancy is associated with excess morbidity/mortality. (Level of Evidence: C)

2011 ACCF/AHA Guideline for the Diagnosis and Treatment of Hypertrophic Cardiomyopathy
Women with HCM safely experience pregnancy and labor with minimal documented risks.

The maternal mortality rate is extraordinarily low and limited to those patients with particularly advanced disease (449). Nevertheless, careful evaluation of the mother and functional assessment is paramount during and just prior to pregnancy.

Usually, special medical precautions are unnecessary, and cesarean delivery is not obligatory. However, women with advanced disease, including progressive heart failure, severe diastolic dysfunction, VT, SVT, or marked LVOT obstruction, will require the care of a high-risk maternal/fetal medical team with close involvement of a cardiologist.

For the woman whose disease is well controlled with medical therapy (beta blockers, verapamil, or disopyramide), there should be no interruption of therapy, but careful maternal and fetal monitoring is advised (157).

For any woman of childbearing age with HCM, it is paramount that genetic counseling be advised before conception. Such patients should be counseled prospectively about the risks of pregnancy and discouraged if deemed necessary.

Careful monitoring is advisable in the first 24 hours after delivery, when large fluid shifts can lead to acute pulmonary edema in the setting of a noncompliant and hypertrophied left ventricle.

2011 ACCF/AHA Guideline for the Diagnosis and Treatment of Hypertrophic Cardiomyopathy
Use metoprolol, and not atenolol, as the drug is hydrophilic and crosses the placenta. There are higher concentrations in breast milk. Verapamil and sotalol can also be used, but not amiodarone.

Atrial fibrillation is poorly tolerated and may require electrical cardioversion (safe). Avoid dehydration and maintain beta blocker usage to allow adequate filling of the left ventricle. Followup with cardiologist at least once a trimester. Vaginal delivery is usually preferred. Epidural anesthesia must be administered cautiously in women with LVOT obstruction. Monitoring of LVOT obstruction can be monitored by echo and invasive monitoring with SG catheter is usually not necessary.

Close attention to fluids
Oxytocin only as a slow IV infusion with minimum dose to avoid hypotension, tachycardia and arrhythmia.

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