Pregnancy in Non-Peripartum Cardiomyopathy

Avraham Shotan, Lubov Vasilenco, Michael Shochat, Mark Kazatsker, David Blondheim, Yaniv Levi,

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Heart Institute, Hillel Yaffe Medical Center, Hadera

Celia Oakley et al: **Expert consensus document on management of cardiovascular diseases during pregnancy** Euro Heart J 2003:24:761-781

המרכז הרפואי הלל יפה

Dilated Cardiomyopathy

Patients with DCM should be advised against pregnancy, because of the high chance of deterioration both during gestation and peripartum

If pregnancy occur, termination should be advised if EF is <50% and/or LV dimensions are definitely above normal

If termination is refused the patients must be seen frequently and LV function be checked by echo.

Early admission to hospital is wise especially as both ACE-I and Angiotensin II antagonists are contraindicated and treatment options are much more limited than outside pregnancy

Rania V.: June 2004

24 yrs old, a teacher for science in Rahat (a Beduine city)

At the age of 10 months she was diagnosed as Dilate CMP

Treatment:	Carvedilol	12.5 mg BID
	Captopril	25 mg TID
	Digoxin	0.25 mg QD

During the last decade she is active and asymptomatic – NYHA FC I

Echo: LVEF 35-40%, MR +2

Can she get pregnant?

If positive, she plans to get married!

המרכז הרפואי
הלל יפה

Rabin Medical Center

Petach Tiquva

המרכז הרפואי
הלל יפה

9 Feb 2005

To: **Dr. Shotan**

From: **Dr. Tuvia Ben Gal – Heart Failure unit**

This patient is under our surveillance due to Non-Ischemic CMP. Asymptomatic

She expressed her will to get pregnant, but as her left ventricle is significantly impaired,

I expressed my reservations, specifying the increased risk.

…

Holter: Short runs of asymptomatic VT.

Currently it seems that she doest not need ICD

המרכז הרפואי הלל יפה

Rania V.: 24 Nov 2005

12th week of **twin pregnancy**

Asymptomatic

Treatment:	Carvedilol	12.5 mg BID
	Captopril	discontinued at 6th week
	Digoxin	0.25 mg QD

ECG: Sinus, VPB's, normal P wave, PR 0.19, LBBB (QRS 0.14 sec)

30 Jan 2006 - 22nd week

Asymptomatic

Echo: LVEDD 62, ESD 54, LA 40 mm

LVEF(Simpson) 35% with diffuse hypokinesis

Moderate diastolic dysfunction

MR – +3 (moderate-severe)

המרכז הרפואי
הלל יפה

At the end of 34th week dyspnea, Initially during effort later at rest

6 May 2006 36th week

She was hospitalized in our high risk pregnancy unit.

On admission: BP 120/70, p 82 regular, lungs are clear, SM 3/6.

Hb – 9.4 gr/dL

Echo: Severe LV dysfunction (LVEF <30%), MR +4 (severe), Sys PAP 50 mmHg

I.V. Furosemide 40 mg BID was added

8 May 2006 - 36th week

She underwent **CS** under epidural anesthesia without SG catheter.

She gave birth to 2 boys: 1,926 gr and 1,774 gr with normal Apgar score and PH.

The operative course was uneventful. Postoperatively she got 2 PC

We continued diuretics, carvedilol and digoxin and renewed captopril

Hb – 11.0 gr/dL

She became asymptomatic and was discharged on 15 May 2006 (8th PP day)

Rania V.: 25 May 2006

המרכז הרפואי
הלל יפה

2.5 weeks PP

Asymptomatic

Echo: LVEDD 72 (baseline 62), ESD 59 (54), LA 45 (40) mm , LVEF <30%, MR +4, Sys PAP 45 mmhg

10 week PP

Asymtomatic. She gets help at home.

We discussed the timing of mitral valve surgery

The question of a subsequent pregnancy was raised.

I explained that currently it is contraindicated.

Rania V.: 23 Aug 2006

המרכז הרפואי
הלל יפה

She didn't show up to the scheduled visit

I called her husband few days later

On the morning of 23 Aug 2005 (**15th week PP**).

R. entered the bathroom to wash one of her babies

A noise was heard. She was found on the floor

Mobile CCU team found her in VF

CPR was unsuccessful

המרכז הרפואי
הלל יפה

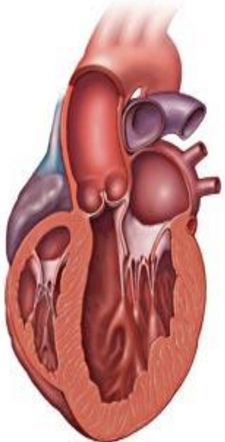
Suggested topic for CPP 2014 congress in Venice:

Management of women with heart disease during pregnancy:
what do we know,
what do we think we know,
and what we would like to know?

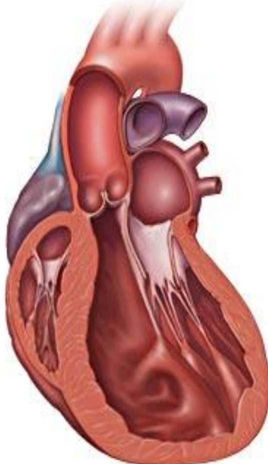
Samuel Siu

Toronto, Canada

Normal heart



Heart with
dilated cardiomyopathy



Grewal J, Siu SC, Ross HJ, Mason J, Balint OH, Sermer M, Colman JM, Silversides CK

Pregnancy Outcomes in Women With Dilated Cardiomyopathy

J Am Coll Cardiol 2010;55:45–52

- 12/1994 – 7/2008
- 32 women: 27 idiopathic DCM (84%)
  5 doxorubicin-induced CMP (16%)
- 4 – HF episode before pregnancy: 2 mild, 1 moderate, 1 severe — LV systolic dysfunction
- NYHA FC

NYHA FC	
I	24 (67%)
II	6 (17%)
III-IV	6 (17%)

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הלל יפה

Table 1	Baseline Characteristics of Pregnant Women (n = 36)
Clinical	
Pregnancies	36
Women	32
Nulliparity	16 (44)
Age at enrollment, yrs	32 (27–35)
Other cardiac defects	
Secundum ASD*	3 (8)
MVP (>mild MR)	3 (8)
History of cardiovascular events	
Heart failure	4 (11)
Transient ischemic attack	1 (3)
Supraventricular tachycardia	2 (6)
Atrial fibrillation/flutter	2 (6)
Other medical conditions	
Hypertension	3 (8)
Hyperlipidemia	1 (3)
Smoking history	4 (11)
Epilepsy	1 (3)
Cancer†	5 (14)
Prior cardiac intervention	1 (3)

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המרכז הרפואי
הלל יפה

Cardiac medications at first antenatal visit	
ACE inhibitors	4 (11)
Beta-blockers	13 (36)
Digoxin	8 (22)
Diuretic	7 (19)
Echocardiographic	
Left ventricular systolic dysfunction	
Mild	18 (50)
Moderate	8 (22)
Severe	10 (28)
Moderate/severe MR	10 (28)
Moderate/severe TR	7 (19)

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- **14 of 36 (39%)** pregnancies **(**up to 6 mths PP) were complicated by **≥1 adverse maternal cardiac** event**.**
- **1 – HF** at 13 wks followed by **NSVT → therapeutic abortion.** 24 wks afterwards recurrent VT.
- **Atrial fibrillation / flutter** in **4 – antepartum** (17, 23, 28, and 36 wks); **1** during **labor & delivery.**
- **HF** in **3** during **antepartum** (20, 28, 38 wks); **1** during **labor & delivery; 4 post-partum** (2 & 5 d, 12 & 16 wks).
- **TIA** in **1** at 19 wks.
- **All** adverse maternal cardiac events were **successfully managed** with **medical therapy.**

Table 2 Maternal Adverse Cardiovascular Outcomes During Pregnancy

	Any Cardiac Event	Cardiac Arrest or Death	Heart Failure	Arrhythmia	Stroke/TIA	Angina or MI
Total	17	0	9	7	1	0
Timing of events						
Antepartum	10	0	4	5	1	0
Labor and delivery	2	0	1	1	0	0
Post-partum (6 months)	5	0	4	1	0	0

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הלל יפה

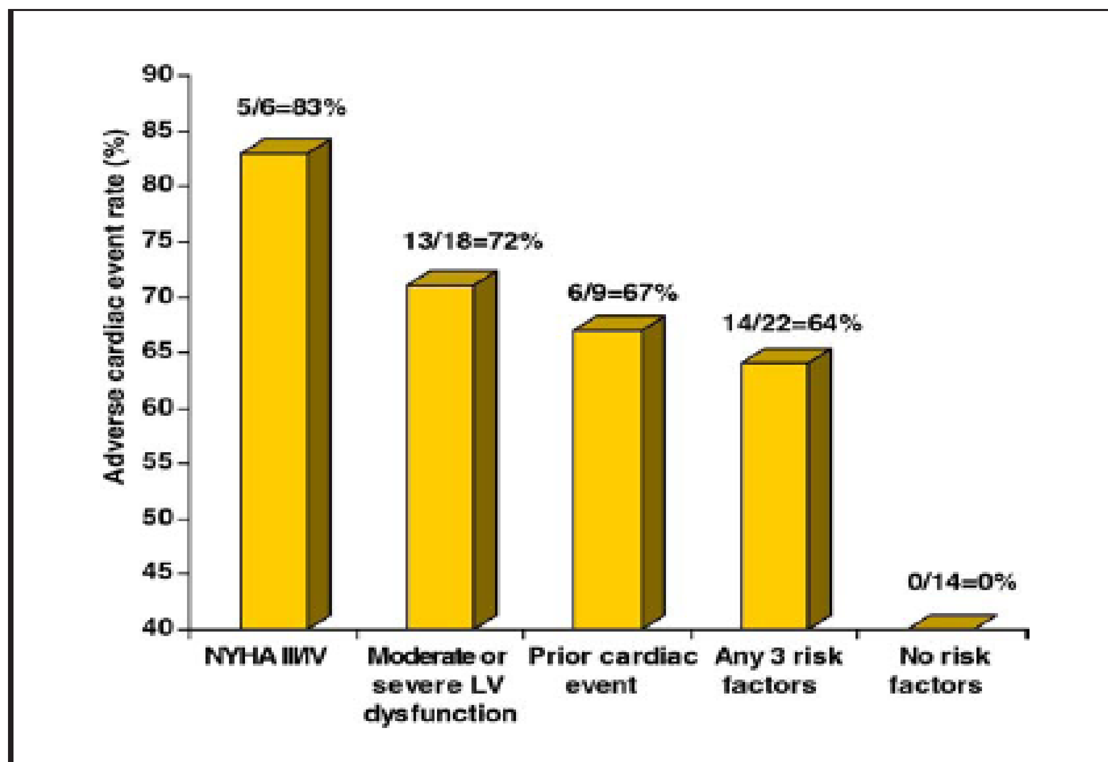

Figure 1 Incidence of Adverse Cardiac Events According to Maternal Risk Factors

The first 3 risk categories are not mutually exclusive. Any risk factor refers to the presence of any 1 of the 3 risk factors (moderate or severe left ventricular [LV] dysfunction, New York Heart Association [NYHA] functional class III or IV, previous cardiac events).

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המרכז הרפואי
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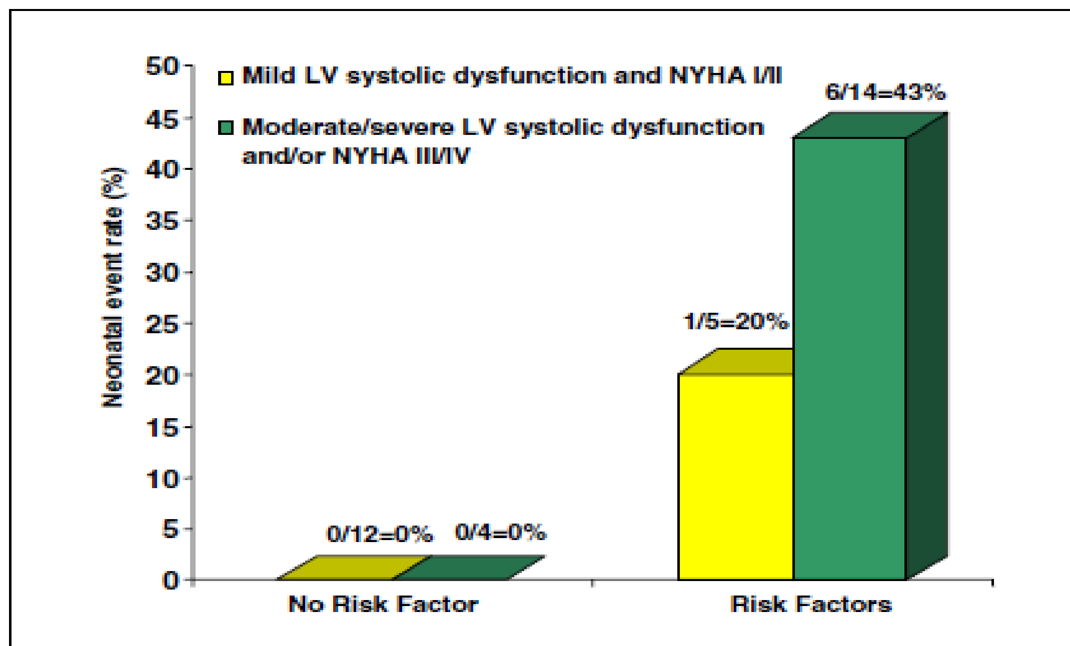

Figure 2 Frequency of Neonatal Events in Women With and Without Risk Factors

Yellow bars represent women with both mild LV systolic dysfunction and NYHA functional class I or II. **Green bars** represent women with moderate or severe LV systolic dysfunction and/or NYHA functional class III or IV. Risk factors of adverse fetal and/or neonatal events included both obstetric and nonobstetric parameters. Obstetric risk factors include a history of premature delivery or rupture of membranes, incompetent cervix, cesarean delivery, and during the present pregnancy, intrauterine growth retardation, antepartum bleeding >12 weeks gestation, febrile illness, and uterine/placental abnormalities. Nonobstetric risk factors include smoking, anticoagulation use, multiple gestation, and maternal age <20 and >35 years. Abbreviations as in Figure 1.

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Pregnancy Outcomes in Women With Dilated Cardiomyopathy

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המרכז הרפואי הלל יפה

Table 4 Obstetric and Fetal Outcomes

	Pregnancies, n (%)
Adverse obstetric outcomes	
Total events*	5/36 (14)
Pre-eclampsia	3 (8)
Post-partum hemorrhage	2 (5)
Noncardiac death	0 (0)
Adverse fetal outcomes	
Total events†	7/35 (20)
Live birth weight <2,500 g	5 (14)
Pre-term delivery (<37 weeks)	5 (14)
Intraventricular hemorrhage	0 (0)
Respiratory distress	1 (3)
Fetal death‡	1 (3)
Neonatal death	0 (0)
Intrauterine growth retardation	1 (2)

*Percentage of total 36 pregnancies that had an obstetric complication. †Percentage of 35 pregnancies that had a neonatal complication (36 pregnancies minus the therapeutic abortion). Each twin and triplet pregnancy was counted as a single pregnancy: the twins and triplets all had low birth weight (<2,500 g), and the triplets were also premature (<37 weeks). ‡Occurred at 28 weeks of gestation in a woman who developed pulmonary edema.

Short and Long Term Outcome of Pregnant Women with Preexisting Dilated Cardiomyopathy – NTproBNP & Echocardiography Guided Study

Blatt A, Svirski R, Morawsky G, Uriel N, Neeman O, Sherman D, Vered Z, Krakover R. **IMAJ 2010; 12: 613–616**

- Period: June 2005 to October 2006
- Aim: Usefulness of prospective serial echocardiographic follow-up and plasma NT-pro-BNP
- Population: **7** women with **DCM** either known or diagnosed in the first trimester

Table 1. Characteristics of patients with preexisting dilated cardiomyopthy

Age (yrs)	33.5 ± 3.3
Ethnicity	
Caucasian	6
Black	1
Risk factors	
Hypertension	1
Diabetes mellitus	1
Gestation-induced	
Hypertension	0
Diabetes mellitus	0
Hypothyroidism	4
NYHA Functional class	
I	4
II	3
Prior heart failure acute decompensation	2
Medication	
None	3
Beta-blocker	2
ACE/ARB	4
Diuretic	1

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המרכז הרפואי
הלל יפה

- The delivery and post-partum were **complicated in 3 patients (42%)**
- **2 - acute heart failure** resolved conservatively
- **1 - major pulmonary embolism**
- **LVEF** was stable

	Baseline	35% ±2.8
	30 weeks	33% ±2.9
post-partum	1 day	35% ±2.8
	90 days	34% ±3.1

- The **NT-ProBNP** levels raised significantly in the peripartum in all 3 patients with complications.

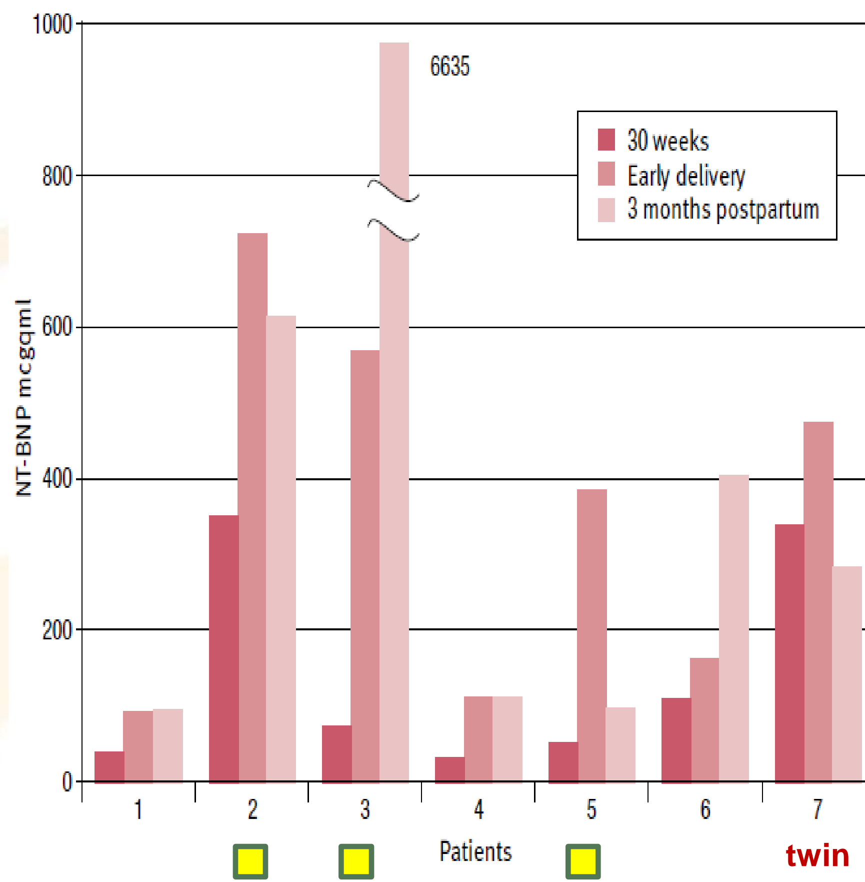


Figure 2. NT-BNP levels during pregnancy and postpartum

Cardiomyopathies

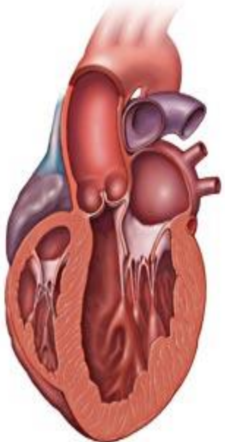
המרכז הרפואי
הלל יפה

Carole W. Warnes: Pregnancy and Heart Disease

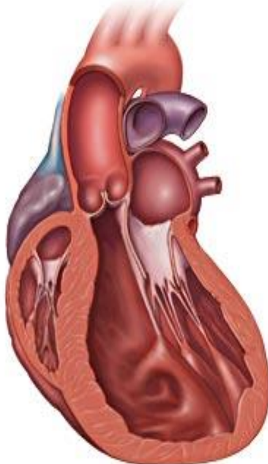
Braunwald's Heart Disease

9th edition, 2012; p 1776

Normal heart



Heart with dilated cardiomyopathy



- **Patients with idiopathic dilated CMP are usually counseled not to have pregnancy if LVEF is <40%**
- **Because ACE-I are contraindicated in pregnancy, ventricular function must be assessed without the drug**
- **Exercise testing may be helpful because women with LVEF 40-50% may not tolerate pregnancy if they have poor functional aerobic capacity**
- **Early delivery may be necessary**

European Heart Journal (**2011**) 32, 3147–3197
doi:10.1093/eurheartj/ehr218

ESC Guidelines on the management of cardiovascular diseases during pregnancy

The Task Force on the Management of Cardiovascular Diseases during Pregnancy of the European Society of Cardiology (ESC)

- **Differentiation from PPCM is supported by the time of manifestation.**
- If not known before conception, the condition is **most often unmasked during the first or second trimester** when the haemodynamic load is increasing. A **family history** of DCM speaks in favour of the DCM diagnosis and against PPCM.
- The few cases of classical DCM in pregnancy describe marked deterioration during pregnancy.
- Secondary cardiomyopathies, such as infiltrative or toxic cardiomyopathies, or storage diseases and other rare forms, can also manifest themselves in pregnancy. Hypertensive or ischaemic heart diseases can also cause similar clinical pictures.
- **Maternal and offspring risk Women with DCM should be informed about the risk of deterioration of the condition during gestation and peripartum. (IC)**
  They should be councelled based on individual risk stratification.
- **If pregnancy occurs, LVEF<40% is a predictor of high risk, and close monitoring in a tertiary centre should be advised.**
- **If LVEF is <20%, maternal mortality is very high, and termination of the pregnancy should be considered.**

המרכז הרפואי
הלל יפה

ROPAC

European Registry on Pregnancy and Heart Disease

Euro Heart Survey Programme

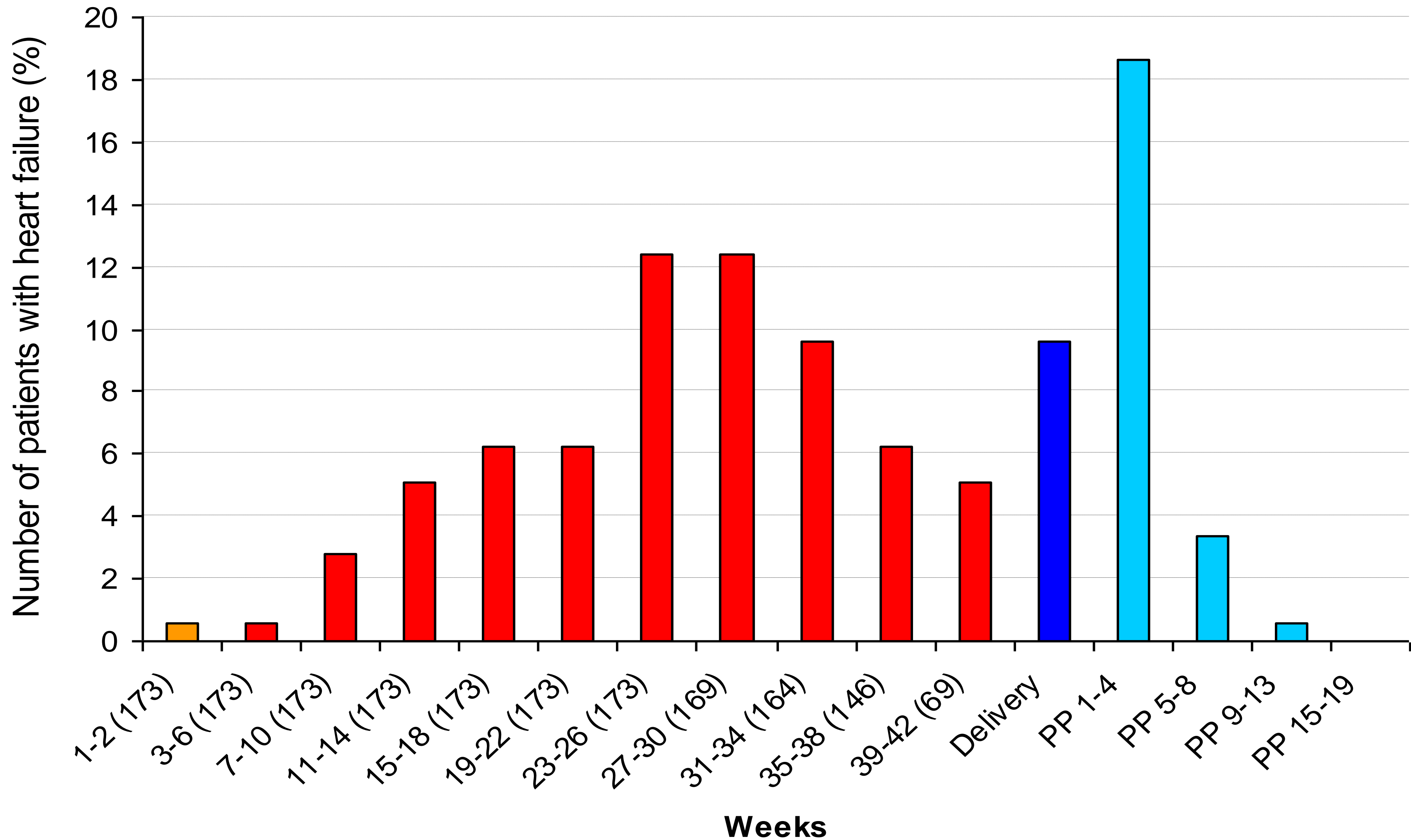
Countries participating in ROPAC

המרכז הרפואי
הלל יפה

Participating countries in Pregnancy & Heart Disease II
ESC National Cardiac Societies invited, not yet replied
ESC Affiliated Cardiac Societies (not invited or not replied)

Results of ROPAC: when does heart failure occurs?
173 patients (13%) with heart failure

המרכז הרפואי
הלל יפה



Maternal outcome?

	Patients with HF (n=173)	Patients without HF (n=1148)	p value
Maternal mortality (%)	4,8	0,5	<0,001
Cardiac			
Atrial fibrillation (%)	1,2	0,9	0,71
Ventricular arrhythmias (%)	2,9	1,8	0,35
Thrombo-embolic events (%)	1,2	0,3	0,14
Endocarditis (%)	1,2	0,1	0,006
Bleeding complications during pregnancy (%)	2,9	1,4	0,14
Bleeding complications post partum (%)	4,6	5	0,85
Obstetric			
Intra uterine growth retardation (%)	13	4,6	<0,001
Pregnancy induced hypertension (%)	2,9	2,4	0,67
Pre-eclampsia (%)	12	1,9	<0,001

Fetal outcome

המרכז הרפואי
הלל יפה

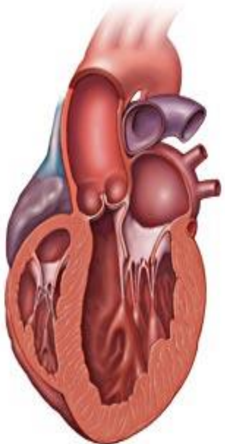
Fetal outcome	Patients with HF (n=173)	Patients without HF (n=1148)	p value
Fetal death (%)	4,6	1,2	0,001
Neonatal death (%)	0,7	0,6	0,92
Premature birth < 37 weeks (%)	30	13	<0,001
Birthweight < 2500 gram (%)	24	13	<0,001
Apgar score < 7 (%)	13	9,3	0,10
Adjusted mean birthweight (grams)	3328	3358	0,46

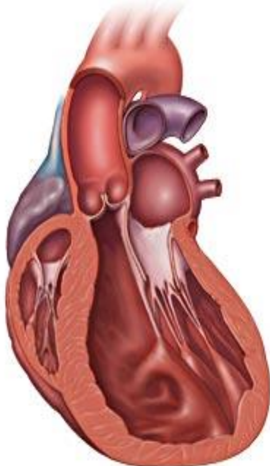
More data is needed!

Help including patients!

eorp@escardio.org

המרכז הרפואי הלל יפה





המרכז הרפואי
הלל יפה

The Risk of Pregnancy in Dilated CMP

1. Malignant arrhythmias
2. Pump failure
3. ↑ Non-cardiac morbidity, like: TIA/CVA, PE

המרכז הרפואי
הלל יפה

- I.H.
- 27 yr, a teacher
- Usually healthy
- Jogging – 5 km 3/week
- No family history
- 2007 – Spontaneous abortion at 21st week
- She presented at 4/2009 with labor at her 38th week (2nd pregnancy)

המרכז הרפואי
הלל יפה

I. H.

During epidural catheter insertion severe dyspnea

Physical Examination: severe pulmonary congestion, HR 140, O2 sat 82%

Treatment: I.V. Furosemide + Oxygen → HF symptoms and signs resolved

Normal vaginal delivery

CT angio – no PE

Echo – LVEF < 30%, LVEDD - 56, ESD - 51,

severe diastolic dysfunction (restrictive), sys PAP – 45 mmHg

Dyspnea on mild effort (phone conversation) since gestational 20th week

I. H.

DD: PPCM or DCM

המרכז הרפואי הלל יפה

Bromocriptine	for 6 months
Carvedilol	50-100 mg /d
Ramipril	10mg /d
Digoxin	0.125 mg 6/w
Isosorbide mononitrate	100 mg /d
Spironolactone	25 mg /d

Levosimendan IV course (potential improving restriction)

Asymptomatic

No change during 2 years of follow-up

CRTD was implanted

I didn’t approve a subsequent pregnancy. Surrogacy program – 2 yrs

Our Experience

המרכז הרפואי הלל יפה

	Age	Diagnosis	Echo	Gestation		Delivery	Outcome
RV 2006		Dilated CMP Age 10 mths	LVEF 40%, EDD 62 MR +2, Diastolic dysfunction	Twin	Deteriorate 34th w	CS 36th w uneventful	Sudden death 15 w pp
IH 2009	27	Dilated CMP 38th w Symptoms 20th w PPCM vs. DCM	LVEF <30%, EDD 56 Restrictive pattern		Pulm edema 38th w	Normal vaginal 38th w	
LS 2012	35	1995 – acute CP ↑ST, CPK 10,000 Normal coronaries 1997 syncope - ICD	LVEF <30%, EDD 60				
MS	26	Age 3 Wilm's- Surgery, Chemotherapy adriamycin Age 18 LVEF 35%, NYHA I	LVEF – 25%, EDD 52 No diast dysfunction				
KAS	38	LVD post 1st preg PPCM vs. DCM	LVEF 40% MR +1-2				

המרכז הרפואי הלל יפה

- K.A.S. 36 yr
- Few weeks after 1st delivery LV dysfunction – PPCM vs. DCM
- 2nd marriage younger husband
- Asymptomatic. Walking, dancing.
- LVEF 40%, MR +1-2
- 2011 – 2nd pregnancy. At 28th w dyspnea and mild congestion after a birtday party
- Hospitalized: LVEF 30%, MR +3. I.V. Furosamide, triamcinolone
- Discharged after 2 days. Asymptomatic.
- Repeated echo – LVEF 40% MR +1-2.
- Bio-impedance – return to baseline
- Delivery at 39th week – normal vaginal.
- Post-partum - uneventful

המרכז הרפואי הלל יפה

- K.A.S. 38.5 yr
- 7/2012 – 8th w - 3rd pregnancy
- Asymptomatic
- B.P. 85/60, pulse 90 irregular.
- Lungs are clear, SM 2/6 at erb and apex
- ECG – Sinus rhythm, Non-Sustained VT 3-5 beats.
- She refused abortion.
- 9th w – ICD (CRTD + Plug) was implanted
- Bisoprolol 2.5 mg QD,
- Digoxin 0.125 mg QD,
- Iron
- Bio-impedance throughout 3rd pregnancy no decline (no HF)

KAS - 3rd pregnancy

27th w

Practically asymptomatic. NYHA FC I

Device interrogation: Numerous NSVT

10 episodes of VF 19-40 s'

5 DC shock – she felt once or twice short "pintch"

Attempt 1

(AS) 800 AS 868 (AS) 835 (AS) 790 (AS) 733 AS 673 AS 723 AS 710 AS 678 AS 643 AS 663 AS 685 AS 700 AS 653 AS 655 AS 663 AS 570

PVC 588 RVS 580 RVP 1000 VT-1 388 VF 258 VF 220 VF 208 VF 245 VF 225 VF 205 VF 243 VF 198 VF 210 VF 195 VF 203 VF 195 VF 180 VF 173 VF 158 VF 225 VF 205 VF 208 LVS 55 VF 238 VF 203 VF 178 VF 215 VF 198 VF 255 RVS 468 RVS 763 RVS 500 RVS 835 RVS 573 -- RVS 585

PVP→ PVP→ PVP→ V-Epsd V-Detect Chrg Chrg Dvrt

3 of 10 Page 4 of 10 Page

Our Experience

המרכז הרפואי
הלל יפה

	Age	Diagnosis	Echo	CRTD	Gestation		Delivery	Outcome
RV 2006		Dilated CMP Age 10 mths	LVEF 40%, EDD 62 MR +2, Diastolic dysfunction		Twin	Deteriorate 34th w	CS 36th w uneventful	Sudden death 15 w pp
IH 2009	27	Dilated CMP 38th w Symptoms 20th w PPCM vs. DCM	LVEF <30%, EDD 56 Restrictive	2012		Pulm edema 38th w	Normal vaginal 38th w	Surrogacy
LS 2012	35	1995 – acute CP ↑ST, CPK 10,000 Normal coronaries 1997 syncope - ICD	LVEF <30%, EDD 60	Upgrade 2012	2013 spontaneous abortions (2) at 8th w			
MS 2013	26	Age 3 Wilm's- Surgery, Chemotherapy adriamycin Age 18 LVEF 35%, NYHA I	LVEF – 25%, EDD 52 No diast dysfunction	Recomm.				Surrogacy
CA	38	LVD post 1st preg PPCM vs. DCM	LVEF 40% MR +1-2	2012 + plug	2011 2012	Deteriorate HF 28th w 2nd p NSVT 27th VF	Vaginal 39th w Vaginal 40th w	Successful deliveries

Pregnancy in DCM – Our limited experience

המרכז הרפואי
הלל יפה

- Associated with substantial risk to both – mother and fetus (IC)
- Preconception evaluation and preventive measures, like:
  - ICD/CRTD
  - Discontinue ACE-I, ARBs at 5-6th w
  - Correct significant valvular / congenital malformations
- CRTD / ICD – Stronger indication / Lower threshold
- Close monitoring – frequent evaluation
  - Clinical
  - Echocardiographic
  - BNP
  - Bio-impedance
  - Telemedicine, Carelink
- Try to sleep better at night and wish the patient and yourself "*Mazal & Bracha*"

CPP 2014

The 3rd International Congress on
Cardiac Problems in Pregnancy
Hilton Molino Stucky Venice, Italy
February 20-23, 2014

PLAN TO BE WITH US
FEBRUARY 20-23, 2014
www.cppcongress.com

Thank You

תודה רבה