PERIPARTUM CARDIOMYOPATHY

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Case presentation
Review of peripartum cardiomyopathy
Case presentation

Review of peripartum cardiomyopathy
24 yo AA G7P5A1@ 30 3/7 wks
Presents with one week of SOB, cough, DOE ½ block, orthopnea, and PND
PMHx:
- asthma since childhood, and
- mild chronic HTN
Exam: Moderate resp. distress
- BP 120/90, HR 110, RR24, afebrile 217#
Case presentation

- Exam: JVD ~ 6 cm, Bilateral Wheezing and crackles $\frac{1}{2}$ way up, 3+ pitting edema
- Treatment: Solumedrol, albuterol, flovent, lasix. Beta methasone x2
- Echocardiogram
  - Left ventricular end diastolic diameter 77 mm, Left ventricular end systolic diameter 64 mm, Ejection fraction 19%, nl valves, mild Mitral regurgitation
Case presentation

- Treatment optimized with digoxin, lasix, and hydralazine
- 31 4/7 wks
  - NRFHRT
  - BPP 2/10
- Primary low transverse c-section & BTL
  - Right heart catheterization (PCWP=9, CO 6.5)
  - GET
  - 1390 gm male infant with apgars 6 & 8
Case presentation

- Postoperatively, unremarkable course
- Rx: Enalapril, lasix, digoxin
- Echocardiogram
  - LVEDD 68 mm, LVESD 49 mm, EF 35%
- Discharged on POD # 5 in stable condition
Case presentation

Review of peripartum cardiomyopathy
Review of Peripartum Cardiomyopathy (PPCM)
Incidence

- About 1:10,000-15,000 deliveries in the USA
- Higher incidence reported in Japan (1:6,000) and South Africa (1:1,000)
Definition

- Classic
  - Development of cardiac failure in the last month of pregnancy or within 5 months of delivery
  - Absence of an identifiable cause for the cardiac failure
  - Absence of recognizable heart disease prior to the last month of pregnancy

- Additional
  - Left ventricular systolic dysfunction demonstrated by classic echocardiographic criteria, such as depressed shortening fraction or ejection fraction

Time of onset of PPCMP

Demakis JG, Rahimtoola SH. Circulation 44:96;1971
Limitations of NIH Definition

- Based on limited number (27) of pts studied before 1971 in a single institution
- Other studies showed diagnosis of PPCM before the last gestational month and after the 5th pp months
- PPCM can occur in pts with other forms of heart disease (Eisenmenger’s syndrome, VSD, post Fontan surgery, mitral stenosis, congenital CAD)
Modified Criteria

- Development of cardiac failure during pregnancy or within 6 months of delivery
- Can occur in patients with other forms of heart disease
- Absence of determinable cause for heart failure
- Demonstrable impairment in LV systolic function
Timing of Diagnosis

Elkayam et al. NEJM 2001:344;1567
Usual Clinical Presentation

- CHF symptoms and signs
- Arrhythmias
- Embolic Phenomenon
Peripartum Cardiomyopathy

- **Symptoms:**
  - Decreased Exercise Capacity
  - Distended neck veins
  - Tiredness
  - Dyspnea
  - Orthopnea
  - Palpitations
  - Lightheadedness
  - Syncope

- **Signs:**
  - Distended neck veins
  - Pedal edema
  - Palpable RV impulse
  - Pulmonary basilar rales
  - Functional murmurs
Fig. 3 Chest radiograph on admission (left) and 1 month after admission (right) in case 2.
Etiology

- The cause of PPCM is still unknown
- Suggested etiologies
  - Nutritional disorders
  - Immunological mechanisms
  - Myocarditis
  - Tocolytic therapy
  - Stress-activated proinflammatory cytokines (TNF-α or interleukin 1)
  - Abnormalities of relaxin (hormone)
  - Selenium deficiency
Risk Factors

- Maternal age > 30 yrs
- Multiple pregnancies
- African American
- Poor nutrition
- Twin pregnancies
- History of Preeclampsia
- Long-term (> 4 wks) tocolytic tx
Abnormal Immune Response

- Fetal cells may escape into the maternal circulation and not be rejected due to immunosuppressive state of the mother.
- Following PP recovery, these cells are recognized by the recovered maternal immune system. Cytokines are released leading to myocytotoxicity and myocarditis.
- PPCM is associated with high titers of autoantibodies against select cardiac tissue proteins, which supports abnormal immunologic activity as a possible cause.
IVIG for PPCM

- A retrospective study comparing the clinical outcome of 6 women with PPCM treated with IV immune globulin (1 g/kg qd for 2 days) with 11 historical control subjects

Bozkurt et al, JACC 1999;34:177
**Immune Globulin in PPCM**

*Figure 1.* Change in left ventricular ejection fraction (LVEF) during early follow-up. *Improvement significantly greater than with conventional therapy alone, p = 0.042.*

Bozkurt et al. JACC; 1999: 34;177
PPCM and Extensive Thromboembolism

- 27 yo pt with PPCM presented with acute orthopnea, hypotension (80/40 mmHg) and tachycardia (132 bpm) necessitating mechanical ventilation
- Abdominal ultrasound - near complete occlusion of IVC
- TEE - large thrombus floating in RA and RV obliterating the dilated RV
- Treated successfully with rt PA for 24 days

Janssens et al, Heart 1997; 78:515
OUTCOME IN 100 PATIENTS WITH A DIAGNOSIS OF PPCM

- Normalized (LVEF ≥50% at last follow-up) - 45 Patients
- Deteriorated (LVEF <50% at last follow-up) - 55 Patients
- Transplantation - 4 Patients
- Death - 8 Patients

Sliwa et al, JACC 2000;35:701
Predictors of Outcome

- Size of LV
- PA and PCW pressures
- Older age
- High parity
- Baseline EF (29 ± 5% vs. 20 ± 10%)
- Baseline BP (114 ± 14 vs. 102 ± 15 mmHg)

Sliwa et al, JACC 2000;35:701
# Recovery of Left Ventricular Ejection Fraction (EF)

<table>
<thead>
<tr>
<th></th>
<th>EF @ Diag</th>
<th>EF @ F/U</th>
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<tbody>
<tr>
<td>Black Patients</td>
<td>27 ± 12%</td>
<td>41 ± 12%</td>
</tr>
<tr>
<td>White Patients</td>
<td>28 ± 12%</td>
<td>43 ± 15%</td>
</tr>
<tr>
<td>Patients with pre-eclampsia</td>
<td>31 ± 11%</td>
<td>50 ± 10%</td>
</tr>
<tr>
<td>Patients without pre-eclampsia</td>
<td>27 ± 12%</td>
<td>41 ± 15%*</td>
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P value < 0.01 vs. patients with pre-eclampsia

Sliwa et al, JACC 2000;35:701
Treatment

Pharmacologic therapy
- Diuretics
- ACE inhibitors
- Beta blockers
- Digoxin
- Nitrates
- Hydralazine
- Immune globulin?

Non-pharmaceutical therapy
- Low sodium diet
- Fluid restriction
- Modest daily activity
Treatment of severe heart failure

- Dobutamine
- Milrinone
- Dopamine
- Nitroglycerin
- Intraaortic balloon pump
- Left ventricular assist device
- Cardiac transplantation
Diuretics

- Main goal is to treat symptoms by treating the volume overload.
- Usually the first line of treatment
- Daily weights
- Strict I’s and O’s
β-Blockers and Heart Failure

- **Paradigm shift**
- Its improvement on patients with heart failure was first described in 1975, yet heart failure was once considered a relative contraindication to β-blockers because of its negative inotropic effect.
- Also shown to improve mortality along with ACE Inhibitors.
β-blockers: Mechanisms of action

- Decreases HR, allowing for more diastolic fill time, increasing stroke volume and cardiac output.
- Decreases long term catecholamine exposure
- Increases cardiac β-receptors (allowing a smaller amount of catecholamines to have the same effect)
**Cautions:**

- Should not be used as first line, may worsen acute decompensation
- Be careful when systolic BP < 100 mmHg, HR < 80, and when delivering soon
Digoxin and heart failure

- Positive inotrope
- Recently fallen out of favor for treatment of heart failure
- Unlike ACE Inhibitors and $\beta$-blockers, does not improve mortality in patients with heart failure
The DIG trial

- 1997 NEJM large randomized placebo controlled trial.
- 6800 patients with EF < 45% were randomized to Digoxin, diuretics, and ACE Inhibitors versus placebo, diuretics and ACE Inhibitors.
The DIG trial

- Overall mortality was not changed
- There was a 12% decrease in death by heart failure, offset by an increase in death by arrhythmia
- Did decrease the number of hospitalizations
- Women had increased risk of death from digoxin from arrhythmias (may have been related to higher levels of serum digoxin)
Digoxin

- Currently recommendations are to use it for patients still with symptoms not controlled by diuretics and ACE inhibitors and/or β-blockers.
- There are other recommendations to keep serum levels under 1.0 ng/dL.
- Use of β-blockers with digoxin may decrease risk of arrhythmias.
Hydralazine/Nitrates

- Can be used to increase oxygen delivery to the myocardium and to reduce afterload.
- May be used if there is intolerance to ACE Inhibitors (but is a very poor substitute)
One more thing... 

Don’t forget the heparin!!

PPCMP patients with significant left ventricular dysfunction should be anticoagulated.
Therapeutic Considerations
Postpartum

- Use ACE-inhibitors until LV function normalizes
- Role of BB for reverse remodeling or prevention of death not established
- Effect of immunosuppressive therapy unclear
- Temporary mechanical support (IABP, LVAD) may be useful to allow recovery of LV function
Is the normalization of LV function complete post PPCM?
Contractile Reserve in Patients With Peripartum Cardiomyopathy and Recovered Left Ventricular Function

Lampert et al. AM J Ob Gyn 1997; 176:189
"...currently, there is no consensus regarding recommendations for future pregnancy after PPCM."

Peripartum Cardiomyopathy
NHLBI Workshop
Recommendations and Review
(JAMA 2000;283:1183-1188)
Maternal and Fetal Outcomes of Subsequent Pregnancies in Women With Peripartum Cardiomyopathy

44 PATIENTS
60 PREGNANCIES

Group A
Normalized LVEF
42 Pregnancies

Group B
Persistent LV dysfunction
18 pregnancies

Elkayam et al NEJM 2001;344:1567
EFFECT OF INITIAL AND SUBSEQUENT PREGNANCY ON LVEF IN ALL PATIENTS

Elkayam et al NEJM 2001;344:1567: Group A denotes patients who recovered LVEF function in six months, Group B denotes patients who did not.
EFFECT OF INITIAL AND SUBSEQUENT PREGNANCY ON LV FUNCTION IN A SUBGROUP OF PATIENTS WITH >20% REDUCTION IN LVEF

Elkayam et al NEJM 2001;344:1567: Group A denotes patients who recovered LVEF function in six months, Group B denotes patients who did not
Maternal Complications Associated With Subsequent Pregnancy*

Group A: Patients who recovered LVEF function in six months
Group B: Patients with continued dysfunction after six months

* including aborted pregnancies

Elkayam et al NEJM 2001;344:1567
EFFECT OF SUBSEQUENT PREGNANCY ON FETAL OUTCOME

Elkayam et al NEJM 2001;344:1567
EFFECT OF SUBSEQUENT PREGNANCY ON FETAL OUTCOME

Elkayam et al NEJM 2001;344:1567: Group A denotes patients who recovered LVEF function in six months, Group B denotes patients who did not
Mode of Delivery

Elkayam et al. NEJM 2001;344:1567
Conclusions

- Subsequent pregnancies in pts with a hx of PPCM are associated with decreased cardiac function that may be severe and persistent and can lead to CHF and even to death.
- Clinical and functional deterioration in the mother, and fetal growth retardation and loss are more likely in pts with persistent LV dysfunction.

Maternal and Fetal Outcomes of Subsequent Pregnancies in Women With Peripartum Cardiomyopathy NEJM 2001
Conclusions

- Maternal morbidity however, can also occur in pts who normalize LV function prior to the subsequent pregnancy.
- While subsequent pregnancies in pts with PPCM and persistent LV dysfunction are associated with a significant risk of death, such a risk seems small in pts with recovered LV function.

Maternal and Fetal Outcomes of Subsequent Pregnancies in Women With Peripartum Cardiomyopathy NEJM 2001
Postpartum counseling

- Six months postpartum is generally considered the key time to make an evaluation.
- Resolution of cardiomyopathy occurs in approximately 50% of patients in several case series.