Pregnancy in cardiomyopathies and congenital heart disease

Inherited cardiomyopathy

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I have nothing to disclose.
Overall death rates per million maternities UK, 2003–05.

Royal College of Obstetrician and Gynaecologist, 2007
European Pregnancy & Heart Disease Registry

- 1321 patients, at June 2011

- 42% DCM
- 22% previous PP-CMP
- 18% HCM
- 18% other
<table>
<thead>
<tr>
<th>Inherited Cardiomyopathies (CMPs)</th>
<th><em>This estimate of prevalence is based on sparse literature and it is calculated on the assumption that about 25% of DCM are familial</em></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DCM</strong></td>
<td>1 in 2500*</td>
</tr>
<tr>
<td><strong>HCM</strong></td>
<td>1 in 500</td>
</tr>
<tr>
<td><strong>ARVC</strong></td>
<td>1 in 1000-10 000</td>
</tr>
<tr>
<td><strong>LVNC</strong></td>
<td>1 in 5000-10 000</td>
</tr>
<tr>
<td><strong>RCM</strong></td>
<td>very rare</td>
</tr>
<tr>
<td><strong>LQTS</strong></td>
<td>1 in 1000-5000</td>
</tr>
<tr>
<td><strong>Brugada</strong></td>
<td>1 in 2000-5000</td>
</tr>
<tr>
<td>Authors</td>
<td>Years</td>
</tr>
<tr>
<td>------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Turner et al</td>
<td>1969</td>
</tr>
<tr>
<td>Oakley et al</td>
<td>1979</td>
</tr>
<tr>
<td>Siu et al</td>
<td>2001</td>
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<td>Autore et al</td>
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<td>Thaman et al</td>
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<td>Grewal et al</td>
<td>2010</td>
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<tr>
<td>Palojoki et al</td>
<td>2010</td>
</tr>
<tr>
<td>Bauce et al</td>
<td>2005</td>
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<td>Seth et al</td>
<td>2007</td>
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</table>
Complexity of the study on pregnancy in CMP

Retrospective investigation

- Censoring bias: deaths lost (mean age at diagnosis > mean age at pregnancy)
- Cardiac conditions at time of pregnancy?

Prospective investigation

- Unfeasible: rare diseases, low number of pregnancies and rare events
- Selection bias: enrollment of pts with favorable clinical profile
Doctor, I am expecting a child!!! What is my risk?

..aarghh... mortality? morbidity? disease progression?
Dilated Cardiomyopathy (DCM)

- Dilated LV
- Impaired systolic function
# PREGNANCY in DCM*: events

<table>
<thead>
<tr>
<th>Study</th>
<th>Pts n°</th>
<th>Cardiac death</th>
<th>Cardiac event</th>
<th>Heart failure</th>
<th>Arrhythmias</th>
<th>When</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grewal et al. 2010</td>
<td>32</td>
<td>0%</td>
<td>39%</td>
<td>28%</td>
<td>21%</td>
<td>III TRIMESTER puerperium</td>
</tr>
<tr>
<td>Siu et al. 2001</td>
<td>23</td>
<td>4.3%</td>
<td>48%</td>
<td>30.4%</td>
<td>8.6%</td>
<td>--</td>
</tr>
<tr>
<td>Avila et al. 2003</td>
<td>18</td>
<td>10%</td>
<td>30%</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Bernstein et al. 2001</td>
<td>8</td>
<td>0%</td>
<td>25%</td>
<td>25%</td>
<td>-</td>
<td>III trimester puerperium</td>
</tr>
<tr>
<td>Palojoki et al 2010</td>
<td>5</td>
<td>0%</td>
<td>20%</td>
<td>--</td>
<td>--</td>
<td>puerperium</td>
</tr>
</tbody>
</table>

* peri-partum CMP not included

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Grewal et al. JACC 2009; 55: 45-52  
Siu et al. Circulation 2001; 104:515-521  
Palojoki et al. Eur J Heart Fail 2010; 12: 630-33
PREGNANCY in DCM: risk factors

Grewal et al. JACC 2010

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Adverse cardiac event rate (%)</th>
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<tr>
<td>NYHA III-IV</td>
<td>83</td>
</tr>
<tr>
<td>LV dysfunction with EF&lt;45%</td>
<td>72</td>
</tr>
<tr>
<td>Previous cardiac event</td>
<td>67</td>
</tr>
<tr>
<td>Any 3 risk factors</td>
<td>64</td>
</tr>
<tr>
<td>No risk factors</td>
<td>0</td>
</tr>
</tbody>
</table>

Grewal et al. JACC 2010
Cardiac Outcomes in Pregnant Versus Nonpregnant Women With Significant LV Systolic Dysfunction

Increased hemodynamic load

Drug withdrawal (ACE inhibitors, AT II antagonists, diuretics)

Log rank p value = 0.001

Grewal et al. JACC 2010
Outcome in pregnancy and type of DCM

**Etiology**
- No evidence to determine whether pregnancy might be better tolerated in certain DCM

**Timing**
- DCM complicating pregnancy early had outcome similar to PPCM, with a maternal mortality up to 9%

Severe LV dysfunction
NYHA III-IV

30 ≥ EF <45%
Prior cardiac event

EF ≥ 45%
NYHA I-II

Pregnancy not advised
MORTALITY
High risk
MORBIDITY
Low risk
Hypertrophic Cardiomyopathy (HCM)

- Impaired diastolic function
- LVOT obstruction
- Sudden death
- Volume overload
- Increased heart rate
- Changes in vascular volume and resistances
- Hypotension
- Syncope
- Pulmonary congestion
## PREGNANCY in HCM: events

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<td>43%</td>
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<tr>
<td>Probst et al. 2002</td>
<td>41</td>
<td>0%</td>
<td>0%</td>
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<tr>
<td>Autore et al. 2002</td>
<td>100</td>
<td>2%</td>
<td>15%</td>
<td>15%</td>
<td>1% AF 1% syncope 0% VT</td>
<td>III TRIMESTER, DELIVERY</td>
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<tr>
<td>Thaman et al. 2003</td>
<td>127</td>
<td>0%</td>
<td>27.5%</td>
<td>20.5%</td>
<td>0.7% AF 1.5% syncope No VT</td>
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<td>10</td>
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PREGNANCY in HCM: mortality

2 cases:

1. Massive LV hypertrophy, severe LV outflow obstruction, heart failure in previous pregnancy: died suddenly 4 days after delivery.

2. Malignant family history of sudden death and end stage disease, ventricular arrhythmias during labour: died immediately after emergent caesarian delivery despite cardiopulmonary resuscitation attempts.

JACC 2002;40:1864-9
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Outcome of HCM in pregnancy: specific issues

No increase in major ventricular arrhythmias

No progression of the disease
PREGNANCY in HCM

Severe LV obstruction, NYHA III-IV
- Pregnancy not advised
  - MORTALITY: High risk
  - MORBIDITY: Low risk

LV obstruction, Severe LVH
- MORTALITY: High risk

All other cases
- Low risk
C. O. 31 yrs

Risk profile:

- Family history of SD death (mother at 48 yrs)
- Massive LVH: 34 mm
- Nonsustained VT
- ABPR During Exercise

ICD implanted in 2003

Appropriate discharge (VF) of ICD in 2010

Pregnancy at 30 yrs (2011)

Premature birth at 30° week

Cesarean section with epidural anesthesia
Arrhythmogenic Right Ventricular Cardiomyopathy (ARVC)

Ventricular arrhythmias

RV dilation and dysfunction
### PREGNANCY in ARVD

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<th>n°</th>
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<th>Heart failure</th>
<th>Arrhythmias</th>
<th>When</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bauce et al. 2006</strong></td>
<td>6</td>
<td>0%</td>
<td>17%</td>
<td>0%</td>
<td>17%, 1 SVT</td>
<td>III TRIMESTER PUERPERIUM</td>
</tr>
<tr>
<td><strong>Rigato et al. 2012</strong></td>
<td>27</td>
<td>0%</td>
<td>14%</td>
<td>0%</td>
<td>14%, 1 SVT</td>
<td>III TRIMESTER PUERPERIUM SECOND PREGNANCY</td>
</tr>
<tr>
<td><strong>Case report</strong></td>
<td>2</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>--</td>
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</table>

ESC Congress 2012
Pregnancy in ARVD

Careful clinical follow-up in the last trimester and puerperium

Do not withdraw BB during puerperium and breastfeeding
Long QT syndrome (LQTS)

Syncope

Ventricular arrhythmias
Sudden death
PREGNANCY in LQTS
(International LQTS Registry)

Annual Cardiac Event Rate

Pre-pregnancy
Pregnancy
Post-partum

- Syncope
- ACA or LQT death

n° 391 pts

JACC 2007; 49: 1092-8
PREGNANCY in LQTS: the genotype

![Bar graph showing annual cardiac event rate for LQT1, LQT2, LQT3, and nongenotyped groups, with different colors for pre-pregnancy, pregnancy, and post-partum periods.]

JACC 2007; 49: 1092-8

n° 391 pts
HORMONES AND ARRHYTMIAS

↓ β1 expression

↑ adrenergic activity

↑ β1 expression

↓ β1 expression

RISK OF ARRHYTMIAS

HORMONES AND ARRHYTMIAS

PREGNANCY

BIRTH

Hormones levels

estrogens

progesteron
Doctor, I would like to have a natural delivery!!!
Up to 85% of deliveries are vaginal Cesarean delivery was mainly performed for obstetric indication

- ECG monitoring (labour, delivery, early post partum)
- Fluid supply
- Check electrolytes

- Adequate pain management
- Slow titration of epidural anaesthesia
- General anaesthesia for urgent/emergent cesarean delivery

Krul et al. EJHF 2011
Grewal et al. JACC 2010
Autore et al. JACC 2002
"Doctor, what is the risk for the baby?"

...gulp...
Fetal and neonatal complications are more common in women with high risk pregnancy.

Arq Bras Cardiol 2007; 88(4) : 423-428
J Am Coll Cardiol 2010;55:45–52
Doctor, I forgot to tell you that I have an ICD...
ICD AND PREGNANCY

44 pts
18% CMPs
95% abdominal ICD

1 inappropriate shock
10 appropriate shocks

Other complications:
• Tenderness ICD pocket
• Generator migration
• Pericarditis (epicardial patches)

14 pts
72% CMPs

No inappropriate shock
1 appropriate shock

Other complications:
• Atrial lead fracture
• Lead-related thrombus

Shuler PK et al. Europace 2012 Jun 27
The presence of an ICD does not itself contraindicate future pregnancies.

Treatment with an ICD should also be considered during pregnancy to protect the mother’s life.

Pregnancy seems not to increase the risk of major ICD complications.
Genetic counselling

The clinical relevance of the DNA analysis in the context of pregnancy is low.

Clinical management is mainly guided by the presenting phenotype.

Prenatal screening is feasible but not appropriate in most cardiomyopathies.

ESC WG Myocardial and Pericardial Diseases 2010
ESC Guidelines 2011
Conclusions

☑ Inherited CMPs cannot be considered as a contraindication to pregnancy.

☑ Pregnancy is well tolerated in a large proportion of patients with inherited CMPs.

☑ Maternal mortality is rare but can occur in high risk patients.

☑ Risk stratification is mainly based on evaluation of clinical and hemodynamic conditions.
There is a lot we do not know about pregnancy in CMPs

Registries and multicentre studies are needed to improve the state of knowledge