Risk of Subsequent Pregnancy in Women with a History of Peripartum Cardiomyopathy

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PPCM and SSP
Case 1

- A 22 YO G 3, P3, Hx of PPCM after her 2nd pregnancy with severe LV dysfunction. Was listed for cardiac transplantation but had a subsequent recovery and had normal EF early in her 3rd pregnancy.

- 4 months after delivery had VF arrest, was successfully resuscitated but developed cardiogenic shock, complicated by multi organ failure.
PPCM and SSP
Case 1

- Echocardiogram demonstrated global LV systolic dysfunction with LVEF of 15%. Cardiac catheterization showed normal coronaries and endomyocardial biopsy ruled out myocarditis.

- She required support by an intra aortic balloon pump and later by a tandem heart pump and was considered for LVAD but gradually improved with LVEF increasing to 45% within 3 weeks.
Patient required long term rehabilitation which resulted in neurological improvement and recovery of LVEF to 60% at 4.5 months.
In the 247 postings analyzed, the subject of pregnancy subsequent to the diagnosis of PPCM was mentioned 102 times, making it an issue that was foremost in the minds of many women.
A survey of members of the ACC that relied solely on a questionnaire that provided information on 67 SSPs

<table>
<thead>
<tr>
<th>Group</th>
<th>Normal LV function</th>
<th>LV Dysfunction</th>
<th>Maternal mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>74.4%</td>
<td>23.6%</td>
<td>2.3%</td>
</tr>
<tr>
<td>N=43</td>
<td></td>
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<tr>
<td>Group 2</td>
<td>37.5%</td>
<td>54.2%</td>
<td>8.3%</td>
</tr>
<tr>
<td>N=24</td>
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</table>
A Survey of the members of the American College of Cardiology identified 60 well documented subsequent pregnancies in women with Hx of PPCM. 44 first SSP were divided into Group 1 – women who normalized LV function prior to pregnancy and group 2 – women with persistent LV dysfunction.
Change in Ejection Fraction

LV recovery >50%
Maternal outcome

- HF Symptoms: 21% (A), 44% (B)
- >20% Decreased LVEF: 21% (A), 25% (B)
- Persistent Dysfunction: 14% (A), 31% (B)
- Maternal Mortality: 0% (A), 19% (B)
Fetal Outcome

Percentage of Cases

- Prematurity: 50% (Orange), 13% (Green)
- Therapeutic Abortions: 25% (Orange), 4% (Green)
Risk of heart failure relapse in subsequent pregnancy among peripartum cardiomyopathy mothers

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b A Mother’s Heart, Peripartum Cardiomyopathy Support Network

61 post PPCM pregnancies identified between 2003 and 2009 from Registry in Haiti (12 cases) and internet support group website “A mother’s heart” in the US (49 cases).

Recovery was defined as achieving LVEF of ≥55%.

Relapse of PPCM was defined as a decrease of EF to ≤45% with or without symptoms of HF in women with pre SSP LVEF of ≥55%, and a decrease of ≥10% for women with LVEF ≤45%.
Incidence or Relapse in Relation to LVEF Before SSP

- < 45% - 49% = 53%
  USC 44%

- 50%+ > 55% = 25%
  USC 21%
## Patients with Normal LV Function Prior to SSP

<table>
<thead>
<tr>
<th>Author (Reference number)</th>
<th>Year</th>
<th>Number of pregnancies</th>
<th>Deterioration of LV function</th>
<th>Symptoms of heart failure</th>
<th>Persistently Decreased LVEF at follow-up</th>
<th>Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elkayam (10)</td>
<td>2001</td>
<td>23</td>
<td>4 (17%)</td>
<td>6 (20%)</td>
<td>2 (50%)</td>
<td>0(0%)</td>
</tr>
<tr>
<td>Avila (12)</td>
<td>2002</td>
<td>6</td>
<td>NA</td>
<td>0 (0%)</td>
<td>NA</td>
<td>0(0%)</td>
</tr>
<tr>
<td>Sliwa (13)</td>
<td>2004</td>
<td>2</td>
<td>2 (10%)</td>
<td>2 (100%)</td>
<td>2 (100%)</td>
<td>0(0%)</td>
</tr>
<tr>
<td>Chappa (14)</td>
<td>2005</td>
<td>4</td>
<td>4 (100%)</td>
<td>4 (100%)</td>
<td>3 (75%)</td>
<td>0(0%)</td>
</tr>
<tr>
<td>Habli (16)</td>
<td>2008</td>
<td>21</td>
<td>NA</td>
<td>6 (28%)</td>
<td>NA</td>
<td>0(0%)</td>
</tr>
<tr>
<td>Chee (21)</td>
<td>2009</td>
<td>2</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0(0%)</td>
</tr>
<tr>
<td>Fett (19)*</td>
<td>2010</td>
<td>35</td>
<td>8 (17%)</td>
<td>NA</td>
<td>1 (12%)</td>
<td>-</td>
</tr>
<tr>
<td>Mandal (20)</td>
<td>2010</td>
<td>5</td>
<td>NA</td>
<td>2 (40%)</td>
<td>1 (50%)</td>
<td>0(0%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>98</td>
<td>18/66 (27%)</td>
<td>20/63 (32%)</td>
<td>9/71 (13%)</td>
<td>0/63 (0%)</td>
</tr>
</tbody>
</table>
# Patients with Persistent LV Dysfunction Prior to SSP

<table>
<thead>
<tr>
<th>Author (Reference number)</th>
<th>Year</th>
<th>Number of pregnancies</th>
<th>Deterioration of LV function</th>
<th>Symptoms of heart failure</th>
<th>Persistently decreased LVEF at follow up</th>
<th>Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elkayam (10)</td>
<td>2001</td>
<td>12</td>
<td>4 (33%)</td>
<td>6 (50%)</td>
<td>5 (42%)</td>
<td>3 (25%)</td>
</tr>
<tr>
<td>Avila (12)</td>
<td>2002</td>
<td>9</td>
<td>NA</td>
<td>4 (44%)</td>
<td>2 (22%)</td>
<td>1 (11%)</td>
</tr>
<tr>
<td>Sliwa (13)</td>
<td>2004</td>
<td>4</td>
<td>4 (100%)</td>
<td>4 (100%)</td>
<td>2 (50%)</td>
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</tr>
<tr>
<td>Chapa (14)</td>
<td>2005</td>
<td>4</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>4 (100%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Fett (15)</td>
<td>2006</td>
<td>16</td>
<td>8 (50%)</td>
<td>8 (53%)</td>
<td>7 (44%)</td>
<td>1 (6%)</td>
</tr>
<tr>
<td>Habli (16)</td>
<td>2008</td>
<td>10</td>
<td>9 (53%)</td>
<td>NA</td>
<td>5 (29%)</td>
<td>1 (6%)</td>
</tr>
<tr>
<td>Hilfiker (18)</td>
<td>2007</td>
<td>12</td>
<td>5 (42%)</td>
<td>NA</td>
<td>6 (50%)</td>
<td>3 (25%)</td>
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<tr>
<td>Kleiner</td>
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<td></td>
</tr>
<tr>
<td>Fett (19)*</td>
<td>2010</td>
<td>26</td>
<td>10 (46%)</td>
<td>NA</td>
<td>5 (80%)</td>
<td>1 (0.4%)*</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>93</td>
<td>40/84 (48%)</td>
<td>22/45 (49%)</td>
<td>36/93 (39%)</td>
<td>11/67 (16%)</td>
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</tr>
</tbody>
</table>
PPCM and SSP
Case 2

- 41 YO female with a history of PPCM diagnosed after her first pregnancy 3 years ago with LVEF of 15%, recovered to 50% and NYHA class I within few months on standard HF therapy.
During 2\textsuperscript{nd} pregnancy she developed VF arrest at 34 weeks gestation, LVEF reduced to 20\%. She was stabilized with medical therapy and delivered by an uncomplicated C section 1 week later without events.
She had a secondary prevention ICD after the delivery. LVEF recovered again to ~50%, she remained asymptomatic for 3 y when she presented with ICD Staph infection with a huge vegetation on the ICD had the ICD explanted surgically.
Outcome in patients with more than one SSP:

One successful pregnancy does not predict outcome of future pregnancies

- Elkayam NEJM 2001: 1 woman with recovered LV function who showed no change in cardiac function during the 1<sup>st</sup> SSP had substantial decrease in EF from 55% to 40% during the 2<sup>nd</sup> pregnancy, which did not recover after a follow up period of 3 months.

- Fett Ann Int Med 2006: 1 patient who had 2 SSP with worsening HF occurring after the second but not after the first.

- Fett Int J Gynaecol Obstet 2010: 1 woman who developed HF during the 2<sup>nd</sup> SSP but not during the first and one mother who had 3 SSPs and relapsed during the 3<sup>rd</sup> only.
Outcome in patients with more than one SSP: Summary

- This limited information suggests that one uneventful SSP cannot predict the risk of later pregnancies in women with a history of PPCM.
Termination Of Pregnancy

- Elkayam et al 2001: mean LVEF decreased by 14% (49±12 % to 42±14 % P<0.001, ) in 35 women who did not have abortions, as compared to a decrease of only 7% in 9 women who had abortions (from 46±13 % to 43±11 %, P=0.20).

- Habli et al 2008: reported worsening of cardiac symptoms related to SSP without abortion in 21% of 19 women with initial EF >25%, compared to what was described as “No end stage cardiac disease” in all 8 women with early abortion.
Effect of termination of pregnancy

- Although information is not sufficient to establish firm conclusions it seems that in patients with severe LV dysfunction early termination of SSP may prevent further deterioration.
Can Relapse of PPCM be predicted

- Best predictor seems to be the EF prior to SSP.
- Normal cardiac response to exercise in women with normal LV function suggested but not likely to be a predictor since relapse in such patients often occurs post partum and is not related to hemodynamic changes during pregnancy.
Patient 3

- 39 YO, G4, P3.
- PPCM after 2\textsuperscript{nd} pregnancy when presented in VT and low EF which completely recovered within 6 m.
- 3\textsuperscript{rd} pregnancy associated with LV dysfunction and ventricular arrhythmias followed by complete recovery. Presented to ED 1 week PP (4\textsuperscript{th} pregnancy) with CHF and EF of 25%.
- Developed VT and VF in the hospital requiring cardioversion.
- Discharged after 2 m of observation with EF of 35%.
Subsequent pregnancy in women with a history of PPCM is associated with a risk of relapse.

The risk is high in women with persistent LV dysfunction who are in addition at risk of deterioration due to the increased hemodynamic burden of pregnancy.
Summary and Conclusions

Persistent LV Dysfunction

- Almost 50% of such patients have been reported to have deterioration during or following SSP leading potentially to major morbidity and even mortality.
Available information also suggests an increased risk of premature delivery and abortions in women with persistent LV dysfunction.

Termination of pregnancy may prevent further deterioration in such patients.
Summary and Conclusions

Normal LV Function

- Complete recovery of LV function prior to the SSP is associated with better prognosis and most women are likely to have normal pregnancy.

- At the same time however, uneventful pregnancy is not guaranteed and a large minority of about 20% will have a relapse of PPCM associated with a substantial fall in LV systolic function.
Although rate of recovery is relatively high and incidence of mortality is low, relapse of PPCM can be associated in some patients with severe deterioration of LV function, CHF, life threatening arrhythmias and the need for aggressive therapy including the use of temporary and permanent devices.
Thank you
See you in CPP 2016

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