Chapter

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Peripartum Cardiomyopathy

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Risk Factors for PPCM

Women at particular risk are older age, multiparous and taking long-term tocolytic agents. 24-37% of cases may occur in young primigravid patient[1-3].

Other risk factors are racial like African origin because of low socioeconomic status toxemia or hypertension of pregnancy and twin pregnancy.

Etiology

The etiology of PPCM is currently unknown and many hypothesis have been proposed. Early suggestions that nutritional deficiencies such as selenium[4] and other micronutrients might contribute but could not be confirmed.

Currently more and more evidence suggests that peripartum cardiomyopathy is actually a type of myocarditis arising from infections, autoimmune or idiopathic process.

Proposed factors contributing to pathogenesis of PPCM viz[4-7].

- Viral antigen persistence
- Stress activated cytokines
- Autoimmune responses
- Genetic factors
- Micronutrients
- Microchimerism
- Increased myocyte apoptosis
- Excessive prolactin production

Clinical Presentation

The presenting features of (PPCM) include[8,9]: shortness of breath, fatigue, chest pain, palpitation weight gain, peripheral edema, cough, orthopnea, paroxysmal nocturnal dyspnea, hemoptysis and abdominal pain.

- Physical findings of PPCM include signs of heart failure like loud pulmonic component of the second heart sound. Mitral and / or tricuspid regurgitation, third heart sounds, cardiomegaly, signs of pulmonary arterial hypertension such as elevated jugular venous pressure, hepatomegaly, peripheral edema, pulmonary rales etc[2,11,12].

Diagnosis

Peripartum cardiomyopathy (PPCM) is a dilated cardiomyopathy that is defined as:[8,10]

1. Development of cardiac failure in the last month of pregnancy or within 5 months after delivery.
2. Absence of a demonstrate cause for the cardiac failure.
3. Absence of a demonstrable heart disease before the last month of pregnancy.
4. Documented systolic dysfunction by echocardiography.

This documentation helps and avoid misdiagnosing other conditions that present with pulmonary edema in pregnancy.

Investigations

- **The electrocardiogram** may show tachycardia, ST-T wave changes, conduction abnormalities and arrhythmias.
- **Chest radiography** should be performed with abdominal shielding to evaluate the etiology of hypoxia and exclude pneumonia. Patchy infiltrates in the lower lung fields with vascular redistribution /

cephalization, cardiomegaly and pleural effusions indicate congestive heart failure.

- **Doppler echocardiography** commonly shows enlargement of all four cardiac chambers with marked reduction in left ventricular systolic function, small to moderate pericardial effusion and mitral, tricuspid and pulmonary regurgitation may be evident. The ECHO criteria includes[13,14]:
- Ejection fraction of < 45%.
- Fractional shortening of < 30% or both.
- End diastolic dimension of > 2.7 cm / m^2 body surface area.

The clinical presentation and hemodynamic changes are indistinguishable from those found in other forms of dilated cardiomyopathy.

Medical Management

Patients with PPCM in cardiac failure are treated similarly as in patients who are not pregnant. The mainstays of medical therapy[15-17] are digoxin, loop diuretics and after load reduction with hydralazine and nitrates. Due to high risk for venous and arterial thrombosis, anticoagulation with heparin should be done, vaginal deliveries are preferred because third spacing of fluids, endometritis and pulmonary emboli occur much more often after cesarean deliveries.

Angiotensin converting enzyme inhibitions (ACEIs) and ARBs should be avoided during pregnancy. However, these agents may be used during postpartum period.

- **Drugs:**
  - ***Digoxin, diuretics, and afterload reduction.***
    - Use inotropic support with dobutamine when indicated. Improving cardiac output ensures adequate uteroplacental perfusion.
    - Use diuretics when the mother is volume overloaded, but be careful because maternal volume depletion can lead to uteroplacental hypoperfusion.
    - Hydralazine, in combination with nitrates, is the first choice for afterload reduction and vasodilatation during pregnancy.
    - Nitrates may be used to decrease maternal preload, when indicated, and are safe to the mother and fetus. As with any medication that alters maternal hemodynamics, a drop in blood pressure can result in fetal hypoperfusion and distress. Intravenous drips should be titrated very slowly, and maternal intravascular euvolemia should be maintained.
- ***Anticoagulation***
  - Arterial or venous thrombosis has been reported in as many as 50% of women with PPCM, and the risk likely is related to the degree of chamber enlargement, systolic dysfunction, and the presence of atrial fibrillation. Pregnancy is a hypercoagulable state. Once the diagnosis of PPCM is established, anticoagulation should be considered and continued until at least 6 weeks postpartum.
  - Heparin is the drug of choice, unfractionated heparin (UFH) has an advantage over low molecular weight heparin (LMWH) because of the ease with which the level of anticoagulation with UFH can be assessed by obtaining an activated partial thromboplastin time (aPTT). In addition protamine is not as effective at reversing LMWH in the setting of obstetric bleeding. The decision to use prophylactic dosing versus a high-dose regimen that will elevate the aPTT must be individualized based on obstetric issues and the severity of the disease. Women with atrial fibrillation, documented left ventricular thrombus, an ejection fraction $\leq$ 30%, or severely dilated ventricles should receive full-dose subcutaneous heparin to prevent arterial embolism.
  - Warfarin[17] carries a risk of spontaneous fetal cerebral hemorrhage in the second and third trimesters but is compatible with breastfeeding and is, therefore, the preferred medication postpartum.
  - Due to the occurrence of epidural hematomas, the American Society of Anesthesiology recommends that women on full-dose LMWH not receive spinal or epidural anesthesia for 24 hours after the last injection. Therefore, if cesarean delivery is required, these patients may receive an inhaled anesthetic that can further depress myocardial contractility.

A recent open-label clinical trial assigned a group of women with PPCM to pentoxifylline[18] 400 mg tid.

All patients were treated with diuretics, digoxin, enalapril, and carvedilol.

Maternal pain control is of paramount importance. The uterus can expel the fetus without maternal pushing.

Ideally, the laboring patient will receive early epidural anesthesia, and labor will be augmented with oxytocin, when necessary.

The patient should not be allowed to push, and the obstetrician may apply a low-forceps or a vacuum device to assist with the final stage of the delivery.

- **Route of delivery:**

  Unless the mother is decompensating, managing her medically and waiting for a spontaneous vaginal delivery is reasonable. If she is not responding to medical therapy or if the fetus must be delivered for obstetric reasons, the best plain is to induce labor with the goal of a vaginal delivery.

Surgical Management

Use intra-aortic balloon pumps when indicated. Cardiac transplantation and left ventricular assist devices have been used to treat PPCM. These should be considered for women with progressive left ventricular dysfunction or deterioration despite medical therapy. Most centers will need to consider transfer of such patients to a heart transplant center for such therapy. However, left ventricular function in most of these patients improves over time, and surgical therapy should be delayed if possible.

- **Diet:** Low sodium (2 g/d sodium chloride).
- **Activity:**
  - Strict bedrest may increase the risk of venous thromboembolism and no longer is recommended as a mainstay of therapy.
  - Activity should be limited only by the patient's symptoms. In severe cases of true PPCM, bedrest may promote better uteroplacental perfusion.
- **Complications:**
  - ***Fetal*** distress due to maternal hypoxia and placental hypoperfusion as a result of poor cardiac output[20].
  - ***Maternal*** hypoxia, thromboembolism, progressive cardiac failure, arrhythmias, misinterpretation of hemodynamics, inadequate treatment or testing because of exaggerated concern about the effect on the fetus, misdiagnosis of preeclampsia.
- **Prognosis:**

  Prognosis seems dependent on recovery of left ventricular function. 30% patients return to baseline ventricular function within 6 months and 50% of patients have significant improvement in symptoms and ventricular function[19].

The mortality rate has been 28% in a series of black women from South Africa with PPCM. Cytokine and Fas levels were elevated in the entire cohort and were highest in the women who died.

Mortality rates range from 7-56% and are directly related to recovery of ejection fraction, as with any cardiomyopathy.

- **Patient education:**
  - ***Future pregnancies:***
    - Peripartum cardiomyopathy remains a rare but troubling complication of pregnancy[21]. Current recommended medial therapy remains the standard pharmacologic treatment for heart failure, however, outcomes on conventional therapy vary widely. In some patients inspite of medical therapy chronic cardiomyopathy may persist. Future investigations must focus on clinical and biological predictors of outcomes so that investigative therapy may be targeted to those women predicted not to recover. Given the rarity of this disorder, collaborative international multicenter studies will be of great assistance in the search to improve methodologies to diagnose and treat this troubling disorder.
    - Future pregnancy is not recommended in women with persistent ventricular dysfunction due to concern about the ability of the dysfunctional heart to handle the increased cardiovascular workload.
    - Prior to a subsequent pregnancy[21]

    a. Women should undergo echocardiography and, if findings are normal, dobutamine stress echocardiography should be done.

    b. Pregnancy should not be recommended to women with persistent left ventricular dysfunction.

    c. Patients with normal findings upon echocardiography but decreased contractile reserve should be warned that they might not tolerate the increased hemodynamic stresses of pregnancy.

    d. Patients with full recovery should be told that, while a small chance of recurrence exists, the mortality rate is low and the majority of such women have normal pregnancies.

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