The Implications of Aortic Root Dilation and ITP in Term Parturient

Sona Doshi, Susan Alvarez

In the past few years, there has been an upswing of women with known congenital cardiac defects carrying their pregnancy to term. Due to the intravascular and hemodynamic changes of pregnancy, the mode of delivery and appropriate intervention must be discussed amongst the OB, OB anesthesiologist, and care team in order to minimize risk of cardiac decompensation and maintain safety of the fetus and mother. Recently, our team was presented with the case of a 29 year old G2P1 female with a known history of congenital bicuspid aortic valve treated with the Ross procedure at age 11 with subsequent aortic insufficiency, and recently diagnosed immune mediated thrombocytopenic purpura. Upon presentation, the patient was at 35 weeks of gestation, new onset aortic root dilation of 4.8cm and stable platelet count of 177. Of utmost concern, the rate of root dilation was closely examined, and the risk of rupture with delivery was discussed amongst Cardiology, Obstetrics, Cardiothoracic Surgery, and Anesthesiology.

After thorough examination, it was determined that the patient would undergo cesarean section with a carefully titrated neuraxial block, thereby minimizing blood loss, risk of fetal hemorrhage, and maintaining cardiac stability. After careful placement of a lumbar epidural, local anesthetic was carefully titrated until an adequate level of surgical anesthesia was acquired. With careful titration of vasopressors and venodilators, the patient successfully underwent an uneventful cesarean section with minimal blood loss. Postoperatively, the patient was followed in the CCU and serial lab work and echoes showed no signs of worsening aortic dilatation or platelet insufficiency. The patient was discharged home post-operative day 3 with her newborn child.
An Unusual Presentation of Peripartum Cardiomyopathy

Steven Zeichner, Claudia Clavijo, Shannon Simon
University of Colorado School of Medicine, USA

Background
Takatsubo Cardiomyopathy (TCM), It is most commonly seen in post-menopausal women and could mimic acute coronary syndrome, however it has been also observed in the operating room and obstetrics ward. The most common ECG changes include ST segment elevation, T wave inversion ST segment depression, new LBBB, Q waves, and significant QT prolongation.

Objective
Our objective is to illustrate a case of Takatsubo cardiomyopathy diagnosed in the immediate post-partum period in a healthy parturient.

Clinical case
A 35 year-old healthy woman was admitted for delivery of a fetus with congenital diaphragmatic hernia. At 37 weeks EGA she underwent an uneventful cesarian delivery under spinal anesthesia. No exogenous catecholamines were given. During caesarean section the patient maintained sinus rhythm on the standard EKG tracing. One-hour post operatively, the anesthesiologist noted frequent and multifocal premature ventricular contractions (PVC). The patient reported no cardiac symptoms. EKG reveled sinus rhythm with premature ventricular contractions of two morphologies. A transthoracic echocardiogram indicated diminished left ventricular systolic function, estimated EF of 46%. Left ventricular dilation and focal basilar hypokinesis were also noted. Right ventricular size and systolic function were preserved. Echocardiographic changes correlated with Takotsubo cardiomyopathy. The patient was followed by cardiology and improvement of cardiac function was detected 6 weeks post-partum.

Conclusion
Even though uncommon, Takotsubo cardiomyopathy could present in peripartum women. PVCs have not been previously described as initial manifestation of Takotsubo cardiomyopathy. Cardiomyopathy should be considered in the differential diagnosis of arrhythmias in peripartum women.
Acute Postpartum Spontaneous Pan-Coronary Arteries Dissection: A Successful Coronary Bypass Grafting Story!

Muhanad Al-Zubaidi, K H Lim, Mark Saling, Tiba Alwardi, Ahmad Abdul Karim

Background
SCAD is a dissecting of a coronary artery resulting in a false lumen formation between the adventitia and tunica media. Puerperium is a known predisposing factor.

No consensus on optimal treatment. Conservative medical treatment is mostly considered in stable patient yet coronary angioplasty and surgical coronary bypass have been considered in unstable patient. SCAD of all major coronaries is very rare entity with limited treatment data.

Case Report
Ten days after her labor, 31 year-old female presented with chest pain and diagnosed with inferior STEMI. Coronary angiogram revealed acute dissections of the mid and distal segments of the RCA and left main coronary dissection that extended into the proximal LAD and its major diagonal branch, as well as, another dissection in the left circumflex artery and its acute marginal branch. EF was 40% with inferior akinesia. IABP was placed then emergent quadruple CABG surgery was performed.

Comments
26.1% of SCAD cases happen during pregnancy, mostly in postpartum. This association of SCAD and pregnancy suggests that sex hormones changes may play a pathological role.

The patient’s TIMI II flow, LV systolic dysfunction and SCAD involving the left and right coronaries were a big treatment dilemma.

Coronary stenting would be very complicated procedure with unknown success rate. Conservative management for severe multi-vessel disease carries significant cardiac risk with controversial outcome. One retrospective review study showed that an early intervention with either CABG or coronary angioplasty for acute SCAD leads to a better outcome. We elected to proceed with CAGB after supporting the LV with IABP. This approach has successful outcome and without complications.

Conclusion
Multi-vessel SCAD is a rare entity with high mortality rate and limited optimal treatment data. CABG with IABP placement, if reduced LV systolic dysfunction, can be valid treatment option. Further studies are needed to identify ideal treatment.
Safety of Nifedipine in threatened preterm labor investigated by three-dimensional echocardiography

Leonti Grin1, Avishag Laish-Farkash3, Simon Shenhav1, Xavier Piltz2, Liah Ganelin1, Eyal Y Anteby1, Chaim Yosefy2

1Barzilai Medical Center, Faculty of Health Sciences, Ben Gurion University of the Negev, Israel
2Barzilai Medical Center, Faculty of Health Sciences, Ben-Gurion University of the Negev, Israel
3Assuta Medical Center, Faculty of Health Sciences, Ben-Gurion University of the Negev, Israel

Background
Calcium channel blockers (CCB) are indicated as a first line tocolytic therapy for women with threatened preterm labor (TPTL). Data on CCB’s safety in pregnancy is scarce, thus are not labeled for tocolysis.

Objective
To evaluate atrial parameters and peripheral vascular endothelial function, using real-time three-dimensional transthoracic echocardiography (RT3DTTE) in women treated with Nifedipine in the early third trimester (III-T).

Method
A prospective single-center subject design study where each participant served as her own control. We studied 25 pregnant women at a gestational age of 25–33 weeks with TPTL prior to – versus 48 hours post-Nifedipine treatment. Two-dimensional transthoracic echocardiography (2DTTE) and RT3DTTE were used to study left atrial (LA) volumes and indexes, emptying fraction, left ventricle and total vascular resistance (TVR). Brachial artery reactivity assessment (BART) through flow-mediated vasodilation (FMV) test.

Results
2DTTE showed a significant increase in LA area (from 15.2±2.62 to 16.16±2.21 mm², p=0.02) before versus after nifedipine treatment; RT3DTTE showed a significant change in LA end-diastolic volume index [from 23.7±4.2 to 26.75±3.8 mL/m² (p=0.008)], respectively. There was a significant decrease in pulmonary pressure (from 25.4 ±4.2 to 23±2.5 mmHg, p=0.02), in mean arterial pressure (from 80±4 to 76±3 mmHg, p=0.001) and in TVR (from 1160±260 to 1050±206 (dyne s/cm⁵), p=0.04), respectively. Brachial artery baseline diameter differed significantly from its baseline after treatment with a CCB from 3.2±0.35 (mm) to 3.47±0.4 (mm), (p=0.05). No significant change was seen in brachial artery FMV 9.7±7% and 6.7±4.4%, (p=0.1).

Conclusions
According to RT3DTTE and BART measurements, not only that maternal physiological cardiovascular function did not have any safety signal 48 hours post nifedipine treatment but even had favorable hemodynamic changes. Therefore, nifedipine may be administered safely for tocolysis and maintenance therapy for symptomatic relief in pregnant patients with a normal cardiac reserve for TPTL in the III-T.
Hemodynamically Unstable Paroxysmal Wide QRS Complex Tachycardia during Labor.

Anna Kania¹, Janusz Kudlicki¹, Agata Frania-Baryluk¹, Adam Tarkowski¹, Andrzej Wysokinski¹, Magdalena Slodzinska², Bozena Leszcynska-Gorzelak²

¹Medical University of Lublin, Poland
²Medical University of Lublin, Poland

A 24-year old pregnant woman in the 37th week of her pregnancy (G1P1A0) was admitted to the Obstetrics and Perinatology Department due to lower abdominal pain and premature uterine contractions. On admission her heart rhythm was 160/min and blood pressure 90/60 mmHg. Initial ECG revealed tachycardia with wide QRS complex (Fig. A). She was treated with metoprolol 5 mg intravenous. Due to deteriorating condition, the patient was qualified for emergency C-section and performance of electrical cardioversion during operation. Her ECG required differentiation between ventricular tachycardia and supraventricular tachycardia with aberrancy. According to the authors, the trial of extended pharmacotherapy in a patient with hemodynamically unstable wide QRS complex tachycardia of unclear etiology is associated with an increased risk for the child.

In general anesthesia, an effective electrical cardioversion (DC) was performed, using 150 J. After DC, sinus rhythm without any pre-excitation signs was observed. The patient gave birth to a daughter weighing 3360 g with an Apgar score of 4 and 9 points at 1 and 10 minutes, respectively. The newborn required stimulation and Neo-Puff oxygenation. Due to recurrent episodes of tachycardias with wide QRS complex, the mother was qualified for electrophysiology study (EPS). EPS showed an additional pathway (latent pre-excitation syndrome) (Fig. B).

Conclusion: In case of unstable hemodynamically wide QRS complex tachycardias during labor, electrical cardioversion during C-section in general anesthesia, proved to be a safe and effective measure for both mother and child.

Figure A: Holter ECG - tachycardia with wide QRS complex – (A) and ECG during EPS – resetting AVRT orto by single ventricular stimulus (red arrow) (B).
Psychological Adaptation after Peripartum Cardiomyopathy: A Qualitative Study

Mie Gaarskjaer de Wolff, Anne Schjoedt Ersboell, Hanne Kristine Hegaard, Marianne Johansen, Peter Damm, Finn Gustaffson, Niels Vejstrup, Julie Midtgaard

Background
Peripartum cardiomyopathy is a rare and potentially life-threatening condition of heart failure affecting women with no previous heart disease in the last months of pregnancy and up to six months after childbirth.

Objective
To explore women’s experiences of the process of psychological adaptation after peripartum cardiomyopathy.

Design
A qualitative exploratory research design was applied to guide the study. Data was collected through in-depth semi-structured face-to-face, telephone and e-mail interviews. Thematic analysis was applied in the data analysis.

Setting
The study was a sub-study of a larger nationwide research study investigating the incidence and clinical outcome of peripartum cardiomyopathy in Denmark during a ten-year period of 2005-2014.

Participants
Through a criterion-based sampling strategy, 14 Danish women with peripartum cardiomyopathy were recruited for participation in the study. In relation to severity of disease, demographics and pregnancy related characteristic, the sample showed a wide range of diversity.

Results
The overarching theme of the thematic analysis was identified to be Recovering to a new normal after peripartum cardiomyopathy. The overarching theme was comprised by five main themes: Losing trust, Silence after chaos, Disrupted early mothering, Choices made for me and not by me, and Ability to mobilize inner resources.

Conclusions
Findings from this study suggest that women are vulnerable in the time after PPCM diagnosis and struggle to find psychological balance in their life. The need for professional psychological support was often unmet and the physical symptoms were foregrounded in the recovery period. After PPCM, follow-up on psychological wellbeing and morbidity should be offered to women routinely.
Molecular Mechanisms of Arterial Duct Closure via PGE2-EP4

Yoshihiro Ishikawa, Satoko Ito, Utako Yokoyama
Yokohama City University, Japan

Arterial duct of fetus bypasses the lung circulation to the systemic circulation. It must be closed, however, immediately after birth, upon initiation of lung respiration.

We previously demonstrated that PGE2, which is secreted from the placenta, is important, not only for dilating arterial duct during pregnancy, but to increase neointimal thickening. This makes it easy for arterial duct to close upon removal of PGE2 from placenta. Indeed, we demonstrated that PGE2 increases hyaluronic acid production via EP4 and stimulates the migration of vascular smooth muscle cells to increase neointimal thickening. Here, we report that EP4 dramatically upregulates fibulin-1. Fibulin-1 is known to bind a protease ADAMTS-1 to cleave versican, leading to enhanced cell migration. Vascular smooth muscle cells from rat arterial duct tissues were primary cultured. Cell were incubated in the presence of an EP4 agonist, ONO-AE1-329. Microarray analysis demonstrated a dramatic increase of fibulin-1 by 28.2-fold (p<0.01). qPCR showed a 500-fold increase of fibulin-1 (n=10, p<0.01). Immunostaining of fibulin-1 showed a dense staining in the thickened neointimal area. We thus thought that fibulin-1 may bind ADAMTS-1 to increase versican fragmentation in arterial duct tissues. We found that both ADAMTS-1 and fragmented versican were increased by EP4 agonist stimulation.

These molecules were abundantly detected in the neointimal area of human arterial duct tissues as well. EP4 agonist enhanced vascular smooth muscle cell migration, and fibulin-1 siRNA inhibited such migration by 0.6-fold (n=6, p < 0.01). EP4 agonist-induced upregulation of fibulin-1 was negated in the presence of protein kinase A inhibitor and/or phospholipase C inhibitor, suggesting the presence of dual pathway to regulate fibulin-1 expression in these cells. These findings suggest that the production of fibulin-1 induced by PGE2-EP4 plays an important role in neointimal thickening of arterial duct during pregnancy.
ECMO Use during Termination of Pregnancy in a Patient with Eisenmenger Syndrome due to an Uncorrected VSD a Case Report

Marie-Louise Meng
Columbia University Medical Center, USA

Background
Pregnancy in women with severe pulmonary hypertension and Eisenmenger’s has a 50% mortality. (1) Termination is often advised before, and if, maternal decompensation occurs.

Case
This 21-year-old primiparous woman presented at 22 weeks gestation with an uncorrected peri-membranous ventricular septal defect, suprasystemic pulmonary hypertension, Eisenmenger’s, hypoxia and thrombocytopenia. Due to maternal mortality risk, termination was advised. While on inhaled nasal nitric oxide and high flow oxygen, laminaria were placed. Painful uterine contractions ensued. Combined spinal epidural anesthesia was performed. The epidural catheter was slowly dosed while titrating vasopressors. Minutes after the dilation and evacuation, oxygen saturation decreased from 80s to 60. VV-ECMO was initiated so as to maintain systemic oxygenated blood. Epidural catheter was maintained until the following day when the platelets were stable, as platelet dysregulation can occur during the first few hours after ECMO initiation. Heparin for anticoagulation while on ECMO was held (5 hours), the epidural catheter was removed. Diuresis was performed. VV-ECMO was required for three days. She was discharged on post-operative day 35 on sildenafil, warfarin with an intrauterine contraceptive device.

Conclusion
Preparation for the hemodynamic and coagulation challenges that arise in these high-risk patients is imperative. Laminaria placement can be performed under neuraxial anesthesia, if needed, as increased pulmonary pressures with catecholamine release from pain can worsen the right to left shunt and cause right heart failure. Slowly initiated neuraxial blockade allows for augmentation of systemic vascular resistance and preload and avoids the intrathoracic pressure changes of intubation and mechanical ventilation. In this patient, fluid shifts with uterine contraction post-termination caused increased right to left shunting requiring urgent VV-ECMO. Transthoracic echocardiography can monitor right heart function during preload fluctuations peri-delivery.

A 39 year old female, Filipino, known Rheumatic Heart Disease, G8P7 on her 29 weeks AOG who was admitted for acute heart failure with chronic fever. She arrived at the emergency room in respiratory distress hence immediately intubated.

Examination revealed displaced point of maximal impulse with murmurs of aortic and mitral regurgitation. Abdominal examination revealed positive for fetal heart tone. Diuretics, vasodilator and antibiotic therapy were given. Transthoracic echocardiography revealed vegetation on the right coronary cusp with severe aortic regurgitation. OB started patient on Dexamethasone and medical therapy continued to optimize fetal viability. Biophysical score revealed fetal distress hence emergency cesarean section done followed by valve surgery.

Patient was discharged on the 25th hospital day. Repeat echocardiogram showed normally functioning metallic aortic and mitral valve with no paravalvular leak.
The Burden of Cardiac Disease in Pregnancy in Western Kenya

Joy Alera\textsuperscript{1}, Rebecca Lumsden\textsuperscript{3}, Felix Barasa\textsuperscript{4}, Gerald Bloomfield\textsuperscript{2}, Christian Bernard\textsuperscript{1}, Astrid Christoffersen-Deb\textsuperscript{1,5}

\textsuperscript{1}AMPATH, Kenya  
\textsuperscript{2}Duke University, USA  
\textsuperscript{3}University of Massachusetts, USA  
\textsuperscript{4}Moi Teaching and Referral Hospital, Kenya  
\textsuperscript{5}University of Toronto, Canada

Introduction
Cardiac disease in pregnancy is emerging as a significant contributor of non-obstetric maternal morbidity and mortality globally. The burden of cardiac disease in pregnancy in high income countries is well described; however, few studies characterize its burden in low and middle income countries where the prevalence of disease among women of reproductive age is high.

Objective
To describe the maternal and neonatal outcomes of cardiac disease in pregnancy at a high volume obstetrical facility in western Kenya.

Methods
We conducted a retrospective case-control study of all women with cardiac disease admitted to a national referral hospital in western Kenya during pregnancy or up to 6 weeks postpartum from January 2011 through March 2016. Cases were matched to controls without cardiac disease based on age and parity. Cardiac history and pregnancy outcomes, including adverse maternal events (obstetric or cardiac) and neonatal events, was collected.

Results
A total of 97 cases and 242 controls were identified. Rheumatic heart disease was the most common cardiac condition (71%). Mortality among cardiac cases was significantly higher than controls (8.3% vs 0%, p0.0001). Risk of an adverse maternal or neonatal event was higher in women with cardiac disease compared to those without (OR 15.44, 95% CI 8.52 – 27.95). Nearly two-thirds (62%) of cardiac cases experienced at least one adverse maternal or neonatal event, compared to only 10% of controls (p0.001). Significantly higher rates of premature delivery (21% vs 8%, p0.002), low birth weight (26% vs. 9%, p0.001) and intrauterine fetal demise (11% vs 3%, p0.001) were observed among cardiac cases.

Conclusion
Cardiac disease in pregnancy is associated high rates of maternal mortality and significantly higher risks of neonatal morbidity. Early disease identification and coordinated obstetric and cardiovascular care strategies are needed to reduce preventable maternal and neonatal adverse outcomes among this high risk population.
Objective
To demonstrate the insidious nature of this ultimately life threatening condition.
To identify evidence based recommendations to aid earlier diagnosis in our local context.

Methods
Case report and literature review using Cochrane library, EMBASE and Medline.

Results
A 29 year old in her second pregnancy booked at 10 weeks gestation with DCDA twins. She presented on three occasions with shortness of breath and gross peripheral oedema. Ultrasound Doppler was negative for venous thromboembolism, so her symptoms were thought to be secondary to pregnancy. Following caesarean section, she collapsed with acute heart failure and required ICU admission. She was diagnosed with cardiomyopathy and cardiac transplant assessment was considered but she responded well to medical therapy.

Cardiomyopathy is an important cause of maternal morbidity and mortality. The literature shows that early diagnosis improves outcomes, but that there are often delays due to the similarities between pregnancy symptoms and those of cardiomyopathy. Echocardiogram is the gold standard investigation, but recent evidence has also identified NT-proBNP as a sensitive biomarker of developing heart failure in pregnancy.

Conclusion
Many women present in pregnancy with shortness of breath and oedema. To prevent over-investigating these women and putting a heavier burden on our cardiology services, we have developed a protocol using NT-proBNP to differentiate between pregnancy symptoms and heart failure. This identifies women who require urgent echocardiograms and helps ensure they are carried out promptly, aiding earlier diagnosis and treatment. It also enables us to confidently reassure those women with normal NT-proBNP levels that there is no underlying heart failure.
Abnormalities of cardiac enzymes are usually a cause for concern, markedly increased cardiac troponin I (cTnI) even more so, as it usually underpins significant myocardial injury. Acute coronary syndrome (ACS) in a woman of reproductive age is rare. However, their incidence in the peripartum period is rising. Increased maternal age, unhealthy lifestyles like smoking and obesity, with an increase in comorbidities like diabetes, hypertension and renal disease may have a role.

There are, however, other circumstances where raised cTnI may be encountered without overt myocardial necrosis. Serum cTnI levels have previously been studied in hypertensive disorders of pregnancy, to define their diagnostic value in these patients. Other factors like altered renal function, as may occur in pregnancy related hypertensive disorders, may also affect the serum troponin levels, leading to misdiagnosis and incorrect management in patients presenting to an ICU with severe preeclampsia or following an eclamptic seizure.

We highlight the diagnostic and management difficulties faced in these patients and discuss the management of a patient who presented with raised cTnI following multiple eclamptic fits, without other signs of an acute cardiac event.
Impaired Endothelial Function Associated with Complicated Pregnancies

Avital Porter¹, Anet Fusman¹, Ilana Gezel¹, Helena Ashkenazi¹, Efrat Litman¹, Arnon Viznizer², Ran Kornowski¹

¹Rabin Medical Center, Israel
²Rabin Medical Center, Israel

Background
Endothelial dysfunction is an early manifestation of atherosclerosis. Normal aging and menopause are related to endothelial dysfunction. Pregnancy is characterized by major physiological adaptations, and is considered to be a natural "stress test" upon maternal vascular health in which endothelial dysfunction might have a central role. We hypothesized that pregnant women with complicated pregnancies will have endothelial dysfunction, that persists following child-birth.

Aim
To compare endothelial function testing (EFT) between pregnant and non-pregnant women with cardiovascular risk factors.

Methods & Results
Between February 2014 to December 2016, 198 women referred to our Women’s Cardiology Clinic, underwent systematic EFT. Main indications for EFT were: menopause, multiple risk factors and a complicated pregnancy. Assessment of EFT was done using digital pulse amplitude tonometry (ENDOPAT, Itamar Medical, Caesarea, Israel). Reactive hyperemia index (RHI) of ≤1.67 was considered abnormal. 18 women (9.09%) had complicated pregnancy (12 diabetes mellitus, 3 hypertension and 4 pre-eclampsia/eclampsia). 81 women (40.9%) had abnormal EFT results: 68 (37.7% of non-pregnant women) of them non pregnant, and 13 (72.2% of pregnant women) pregnant. Non—pregnant women were older, 50% of them post-menopausal and with least 2 major cardiovascular risk factors.

Conclusions & Implications
In a cohort of women referred for EFT we observed young women with complicated pregnancies, have impaired EFT results compared to non-pregnant women. This finding may indicate a causative relation between complicated gestation and endothelial dysfunction. We propose to further explore the EFT among women with complicated pregnancies in order to identify those at high risk for cardiovascular events.
A Rare Case of Co-occurrence Neurofibromatosis Type 1, Hypertrophic Cardiomyopathy, Quadricuspid Aortic Valve and Hypertension Due to Left Renal Artery Stenosis in Pregnant Woman.

Anna Kania, Janusz Kudlicki, Agata Frania-Baryluk, Andrzej Wysokiński
Medical University of Lublin, Poland

We observed a 25-year old pregnant woman in the 20th week of her pregnancy (G1P1A0). She was diagnosed with neurofibromatosis type 1 (NF1) and hypertension due to left renal artery stenosis, which was surgically correct in childhood. Physical examination revealed multiple café au lait spots and neurofibromas of the skin (Fig.1A). Pregnancy was diagnosed in 16 weeks gestation and until this time she was treated with enalapril 10 mg, metoprolol 50 mg and amlodipine 10 mg. Patient’s mother suffered from NF 1 and suddenly died at the age of 63. ECG revealed significant left ventricular hypertrophy (Fig1B). Transthoracic echocardiography (TTE) showed massive left ventricular thickening with intraventricular gradient-25mmHg, systolic anterior motion of the mitral valve (SAM) and quadricuspid aortic valve(Fig1C). In the literature, there are some cases of comorbidity NF 1 and hypertrophic cardiomyopathy (HCM). Because of high blood pressure, she was receiving metyldopa 250 mg 3 times daily, amlodipine 5 mg 2 times daily and metoprolol 25 mg 2 times daily.

In the 37th week of pregnancy, a Cesarean section was performed. She gave birth to a son weighing 3120 g, with Apgar score of 9 points. Due to presence of café au lait spots of child’s skin, neurofibromatosis disease was suspected. The son’s brain CT showed foci of T2 hyperintensity and glioblastoma of the right optic pathways, typical from NF 1. He received 4th cycle of chemotherapy.

Conclusion:
We observed very rare case of co-occurrence NF1, HCM, quadricuspid aortic valve and surgically corrected left renal artery stenosis with secondary hypertension in pregnant woman.

In our patient massive left ventricular hypertrophy and intraventricular gradient with SAM is most probably due to HCM with some influence of arterial hypertension.

The child’s brain lesions should concern rather NF1 than using pharmacotherapy (ACE-Inhibitor) in early pregnancy.
Not All Peripartum Cardiac Dysfunction is Peripartum Cardiomyopathy: Case Report of a Peripartum Non-ST Elevation Myocardial Infarction Presenting with Cardiac Systolic Dysfunction

Rachael Baird¹, Jeff Chapa², David Majdalany³
¹Cleveland Clinic Foundation, USA
²Cleveland Clinic Foundation, USA
³Cleveland Clinic Foundation, USA

Background
New onset systolic dysfunction in late pregnancy raises suspicion for peripartum cardiomyopathy. However, pregnant women are also at 3-4 times increased risk for myocardial infarction (MI), with mortality rate highest in the peripartum period. Here we present a case of postpartum cardiogenic shock with a presentation initially suspicious for peripartum cardiomyopathy.

Case
A 34-year-old G1 with past medical history significant for type 1 diabetes mellitus and a 1 week history of worsening dyspnea on exertion and orthopnea underwent emergent cesarean section at 36 3/7 weeks for non-reassuring fetal heart tracing in the setting of induction of labor for preeclampsia. Post-operatively, she became tachycardic, hypertensive, and desaturated requiring endotracheal intubation. Troponin and CK-MB were initially elevated to 1.0 and 37, respectively, and electrocardiogram showed anterior Q-waves. Chest CT angiogram revealed bilateral pleural effusions with no pulmonary embolism. She was transferred to the cardiac care unit and required diuresis and pressor support. Echocardiogram on post-operative day 1 showed ejection fraction (EF) of 30% with apical and anterior wall motion abnormalities. Cardiac MRI showed no scar, fibrosis, or delayed enhancement, but confirmed anterior and apical wall motion abnormalities. Coronary angiography revealed a proximally occluded left anterior descending (LAD) artery with elevated left ventricular end diastolic pressure to 37mmHg. A cardiac positron emission tomography scan demonstrated a large area of hibernating myocardium in the LAD distribution, prompting referral for coronary artery bypass grafting with left internal mammary artery to the LAD. The post-operative course was uncomplicated. Her LV function and functional capacity gradually improved with medical therapy to near normal at 2 years post-event.

Conclusion
This case of a patient with peripartum anterior MI with subsequent recovery of LV function post-revascularization emphasizes the importance of being aware of mimickers of peripartum cardiomyopathy, such as ischemic heart disease, in pregnant patients with cardiac decompensation.
Aortopathy and Pregnancy

Dominica Zentner
Royal Melbourne Hospital, Australia
University of Melbourne, Australia

Background
Pregnancy represents a time of increased risk for women with aortopathy, as pregnancy and the puerperium have been shown to be associated with an increase in the most devastating aortic event – aortic dissection.

Aim
This presentation would discuss the myriad of aortopathies being faced by clinicians looking after women contemplating pregnancy. These women may come for pregnancy discussions after a genetic diagnosis, for example of Marfan syndrome; in the setting of a known congenital diagnosis, either commonly associated with a dilated aorta such as bicuspid aortic valve, or complicating other congenital heart disease diagnoses – typically the conotruncal abnormalities. Additionally, as women become older first time mothers, there is an increasing likelihood of looking after women with the population’s most common cause of a dilated aorta, hypertension. The challenges are in how wide the pre pregnancy imaging should be (just the aorta or the wider arterial tree as well?), what management should be offered in pregnancy, how delivery should be achieved and in the relevant counseling and the pre/ during pregnancy diagnostic testing that be offered of the fetus.

Conclusion
The identification of new genetic causes of aortopathy has revealed new diagnoses. There is little experience outside of Marfan syndrome in pregnancy. It is possible that the available literature is skewed by an ascertainment bias towards the most syndromic cases and those where women have had catastrophic events. A practical approach to management and the remaining areas of uncertainty will be discussed.
Intraoperative Hypotention and Bradycardia due to Intravenous Oxytocin Administration in Women Undergoing Cesarean Section under Regional Anesthesia: a Prospective Comparative Study

Efim Shifman¹, Alexandr Bukhtin², Leonid Gavrikov³, Alexandr Kulikov⁴, Galina Tikhova⁵

¹Vladimirskii Moscow Regional Research and Clinical Institute, Russia
²Ushakova Clinical Perinatal Center №1, Russia
³Volgograd State University, Russia
⁴Ural State Medical University, Russia
⁵Petrozavodsk State University, Russia

Background
Known adverse effects that occur after intravenous oxytocin administration (OT) during cesarean section (CS) include hypotension and bradycardia.

Objective
The goal of the study was to compare mean blood pressure (MBP) and heart rate (HR) decrease in patients undergoing CS under different methods of regional anesthesia and receiving intraoperative OT.

Methods
The study includes 146 women (31.0+/−5.3 years old, 38.4+/−1.7 weeks of gestation) undergoing CS under spinal (group S), epidural (group E) or combined spinal-epidural anesthesia (group C). Protocol of intraoperative OT follows “Rule of Threes” algorithm. Each intravenous OT provides 3U. MBP and HR were recorded at 6 points: before surgery (baseline values), before the first OT dose, after first, second, third OT dose and at the end of surgery. Percent of patients with MBP10% and HR10%, respectively) was compared between groups at each control point.

Results
Percent of patient in group E who required third OT dose (27.0+/−7.3%) was substantially less than in groups S (35.0+/−10.7%) and C (37.1+/−5.1%), p = 0.28. Percent of patients with MBP10% varied around 50% in all groups throughout the surgery (40.0%-62.0%). The most apparent differences manifested after the third OT between groups S (28.6%) and C (78.4%), p=0.01, and between groups E (45.5%) and C, p = 0.048. Percent of patients with HR10% varied around 30% in all groups throughout the surgery (22.2%-39.3%). The most evident difference between the groups were observed after third OT (14.3, 18.2 and 45.9 in groups S, E and C respectively, p0.05. By the end of surgery 54.1% of patients in group E showed HR10%.

Conclusion
Statistically significant difference in patient’s rate with MBP10% and HR10% due to intraoperative OT is observed after third OT dose between groups with different methods of regional anesthesia.
Predicting Outcomes in Parturients with Underlying Cardiac Disease: an Irish Perspective

Alain Fennessy, Dana Teodorescu, Patrick C Thornton
The Rotunda Hospital, Ireland

Background
The incidence of pregnancy in women with underlying cardiac disease is increasing and this is now the leading cause of maternal death in the UK and Ireland. This is due to increased incidence of women with congenital heart disease reaching child-bearing age, the general trend towards increased maternal age, and well as increased incidence of chronic diseases which increase cardiac risk, such as diabetes mellitus and hypertension.

Objective
The Rotunda Hospital in Dublin in combination with the Mater Misericordiae University Hospital provides obstetric care to parturients with underlying cardiac disease. Women deemed at increased risk are discussed in the joint Obstetric Cardiac multidisciplinary meeting so that delivery can be planned appropriately. We wanted to compare outcome data with published figures.

Methods
We retrospectively assessed patients discussed in the multidisciplinary meeting using cardiac risk stratification tools for the period 2015-2017. We identified patients using the minutes from each meeting held between 2015 and 2017. Much of the antenatal information required was obtained in this way. We subsequently pulled the paper charts for these women to determine outcome data.

Results
197 patients were identified. 55% for congenital heart disease, 20% for arrhythmias, 9% of these were for valvular heart disease 6% for cardiomyopathy, and 4% for coronary artery disease. We assessed CARPREG and ZAHARA scores, depending on their underlying cardiac disease.

Conclusions
High risk patients were successfully identified using CARPREG and ZAHARA scores with complications comparing favorably with international figures.
Biological versus Mechanical Heart Valve Prosthesis during Pregnancy in Women with Congenital Heart Disease

Heleen Lameijer1,2, Ymkje Van Slooten2, Monique Jongbloed3, Martijn Oudijk4, Marlies Kampman7, Arie Van Dijk8, Marco Post5, Barbara Mulder6, Krystyna Sollie7, Dirkjan Van Veldhuisen3, Tjark Ebels2, Joost Van Melle2, Petronella Pieper2

1University Medical Center Groningen, Netherlands
2University Medical Center Groningen, Netherlands
3Leiden University Medical Center, Netherlands
4Academic Medical Centre, University of Amsterdam, Netherlands
5St. Antonius Hospital, Netherlands
6Amsterdam Medical Center, Netherlands
7University Medical Center Groningen, Netherlands
8Radboud University Medical Centre, Netherlands

Aim
To evaluate pregnancy outcomes in women with mechanical and biological prosthetic heart valves (PHV), including the relation to anticoagulation regimes in women with mechanical PHV.

Design
Retrospective multicenter cohort studying pregnancy outcomes in an existing cohort of patients with PHV.

Results
52 Women had 102 pregnancies of which 78 pregnancies ≥20 week’s duration (59 biological, 19 mechanical PHV, 46 women). Miscarriages (n=19) occurred more frequently in women using anticoagulation therapy (p<0.05). During 42% of pregnancies of women with mechanical PHV a combined low molecular weight heparin (LMWH) vitamin-K-antagonist anticoagulation regime was used (n=8). Overall, cardiovascular, obstetrical and perinatal complications occurred in respectively 17% (n=13), 68% (n=42) and 42% (n=27) of the pregnancies. Women with mechanical PHV had significantly higher cardiovascular (12% vs 32%, p<0.05), obstetric (59% vs 85%, p<0.02) and perinatal complication (34% vs 61%, p<0.05) rates than women with biological PHV. This was related to PHV thrombosis (n=3, p<0.02), post-partum hemorrhage (p<0.02), cesarean section (p<0.02), low birth weight and small for gestational age (both p<0.05). PHV thrombosis occurred in 3 pregnancies, including 2/5 pregnancies with pulmonary mechanical PHV. PHV thrombosis was related to necessary cessation of anticoagulation therapy or insufficient monitoring of LMWH. Other cardiovascular complications occurred equally frequent in both groups.

Conclusion
Complications occur more often in pregnancies of women with a mechanical PHV than in women with a biological PHV, mainly caused by PHV thrombosis and bleeding complications. Meticulous monitoring of anticoagulation in pregnant women with a mechanical PHV is advisable.
The risk of manifestations of ischaemic heart disease (IHD) in fertile women is elevated during pregnancy and the post-partum period. With increasing maternal age and a higher prevalence of cardiac risk factors the incidence of IHD during pregnancy is rising. However, information in the literature is scarce. We therefore performed a retrospective cohort study and systematically reviewed the overall (1975-2013) and contemporary (2005-2013) literature concerning IHD presenting during pregnancy or postpartum period. We report two cases of IHD with atypical presentation during pregnancy or postpartum. In our review we describe 146 pregnancies, including 57 contemporary cases (2005-2013). Risk factors for IHD were present in 80%. Seventy-one percent of the cases of IHD manifested in the 3rd trimester or the postpartum period, 95 percent presented with chest pain. The main cause was coronary dissection (35%) or thrombus/emboli (35%) in the more contemporary group. Maternal mortality was 8% (6% in contemporary group), main cardiac complication was ventricular tachycardia (n=17). Premature delivery rate was 56%, caesarean section was performed in 57%. Perinatal mortality was 4%. In conclusion, IHD during pregnancy or in the postpartum period has high maternal mortality and morbidity rates. Also, premature delivery rate and perinatal mortality rate are high.
Acute Aortic Dissection during Cesarean Section in Young Women with Hypertensive Gestosis: Case Report

Aziza Baya, Aziza Baya, Nezal Rafik, Nezal Rafik, Cherif Samiha, Bouzid Abdelmalek
EHS Djeghri Mokhtar, Algeria

Background
Aortic dissection is unusual in young women and it is frequently associated with pregnancy. In this report we describe successful repair of the aortic dissection three day after cesarean section.

Observation
A 38-year-old primigravid women who had presented a pregnancy hypertension, and during the delivery by cesarean section she had a severe chest pain. CT angiography was performed and showed an aortic dissection type I of De Bakey. The patient was operated in emergency under general anesthesia and assisted ventilation and endotracheal intubation and after control of the femoral artery, a median sternotomy was performed. The ascending aorta was ecchymotic. The patient was placed on atriofemoral cardiopulmonary bypass, the aorta was cross-clamped just proximal to the innominate artery and opened transversely.

The dissection extended proximally to the Sino-tubular junction. The 3 aortic cusps had prolapsed toward the left ventricle because of detachment at 2 of the 3 commissures. The ascending aorta was replaced with a 26 mm Dacron graft.

Cardiopulmonary bypass was discontinued uneventfully. The early postoperative course was unremarkable except for marked systemic hypertension, which was controlled Loxen and Bisoprolol and methyldopa. The patient was discharged at the 7 day.

Discussion
Acute aortic dissection in pregnancy is very rare. In women aged less than 40 years 50% of all aortic dissections associated with pregnancy. Systemic hypertension is the main risk factor. The particularity in our patient is the onset of the acute aortic dissection during the delivery by cesarean section.

Conclusion
In the presence of cardiovascular risk factors and from the outset pregnancy, the conventional measurement of blood pressure alone is not a sufficient marker; diagnostic imaging is often essential. Therapeutic measures must be adapted to the risk profile cardiovascular system taking into account other points of view than those of hypertensive gestosis.
Background
Pulmonary arterial hypertension (PAH) in pregnancy has a maternal mortality rate of 25%. Centers providing care to pregnant patients with PAH must provide advanced monitoring/therapy during and after pregnancy. The MFM-Cardiology Joint Program at our institution was created to address cardiac conditions like this given that cardiovascular disease is now recognized as the leading cause of maternal mortality. The aim of the program is to provide interdisciplinary care to optimize the care of pregnant patients with complex cardiovascular conditions like PAH in an inner-city program.

Objective
The purpose of this study is to review the management of pregnant women with PAH at our center since the inception of the joint MFM-Cardiology program and to evaluate the obstetric, maternal and neonatal outcomes.

Methods
We reviewed all cases of pulmonary hypertension during pregnancy from January 2015 through September 2017 managed in our program. Approval to perform a retrospective review was obtained from institutional review board at AECOM.

Results
Six consecutive cases of PAH were identified over the 2-year period [mean age of pts = 20 years old (range = 21–41)]. Three cases (50%) were WHO group I (2 cases were idiopathic and 1 was related to systemic disease) and three cases were WHO group V (multifactorial). There were 2 cases of severe PAH (mPAP 60 mmHg). Four patients continued pregnancy, one patient was diagnosed on post-partum day 3 and one patient terminated at 20+1 weeks of gestation. Two patients underwent pulmonary artery catheterization and required continuous intravenous prostacyclin infusions. All deliveries occurred after 36 weeks of gestation except the case of termination. There were no maternal or neonatal deaths. Peripartum complications included endometritis (N=1) and preeclampsia (N=3).

Conclusion
The development of an individualized and multidisciplinary approach to the management of PAH during pregnancy may improve maternal and neonatal outcomes.
Echocardiography in Canine Pregnancy: Which Changes are Expected?

Monica Melandri\textsuperscript{1,2}, Ilaria Spalla\textsuperscript{3}, Salvatore Alonge\textsuperscript{1,4}

\textsuperscript{1}Società Veterinaria "Il Melograno" srl, Italy
\textsuperscript{2}Università degli Studi di Milano, Italy
\textsuperscript{3}Royal Veterinary College, UK
\textsuperscript{4}Università degli Studi di Bari "Aldo Moro", Italy

Background

Pregnancy is associated with reversible adaptation in left ventricular (LV) function\textsuperscript{1}. Human uncomplicated pregnancy shows stroke volume (SV) increase during the first trimester, followed by heart-rate (HR) and cardiac output (CO) in late pregnancy\textsuperscript{2}. Few studies analyzed these changes in dogs\textsuperscript{3}.

Objective

To evaluate cardiac morpho-functional changes along pregnancy and to assess fetuses number effect on maternal canine heart.

Methods

Nine healthy Great Danes, a breed prone to Dilated Cardiomyopathy (DCM)\textsuperscript{4} underwent standard M- and B-mode echocardiography\textsuperscript{5} prior to ovulation (T0), and within 7 days of predicted parturition (T1)\textsuperscript{6}. Parameters evaluated and statistically analyzed (ANOVA, p<0.05) were: LV dimension in diastole (LVd) and systole (LVs), end-diastolic (EDVI) and end-systolic (ESVI) volumes indexed to body surface area, end-diastolic (EDV) and end-systolic (ESV) volumes, end-point-septal-separation (EPSS), left atrium to aortic root ratio (LA/Ao), sphericity index (SI), ejection (EF) and shortening (SF) fractions, SV, HR, and CO. Bitches were divided in two groups: ≥7 puppies. The SV, CO and HR variation between them at T1 was calculated.

Results

The ANOVA showed a statistical effect of time on LVd, EDVI, EDV, EF, SF, SV, HR, CO increase, and LVs, ESVI, ESV decrease (p<0.01). In large pregnancies, SV, HR and CO resulted in greater increase by 10.8\%, 6.5\% and 11.47\%, respectively. No difference was observed for EPSS, LA/Ao, SI.

Conclusion

The need for adequate blood supply for fetal development drives to maternal volume overload and cardiac morpho-functional changes. Since any cardiac maladaptation may predict obstetrical complications\textsuperscript{1}, pregnancy-related physiological variations should be considered. Present study indicates that diastolic dimensions and functional parameters increase and systolic dimensions decrease should be expected; EPSS, LA/Ao and SI should remain unchanged, representing maternal cardiac health indicators not affected by gestational age and fetuses’ number. Further studies would investigate if the principle leading to higher increase in SV, CO and HR.
Pregnancy in Women with Corrected Aortic Coarctation: Uteroplacental Doppler Flow and Pregnancy Outcome

Anne Siegmund¹, Marlies Kampman¹, Caterina Bilardo², Ali Balci³, Arie van Dijk⁴, Martijn Oudijk⁵, Barbara Mulder⁶, Jolien Roos-Hesselink⁷, Gertjan Sieswerda⁸, Steven Koenen⁹, Krystyna Sollie-Szarynska², Tjark Ebels¹⁰, Dirk Jan van Veldhuisen¹¹, Petronella Pieper¹

¹University Medical Center Groningen, University of Groningen, Netherlands
²University Medical Center Groningen, University of Groningen, Netherlands
³Isala, Netherlands
⁴Radboud University Medical Center, Radboud University, Netherlands
⁵Academic Medical Center, University of Amsterdam, Netherlands
⁶Academic Medical Center, University of Amsterdam, Netherlands
⁷Erasmus Medical Center, University of Rotterdam, Netherlands
⁸University Medical Center Utrecht, University of Utrecht, Netherlands
⁹University Medical Center Utrecht, University of Utrecht, Netherlands
¹⁰University Medical Center Groningen, University of Groningen, Netherlands

Background
Women with repaired coarctation of the aorta (rCoA) are at risk of hypertensive disorders and other complications during pregnancy. Hypertensive disorders in pregnant women are associated with inadequate uteroplacental flow, which is related to adverse offspring outcome.

Objective
The aim of this study was to investigate the relationship of maternal cardiac function, placental function and pregnancy complications in women with rCoA.

Methods
We included 49 pregnant women with rCoA and 69 controls from the prospective ZAHARA-studies (Zwangerschap bij Aangeboren HARtAfwijkingen, pregnancy in congenital heart disease). Clinical evaluation, echocardiography and uteroplacental Doppler flow (UDF) measurements were performed at 20 and 32 weeks gestation. Univariable regression analysis was performed.

Results
Comparison of rCoA and healthy women. In women with rCoA, tricuspid annular plane systolic excursion (TAPSE) decreased during pregnancy (25.7mm to 22.8mm, P=0.006). UDF indices and pregnancy complication rates were similar in both groups. Offspring of rCoA women had lower birth weight (3233g versus 3578g, P=0.001), which was associated with β-blocker use during pregnancy (β=-418.0, P=0.01).

Association of cardiac function and UDF. Right ventricular (RV) function before pregnancy (TAPSE) and at 20 weeks gestation (TAPSE and RV fractional area change) were associated with impaired UDF indices (umbilical artery pulsatility index at 20 weeks β=-0.02, P=0.01, resistance index at 20 and 32 weeks β=-0.01, P=0.02 and β=-0.02, P=0.01 and uterine artery pulsatility and resistance index at 20 weeks gestation β=-0.02, P=0.05 and β=-0.01, P=0.02).

Conclusions
Women with rCoA tolerate pregnancy well. However, RV function is altered and is associated with impaired placentation.
Uterine rupture is a rare complication of pregnancy, but it is one of the most dangerous obstetric situations threatening the life of both the mother and the fetus. Among factors known to increase the risk of uterine rupture, previous cesarean delivery is thought to be the most important risk factor. Also, severe hemoperitoneum, a lethal condition, is highly likely to follow. We experienced a case of uterine rupture in an unscarred uterus during the labor of a demised fetus. In this case, the diagnosis and treatment of uterine rupture were delayed by almost three hours. The vital sign of the mother could be remained stable because the fetus was trapped in the walls of the ruptured uterus, preventing massive bleeding. Therefore, we can say that the demised fetus saved the mother’s life.
Maternal Deaths Relate to Peripartum Cardiomyopathy in the State of Ceará-Brazil from 2006 to 2016

Regina Carvalho¹, Francisco Gonçalves², Kamilla Marques², Mayara Brilhante³
¹Department of Postgraduate Studies in Cardiology - State University of Ceará, Brazil
²Hospital Nucleus of Epidemiology - Fortaleza General Hospital, Brazil
³Christus University Center – UNICHRISTUS, Brazil

Background
Maternal death is the death of a woman during pregnancy or within 42 days postpartum. Late maternal death (LMD) is death more than 42 days and less than one year after childbirth. Peripartum Cardiomyopathy (PPCM) is one of the causes of direct maternal obstetric death.

Objective
To describe the characteristics of maternal deaths by CPMP in the State of Ceará, Brazil, from 2006 to 2016.

Methods
The Death Certificate was collected from the Health Department of the State of Ceará by the Health Mortality Information System (SIM) of Unified Health System in Brazil. The cause of death is in accordance with the 10th revision of the International Classification of Diseases (ICD 10).

Results
A total of 31 deaths were analyzed: 23 (74%) were by PPCM (Code O90.3), three (9%) due to cardiac arrhythmias or heart failure and five deaths (17%) due to circulatory disease, anesthetic complications, pulmonary embolism, obstetric embolism and gestational edema. Most maternal deaths (45%) occurred within 42 days of delivery, 35% of 43 days for one year and 13% were not reported. Most of the deaths (84%) occurred in a hospital setting and 55% were autopsied. Age varied from 10 to 49 years: 23% were adolescents (10 to 19 years), 71% were between 20-39 years old, 6% were older than 39 years. The women were predominantly brown (61%), single (61%) and had less than 12 years of schooling (80%).

Conclusions
The socioeconomic and demographic profiles of maternal deaths by PPMM reflected a vulnerable social situation. Most of the women were single, with low schooling, and young women, including adolescents. Most deaths occurred within 42 days postpartum. PPCM should be seen as a sentinel event in the puerperium. Information on the condition of maternal death was improperly recorded in maternal death certificates.
Figure 1 - Maternal Deaths due to PPCM (International Classification of Diseases - ICD 10) Ceará – Brazil, from 2006 to 2016.


Figure 2 - Maternal deaths due to PPCM, according to age (years), Ceará - Brazil from 2006 to 2016.

Table 1 - Demographic, educational and obstetric characteristics of maternal deaths by PPCM in Ceará, Brazil, 2006 - 2016.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Race / color</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>26</td>
</tr>
<tr>
<td>Black</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>7.0</td>
</tr>
<tr>
<td>Brown or mixed race</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>19</td>
<td>61</td>
</tr>
<tr>
<td>Ignored /not informed</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>7.0</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>19</td>
<td>61</td>
</tr>
<tr>
<td>Married</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>9</td>
<td>29</td>
</tr>
<tr>
<td>Stable union</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3.0</td>
</tr>
<tr>
<td>Ignored /not informed</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>7.0</td>
</tr>
<tr>
<td><strong>Years of education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3.0</td>
</tr>
<tr>
<td>1 a 3 years</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>8</td>
<td>26</td>
</tr>
<tr>
<td>4 a 7 years</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>6</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>8 a 11 years</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>10</td>
<td>32</td>
</tr>
<tr>
<td>12 years or more</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>7.0</td>
</tr>
<tr>
<td>Ignored /not informed</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>13</td>
</tr>
</tbody>
</table>


Table 2 - Clinical conditions of maternal deaths by PPCM in Ceará, Brazil, 2006 - 2016.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>26</td>
<td>84</td>
</tr>
<tr>
<td>Dwelling</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Others</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>6.0</td>
</tr>
</tbody>
</table>

Death in the puerperium

| Yes, up to 42 days after delivery | 0    | 0    | 1    | 2    | 1    | 2    | 1    | 4    | 1    | 0    | 2    | 14    | 45   |
| Yes, from 43 days to 1 year       | 0    | 0    | 1    | 1    | 0    | 2    | 1    | 0    | 3    | 2    | 1    | 11    | 35   |
| No                               | 1    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 1    | 2     | 7.0  |
| Ignored /not informed             | 1    | 0    | 0    | 0    | 0    | 0    | 2    | 0    | 0    | 1    | 0    | 4     | 13   |

Received medical assistance at the time of death

| Yes                              | 2    | 0    | 1    | 2    | 1    | 4    | 4    | 4    | 4    | 1    | 3    | 3     | 25   |
| No                               | 0    | 0    | 1    | 1    | 0    | 0    | 0    | 0    | 2    | 0    | 1    | 5     | 16   |
| Ignored /not informed            | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 1    | 0    | 0    | 1     | 3.0  |

Confirmation of the diagnosis by necropsy

| Yes                              | 1    | 0    | 2    | 2    | 1    | 2    | 2    | 3    | 2    | 1    | 1    | 17    | 55   |
| No                               | 1    | 0    | 0    | 1    | 0    | 2    | 2    | 1    | 1    | 2    | 3    | 13    | 42   |
| Ignored /not informed            | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 1    | 0    | 0    | 1     | 3.0  |

Hypertensive Disorders in Pregnancy: Maternal Complications and Perinatal Outcome

Svitlana Posokhova, Katerina Nitochko, Svitlana Shevchenko
Posokhova Svitlana, Ukraine

Hypertensive disorders of pregnancy are among the leading causes of maternal and perinatal deaths in developing country. Hypertension is a common medical problem more than 5-8% of all pregnancies in the world. Hypertension is one of the common problems associated with pregnancy that may be followed by eclampsia, acute renal failure, maternal death, premature delivery, intra-uterine growth restriction and other.

Methods
A cross sectional descriptive study was conducted on all the patients admitted to Odessa oblast perinatal center during two years and who possessed the inclusion criteria for hypertensive pregnancy.

Results
Among 9856 delivery cases examined, 758 (7.6%) cases had hypertension. Most pregnant women fell in the 35 - 40 years age-group (51.9%). Eight point five percent (8.5%) were aged under 20 years. 40.2% were nulliparous and only 5.1% had over 5 pregnancies. Among these, 275 (36.3%) had gestational hypertension; 128 (16.9%) had preeclampsia- eclampsia: 156 (20.6%) had preeclampsia superimposed on chronic hypertension: 106 (13.9%) cases had chronic hypertension: and 93 (12.3%) had pregnancy-aggravated chronic hypertension. Gestational diabetes mellitus had 42 (5.5%) women. Ninety-three point six percent (93.6%) had a systolic BP of 140-190 mmHg, and 6.4% had systolic BP greater than 190 mmHg. HELLP (Hemolysis, Elevated Liver enzymes & Low Platelet count) syndrome was present in 1.1 % of cases: 21.8% experienced premature delivery: 32 (4.2%) had IUFD (intrauterine fetal death): 15.1% had IUGR (intrauterine growth retardation): and 17.9% had LBW babies. Intensive treatment compared with routine care reduces the risk of adverse neonatal and maternal outcome.

Conclusions
Based on our results, hypertensive mothers had more perinatal complications. The unpleasant effects of hypertension in pregnancy warrant the need for training, routine prenatal care, the early detection and treatment of hypertension before pregnancy, during delivery and follow-up after delivery.
Background
Hypertension and proteinuria, characteristics of preeclampsia, were often detected after administration of anti-vascular endothelial growth factor (VEGF), i.e. bevacizumab, but the effect on the heart has not been examined in detail.

Objective
The aim of this study was to clarify the morphofunctional cardiac changes in women given bevacizumab, and to compare those with women with hypertensive disorders of pregnancy (HDP).

Methods
A total of 6 women participated and underwent echocardiography and blood tests at before administration (T0), 1 month after administration, and 2 months after administration (T2). Brain natriuretic peptide (BNP), troponin I (TnI), and aldosterone concentration (PAC) were analyzed.

Results
Left ventricular (LV) mass index tended to increase (T0:65±11, T2:87±2 g/m^2) and early diastolic mitral annular velocity (e`) tended to decrease (T0:7.6±0.8, T2:7.0±0.7 g/m²). BNP was not changed, but TnI tended to increase (T0:4.1±3.7, T2:6.9±2.8 pg/mL) and PAC tended to decrease (T0:218±27, T2:131±38 pg/mL). In our previous study, in HDP women, compared to normotensive control pregnancies, LV mass index increased after 2nd trimester, e` decreased after 1st trimester, TnI increased after 3rd trimester, and PAC decreased after 2nd trimester. These changes were similar to HDP women given bevacizumab.

Conclusion
LV hypertrophy, decrease of LV relaxation, increase of myocardial deviation enzyme, and suppression of aldosterone were associated with bevacizumab administration. These changes were similar to HDP, and the possibility that anti-VEGF was an etiology was suggested.
Objective
To compare satisfaction rates among parturients who underwent vaginal and cesarean section delivery.

Methods
Surveys were given to parturients to assess their experiences during delivery. Both vaginal delivery (SVD) and Cesarean section (C/S) parturients rated their pain control satisfaction on a scale from 0-10, 10 being the most satisfied. Only the SVD parturients who received epidural anesthesia were included in the data analysis. We used the Student’s t-test to evaluate the variation in this satisfaction. The Fisher’s exact test was used to analyze C/S parturient mode of preference.

Results
We found no significant difference in pain control between SVD (N=422) and C/S (N=86) parturients; 9.24 [1.52] and 9.44 [1.32] respectively (p=.14095). Among C/S parturients who had experienced previous vaginal delivery (N=27) 13 preferred C/S delivery; however, among those who had not previously delivered vaginally (N=137) 104 parturients would prefer a future C/S over vaginal delivery (p=0.02).

Conclusion
The data demonstrate that pain control with epidural and/or spinal anesthesia is very successful in both vaginal and C/S deliveries. Most parturients are extremely satisfied with their pain control during labor and delivery regardless of mode of delivery. Interestingly, our data shows that parturients who have not previously delivered vaginally and underwent C/S for the current pregnancy shows a statistically significant difference in future choice of delivery mode.
Assessment of the Correlation between Congenital Heart Defects and Brain Injury in Fetuses through MRI Imaging.

Alina Weissmann-Brenner¹, Anna Mitlin¹, Chen Hoffmann², Reuven Achiron¹, Yishai Salem³, Eldad Katorza¹

¹Chaim Sheba Medical center Tel HaShomer, Israel  
²Chaim Sheba Medical center Tel HaShomer, Israel  
³Chaim Sheba Medical center Tel HaShomer, Israel

Objective
To examine the association between congenital-heart-disease (CHD) and brain injury using fetal MRI.

Methods
46 pregnancies with fetuses with CHD that underwent fetal brain MRI were evaluated. Classification of CHD was according to anomalies in situs, 4-chamber-view (4CV), outflow-tracts, arches and veins; and according to cyanotic and complex CHD.

Comparison of MRI results was made between the different classification of the CHD and to a control group of 113 fetal MRI examinations, performed on fetuses with normal heart and brain ultrasound.

Results
No significant differences were found in the brain-pathologies between the different classifications of CHD. The anterior-posterior percentile of the vermis was significantly smaller in fetuses with abnormal-4CV. A significantly higher bi-parietal-diameter was found in fetuses with abnormal-arches, and a significantly smaller transcerebellar-diameter was found in fetuses with abnormal-veins. In comparison to control group, significant differences were found in the overall-brain-pathology, in the cortex-abnormalities and in extra-axial-findings in the study-group. Significant higher rates of overall brain-pathologies, ventricle-pathologies, cortex-pathologies were found in the simple-group compared to in the complex-group and the controls, along with significance in the biometrical-parameters.

Conclusion
Fetuses with CHD demonstrate findings in brain MRI, suggestion in-utero pathogenesis of the neurological and cognitive anomalies found later on.
Longitudinal Assessment of Maternal Ventricular-Arterial Coupling in Singleton and Twin Pregnancies

Edoardo Sciatti², Rossana Orabona¹, Federico Prefumo¹, Enrico Vizzardi², Ivano Bonadei², Adriana Valcamonico¹, Marco Metra², Tiziana Frusca¹,³

¹Department of Obstetrics and Gynecology, University and ASST Spedali Civili, Brescia, Italy, Italy
²Cardiology Unit, University and ASST Spedali Civili, Brescia, Italy, Italy
³Department of Obstetrics and Gynecology, University of Parma, Italy, Italy

Background
Ventricular-arterial coupling (VAC) is a parameter providing information regarding the operating mechanical efficiency and performance of the ventriculoarterial system.

Objective
We aimed to assess maternal VAC, calculated as aortic elastance (Ea) / end-systolic LV elastance (Ees), in uncomplicated singleton and twin pregnancies.

Methods
Ea, Ees and VAC were assessed once for each trimester in 14 singleton and 24 twin uncomplicated pregnancies by maternal echocardiography.

Results
Results are summarized in the attached Table as median (interquartile range). For each trimester, there were no significant differences between singleton and twin pregnancies. Ea significantly decreased from the 1st to 3rd trimester in both singleton and twin pregnancies (p<0.01). Ees had no significant variation across trimesters (p=0.44). As a result, VAC significantly increased from the 1st to 3rd trimester in both singleton and twin pregnancies (p<0.01).

Conclusion
In uncomplicated pregnancies, we observed Ea lower than Ees. Along gestation Ea decreased and Ees remained stable. As a result, VAC increased. These changes match those induced by exercise in healthy young subjects. The role of VAC in identifying pregnancies at increased risk of complications needs to be assessed prospectively.
<table>
<thead>
<tr>
<th></th>
<th>Twin</th>
<th>Ees</th>
<th>VAC</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.79 (1.36)</td>
<td>1.46 (1.31)</td>
<td>1.49 (1.25 to 1.63)</td>
<td></td>
</tr>
<tr>
<td>Ees</td>
<td>2.07 (1.62)</td>
<td>1.75 (1.44)</td>
<td>1.67 (1.31)</td>
<td></td>
</tr>
<tr>
<td>Twin</td>
<td>2.13 (1.77)</td>
<td>1.85 (1.35)</td>
<td>1.53 (1.30)</td>
<td></td>
</tr>
<tr>
<td>VAC</td>
<td>0.76 (0.71)</td>
<td>0.83 (0.71)</td>
<td>0.89 (0.83)</td>
<td></td>
</tr>
<tr>
<td>Twin</td>
<td>0.79 (0.69)</td>
<td>0.81 (0.74)</td>
<td>0.95 (0.74)</td>
<td></td>
</tr>
</tbody>
</table>
Successful Pregnancy after Maternal Near Miss in a Marfan Patient

Felipe Favorett Campanharo\textsuperscript{1,2,3}, Daniel Born\textsuperscript{1,2,4}, Gabriel Dotta\textsuperscript{1,2,4}, Evelyn Traina\textsuperscript{1,3}, Tatiana E N K Hamamoto\textsuperscript{1,2,3}, Alan Roberto Hatanaka\textsuperscript{1,3}, Dirceu Faggion Jr\textsuperscript{1,3}, Rosiane Mattar\textsuperscript{1,3}

\textsuperscript{1}UNIFESP - Federal University of São Paulo, Brazil
\textsuperscript{2}Cardiac Problems in Pregnancy, Brazil
\textsuperscript{3}Obstetrics, Brazil
\textsuperscript{4}Cardiology, Brazil

Introduction

One of the main cause of indirect maternal mortality during pregnancy still heart disease. Marfan syndrome is responsible for +/- 50% of the aortic dissections in pregnancy, but this is not the only risk. Other components of the syndrome or related to it also add risks and should not be underestimated.

Objective

Report a case of a patient with Marfan syndrome, an episode of Maternal Near Miss in the previous pregnancy - due to infection / hemorrhage - that against all recommendations became pregnant once again and followed the prenatal care at UNIFESP-EPM.

Case Report

Patient 26 years old, presented to obstetrical appointment 10 weeks pregnant. Past medical history - IIGIP with an extreme premature delivery - 24w - and neonatal death 3 years earlier. At that time, patient had a painless and early cervicodilatation (cervical insufficiency?) which evolved with chorioamnionitis and sepsis. Once again, a high risk pregnancy, in a patient with a Bentall - Bono surgery and need for anticoagulation. The echocardiogram 72% EF, valvular tubular prosthesis - transvalvular flow with a maximum gradient of 15mmHg. Submitted to an enoxaparin and metoprolol regimen during the entire gestational and puerperium period and on 13\textsuperscript{th} week cervical cerclage - US 22mm cervix. On week 37, cerclage was withdrawal and a successful "trial of labor" resulted in a healthy male newborn Apgar 9/10 weighting 1665g. Once again, in the puerperal period she developed hemorrhage, managed with puerperal curettage and adjustments in anticoagulation.

Conclusion

Marfan syndrome can bring great maternal risks and must be managed in a high-risk pre-natal care. Additional obstetric risks increase the odds of adverse events. Elastic fibers are found in the cervix, and Marfan patients are considered to be at risk for cervical insufficiency and prematurity.
Bentall Procedure (Graft Replacement of the Aortic Valve and Ascending Aorta) During Pregnancy in a Patient with Turner Syndrome. A Case Report

**Anne Kirss**¹, Pille Vaas¹, Sirje Kõvask², Arno Ruusalepp², Arvo Klaar²

¹Women’s Clinic, Tartu University Hospital, Estonia
²Heart Clinic, Tartu University Hospital, Estonia

Cardiac surgery during pregnancy is a high-risk procedure for the mother as well as for the fetus. Only a few aortic valve and aortic root surgeries during pregnancy have been described. According to literature data, fetal mortality rate is 20% when cardiopulmonary bypass is used. Intraprocedural hypothermia impairs uteroplacental perfusion and promotes uterine contractions. Maternal hyperkalemia may cause fetal bradycardia and distress. We report a case of a 31-year-old patient with Turner syndrome with a 5cm aortic aneurysm and bicuspid aortic valve, first diagnosed during pregnancy. In the 13th week of gestation, Bentall procedure was performed (composite graft replacement of the aortic valve and ascending aorta). Pregnancy continued and at 36GW the patient gave birth by Caesarean section to a boy with a birth weight of 1950 g and an Apgar score of 8/9. At the age of five months the infant weighed 6.5 kg and had normal emotional development. The mother is also in good health.
Measuring and Improving Quality of Care for Pregnant Women with Heart Disease

A. L. Depla, B. B. van Rijn, A. Franx, S. V. Koenen
UMC Utrecht, Netherlands

Background
Cardiac disease is the most common cause for maternal mortality in developed countries. In 2010 our tertiary maternity care center introduced an integrated practice unit (IPU) for pregnant women with heart disease.

Objectives
To evaluate quality of care in pregnancies of women with heart disease using established outcome measures.

Methods
In a 5-year cohort of pregnancies in women with cardiac disease we assessed a Dutch adaptation of the adverse outcome index (AOI) as proposed by Mann et al. The weighted adverse outcome score (WOAS) and the Pregnancy and Childbirth dataset of the International Consortium Health Outcome Measurement (ICHOM) were also collected. This high-risk cohort was compared to a regional cohort of all pregnancies in the same time period. Adverse events were audited to identify opportunities for improvement.

Results
The cohort consisted of 140 singleton pregnancies in women with cardiac disease. These pregnancies were classified WHO risk class I, II, III and IV in 17%, 37%, 42% and 1% respectively. Most deliveries were spontaneous (58%), whereas 16% were assisted deliveries and 26% cesarean sections. The AOI was 16% and the weighted adverse outcome score (WOAS) was 4.3. In the regional cohort these numbers were 12% and 4.9 respectively. Outcomes contributing most to the AOI were postpartum hemorrhage (PPH; 7.9%), five-minute APGAR score and severe perineal tears (2.1%). Audit of adverse events revealed improvement options in PPH by adjusting oxytocin administration. ICHOM outcome data were recorded as baseline measurement for future improvements.

Conclusions
The IPU results in a relatively good outcome for this high-risk population compared to pregnancies in our region. Room for further quality improvement is in postpartum administration of oxytocin to prevent PPH. In the future we aspire to measure these outcomes and patient reported outcomes in order to improve care continuously.
Most Women with Successful Repair Congenital Heart Disease can have a Successful Pregnancy

Sonila Bele\textsuperscript{1,4}, Arben Rrugia\textsuperscript{2,5}, Elizama Petrela\textsuperscript{3,6}

\textsuperscript{1}Tirana University Obstetric \& Gynaecologic Hospital “Queen Geraldine”, Albania
\textsuperscript{2}Tirana University Obstetric \& Gynaecologic Hospital “Koco Gliozheni”, Albania
\textsuperscript{3}Faculty of Public Health, Albania
\textsuperscript{4}Tirana University Obstetric \& Gynaecologic Hospital “Koco Gliozheni”, Albania
\textsuperscript{5}Tirana University Obstetric \& Gynaecologic Hospital “Koco Gliozheni”, Albania
\textsuperscript{6}Faculty of Public Health, Albania

Background
The hemodynamic adaptations during pregnancy and delivery in woman with congenital heart disease can cause significant complications. Obstetric and neonatal complications are common.

Objective
To evaluate the course of pregnancy in patients with Congenital Heart Disease in several cases that referred to our clinic.

Methods
This study was monitored in a single-centre cohort between January 2000 and December 2016 the data and information have been collected through clinical record sheets. Patients with valvular heart disease were excluded and only patients with documented unrepaired or repaired Congenital Heart Disease (CHD) entered the study.

Results
Pregnancy outcomes were analyzed in 352 consecutive women aged 29.8 ±5.5 years with heart disease. The patients with corrected CHD including 19% of all cases and patients with uncorrected CHD including 19.3% of all cases. These including Atrial Septal Defect, Ventricular Septal Defect, Tetralogy of Fallot, Coarctation of the Aorta, the ductus Botalli, Pulmonary Stenosis, Transposition of the Great Arteries, Ebstein Anomaly, Eisenmenger Syndrome. There was no maternal mortality. Primipare were 47.6% of women. Average birth number is 1.71±0.89. Average baby weight is 2829.4± 629 gr. The occurrence of Heart failure was 18.7% of all cases. Preeclampsia (28.4 % of all cases with corrected CHD and 36.6% of all cases with uncorrected CHD) may be modifiers of the risk of CV complications. By looking through correlation Kendal’s coefficient, a relation was found between weight at birth and uncorrected CHD (p=0.017), weight and Tetralogy of Fallot (p=0.029), weight and Coarctation of the Aorta (p=0.018). As well as weight and HTP at birth (p=0.003), the occurrence of such pathologies result in low weight at birth.

Conclusion
The number of women with Congenital Heart Disease who reach the fertility age is increasing but still obstetric and neonatal complications are common during pregnancy and delivery.

Key words: congenital heart disease, pregnancy, complications.
Pregnancy Outcomes in Women with Heart Disease at the Colonial War Memorial Hospital, Suva, Fiji

Litia Narube
Fiji National University

Background
Cardiac disease in pregnancy is the third most common cause of maternal mortality in Fiji. The aim of this study was to determine the characteristics of pregnant women with heart disease presenting to the Colonial War Memorial Hospital (CWMH).

Method
A retrospective review of case notes of all pregnant women identified with heart disease who birthed in the hospital between January 2011 and December 2013 (36 months).

Findings
Of the 24,844 livebirths in CWMH during the study period, 153 women, aged 15 to 43 years of age, were confirmed with a cardiac lesion, which gives a prevalence rate of 6.2 per 1,000 livebirths. Rheumatic heart disease was the commonest cardiac lesion (112, 90%) followed by congenital heart disease (6, 5%) and hypertensive cardiomyopathy (3, 2%). Most of the cardiac lesions (120, 73%) were detected during pregnancy. There was a higher rate of intervention, morbidity and mortality associated with a cardiac lesion. The rate of instrumental deliveries, caesarean sections and admissions to intensive care were 3.5, 1.5 and 44 times higher compared to pregnant women without a heart lesion. The case-fatality rate was 2.0%.

Conclusion
Women with a cardiac lesion in pregnancy had more interventions, higher morbidity and mortality compared to women without a cardiac lesion. Early diagnosis and evaluation of cardiac function were essential for better maternal outcomes. All pregnant women should be screened with an echocardiogram to improve early detection of cardiac lesions.
Outcome of Pulmonary Hypertension in Pregnancy: Experience from Resource Limited Setting in a University Hospital in Northern Ethiopia

Abraha Weldegerima¹, Awol Yeman², Ermias Abate², Haftom Berhane⁶, Anna Whelan⁴, Joan Briller³, Heather Nixon⁵, Gelila Goba⁴

¹Mekelle university college of health sciences, Ethiopia
²Mekelle university college of health sciences
³University of illinois hospital, Chicago, USA
⁴University of Illinois hospital, Chicago, USA
⁵Nixon Heather, USA
⁶Mekelle University College of Health Sciences, Ethiopia

Introduction
Pulmonary hypertension (PH) is a rare disease and when associated with pregnancy can be devastating. In the developed world, maternal mortality from PH has decreased from 56% in the 1970s to 16% as of 2014. In the developing world, there are still many challenges in the management of these cases.

Objective
To review the management of such patients in a resource limited setting from September 2016 to September 2017.

Methods
Cases with severe PH were identified from high risk antenatal care follow up, cardiology clinic and wards. Severity and type of pulmonary hypertension, NYHA functional status, mode of delivery and anesthesia as well as neonatal and maternal outcomes were noted.

Results
20 cases of severe PH were reviewed. Seventeen of the patients had chronic rheumatic valvular heart disease (85% Group 2 PH of which 16 had an average mitral valve area of 0.9sqcm), and 3 had congenital heart defects (Group 1 PH). The average pulmonary arterial pressure as measured on Echocardiography was 104.2 mmHg (SD 11.4). Thirteen of the patients had NYHA functional class III or more (65%). 11 patients underwent cesarean deliveries, 4 underwent vaginal deliveries with assisted second stage. Three patients underwent termination of pregnancy. Sixty-five percent of pregnancies resulted in live birth. There were 5 deaths (25%) with a mean age at death of 25.8 years. Death was caused by pulmonary edema in 2 cases and pulmonary venous thromboembolism in 3 cases.

Conclusion
Group 2 PH caused by mitral stenosis complicating pregnancy continues to be a significant contributor in our set up. Although these cases were managed in a low resource setting, the outcomes are comparable to studies from the developed world. Multidisciplinary team treatment including cardiology, anesthesia, and obstetrics is important to improve maternal and fetal outcomes.

Key words: pulmonary hypertension, pregnancy, anesthesia.
A Single Center Series of GUCH Pregnancies: Maternal and Fetal Outcomes

Gelsomina Del Sordo1, Silvia Salvi2, Sara De Carolis3, Carmelinda Martino4, Maria Grandinetti5, Maria Lucia Narducci6, Gianluigi Perri7, Francesca Graziani8, Angelica Delogu9, Antonio Amodeo10, Gaetano Draisci11, Massimo Massetti12, Antonio Lanza13

1Università Cattolica del Sacro Cuore, Policlinico Gemelli, Italy
2Università Cattolica del Sacro Cuore, Policlinico Gemelli, Italy
3Università Cattolica del Sacro Cuore, Policlinico Gemelli, Italy
4Università Cattolica del Sacro Cuore, Policlinico Gemelli, Italy
5Università Cattolica del Sacro Cuore, Policlinico Gemelli, Italy
6Università Cattolica del Sacro Cuore, Policlinico Gemelli, Italy
7Università Cattolica del Sacro Cuore, Policlinico Gemelli, Italy
8Università Cattolica del Sacro Cuore, Policlinico Gemelli, Italy
9Università Cattolica del Sacro Cuore, Policlinico Gemelli, Italy
10Università Cattolica del Sacro Cuore, Policlinico Gemelli, Italy
11Università Cattolica del Sacro Cuore, Policlinico Gemelli, Italy
12Università Cattolica del Sacro Cuore, Policlinico Gemelli, Italy
13Università Cattolica del Sacro Cuore, Policlinico Gemelli, Italy

Objective
Significant hemodynamic changes occur during pregnancy in Grown Up Congenital Heart Disease (GUCH) women, leading to an increased risk of cardiac and obstetric complications. The aim of the present study was to evaluate the pregnancy outcome in GUCH women in a tertiary referral hospital.

Methods
This is a retrospective study including patients from May 2012 to October 2017 in our GUCH Out-patient clinic and High-Risk Pregnancy Division. Integrated checks by multidisciplinary team including congenital cardiac surgeons, cardiologists, anaesthesiologists and obstetricians were performed. Timing of controls, mode of delivery, and type of anaesthesia was discussed for each woman. Maternal data were collected during pregnancy and 12 months after delivery. Pregnancy outcome, obstetrical complications, cardiac outcomes, maternal mortality and morbidity were evaluated.

Results
Thirty-eight pregnant women were assessed during this period with thirty-nine pregnancies. The majority of patients (54.5%) suffered of complex congenital heart disease. Live births were 97% (one miscarriage): 76% were at term deliveries while 24% were preterm. A Caesarean section was performed in 84% of cases: 62% was requested for maternal cardiac reasons according to the multidisciplinary team indications. The rate of small for gestational age infants was 21%. The mean neonatal birth weight was 2761 g.

No maternal death during pregnancy or after delivery occurred. NYHA class worsening and new onset or worsening of pulmonary hypertension was observed in 21.2% of patients. Arrhythmias (generally supraventricular) occurred in 27.2% of patients, and arterial hypertension in 9%. Two cases of complex congenital heart disease (5.4%) were observed in the neonates. Two patients needed cardiac surgery after childbirth.

Conclusions
Our experience confirms that GUCH pregnancies are at increased risk for both cardiac and pregnancy complications. The role of a multidisciplinary approach with congenital cardiac surgeons, cardiologists, obstetricians and anesthesiologists is crucial to guarantee the optimal management of GUCH pregnancies.
Molecular and Functional Long-Term Effects of Preeclampsia on the Cardiovascular System Assessed on a mouse model of severe preeclampsia

Aouache Rajaa, Aurélien Ducat, Hélène Collinot, Gilles Gilles Renault, Sébastien Jacques, Francisco Mirałles, Daniel Vaiman
Institut Cochin, France

Preeclampsia (PE) is characterized by de novo hypertension and proteinuria. Women affected with PE have an increased risk of chronic hypertension and premature cardiovascular disease years later. Mice bearing transgenic fetuses overexpressing the human transcription factor STOX1 (storkhead box1) develop a severe preeclamptic phenotype.

The molecular analysis of long term cardiovascular risks induced by preeclampsia will be studied using our mouse model. We started with 10 eight to ten-months-old mice, 5 had control gestations and 5 preeclamptic gestations 6 to 8 months earlier.

We analyzed heart functional parameters by ultrasonography, in normal and stressed conditions. Then we carried out a transcriptional profile of endothelial cells and hearts of the mice. Fibrosis was evaluated by a histology analysis of the hearts. Finally the cytokine levels in mice plasma will be analyzed on 33 cytokines.

The relative mass of the heart of the preeclamptic mice was increased by 11% (p=0.017), with an important fibrosis. Ultrasonography revealed a lesser morphological adaptation to stress. Under dobutamin aortic peak velocity, blood pressure, and right ventricular outflow are significantly increased. The endothelial cells microarray analysis demonstrates that ~3073 transcripts (p0.05) are deregulated in mice affected by PE. Functional clustering works well for the up-regulated transcripts exclusively and revealed significant clustering of genes involved in TNFa signaling, Hypoxia, inflammation, apoptosis, several gene networks centered on interleukin-6, proteoglycan decorin and shc1. We are in the progress of obtaining heart transcriptomics data, as well as brain transcriptomic data.

Our results demonstrate massive quasi-invisible long term effects of preeclampsia, affecting strongly the endothelial cells. Dilatation of hearts and fibrosis indicate a noxious cardiac tissue remodeling in preeclamptic mice. To the best of our knowledge, our study is one of the first to address the molecular effects of preeclampsia in the long term.
Maternal Body Composition in Overweight Non-Obese Women who Underwent Myo-Inositol Supplementation to Prevent Gestational Diabetes: a Randomized Placebo-Controlled Trial

**Salvatore Giovanni Vitale**, Francesco Corrado
*University of Messina, Italy*

**Background**
Maternal body composition undergoes a deep adaptive change during the course of pregnancy, especially in many pathological conditions such as, for example, gestational diabetes mellitus (GDM), pregnancy-induced hypertension (PIH), pre-eclampsia and eclampsia.

**Objective**
To evaluate whether myo-inositol supplementation may change body composition and may reduce incidence of GDM in overweight non-obese women.

**Method**
This is an interim analysis of randomized placebo-controlled trial. Women were randomly assigned into 1:1 ratio in either myo-inositol group (myo-inositol 2g plus 200µg folic acid twice a day) or placebo group (200µg folic acid twice a day). Body composition was evaluated by bioelectrical impedance analysis. Incidence of GDM was also assessed at different gestational age cut-offs (T0: 12°-13° week, T1: 26°-27° week, T2: 31°-32° week, T3: 3 weeks after delivery).

**Results**
From April 2016 to July 2017, 140 pregnant women were enrolled and analysed. 70 women were included into the myo-inositol group and 70 into the placebo group. At T2 women who received placebo had a significant reduction in the fat free mass - fat mass ratio (FFM/FM) (1.84±0.51 vs 2.16±0.45) (p=0.00006), and an increase (p=1.7 x 10^-13) of extracellular water (19.02±2.20 vs 16.08±2.09) compared to those who received myo-inositol. The incidence of GDM was reduced in the myo-inositol group (n= 6, 9%) compared with the placebo group (n= 16, 23%) (p=0.2). After adjustment for confounding factors, myo-inositol treatment was associated with a reduction in the risk of GDM development (OR 4.6, 95% CI 0.02 to 90.8).

**Conclusions**
Myo-inositol supplementation may reduce the incidence of GDM in overweight non-obese women. It could also contribute to a greater increase of fat free mass than fat mass and to a lower increase of extracellular water, with a probable reduction in the risk of developing pregnancy-induced hypertension, pre-eclampsia and eclampsia.
Pregnancy in Women with Cyanotic Congenital Heart Disease

Fernando Baraona\textsuperscript{1,2}, Maria Francisca Arancibia\textsuperscript{1,2}, Polentzi Uriarte\textsuperscript{2}, Rodrigo Gonzalez\textsuperscript{1,2}

\textsuperscript{1}Pontificia Universidad Catolica de Chile, Chile
\textsuperscript{2}Instituto Nacional del Torax, Chile

Background
Pregnancy in women with congenital heart disease has challenged the clinical practice. Chronic cyanosis is a risk factor for adverse maternal and fetal events during pregnancy. There is a recommendation for pregnancy termination. Until 2017, abortion was not legal in Chile.

Objective
We sought to report our experience with pregnancy in cyanotic women.

Methods
From our national congenital heart disease center database, we selected those women with chronic cyanosis who had a pregnancy during the follow-up period.

Results
Since 2005, we have followed 160 pregnancies and 14 of them (corresponding to 14 women) correlated to patients with chronic cyanosis. Most of them had unrepaired complex congenital heart disease and 3 had pulmonary hypertension (Table). Cardiac and pregnancy follow-up visits were performed at our referral center and at their primary local hospital, respectively. We recommended oxygen and iron supplementary therapy to all patients. There were 2 neonatal deaths both in premature neonates. There were no reports of congenital heart disease in the offspring. 1 patient had an episode of symptomatic flutter in immediate post-partum. There were no reports of decompensated heart failure or thromboembolic events. One woman died 2 years after delivery. Adverse neonatal outcomes seem to be associated with women with complex congenital heart disease and lower arterial oxygen saturation.

Conclusion
Pregnancy in women with cyanotic congenital heart diseases is associated with adverse neonatal outcomes. Pre-conception counseling is imperative in this particular population. Pregnancy seems not to confer a higher mortality risk to cyanotic women.
<table>
<thead>
<tr>
<th>Patient</th>
<th>Age at pregnancy (years)</th>
<th>type of Congenital Heart Disease</th>
<th>Arterial Oxygen Saturation %</th>
<th>Previous Obstetric History</th>
<th>Maternal adverse Events</th>
<th>Pregnancy outcomes</th>
<th>Current mother &amp; of spring status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>31</td>
<td>Unrepaired T. Fallot/Pulmonary atresia/ MAPCAs</td>
<td>92</td>
<td>Nulliparous</td>
<td>Hemoptysis</td>
<td>Premature delivery at 24 weeks, Live birth</td>
<td>alive/alive</td>
</tr>
<tr>
<td>2</td>
<td>21</td>
<td>Atrial Septal Defect/Pulmonary Hypertension</td>
<td>92</td>
<td>Nulliparous</td>
<td>Pre-eclampsia</td>
<td>Premature delivery at 23 weeks, Caesarean section, Live birth</td>
<td>alive/alive</td>
</tr>
<tr>
<td>3</td>
<td>21</td>
<td>Single Ventricle/Pulmonary Atresia, Sp DT shunt</td>
<td>84</td>
<td>G2PIA</td>
<td>Flap during peripartum</td>
<td>Premature delivery at 35 weeks, Caesarean section, Live birth, Weight 1400 grams</td>
<td>alive/alive</td>
</tr>
<tr>
<td>4</td>
<td>33</td>
<td>Atrial Septal Defect/Pulmonary Hypertension</td>
<td>85</td>
<td>G2PIA</td>
<td></td>
<td>Planned delivery at 37 weeks, Caesarean section, Live birth</td>
<td>alive/alive</td>
</tr>
<tr>
<td>5</td>
<td>21</td>
<td>eTGA/Mitral Atresia/Sp Fenestrated Fontan operation</td>
<td>86</td>
<td>Nulliparous</td>
<td></td>
<td>Planned delivery at 36 weeks, Caesarean section, Live birth</td>
<td>alive/alive</td>
</tr>
<tr>
<td>6</td>
<td>24</td>
<td>Unrepaired Truncus Arteriosus</td>
<td>86</td>
<td>Nulliparous</td>
<td></td>
<td>Premature delivery at 22 weeks, Caesarean section, Live birth, Weight 1600 grams</td>
<td>alive/alive</td>
</tr>
<tr>
<td>7</td>
<td>25</td>
<td>Unrepaired T Fallot, Sp BT shunt</td>
<td>76</td>
<td>G1DPOA</td>
<td></td>
<td>Planned delivery at 35 weeks, Caesarean section, Live birth</td>
<td>alive/alive</td>
</tr>
<tr>
<td>8</td>
<td>20</td>
<td>Double outlet Right Ventricle, Sp coroction surgery, Residual ASD and VSD</td>
<td>85</td>
<td>Nulliparous</td>
<td></td>
<td>Spontaneous abortion at 17 weeks</td>
<td>alive/alive</td>
</tr>
<tr>
<td>9</td>
<td>23</td>
<td>Single ventricle/Tricuspid Atresia/Sp Shunt BT</td>
<td>84</td>
<td>Nulliparous</td>
<td></td>
<td>Premature delivery at 25 weeks, Caesarean section, Live birth, Weight 670 grams, Neonatal death at day 3</td>
<td>alive/head</td>
</tr>
<tr>
<td>10</td>
<td>26</td>
<td>Tricuspid atresia/Sp Fenestrated Fontan operation</td>
<td>85</td>
<td>Nulliparous</td>
<td></td>
<td>Premature delivery at 23 weeks, Caesarean section, Live birth</td>
<td>alive/alive</td>
</tr>
<tr>
<td>11</td>
<td>19</td>
<td>Pulmonary Atresia/Ventricular Septal Defect/Sp BT shunt</td>
<td>85</td>
<td>Nulliparous</td>
<td></td>
<td>Premature delivery at 25 weeks, Caesarean section, Live birth, Weight 1600 grams</td>
<td>dead/alive</td>
</tr>
<tr>
<td>12</td>
<td>29</td>
<td>Atrial Septal Defect/Pulmonary Hypertension/Total anomalous pulmonary venous connection</td>
<td>85</td>
<td>Nulliparous</td>
<td></td>
<td>Planned delivery at 36 weeks, Caesarean section, Live birth, Weight 1550 grams</td>
<td>alive/alive</td>
</tr>
<tr>
<td>13</td>
<td>23</td>
<td>Single Ventricle/Transposition Great Arteries, Sp BT shunt</td>
<td>86</td>
<td>Nulliparous</td>
<td></td>
<td>Planned delivery at 37 weeks, Caesarean section, Live birth</td>
<td>alive/alive</td>
</tr>
<tr>
<td>14</td>
<td>31</td>
<td>Atrial Septal Defect/Pulmonary Hypertension</td>
<td>85</td>
<td>Nulliparous</td>
<td></td>
<td>Premature delivery at 23 weeks, Caesarean section, Live birth, Weight 1600 grams</td>
<td>alive/alive</td>
</tr>
</tbody>
</table>
Possibilities of Non-invasive Monitoring Of Central Hemodynamic Indicators In Obese Parturients.

Efim Shifman¹, Dmitriy Marshalov², Ivan Salov², Alexey Petrenko², Alexandr Kulikov³

¹The State Budgetary Healthcare Institution of Moscow Area «Moscow’s regional research clinical institute n.a. M.F. Vladimirskiy», Russia
²V.I. Razumovsky Saratov State Medical University, Medical Faculty, Russia
³The Ural State Medical University, Russia

Background
Obesity in pregnant women can lead to the development of cardiac dysfunction, a decrease in functional reserve, systemic disorders, a significant increase in obstetric and anesthesia risk. Objective: to study the possibility of non-invasive monitoring of central hemodynamics in obese parturients during cesarean section.

Methods
A comparative analysis was carried out of the methods used to determine the indices of central hemodynamics using the calculation method and a non-invasive ultrasound method using the USCOM device (Australia). 80 pregnant women were examined: 20 with normal body weight, 20 with obesity of I degree, 20 with grade II and 20 with grade III obesity. The gestation period is 37-40 weeks. The following were studied: minute distance (MD), stroke volume (SV), cardiac output (CO), total vascular resistance (TVR) by USCOM device (Australia), followed by comparison of measured values with the calculated methods. Calculation of central hemodynamics was carried out according to generally accepted formulas (Starr’s formula). Statistical processing was performed using the application software package (Statistica 10.0). The average value of SV, according to the Ultrasound monitoring, was significantly lower by 30.2%, in comparison with that calculated according to Starr’s formula (p 0.005). CO was lower by 32%, TVR by 57%.

Results
A pronounced dependence of the differences between the calculated and ultrasound indicators on BMI and morbid obesity was found, these differences were most pronounced. According to the ultrasound method, this category of patients showed a significant decrease in the parameters of SV, CO and an increase in TVR even at normal blood pressure values, which dictated the need for additional intraoperative infusion and inotropic support.

Conclusion
The US-method of central hemodynamics monitoring can be recommended as a standard for perioperative monitoring in parturients with obesity.
Connection of Central Hemodynamics Indicators and Intra-abdominal Hypertension in Obese Parturients

Efim Shifman\textsuperscript{2}, Dmitriy Marshalov\textsuperscript{1}, Ivan Salov\textsuperscript{1}, Alexey Petrenko\textsuperscript{1}, Alexandr Kulikov\textsuperscript{3}

\textsuperscript{1}V.I. Razumovsky Saratov State Medical University, Medical Faculty, Russia
\textsuperscript{2}The State Budgetary Healthcare Institution of Moscow Area "Moscow regional research clinical institute n.a. M.V. Vladimirsky, Russia
\textsuperscript{3}The Ural State Medical University

Background
There are assumptions about the relationship between the intra-abdominal hypertension (IAH) and hemodynamic disorders in the complicated course of pregnancy in obese patients.

Objective
The aim of the study was to study the relationship between central hemodynamics indices and intra-abdominal pressure in obese parturients. Material and methods: 80 pregnant women were examined: 20 with normal body weight, 20 - I grade of obesity, 20 with grade II and 20 with grade III. The gestation period was 37-40 weeks. Minute distance (MD), stroke volume (SV), cardiac output (CO) and total vascular resistance (TVR) were investigated (USCOM device (Australia)). Intraabdominal pressure was measured by an over-the-bladder method. Statistical processing was performed using the application software package (Statistica 10.0).

Results
Kraskel-Wallis test revealed statistically significant differences (p 0.001) in terms of absolute values of IAP in the categories of pregnant women determined by BMI. Spearman’s method established a positive correlation between the mean strength of the initial BMI and the level of IAP in the third trimester (r = 0.45, p 0.001). Correlation analysis also revealed a strong correlation between the level of IAP and the magnitude of the following indices of central hemodynamics: SV, CO, TVR. The higher the level of IAP (more than 20 mm Hg), the more expressed is the decrease in SV and the higher are indices of vascular resistance. The strength of connection of hemodynamic parameters with BMI was less pronounced than with the level of IAP (0.48 vs 0.71).

Conclusion
The study showed the potential for a relationship between the high incidence of hypertensive conditions during pregnancy with obesity and the level of IAP. This circumstance proves the advisability of using methods that reduce the level of IAP (abdominal decompression, epidural analgesia,) in the correction of hemodynamic disorders in pregnant women with obesity.
Birthweight in Pregnancies Complicated by Maternal Heart Disease a Retrospective Multicentre Study

Matthew Cauldwell¹, Philip Steer², Gemma Malin³, Suzanne Wallace⁴, Adam Jakes⁴, Gemma Ulivi⁵, Tom Everett⁵, Margaret Simpson⁶, Monique Sterrenberg⁷, Mark Johnson⁸

¹Chelsea and Westminster Hospital
²Chelsea and Westminster Hospital
³Nottingham University Hospital
⁴St Thomas' Hospital
⁵Leeds General Infirmary
⁶Golden Jubilee Hospital Glasgow
⁷Southampton Hospital
⁸Chelsea and Westminster Hospital

Background
Pregnancies in women with cardiac disease (congenital and acquired) have higher than average complication rates. For example, a previous study from our unit reported that compared to contemporaneous controls, mean birthweight centile (corrected for parity, gestational age and sex) was 31 compared with 49.

Objective
The aim of this study was to collate data from a larger multi-centre cohort to assess mean and centile distribution of birthweight in pregnancies complicated by heart disease (congenital and acquired) compared with contemporaneous controls.

Methods
Data on birthweight and gestational age at birth 24 weeks gestation were collected from six specialist UK maternity units caring for pregnant women with congenital and acquired heart disease. Women who delivered immediately before and immediately after each index pregnancy were used as controls. Data was obtained from medical and obstetric notes. Birth weight percentiles correcting for gestational age, sex and parity were calculated using the Aberdeen norms. We assessed the relationship between systemic ventricular function at the beginning of pregnancy (graded as normal, mild, moderate, or severe impairment) and birthweight centile. First and subsequent births were analysed separately.

Results
1245 pregnancies in women with heart disease and 2369 controls were identified. Baseline demographics including age, maternal height and weight and BMI did not differ between women with heart disease and controls. In 665 primiparous women with heart disease the mean BW centile was 41 (SD 29.2) vs 53 (SD 27.2) in 1352 controls (p<0.001), and in 577 parous women was 41 vs 51 in 1021 controls. Primiparous women (50) with impaired ventricular function had significantly smaller babies (mean centiles: Normal= 42, mild impairment 30, moderate impairment 32, severe 21), as did multiparous women (mean centiles: Normal= 41, mild impairment 31, moderate impairment 28, severe 25).

Conclusion
Women with heart disease have smaller babies than contemporaneous controls.
Cardiac disease in pregnancy – Improving Awareness through Teaching

**Background**
Every day a pregnant or postpartum woman dies in the UK. At least 2/3 of these deaths are due to medical or mental health conditions. Cardiac disease has been the leading cause of indirect maternal mortality and the leading overall cause of maternal mortality in the UK since the 2000. A Collaborative product between Royal College of Physicians and Royal College of Obstetricians and Gynaecologists devised a poster as part of the Preventing Maternal Deaths Project; “Three P’s in a Pod”. The poster highlights the main causes of maternal death, including cardiac disease. These were distributed to all Emergency Departments and Acute Medical Units (AMUs) in the UK.

**Aims**
Identify specific areas in which multidisciplinary team lack confidence in delivering care to the pregnant woman on the AMU. Identify effective ways in which to educate health care professionals on care of the pregnant woman. Trial teaching methods and resurvey to assess whether these methods are effective.

**Methods:**
Population surveyed - Junior Doctors, Nurses and Pharmacists on the AMU at St Thomas’ Hospital. Pre-intervention survey distributed. Intervention phase - adhoc 15 minute teaching sessions delivered on AMU on shortness of breath and chest pain in pregnancy focusing on key messages that healthcare staff need to know. Post-intervention survey distributed.

**Lessons learnt**
Teaching well received. Short informal workshops easily delivered and well attended. Lack of awareness regarding drugs in pregnancy and maternity early warning scores. Desire for further teaching.

**Future work**
Teaching sessions continue on a monthly basis. Development of a multidisciplinary simulation course (MEmO – Medical emergencies in Obstetric Patients) – incorporates drills e.g. recognition of deteriorating pregnant patient, Acute coronary syndrome, Pulmonary Oedema and Maternal Cardiac arrest. Maternal cardiac arrest simulation in the Emergency department.
Anesthesia in Parturient Suffering from Marfan’s Syndrome Associated Aortic Root Dilatation

Jacob Weinstein\(^1\), Rafael Kuperstein\(^2\), Irina Dolgoker\(^1\), Michal Nir-Simchen\(^3\), Dina Orkin\(^1\), Haim Berkenstadt\(^1\)

\(^1\)Haim Sheba Medical Center, Israel  
\(^2\)Haim Sheba Medical Center  
\(^3\)Haim Sheba Medical Center

Background
Marfan’s syndrome (MS) parturient may present challenges for anesthesiologist, ranging from hemodynamic instability and aortic dissection\(^1,2\), to difficult neuroaxial anesthesia due to dural ectasia.

Aims
To review data on parturients suffering from MS giving birth in our institution.

Methods
Pregnant MS patients treated in a multidisciplinary clinic and gave birth in our hospital between 2006-2015 were included.

Results
During this period, 15 patients were followed during 25 pregnancies.\(^1\) From 7/25 pregnancies in high risk patients (aortic root diameter ≥ 40 mm), 1 was terminated due to fetal MS diagnosis, 6 deliveries were by a cesarean section (CS) from them 4 under general anesthesia (GA) and 2 under spinal anesthesia (SA). Among 18/25 pregnancies in none high-risk patients (aortic root diameter of 40 mm), 2 were terminated prematurely, 9 had vaginal delivery (4 with epidural analgesia), 7 had CS (5 under GA and 2 under SA). There were no difficulties or complications in the performance of epidural analgesia/anesthesia, and there were no hemodynamic or neurologic adverse effects. During CS standard monitoring was used, no events of hemodynamic instability were indicated, and no inotropes or vasopressors were required. Two patients were diagnosed with post-partum aortic dissection: a patient from the high-risk group underwent surgical repair, while a patient from the non-high-risk group was treated conservatively.

Conclusions
Although no anesthesia adverse effects were indicated, post-partum aortic dissection remains a significant problem. MS parturients needs to be followed by a multidisciplinary team in an institution capable of diagnosis and treatment of aortic dissection.
Persistent Significant Left Atrioventricular Valve Regurgitation after Second Delivery in a Patient with Repaired Atrioventricular Septal Defect

Masahiro Nakao, Takuya Kawamura, Ryoko Ono, Ryo Suzuki, Ikuno Kawabata, Atsushi Yoshida, Shinji Katsuragi
Sakakibara Heart Institute, Japan

Background
A repaired atrioventricular septal defect (AVSD) is thought to be well tolerated in women during pregnancy in case of preserved ventricular function and without severe valve regurgitation. However it is not clear regarding safety during the subsequent pregnancy.

Case presentation
A 30-year-old primiparous woman at 8 weeks of gestation was referred to our institute. She had a history of surgical repair for incomplete AVSD and mild left atrioventricular valve regurgitation (LAVVR) remained. She delivered a girl at 41 weeks of gestation without any cardiac complication. Monitoring with echocardiograms during pregnancy showed transient progression to moderate LAVVR in the late pregnancy but recovered to mild after delivery. In her subsequent pregnancy two years later, she developed palpitation at 20 weeks of gestation. An electrocardiogram revealed paroxysmal supraventricular tachycardia (PSVT) and was treated with adenosine infusion. An echocardiogram showed progression from moderate to severe LAVVR, with left atrial and ventricular dilatation. She had PSVT frequently in late pregnancy and was transferred to another hospital because of fetal tachyarrhythmia. She delivered a baby at 38 weeks of gestation and a follow-up echocardiogram showed that moderate LAVVR remained.

Discussion
As a long-term issue in patients with repaired AVSD, arrhythmia (supraventricular arrhythmia, atrioventricular block) and residual LAVVR are reported. Increased blood volume and enhanced sympathetic nervous system during pregnancy may cause such an arrhythmia or deterioration of pre-existing LAVVR. In this case, such a burden in the first pregnancy might increase the risk of cardiac complication during the second pregnancy.

Conclusion
Multiparous women with repaired AVSD and residual LAVVR may need more careful management during pregnancy.
Background
Rheumatic MS is the most common valve lesion in women of childbearing age and some women will present with symptoms for the first time during pregnancy due to the hemodynamic changes. The severity depends on the valve area, trans-mitral gradient and pulmonary pressure. Women who are refractory to pharmacological therapy may be considered for percutaneous mitral balloon valvuloplasty.

Objective
To evaluate the clinical outcome of pregnant woman with MS.

Methods
We collected cardiologic and obstetrics data about a woman with MS (WHO III, NYHA II).

Results
A 32 years woman became pregnant on October of 2016. The valve stenosis was accidentally discovered on 2012; the last echocardiogram before pregnancy showed normal EF, mild MI, anatomic area 1.6 cm\(^2\) and trans-mitral gradient 5.8 mmHg. During the II trimester of pregnancy the trans-mitral gradient got worse (until 15 mmHg), the valve area reduced to 1 cm\(^2\) and the left atrium increased; we progressively increased the b-blocker therapy with metoprolol 50mg/day until 150 mg/day. The woman responded to the therapy and she didn’t need any diuretic or percutaneous valvuloplasty. The echocardiogram parameters remained steady.

We induced the labour at 38 weeks, thought endocervical balloon, artificial amniorrhexis and oxytocin infusion. A female baby of 2140 gr (8°centile) was born with a vacuum-assisted vaginal delivery in the second stage of the labour. Three days after, the trans-mitral gradient was 11.5 mmHg, the valve area was 1.2 cm\(^2\) and the left atrium got smaller; the women took in the therapy with metoprolol 100 mg 2 times/day. 30 days after the delivery the trans-mitral gradient returns to 6.5 mmHg and the valve area was 1.2 cm\(^2\): moderate MS with a good hemodynamic compensation.

Conclusion
Because of the high risk of maternal hearth complications, an elective percutaneous balloon valvuloplasty should be considered before another pregnancy is planned.
Fetal Growth Patterns in Women with Maternal Arrhythmias

Karen Florio²,4, Emily Williams⁴, Tara Daming²,4, Anna Grodzinsky¹,3, Krishna Patel¹,3, Stephanie Sparkes⁵, Rebecca Gray², Darcy White², Valerie Rader¹,3, Laura Schmidt¹,3, John Lee¹,3, Anthony Magalski¹,3, John Spertus¹,3

¹Saint Lukes Hospital of Kansas City, USA
²Saint Lukes Hospital of Kansas City, USA
³University of Missouri-Kansas City, USA
⁴University of Missouri-Kansas City, USA
⁵Saba University, Netherlands

Background
Fetal growth patterns in women with maternal arrhythmias without structural cardiac defects have not been well established; therefore optimal antenatal surveillance of these pregnancies is unclear.

Objective
We sought to evaluate the association between maternal arrhythmias and fetal growth.

Study Design
This was a retrospective cohort analysis of 45 singleton pregnancies complicated by various maternal arrhythmias in Kansas City between 2006 and 2016. All patients had echocardiographically normal hearts. We stratified women by need for antiarrhythmic agents, NYHA classifications, and WHO maternal risk scores. To assess whether maternal arrhythmia was associated with fetal growth restriction by ultrasound assessment, our outcomes of interest were estimated fetal weight percentile values in the third trimester and birth weight percentiles. Variables were compared using Student’s T-test or Chi-square tests.

Results
We found that fetal growth of the entire cohort was normal, with normal estimated fetal weight and birth weight percentiles (55.7 +/- 34.9 % and 55.8 +/- 27.8 %, respectively). There was no increased burden of adverse events as defined by NICU stay, neonatal demise/stillbirth, hypertensive disorders, preterm delivery, or chorioamnionitis in the cohort. The percentage of IUGR infants was 7.3%, which is not statistically different from the general population. When stratified by maternal cardiac risk, there was no association with WHO scores, NYHA classification or need for antiarrhythmics with fetal growth patterns. There were no other parameters that were associated with fetal growth restriction.

Conclusions
Women with maternal arrhythmias do not show significantly different fetal growth patterns than the general population. This suggests that in women with arrhythmias not associated with structural heart abnormalities, intensive antenatal growth surveillance may not be routinely medically indicated. These findings should be further explored in a larger cohort.
Background

There are now more adults living with congenital heart disease than are there children. As such, there are more women with congenital heart disease desiring pregnancy than ever before. Obstetric outcomes in patients with maternal congenital heart disease have been studied, but little is known regarding antepartum management.

Objective

To evaluate the association of echocardiographic parameters and fetal growth in women with congenital heart disease.

Study Design

This was a retrospective cohort analysis of 83 singleton pregnancies complicated by maternal congenital heart disease in Kansas City between 2006 and 2016. We stratified women by the modified World Health Organization (WHO) classification of maternal cardiovascular risk, CARPREG scores, and left and right outflow obstruction. To assess whether maternal congenital heart disease was associated with fetal growth restriction, we evaluated estimated fetal weight and abdominal circumference percentile values in the third trimester and birth weight percentiles. Variables were compared using Student’s T-test or Chi-square tests.

Results

We found fetal growth of the cohort was normal, with normal EFW and birth weight percentiles (54.9 +/- 28.3 % and 54.3 +/- 23.5 %). When stratified by maternal cardiac risk, there was no association between CARPREG or WHO scores and fetal growth patterns, though women with a WHO risk score 2 trended toward having growth restricted infants (p=0.07). Right obstructive lesions were found to have significantly decreased birth weight percentile (35.6 +/- 24.5% vs. 57.2 +/- 23.1%, p=0.02). Low cardiac output was not associated with growth restriction (p=0.33).

Conclusions

Women with WHO scores of ≤2 and CARPREG scores
<table>
<thead>
<tr>
<th>Table 1: Cohort Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of pregnancies</td>
</tr>
<tr>
<td>Maternal Age (years)</td>
</tr>
<tr>
<td>WHO Risk</td>
</tr>
<tr>
<td>2 or less</td>
</tr>
<tr>
<td>3 or greater</td>
</tr>
<tr>
<td>CARPREG Score</td>
</tr>
<tr>
<td>Less than 1</td>
</tr>
<tr>
<td>Greater than 1</td>
</tr>
<tr>
<td>Left heart obstruction</td>
</tr>
<tr>
<td>Pulmonary hypertension</td>
</tr>
<tr>
<td>Ethnicity</td>
</tr>
<tr>
<td>Caucasian</td>
</tr>
<tr>
<td>African American</td>
</tr>
<tr>
<td>Hispanic</td>
</tr>
<tr>
<td>Parity</td>
</tr>
<tr>
<td>Nulliparous</td>
</tr>
<tr>
<td>Multiparous</td>
</tr>
<tr>
<td>Mode of Delivery</td>
</tr>
<tr>
<td>Cesarean Delivery</td>
</tr>
<tr>
<td>Vaginal Delivery</td>
</tr>
<tr>
<td>Operative Vaginal Delivery</td>
</tr>
<tr>
<td>Pre-Pregnancy BMI</td>
</tr>
<tr>
<td>Delivery BMI</td>
</tr>
<tr>
<td>Fetal Gender</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2: Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter</td>
</tr>
<tr>
<td>Third trimester EFW %</td>
</tr>
<tr>
<td>Third trimester AC%</td>
</tr>
<tr>
<td>Birth weight Percentile</td>
</tr>
<tr>
<td>Growth Restricted by EFW</td>
</tr>
<tr>
<td>Growth restricted by birth weight</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>WHO Risk &lt;= 2</th>
<th>WHO Risk &gt;2</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Third trimester EFW %</td>
<td>52.6 +/- 37.1</td>
<td>60.9 +/- 36.7</td>
<td>0.307</td>
</tr>
<tr>
<td>Third trimester AC%</td>
<td>57.9 +/- 32.9</td>
<td>58.7 +/- 37.9</td>
<td>0.942</td>
</tr>
<tr>
<td>Birth weight Percentile</td>
<td>54.6 +/- 22.4</td>
<td>53.2 +/- 26.8</td>
<td>0.810</td>
</tr>
<tr>
<td>Growth Restricted by EFW</td>
<td>3 (5.9%)</td>
<td>0 (0%)</td>
<td>1.00</td>
</tr>
<tr>
<td>Growth restricted by birth weight</td>
<td>0 (0%)</td>
<td>2 (5.1%)</td>
<td>0.067</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Left Heart Obstruction</th>
<th>No Left Heart Obstruction</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Third trimester EFW %</td>
<td>56.0 +/- 22.5</td>
<td>54.5 +/- 20.6</td>
<td>0.845</td>
</tr>
<tr>
<td>Third trimester AC%</td>
<td>61.7 +/- 30.4</td>
<td>57.3 +/- 35.3</td>
<td>0.734</td>
</tr>
<tr>
<td>Birth weight Percentile</td>
<td>55.0 +/- 19.4</td>
<td>53.7 +/- 24.2</td>
<td>0.868</td>
</tr>
<tr>
<td>Growth Restricted by EFW</td>
<td>0 (0%)</td>
<td>2 (4.9%)</td>
<td>1.00</td>
</tr>
<tr>
<td>Growth restricted by birth weight</td>
<td>0 (0%)</td>
<td>2 (2.9%)</td>
<td>1.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Right Heart Obstruction</th>
<th>Right Heart Obstruction</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Third trimester EFW %</td>
<td>50.7 +/- 39.2</td>
<td>58.4 +/- 25.0</td>
<td>0.846</td>
</tr>
<tr>
<td>Third trimester AC%</td>
<td>60.7 +/- 35.5</td>
<td>60.1 +/- 34.3</td>
<td>0.970</td>
</tr>
<tr>
<td>Birth weight Percentile</td>
<td>35.6 +/- 24.5</td>
<td>57.1 +/- 23.2</td>
<td>0.016</td>
</tr>
<tr>
<td>Growth Restricted by EFW</td>
<td>0 (0%)</td>
<td>2 (5.7%)</td>
<td>1.00</td>
</tr>
<tr>
<td>Growth restricted by birth weight</td>
<td>0</td>
<td>2 (9.3%)</td>
<td>0.133</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Cardiac Output &lt;5L</th>
<th>Cardiac Output &lt;5L</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth weight Percentile</td>
<td>44.4 +/- 23.3</td>
<td>54.4 +/- 23.7</td>
<td>0.165</td>
</tr>
<tr>
<td>Growth Restricted by EFW</td>
<td>1</td>
<td>2</td>
<td>1.00</td>
</tr>
<tr>
<td>Growth restricted by birth weight</td>
<td>2 (12.5%)</td>
<td>0 (0%)</td>
<td>0.097</td>
</tr>
</tbody>
</table>
Background
Peripartum cardiomyopathy (PPCM) is a significant cause of maternal morbidity and mortality worldwide, yet its etiology remains unknown. Recent research suggests that it is a vascular disease, triggered by late–gestational secretion of potent antiangiogenic agents from the placenta and pituitary gland. Preeclampsia (PE) has a close correlation with PPCM, even if no comprehensive evaluation of the relationship between PE and PPCM exists. Risk factors include multiparity, black race, older maternal age, preeclampsia, and gestational hypertension.

Objective
Identification of patients with risk factors for the development of PPCM in order to get a prompt diagnosis and ensure a proper treatment.

Methods
A 32-year-old PARA 0020 black race woman with a diamniotic dichorionic twin pregnancy at 31+6 weeks of gestation was admitted to obstetrics department in “Ca’ Foncello Hospital” in Treviso for preeclampsia. An emergency cesarean section was decided because of acute dyspnea and chest pain. At the moment of the resuscitation, the patient experienced severe bradycardia. She was transferred to intensive care unit where she was hemodynamically stabilized. An echocardiogram was performed with the diagnose of cardiac insufficiency with a severe reduction of ejection fraction. Therapy with fluid and salt restriction, β-blocker, diuretic, calcium antagonists was administered. The left ventricle ejection fraction normalized. The patient is now in regular cardiological follow-up.

Conclusions
PPCM could be misdiagnosed or diagnosed late because of its ambiguous symptoms which closely resemble those within the normal spectrum of pregnancy and the postpartum period. The delayed identification carries a high mortality rate. If promptly diagnosed, in about 50% of patients the ejection fraction normalizes. Regardless of recovery, however, a second pregnancy is usually not recommended for these patients because PPCM recurs in more than 30% of subsequent pregnancies, which puts both mother and baby at great risk.
Heart Disease in Pregnancy: Developing a Center of Excellence

Rebecca Gray1, Darcy White1, Karen Florio1,4, Tara Daming1,4, Anna Grodzinsky2,3, Emily Williams5, Krishna Patel2,3, Stephanie Sparkes5, Laura Schmidt2,3, Valerie Rader2,3, John Lee2,3, Anthony Magalski2,3, John Spertus2,3

1Saint Luke’s Hospital of Kansas City, USA
2Saint Luke’s Hospital of Kansas City, USA
3University of Missouri-Kansas City, USA
4University of Missouri-Kansas City, USA
5Saba University, Netherlands

Background
The maternal mortality rate in the US has been increasing with cardiovascular disease as the number one contributing factor. The trend is to manage these patients separately rather than in a multidisciplinary setting. As part of the Saint Luke’s Mid-America Heart Institute and Maternal-Fetal Medicine unit in Kansas City, Missouri, we have developed a multidisciplinary approach to the care for pregnant women with both acquired and congenital heart disease.

Objective
Our purpose to outline criteria for a center of excellence for heart disease and pregnancy.

Methods
Develop and coordinate multidisciplinary teams to include maternal fetal medicine, genetics, cardiology, cardiovascular surgery, anesthesia, critical care, OB services and neonatology. Patient-centered care is delivered at antenatal visits in an integrated fashion. We recommend monthly team meetings to discuss plan of care regarding antepartum management, timing, mode and location of delivery. Additional services should include: availability of termination services, intensive care nursery, cardiovascular intensive care unit, perfusionists, cardiac imaging (including availability of echocardiogram and cardiac MR), nurses specialized in both obstetrics and cardiovascular medicine, and availability of massive transfusion capabilities.

Results
We have cared for over 380 women with various cardiac problems in pregnancy since the inception of our program in 2014. To date, we have had one maternal death, 19 deliveries requiring intensive care setting, 113 full term deliveries, 75 cesareans, 73 vaginal deliveries, 11 operative vaginal deliveries, 36 NICU admissions and 2 patients requiring cardiothoracic services. Every patient received at least one integrated visit in the MFM unit and 6 weeks postpartum visit.

Conclusion
In order to combat the rising maternal mortality rate, the need for multidisciplinary care for pregnant women with cardiovascular disease cannot be understated. To reverse this trend, we recommend evaluation in a specialized cardiac disease in pregnancy program.
Development of Echocardiographic Parameters in Patients with Peripartum, Inflammatory and Dilated Cardiomyopathy

Jan Krejci\textsuperscript{1}, Marie Lazarova\textsuperscript{2}, Hana Poloczkova\textsuperscript{1}, Petr Hude\textsuperscript{1}, Eva Ozabalova\textsuperscript{1}, Alice Novakova\textsuperscript{1}, Silvie Belaskova\textsuperscript{3}, Lenka Spinarova\textsuperscript{1}

\textsuperscript{1}St. Anne’s University Hospital Brno, Czech Republic
\textsuperscript{2}University Hospital Olomouc, Czech Republic
\textsuperscript{3}St. Anne’s University Hospital Brno, Czech Republic

Introduction
Left ventricle ejection fraction (LVEF) increase in women with peripartum cardiomyopathy (PPCM) is greater than in women with non-inflammatory dilated cardiomyopathy (DCM). It is not clear whether the development of echoparameters differ in women with PPCM and inflammatory cardiomyopathy (ICM).

Objective
Comparison of the one-year development of echocardiographic parameters in women with ICM, DCM and PPCM.

Patients and methods
We evaluated 46 women with the diagnosis of DCM in 24 cases, ICM in 15 cases and PPCM in 7 cases. ICM was defined as the presence of $\geq 14$ LCA+ cells and / or $\geq 7$ CD3+ cells /mm\textsuperscript{2} in bioptic sample. Data are presented as median and interquartile range. The Friedman test was used for one-way repeated measures analysis of variance by ranks. The Kruskal–Wallis test by ranks was used for testing whether samples originate from the same distribution.

Results
In the DCM group, LVEF improved from 25 ± 10\% to 30 ± 20\% after twelve months (p=0.001). In the ICM group, LVEF changed from 20 ± 15\% to 37 ± 15\% after twelve months (p=0.002). In the PPCM group, LVEF increased from 30 ± 20\% to 48 ± 20\% after twelve months (p=0.196). Differences in LVEF changes between groups after twelve months were not statistically significant (p=0.145). Changes in other followed parameters did not differ significantly as well.

Conclusion
In absolute values, the improvement of echocardiographic parameters was the most striking in PPCM group, comparable results were obtained in ICM group and the smallest increase of LVEF was present in DCM group. The statistical significance of the results was limited by a small number of patients.

Study was supported by AZV Grant No 16-30537A, Ministry of Health of the Czech Republic.
Right Ventricular Systolic Dysfunction is Associated with Lack of Left Ventricular Functional Recovery in Peripartum Cardiomyopathy

Evin Yucel\textsuperscript{1}, Christos Mihos\textsuperscript{2}, Nandita Scott\textsuperscript{1,3}, Judy Mangion\textsuperscript{4}, Doreen DeFaria Yeh\textsuperscript{1,3}

\textsuperscript{1}Massachusetts General Hospital, USA
\textsuperscript{2}Mount Sinai Heart Institute, USA
\textsuperscript{3}Massachusetts General Hospital, USA
\textsuperscript{4}Brigham and Women’s Hospital, USA

Background
Right ventricular (RV) dysfunction is often associated with poor outcomes in patients with cardiomyopathy. We sought to investigate the association between baseline RV dysfunction and left ventricular (LV) functional recovery in patients with peripartum cardiomyopathy (PPCM).

Methods
Forty-six patients with PPCM and serial echocardiography between 2003 and 2016 were retrospectively identified from our echocardiography database. LV recovery was defined as LV ejection fraction (LVEF) \( \geq \) 50\% at follow-up. Univariate analyses and receiver operating characteristic were utilized to assess the association between echocardiographic variables, including RV dysfunction, with LV recovery.

Results
The mean age, gravida, and parity were 32 ± 7 years, 2.5 ± 2, and 1.9 ± 1.3. During a mean echocardiographic follow-up of 27 months, 27 (59\%) patients had LV recovery. At baseline, compared to patients with LV recovery, patients with persistent LV dysfunction (N=19) were more likely of black race (53\% vs. 11\%; \( p=0.003 \)) and diagnosed later after delivery (45 vs. 7 days; \( p=0.001 \)), had a lower mean LVEF (23\% vs. 37\%; \( p=0.001 \)), and larger LV end-diastolic diameter (58 vs. 53 mm; \( p=0.005 \)). Importantly, persistent LV dysfunction was associated with a greater prevalence of RV dysfunction both at baseline (53\% vs. 19\%; \( p=0.02 \)) and at follow-up (47\% vs. 0\%) \( p \)

Conclusion
RV dysfunction is an important baseline echocardiographic marker of persistent LV dysfunction in patients with PPCM, and may provide a model for additional patient risk stratification.
Pregnancy in a patient with SLE, Libman-Sacks Endocarditis and Valvular Disease

Linda Njoroge, Mohamed Khayata, Isaac Rhea, Heather Blume, Honor Wolfe, David Hackney, Chantal ELAmm
Case Western Reserve University University Hospitals Cleveland Medical Center, USA

Background
Systemic lupus erythematosus (SLE) patients are at a higher risk of complications in pregnancy including preeclampsia, placental previa or abruption, fetal loss, prematurity and low birth weight. Major hemodynamic, hypercoagulable and hormonal changes in pregnancy can worsen preexisting cardiovascular disease in these patients. We present a case of severe valvular disease in a pregnant SLE patient with significant barriers to care.

Case Report
A 41-year-old G7P3 female with SLE, antiphospholipid syndrome, Libman-Sacks endocarditis with severe mitral and aortic regurgitation, 3 first trimester miscarriages, 3 live vaginal assisted births, polysubstance abuse and medical noncompliance was evaluated at the maternal cardiac clinic at 12 weeks gestation. Her previous viable pregnancies had been complicated by prematurity, intrauterine growth restriction and oligohydramnios. Previous echocardiograms demonstrated stable valvular vegetation’s however during the last pregnancy she did not receive antenatal care and developed acute decompensated heart failure (ADHF) post-partum. She was again noncompliant with surveillance echocardiograms during the reported pregnancy and presented at 35 weeks with vaginal bleeding secondary to placenta previa. She underwent emergency cesarean section and was complicated by ADHF postoperatively. TTE showed worsening valvular dysfunction with severe aortic, mitral and tricuspid regurgitation and a right atrial thrombus that was confirmed on TEE. She was treated with diuretics, vasodilators and anticoagulation but left the hospital early against medical advice. She presented for 2 weeks follow up, clinically compensated and her baby was doing well.

Conclusion
Patients with SLE and antiphospholipid antibodies are at increased risk of developing valvular abnormalities and ADHF in pregnancy particularly during the third trimester. Close symptom surveillance and medical management with anticoagulation, diuretics and afterload reduction can help mitigate decompensation. Medical noncompliance led our patient to decompensate and this has proved to be a significant barrier in her care.
Lethal Cardiovascular and Pulmonary Sequelae Of Valsartan Fetotoxicity: A Case Report

Ngoc-Chi Tu1, Florian Kipfmüller2, Andreas Müller2, Ulrich Gembruch1, Waltraut Merz1

1University of Bonn Medical School, Germany
2University of Bonn Medical School, Germany

Introduction

Standard treatment of dilated cardiomyopathy (DCM) includes angiotensin receptor blockers (ARBs); prescription during pregnancy however is contraindicated. While evidence of teratogenicity is conflicting and observed malformations may be due to confounders such as other antihypertensive medications or hypertension itself, fetotoxicity of ARBs and renal dysplasia in particular, has been well established. Affected neonates often suffer sequelae of renal impairment such as pulmonary hypoplasia and hypertension (PAH) and respiratory distress syndrome (RDS).

Case

A 31-year old Primigravida with DCM was on Valsartan, Furosemide, Bisoprolol, Omeprazole and Aspirin during the first 24 weeks of gestation and was referred due to anhydramnios. Ultrasound examination confirmed a viable fetus with severe biventricular myocardial hypertrophy and enlarged fetal kidneys with renal tubular dysplasia. Close fetomaternal surveillance showed no improvement of renal function. Severe uteroplacental dysfunction with fetal brain sparing necessitated a C-section at 27+2 weeks of gestation. A female newborn with 720g, APGAR scores of 6/7/10 at 1, 5 and 10 minutes, respectively, and umbilical artery pH 7.35 was delivered. She was admitted to NICU and needed intubation due to RDS and pulmonary hypoplasia. Peritoneal dialysis was required during the first six days with subsequent normalization of renal function. Her treatment included NO, sildenafil, diuretics, catecholamines, antihypertensive drugs and prednisolone. She died at eight months of age from cardiovascular (PAH) and respiratory (RDS) complications of ARB-induced oligohydramnios.

Discussion

Oligo-/ Anhydramnios if present during crucial stages of pulmonary development (16 to 22 weeks of gestation) may lead to pulmonary hypoplasia with consecutive RDS and PAH of the newborn. Even after normalization of renal function, death or severe morbidity may occur. Renal and cardiac function is interrelated during gestation, and changes in cardiovascular function such as biventricular myocardial hypertrophy may be present in fetuses with impaired or absent renal function.
Long-term Cardiovascular Outcomes among Women with Marfan Syndrome after Pregnancy

Kristina Kernell, Gunilla Sydsjö, Marie Bladh, Ann Josefsson
Linköping University, Sweden

Background
There are few previous studies investigating long-term cardiovascular outcomes after pregnancy in women with Marfan syndrome. Changes in aortic diameter and the risk of aortic dissection have been studied with conflicting results.

Objective
To study long-term cardiovascular outcomes such as aortic dissection, cardiac arrhythmia, valvular heart disease as well as cardiovascular surgical procedures after childbirth in women with Marfan syndrome.

Methods
All Swedish women with Marfan syndrome born between 1973 and 1993 who had given birth between 1995 and 2010 were included in this national register-based, case-control study. All cardiovascular diagnoses (ICD-10; I10-I74) and cardiovascular surgical procedures (ICD-10; FC, FP, FG, FK, FM, FP) were retrieved from Swedish National Registers. The women were followed until 2013. Comparisons were made between women with Marfan syndrome who had given birth (n=57) and a control group of women with Marfan syndrome who had not given birth (n=216) and to another control group of women without Marfan syndrome who had also given birth matched for age and delivery year (n=114). The median follow-up time in this study was six years.

Results
Among women with Marfan syndrome valvular heart disease and cardiac arrhythmia were the most common diagnoses after childbirth. The overall percentage of cardiovascular disease in women with Marfan syndrome after childbirth was 19.3% compared to 12.0% in women with Marfan syndrome who had not given birth (p=0.192). Women without Marfan syndrome who had given birth were at were low risk of cardiovascular disease (0.9%).

Conclusions
For women with Marfan syndrome pregnancy is a high-risk situation. Higher frequencies of cardiac arrhythmia and valvular heart disease in women with Marfan syndrome were found after childbirth. However, due to the low numbers of cases, statistical significance was not achieved in this study.
Pregnancy in Pulmonary Arterial Hypertension

Magdalena Kaznica-Wiatr¹, Agata Lesniak-Sobelga², Piotr Blaszczak³, Grzegorz Kopec¹, Maria Olszowska¹, Krzysztof Rytlewski⁴, Jaroslaw D. Kasprzak³, Jaroslaw D. Kasprzak, Piotr Podolec¹

¹John Paul II Hospital, Institute of Cardiology, Faculty of Medicine, Jagiellonian University Medical College, Poland
²Wojewódzki Szpital Specjalistyczny im. Stefana Kardynała Wyszyńskiego, Poland
³Uniwersytet Medyczny w Łodzi, Wojewódzki Szpital Specjalistyczny im. dr W. Biegańskiego, Poland
⁴Jagiellonian University Medical College

Background

Pregnancy in pulmonary arterial hypertension (PAH) is contraindicated due to high mortality rate for mother and child. Thus the aim of the study was to assess maternal and newborn outcome in modern treatment era.

Results

Five pregnant females, aged 29.25±9.46 years were enrolled; in 2 idiopathic pulmonary arterial hypertension (IPAH) and in 3 PAH due to congenital heart defects and Eisenmenger syndrome were diagnosed (tab.1). In 4 PAH was diagnosed before pregnancy, in one was newly diagnosed at 24th week of gestation. At early stage of pregnancy 3 patients were in III WHO-FC, 2 in class II. Mean NT-proBNP level was 528±820.83pg/ml. On echocardiography mean RVSP was 103.33±21.33mmHg, TAPSE 15±2.16 mm.

Two patients received sildenafil after discovering pregnancy; then one of them was administered treprostinil from 22nd week, in the second case treprostinil was started few hours before delivery. Caesarean section was performed in 3 cases at gestational week 31, 33 and 37, in one case spontaneous vaginal delivery was noted.

Two patients are alive, two of them died. The pentigravida was lost to follow-up. After delivery and postpartum period in one case bosentan with sildenafil, in second one treprostinil with sildenafil were administered. No newborns deaths or congenital defects were observed.

Conclusion

Considering high mortality rate among pregnant women with PAH, pregnancy is strongly contraindicated, but in some selected patients with well controlled PAH successful pregnancy and labour in the modern treatment era is possible.
Pregnancy Outcomes in Women with Cardiac Disease: Five Years’ Experiences of Multidisciplinary Management According to Modified WHO Risk Score

Hana Al-Ali¹, Heiddis Valgeirsdottir¹, Tansim Akhter¹, Birgitta Birgisdottir³, Ulrica Alström³, Birgitta Jönelid², Carina Blomström-Lundqvist³, Christina Christersson², Ajlana Mulic-Lutvica¹

¹Uppsala University Hospital, Uppsala University, Department of Obstetrics and Gynaecology, Sweden
²Uppsala University Hospital, Uppsala University, Department of Medical Sciences, Cardiology, Sweden
³Uppsala University Hospital, Uppsala University, Department of Anesthesiology and Intensive Care, Sweden

Background
Cardiac disease (CD) is the leading cause of maternal death in Sweden and is not declining. In November 2011, a multidisciplinary group for the management of CD during pregnancy (Heart-Mother-Group) was founded in Uppsala University Hospital.

Objectives
The main aim was to assess cardiac, obstetrical, and neonatal outcomes in pregnant women with CD stratified according to modified WHO risk classifications. A secondary aim was to evaluate compliance with European Society of Cardiology (ESC) recommendations (1).

Methods
A five years’ observational study of pregnant women with CD referred to our tertiary care centre from January 2012 to December 2016. A pre-defined “Heart-mother form” was filled out prospectively. Data were analysed using descriptive statistics.

Results
Out of 123 pregnancies, five terminated pregnancy (one cardiac indication, IV) and one had intrapartal foetal death (II-III).

Ten women had assisted delivery, only one on cardiac indication. Cardiac events were: four arrhythmias, one cardiac arrest, three heart-failures and one stroke. No maternal death occurred. The most common obstetrics complication was postpartum hemorrhage (10%). Three infants had congenital heart disease.

Conclusion
Frequencies of cardiac, and perinatal complications in women with CD are moderately higher than in healthy population. Compliance with ESC guidelines concerning general recommendations was excellent and for specific recommendations there is still improvements potential.
<table>
<thead>
<tr>
<th>Condition</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pregancies (N=123)</td>
<td>91/123 (74%)</td>
<td>21/123 (17%)</td>
</tr>
<tr>
<td>Terminal (N=5)</td>
<td>3/5</td>
<td>1/5</td>
</tr>
<tr>
<td>Fetal</td>
<td>39/118 (33%)</td>
<td>9/118 (7%)</td>
</tr>
<tr>
<td>Vaginal (N=69)</td>
<td>59/69 (88%)</td>
<td>8/69 (12%)</td>
</tr>
<tr>
<td>Induction (N=69)</td>
<td>19/69 (27%)</td>
<td>3/69 (4%)</td>
</tr>
<tr>
<td>Cesarean (N=49)</td>
<td>27/49 (55%)</td>
<td>14/49 (29%)</td>
</tr>
<tr>
<td>Cardiac (N=15)</td>
<td>1/15</td>
<td>9/15</td>
</tr>
<tr>
<td>Cardiac</td>
<td>9/123 (7.3%)</td>
<td>6/123 (5%)</td>
</tr>
<tr>
<td>Prematurity (N=118)</td>
<td>17/118 (14.5%)</td>
<td>5/118 (4.2%)</td>
</tr>
<tr>
<td>NICU (N=118)</td>
<td>9/118 (7.6%)</td>
<td>4/118 (3.4%)</td>
</tr>
</tbody>
</table>
Pregnancy and Birth in a Multiparous Woman with Marfan Syndrome with Aortic Root Dilatation and an Exostent in situ: A Case Report

Imran Ahmed¹, Joann Hale¹, Aisling Carroll²

¹University Hospital Southampton NHS Foundation Trust, UK
²University Hospital Southampton NHS Foundation Trust, UK

There is little clinical experience in the management of pregnancy in women with an exostent in situ for aortic root dilatation and this group of patients has previously been advised to avoid pregnancy due to the attendant risk of aortic dissection. We present a case of pregnancy managed by a combined obstetric and cardiac service at a tertiary centre for a multiparous woman with an exostent in situ.

The patient has a diagnosis of Marfan syndrome with an aortic root sinus measurement of 51mm on magnetic resonance imaging (MRI). She had had an exostent implanted aged 20 and had a previous pregnancy 6 years subsequently where she underwent induction of labour and forceps birth at 37 weeks gestation. Antenatal MRI at 23 weeks in her second pregnancy revealed stable aortic root dilatation. The patient was clinically well throughout pregnancy and blood pressure control was achieved with atenolol. Ultrasound monitoring in pregnancy included fetal echocardiography at 20+4 weeks gestation which was normal, and serial fetal growth assessments at 28 and 34 weeks which were reassuring. Specialist antenatal clinic reviews took place at 24, 28 and 34 weeks.

Multidisciplinary consensus opinion was to opt for elective caesarean section for delivery. This was arranged for 36 weeks and 6 days gestation and was preceded by a course of antenatal steroids for fetal lung maturation. Combined spinal-epidural anaesthesia was performed and the caesarean section was uneventful with an 1100ml blood loss without haemodynamic compromise. Bilateral fallopian tube fimbriectomy was also performed at the time of caesarean for permanent contraception following discussion with the patient. She was normotensive and well postoperatively and discharged home at day 3.

This case demonstrates the successful management of a high risk second pregnancy in a patient with Marfan syndrome with aortic root dilatation and an exostent.
Trends in maternal obesity in England between April 2015 and March 2017

Gemma Govinden, Dilly Anumba
Jessop Wing, Sheffield Teaching Hospitals, UK

Background
Obesity has increased markedly over the last few decades in the pregnant population(1). In the UK Maternal Obesity is the commonest co-morbidity associated with pregnancy and is attributed as one of the causes of increasing rates of cardiac disease in pregnancy; the leading cause of indirect maternal deaths in the UK(2).

Objective
We sought to determine whether there has been a change in maternal obesity rates since the last epidemiological study in 2007 published by Heshlehurst et al.

Methods
Data presented is taken from Hospital Episode Statistics (HES) online database which publishes monthly experimental maternity statistics collected in England. The period looked at was 24 months between April 2015 and March 2017. This was compared to previous data between 1989 and 2007.

Results
During the study period data was collected for 985,427 women booking for pregnancy care between April 2015 and March 2017. On average data was obtained from a mean of 70% of England’s NHS trusts. A mean percentage of 20.2% (range 19-21%, SD 0.56) women who booked were obese with a BMI of 30 or greater. This was compared to data for the period 1989-2007. In the last 9 years there has been a 4.7% increase in obesity rates, representing an annual increase of about 0.5%. Disparity occurs across England, with London having the lowest maternal obesity rate (mean 14.6%, SD 0.82) and the North of England having the highest rates of obesity (mean 22.9%, SD 1.03).

Conclusion
The HES dataset demonstrates that maternal obesity continues to rise, alarmingly at a rate of 0.5% per annum between 2007 and 2016 comparative to 1989-2007 when the annual increase was 0.4% per annum(1,3).
Successful Management of Severe Prosthetic Aortic Valve Stenosis Found in Early Pregnancy


*Sakakibara Heart Institute, Japan*

**Background**

There has been a major advance in internal medicine and surgical technology for congenital heart diseases. This has also brought happiness to women who had been considered unsafe to be pregnant. However, there are many pregnant women with residual valve stenosis and/or regurgitation after surgical repair. These cases require careful perinatal management.

**Case Presentation**

A 22-year-old primigravida with congenital monocuspid aortic valve, coactation of the aorta, and aortic valve stenosis (AS) was referred to our institute after becoming pregnant. She had intracardiac surgery in early infancy and Percutaneous Transluminal Angioplasty for residual AS in early childhood. She married when she was twenty and desired to be pregnant. Prior to the pregnancy, the catheter examination showed aggravated AS. Pregnancy was permitted after aortic valve replacement (AVR) using a biological valve when she was twenty-one. Although she underwent AVR only 9 months ago, echocardiography examination and cardiac MRI at 9 weeks of gestation showed moderate to severe AS. Careful observation with regular hemodynamic assessment was planned due to her strong desire to continue the pregnancy. β-blocker was administered from 11 weeks of gestation. She had no complaints and her cardiac condition was stable during the rest of the pregnancy. She was hospitalized from 30 weeks of gestation to be encouraged to rest and to monitor her fetus complicated with intrauterine growth restriction. A planned caesarean section was performed at 37 weeks of gestation in order to avoid the adverse hemodynamic effects of labour pain.

**Discussion**

Although the outcomes of pregnancy complicated with AS have been significantly improved, there is a risk of progression of AS and other cardiovascular complications even in early pregnancy. Planned intervention by a professional team is important for a successful outcome.

**Conclusion**

Postoperative pregnancy with residual AS needs rigorous cardiac assessment and careful perinatal management.
A Double Whammy: Management of a Mechanical Prosthesis and Severe Pulmonary Hypertension during Pregnancy

**Joan Briller**, Kumar Lal, Nixon Heather, Michaela DellaTorre, Dustin Fraidenberg
1 University of Illinois at Chicago, USA
2 University of Illinois at Chicago, USA
3 University of Illinois at Chicago, USA
4 University of Illinois at Chicago, USA
5 University of Illinois at Chicago, USA

**Background**
Mechanical prosthetic valves and severe pulmonary hypertension (pHTN) are independent predictors for adverse pregnancy outcomes. We present management of a woman with repaired congenital heart disease including a mechanical mitral prosthesis and severe pHTN.

**Objective**
An 18-year-old G1P0 with surgically repaired AV Canal age 5; mechanical mitral prosthesis and pacemaker placement age 16, presented at near viability. TTE showed normal left ventricular and prosthetic function but reduced right ventricular function and severe pHTN. On stress testing she was NYHA Class 1. RHC confirmed severe pHTN (PASP 85mmHg/mean PAP 59mmHg) and pulmonary vascular resistance (~7 Woods units). Cardiac index was 4.1L/min/m2 and pulmonary capillary wedge pressure 16mmHg.

**Methods**
The patient was counseled that she had increased morbidity/mortality but with monitoring, strict anticoagulation, and aggressive pHTN management, risk could be minimized. She elected to continue pregnancy. Multidisciplinary consultation included cardiology, pulmonary hypertension service, maternal fetal medicine, anesthesiology, and neonatology.

**Results**
She received warfarin (T1 dose 3 mg) and aspirin 81 mg daily throughout pregnancy other than brief bridging with low molecular weight heparin for reduced INR until 1 week prior to delivery when aspirin was stopped and she was transitioned to unfractionated heparin. PHTN was initially treated with diuretics and sildenafil, with addition of intravenous prostacyclin prior to delivery. She underwent cesarean delivery for obstetric indication at 35th utilizing non-invasive cardiac output and arterial BP monitoring, delivering a male, Apgars 9/9. Immediately post-delivery she developed chest discomfort; oxygen saturation decreased. Bedside TTE demonstrated IVC dilatation and poor RV contractility treated with dobutamine, diuretics and nitric oxide with improvement. Postpartum she transitioned to oral medications with continued diuresis, echocardiographic and ICU monitoring, doing well at 14 days post-delivery.

**Conclusion**
Management of multiple adverse predictors can be minimized by multidisciplinary planning, balancing maternal vs fetal risks of anticoagulation, and targeted pulmonary hypertension therapy.
Correlation of LV Characteristic and Functional Status at Admission with Left Ventricular Function Recovery in PPCM patients in Tangerang General Hospital Indonesia: a Single Centre Experience

Dian Yaniarti Hasanah1, Dian Hasanah1, Ina Irawadi1,2, Siti Nauli1, Rarsari Soerarso1,2,
Nani Hersunarti1,2, Bambang Siswanto1,2, Dwita desandri1,2

1Tangerang Hospital, Indonesia
2Harapan kita National Cardiac center, Indonesia

Background
Peripartum cardiomyopathy occurs in previously healthy women in the final month of pregnancy and up to 5 months after delivery. Although the incidence is low, the outcome of peripartum cardiomyopathy is highly variable. There are no studies related to prognosis of PPCM in Indonesia or factors associated with higher likelihood of recovery.

Objective
To assess the association of systolic function (LVEF), LV diastolic dimension (ESD), and NYHA at time of diagnosis with LV recovery in PPCM patients.

Method
Retrospective cohort study was conducted in Tangerang General Hospital, Indonesia, from July 2014 to 2016. Thirty six patients were included with all patients had standard heart failure therapy based on guideline. The primary end point of this study was LV EF recovery that was follow up to 24 months. Recovery from peripartum cardiomyopathy is defined as recovery of LVEF to ≥0.50 or improvement by 0.20 within 3-6 months at least and 24 months maximum. Factors predicted with EF recovery analyzed in this study were LVEF, ESD, and NYHA functional status at time of diagnosis.

Results
From 36 patients, fifteen patients (42%) have recovery LV function at follow up to 24 months. Factor associated with EF recovery was baseline EF at diagnosis (p=0.050), meanwhile LV diastolic dimension (ESD) and NYHA functional status were not associated with EF recovery, with p value were 0.853 and 1.000 respectively. Median of EF baseline in EF recovery group was higher than non-recovery group, which was 32.5% (12 – 43) and non-recovery group was 24 % (14 – 39).

Conclusion
LV systolic functions at diagnosis have association with LV recovery at 24 months follow up in PPCM patients in Tangerang General Hospital Indonesia.
### Tabel 1. Subject Characteristics

<table>
<thead>
<tr>
<th>Variables</th>
<th>EF recovery (n = 10)</th>
<th>EF not recovery (n = 26)</th>
<th>Total (36)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years), mean ± SD</td>
<td>32.20 ± 7.13</td>
<td>28.00 ± 6.18</td>
<td>29.17 ± 6.64</td>
</tr>
<tr>
<td>Parity, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>10 (33.3)</td>
<td>20 (66.7)</td>
<td>30 (83.3)</td>
</tr>
<tr>
<td>1</td>
<td>0 (0)</td>
<td>2 (100)</td>
<td>2 (5.6)</td>
</tr>
<tr>
<td>2</td>
<td>0 (0)</td>
<td>2 (100)</td>
<td>2 (5.6)</td>
</tr>
<tr>
<td>3</td>
<td>0 (0)</td>
<td>2 (100)</td>
<td>2 (5.6)</td>
</tr>
<tr>
<td>PPCM history, n (%)</td>
<td>1 (16.7)</td>
<td>5 (16.7)</td>
<td>6 (16.7)</td>
</tr>
<tr>
<td>PEB history, n (%)</td>
<td>4 (44.4)</td>
<td>5 (55.0)</td>
<td>9 (25.0)</td>
</tr>
<tr>
<td>Hypertension, n (%)</td>
<td>3 (25.0)</td>
<td>9 (75.0)</td>
<td>12 (33.3)</td>
</tr>
<tr>
<td>Medication, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lasix/furosemide</td>
<td>8 (25.0)</td>
<td>24 (75.0)</td>
<td>32 (88.9)</td>
</tr>
<tr>
<td>ACEI/arb</td>
<td>8 (30.8)</td>
<td>18 (69.2)</td>
<td>26 (72.2)</td>
</tr>
<tr>
<td>ARB</td>
<td>2 (25.0)</td>
<td>6 (75.0)</td>
<td>8 (22.2)</td>
</tr>
<tr>
<td>BB</td>
<td>9 (30.0)</td>
<td>21 (70.0)</td>
<td>30 (83.3)</td>
</tr>
<tr>
<td>MRA</td>
<td>9 (33.3)</td>
<td>18 (66.7)</td>
<td>27 (75.0)</td>
</tr>
<tr>
<td>Bromocriptine</td>
<td>5 (23.8)</td>
<td>16 (76.2)</td>
<td>21 (58.3)</td>
</tr>
<tr>
<td>Simarec</td>
<td>4 (33.3)</td>
<td>8 (66.7)</td>
<td>12 (33.3)</td>
</tr>
<tr>
<td>NYHA functional status, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class II</td>
<td>1 (25.0)</td>
<td>3 (75.0)</td>
<td>4 (11.1)</td>
</tr>
<tr>
<td>Class III</td>
<td>9 (28.1)</td>
<td>23 (71.9)</td>
<td>32 (88.9)</td>
</tr>
<tr>
<td>Baseline EF (%), mean ± SD</td>
<td>31.31 ± 10.45</td>
<td>25.10 ± 7.00</td>
<td>29.58 ± 9.39</td>
</tr>
<tr>
<td>ESD (%), mean ± SD</td>
<td>48.10 ± 8.63</td>
<td>47.42 ± 10.10</td>
<td>47.61 ± 9.60</td>
</tr>
<tr>
<td>Baseline TAPSE, mean ± SD</td>
<td>1.85 ± 0.44</td>
<td>2.16 ± 0.62</td>
<td>2.08 ± 0.59</td>
</tr>
</tbody>
</table>

### Tabel 2. Factors associated with EF recovery

<table>
<thead>
<tr>
<th>Variables</th>
<th>EF recovery</th>
<th>EF not recovery</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline EF [median (min-max)]</td>
<td>32.5 (14 – 39)</td>
<td>24 (12 – 43)</td>
<td>0.050&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>ESD (mean ± SD)</td>
<td>48.10 ± 8.63</td>
<td>47.42 ± 10.10</td>
<td>0.853&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>NYHA functional status [n (%)]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class III</td>
<td>9 (28.1)</td>
<td>23 (71.9)</td>
<td>1.000&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Class II</td>
<td>1 (25.0)</td>
<td>3 (75.0)</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup>Mann Whitney Test  <sup>b</sup>Unpaired T test  <sup>c</sup>Fisher Exact Test
Perioperative Prophylaxis of Obstetric and Perinatal Complications in Pregnant Required the Urgent Open-Heart Surgery

Iuliia Davydova1,2, Vasiliy Lazorishinets1, Oleksiy Krikunov1, Vitaliy Kravchenko1, Artem Ogorodnyk2, Sergiy Siromakha1, Alice Limanskaya2

1 Institute of Cardiovascular Surgery named after M.M. Amosov, National Academy of Medical Sciences of Ukraine, Ukraine
2 Institute of Pediatrics, Obstetrics and Gynecology National Academy of Medical Sciences of Ukraine, Ukraine

Objectives
The use of CPB during pregnancy is a high-risk procedure, combining risks of maternal and perinatal morbidity and mortality. The activation of the uterine activity occurs as a result of cooling, the heating of the patient, progesterone dilution.

Aim
To evaluate the efficacy of a progesterone block by intravaginal use of micronized progesterone (MP) for the perioperative prevention of miscarriage and premature delivery.

Methods
We performed perinatal management for 10 women with severe cardiovascular pathology, undergone open heart surgeries with CPB: two cases due to the thrombosis of the mechanical valve in the mitral position, infectious endocarditis, subaortic stenosis, 5 women with AoS and BaV, MaS with the aortic aneurysm 62 mm. Progesterone block of 400 mg MP bid was created prior to operational intervention and after it.

Results
One patient with re-prosthesis in the first trimester of pregnancy insisted on pregnancy termination. In second patient with re-prosthesis the antenatal fetal demise was diagnosed in a week after the surgery, the midtrimester pregnancy termination was successfully performed.
Two women with AoS and BAV after the prosthetics of aortal valve and surgery in the aorta, as well as a woman with a subaortal stenosis, continue the pregnancy without any disorders. Five women (3 - with AoS and BaV, 1 - with MaS after the prosthetics of the aortal valve and Bental and Robicsec) and one with plastic of mitral valve due to infectious endocarditis, delivered in 38-39 weeks by elective CS. Five healthy newborns were born, Apgar of 7-9 points, the average weight of newborns was 2,990 ± 30.5 g.

Conclusions
Perioperative prophylactics of miscarriage and premature births by MP vaginally, promoted the prolongation of pregnancy up to full-term and resulted in successful birth of healthy newborns. The three-year follow-up testified about good health state of women and children.
Baseline Right Ventricle Function and Left Ventricle Recovery of Peripartum Cardiomyopathy in Tangerang General Hospital Indonesia

Ina Nadia Irawadi\textsuperscript{1,2,3}, Dian Yaniarti Hasanah\textsuperscript{1,2,3}, Dwita Rian Desandri\textsuperscript{1,2,3}, Siti Elkana Nauli\textsuperscript{1,2,3}, Rarsari Soerarso\textsuperscript{1,3}, Amiliana Mardiani Soesanto\textsuperscript{1,3}

\textsuperscript{1}Faculty of Medicine Universitas Indonesia, Indonesia
\textsuperscript{2}Tangerang General Hospital, Indonesia
\textsuperscript{3}Universitas Indonesia, Indonesia

Background
Peripartum cardiomyopathy (PPCM) as uncommon type of with cardiomyopathy is associated with high morbidity and mortality. Right ventricular (RV) function involvement in cardiomyopathy is commonly recognized, but in PPCM the study was scanty.

Objective
Description of baseline RV function characteristics and its association to recovery of the left ventricular ejection fraction (LVEF) in PPCM patient.

Methods
Single-center retrospective cohort study were conducted in Tangerang General Hospital, Indonesia from July 2014 to 2016. Thirty six PPCM patients with were follow up for 24 months. Baseline RV function was assessed by echocardiographic tricuspid annular plane excursion (TAPSE) and then divided into 2 groups: reduce RV function (TAPSE \leq 1.6 cm) and preserve RV function (TAPSE 1.6 cm). The primary end point was LVEF recovery, defined as 20\% LVEF improvement from baseline or 50\% at the end of follow up time. RV function at baseline was predicted as association factor with LVEF recovery. Statistical analysis was performed to assess the association of TAPSE baseline with LVEF recovery.

Results
Ten out of 36 PPCM patients (27.8\%) have reduced RV function at the beginning of the examination, with mean baseline TAPSE of all patients was $2.08 \pm 0.59$. At follow up, of the ten patients there were entirely recovered RV functions. There were 10 patients (27.8\%) from all patients were have recovery LVEF function. Two of 10 patients had RV function that was reduced at baseline while the remaining 8 had baseline preserve RV function. However, baseline RV function was not associated with EF recovery (p=0.159).

Conclusion
Reduced RV function at baseline examination occurred in one third of PPCM. Although statistically baseline RV function was not significantly associated with recovery of left ventricular function, but left ventricular function improvement occurred four-fold in the group with preserve baseline RV function.
Novel Predictors of Gestational Diabetes Mellitus among Pregnant Saudi Women

Nasser Al-Daghri¹, Sara Al-Musharaf², Mona Fouda², Iqbal Turkestani², Shaun Sabico¹, Syed Danish Hussain¹, Mohammed Ghouse Ansari¹, Fatima Al-Tawashi², Saravanan Ponnnusamy³, Philip McTernan³

¹King Saud University, Saudi Arabia
²King Saud University, Saudi Arabia
³Warwick Medical School, Warwick University, UK

Background
Vitamin D deficiency has been proposed as an independent risk for gestational diabetes mellitus (GDM). Prevalence of vitamin D deficiency in the Kingdom of Saudi Arabia is high and may adversely affect the pregnancy outcome among the local population. The aim of this study was to assess the prevalence of gestational diabetes mellitus (GDM) in Saudi pregnant women and to identify the risk factors involved in the development of GDM.

Methods
This was a prospective study of 297 pregnant Saudi women (mean age 28.9±5.3 years) performed between January 2014 and December 2015 from three tertiary care antenatal clinics in Riyadh, Saudi Arabia. Demographics, anthropometrics, biochemical and lifestyle factors were collected during the first trimester of pregnancy to assess GDM risk. Diagnosis of GDM was made by glucose tolerance test (GTT) in the second trimester of pregnancy.

Results
Out of 297 pregnant women, 98 (33%) developed GDM. Family history of type 2 diabetes mellitus (T2DM), pre-pregnancy and being obese in the 1st and 2nd trimesters were significant risk factors for GDM (p<0.05). Previous history of GDM [OR (odds ratio) 11.13 95%, CI (confidence interval) 3.1-40.0, p<0.001], vitamin D deficiency (OR 4.0, 95% CI 1.1-14.2, p=0.03), high HbA1c (OR 3.1, 95% CI 1.3-7.1, p=0.037) and low HDL-cholesterol (OR 2.1, 95% CI 1.0-4.4, p=0.046) during early pregnancy were significant risk factors for GDM. Furthermore, women with GDM had higher random blood glucose levels in early pregnancy than women without GDM (p=0.002). Maternal lifestyle factors such as physical activity conferred protection against GDM (p=0.007).

Conclusion
The prevalence of GDM is high among Saudi pregnant women. Vitamin D deficiency in early pregnancy was 4 times more likely to develop GDM than those without vitamin D deficiency. Low HDL-cholesterol and high HbA1c emerged as novel cardiometabolic predictors of GDM in Saudi population.
Ebstein’s Anomaly in Pregnancy

Kestutis Rimaitis\textsuperscript{1}, Dalia Urbanait\textsuperscript{2}, Vilda Baliulei\textsuperscript{3}, Andrius Macas\textsuperscript{1}

\textsuperscript{1}Professor, Lithuania
\textsuperscript{2}Resident, Lithuania
\textsuperscript{3}Doctor, Lithuania

Background

Ebstein’s anomaly is a rare congenital heart disease, characterized by apical displacement of the tricuspid valve, leading to tricuspid regurgitation, right atrial enlargement and right ventricular dysfunction. Spinal anaesthesia is contraindicated for such patients because of feasible major haemodynamic instability, thus it is a challenge for anesthesiologist.

Case report

A 20-year-old woman, with the history of Ebstein’s anomaly, was admitted to hospital in the 38th week of gestation. During pregnancy, she experienced shortness of breath during physical activity and episodes of tachycardia. Metoprolol was discontinued for unknown reasons 2 weeks till hospitalization.

Evaluation of physical condition: HR 138 beats/min, BP 135/90 mmHg, RR 18-20 breaths/min, normal oxygenation state. Heart auscultation: the third extra heart tone, the II’systolic murmur. ECG: sinus tachycardia, right bundle branch block. Echocardiography: right atrial and right ventricle enlargement, the tricuspid valve displacement. Class II (NYHA).

In the operating theatre: IV line was established; necessary monitoring was adjusted. Oxygen and air mixture was given (ratio 1:1). The epidural anaesthesia was performed in sitting position. Supine position was provided and the parturient started to complain in weakness, shortness of breath, fear of death. Supraventricular tachycardia was recorded: 123→160-180 bpm. Hypotension occurred: 140/92→100/65→80/40 mmHg. Semi-sitting position was provided urgently. Ephedrine hydrochloride was administered intravenously to stabilize haemodynamic. Caesarean section was performed in the semi-sitting position. New-born evaluation in Apgar score was 10/10. Fluid balance: total blood loss 400 ml, crystalloids limited to 1000 ml. The patient was treated in the ICU after surgery. There was no pathological cardiac rhythm during postoperative period.

Discussion

Early diagnosis and multidisciplinary approach to management of a parturient with Ebstein’s anomaly may determine better outcomes. Epidural anaesthesia has a minimal effect on haemodynamic, provides adequate anaesthesia and can be used safely for such patients.
Pregnancy and Delivery Outcomes in Women with Cardiovascular Diseases

Emilija Petrulionyte1, Sabina Spiliauskaite1,3, Diana Ramasauskaite1,3,4, Lina Gumbiene1,2,4, Zaneta Petrulioniene1,2,4

1Vilnius University, Lithuania
2Vilnius University Hospital Santaros Klinikos, Lithuania
3Vilnius University Hospital Santaros Klinikos, Lithuania
4Vilnius Univeristy Faculty of Medicine, Lithuania

Background
In western countries 0.2–4% of all pregnancies are complicated by cardiovascular diseases (CVD). CVD is the major cause of maternal mortality. Number of patients with cardiac problems during pregnancy is increasing.

Objective
To evaluate pregnancy and delivery outcomes in women with CVD.

Methods
We reviewed 9000 case histories of women who gave birth in Vilnius University Hospital Santaros Clinics from 2013 to 2016. Eligible for the study were 177 women with structural and non-structural CVD. Maternal age, gestational age, mode of delivery, weight and APGAR scores of neonates were evaluated.

Results
Study population consisted of 177 women including 91 (51,4%) with structural CVD: 45 (25,4%) had congenital heart diseases, 16 (9%) - valve diseases, 1 (0,6%) - coronary heart disease, 6 (3,4%) - cardiomyopathies, 23 (13%) - two structural CVD; 86 (48,6%) - with non-structural CVD: 53 (29,9%) had primary arterial hypertension, 26 (14,7%) - arrhythmias, 1 (0,6%) - pulmonary artery thromboembolism and 6 (3,4%) - two non-structural CVD. Mean maternal age was 30 ± 5,9 years; 35 (19,8%) women were 35 years old. There were 96 (54,2%) primagravidas. Mean gestational age was 37 ± 3 weeks; 30 (16,9%) delivered prematurely. Vaginal delivery occurred in 107 (60,5%) cases, 5 (2,8%) were assisted by vacuum extraction, 1 (0,6%) - by forceps; emergency Cesarean section was performed in 26 (37,1%), planned in 44 (62,9%) cases. Mean neonatal weight was 3253,8 ± 760 grams; 142 (80,2%) neonates were at normal birth weight for gestational age, 168 (94,9%) - born without hypoxia.

Conclusions
Structural CVD were more often than non-structural, the most common disease was primary arterial hypertension. Premature delivery rate in study population was 3 times higher than in Lithuanian population. Majority of women delivered vaginally, most neonates were at normal birth weight and without hypoxia.
Peripartum cardiomyopathy and other Forms of Dilated Cardiomyopathies, Heart Failure Diagnosis and Management

Hironobu Hyodo, Naoko Fukuda, Saho Fujino, Yuki Taketani, Miho Saito, Norihiko Nakazato, Etsuko Saito, Chikako Hikosaka, Midori Funakura, Sorahiro Sunagawa, Koji Kugu
Tokyo Metropolitan Bokutoh Hospital, Japan

Peripartum cardiomyopathy (PPCM) is one of the most critical diseases in the pregnancy and delivery period. Coughing or dyspnea is possible primary symptom of the disease which caused by cardiogenic pulmonary edema. Preeclampsia is one of the risk factor of the disease and may possibly cause dyspnea. It is caused by vascular hyperpermeability and may cause non-cardiogenic pulmonary edema (NCPE). Transfusion-related acute lung injury (TRALI) followed by DIC treatment or excessive volume of infusion may be other cause rather than preeclampsia itself of NCPE. Because these diseases have different origin and thus have different approach to be treated, it should be quite important in preeclamptic women with dyspnea to distinguish PPCM from NCPE.

Twelve preeclampsia cases with dyspnea in our institute between 2013 and 2017 were reviewed. One case was PPCM which occurred before the delivery but be diagnosed as PPCM after the delivery. Five other cases occurred before delivery and three of them relieved temporarily by administration of furosime or other diuretics. Four cases were TRALI after the treatment of DIC followed by HELLP syndrome, placental abruption, or other preeclampsia complications.

Dyspnea in preeclamptic women may be caused by various factors such as vascular hyperpermeability, etc. Because PPCM is basically diagnosed by exclusion diagnosis, ultrasonocardiography may be an indispensable procedure for preeclamptic women with acute dyspnea. Even though PPCM has come to attention, NCPE may have much higher incidence in preeclamptic women.
Hypertriglyceridemia and Gestational Diabetes Mellitus Risk in Saudi Pregnant Women

Nasser Al-Daghri¹, Kaiser Wani¹, Ihtisham Bukhari¹, Abdulrahman Al-Ajlan², Mona Fouda²

¹King Saud University, Saudi Arabia
²King Saud University, Saudi Arabia

Background

Gestational diabetes mellitus (GDM) is the most common endocrine complication of pregnancy. While the mechanistic basis of GDM has not been completely understood, there is a need to identify reliable markers in early pregnancy, so as to design treatment strategies to reduce the burden of cardiometabolic disease onset in later pregnancy and postpartum.

Methods

A total of 498 Saudi pregnant women in first trimester were recruited to investigate the association between development of GDM and various components of metabolic syndrome. All the individuals were screened for GDM by OGTT according to International Association of the Diabetes and Pregnancy Study Groups (IADPSG) criteria at their 2nd trimester (fasting glucose 5.1mmol/l and 2 hour OGTT value 8.5 mmol/l). The association between cardiometabolic parameters in first trimester and GDM risk was determined.

Results

A total of 101 (20.3%) women were diagnosed with GDM based on the IADPSG criteria. GDM risk was significantly higher in women with hypertriglyceridemia at 1st trimester (triglycerides ≥1.7mmol/l) [Odds Ratio: 2.07; Confidence Interval (CI): 1.3–3.4; p=0.004], even after adjusting for age, body mass index (BMI) and parity (OR: 1.52; CI: 0.6–2.4, p=0.005). Also, the GDM women were found to have significantly higher hypertriglyceridemia than the non-GDM women (40.5% vs 24.7%, p=0.003). Women detected with GDM were found to have significantly higher percentage of metabolic syndrome than the non-GDM women (25.1% vs 13.4%, P=0.008). Among both groups after multiple adjustments, no significant difference was found between central obesity, low HDL-cholesterol and hypertension.

Conclusions

Our data suggests that the incidence of GDM in Saudi pregnant women is strongly associated with higher circulating levels of triglycerides in early pregnancy. These findings are of considerable clinical importance as triglyceride levels in early pregnancy may be used as markers for the incidence of GDM.
Case Presentation

26 year old Type 2 Diabetic, P1+2, chronic hypertension, previous severe pre-eclampsia, presented at 16 weeks gestation with worsening chest pain and shortness of breath. She had been seen on the previous day with similar symptoms, discharged home with diagnosis of acute exacerbation of asthma and treated with oral steroids and antibiotics.

On admission she was found have a positive troponin (279 rising to 7129), lactate 4.2 and ST depression in leads V4 and V5 on ECG. She was treated for Acute Coronary Syndrome and investigations for pulmonary embolus (PE) were commenced. CTPA showed no evidence of PE but heavily calcified coronary arteries.

Percutaneous coronary intervention (PCI) was performed and moderate coronary artery disease with a severe ulcerated plaque in the proximal part of the left anterior descending (LAD) coronary artery was found. A multidisciplinary team discussion was held and the decision was to place a stent in the LAD. The right coronary artery would need assessment postnatally as there was a proximal occlusion present. Clopidogrel and aspirin were used in this patient.

Risk factors for ischemic heart disease include: hypertension necessitating medication since age 16 yrs. old; type 2 diabetes; cholesterol 5.5; strong family history with myocardial infarction aged 35 years old in her mother and smoking.

The remainder of the pregnancy progressed uneventfully and a decision to perform an elective caesarean section was performed at 37+ week’s gestation.

Four months postnatally she underwent Coronary artery bypass graft (CABG) of 4 vessels due to being readmitted with a further non-ST segment elevation myocardial infarction with a positive troponin and a two week history of crescendo angina. A coronary angiogram showed severe disease in the LAD distal to the stent, severe disease in OM1 and circumflex arteries. This was uncomplicated and she made a good recovery.
Maternal Right Ventricular Function, Uteroplacental Circulation in Early Pregnancy, and Outcome in Women with Congenital Heart Disease

Anne Siegmund1, Marlies Kampman1, Martijn Oudijk2, Barbara Mulder3, Gertjan Sieswerda1, Steven Koenen5, Yoran Hummel1, Krystyna Sollie-Szarynska6, Henk Groen7, Arie van Dijk8, Caterina Bilardo6, Dirk Jan van Veldhuisen1, Petronella Pieper1

1University Medical Center Groningen, University of Groningen, Netherlands
2Academic Medical Center, University of Amsterdam, Netherlands
3Academic Medical Center, University of Amsterdam, Netherlands
4University Medical Center Utrecht, University of Utrecht, Netherlands
5University Medical Center Utrecht, University of Utrecht, Netherlands
6University Medical Center Groningen, University of Groningen, Netherlands
7University Medical Center Groningen, University of Groningen, Netherlands
8Radboud University Medical Center, Radboud University, Netherlands

Background
A relation between maternal right ventricular (RV) dysfunction and uteroplacental circulation in pregnant women with congenital heart disease (CHD) has been suggested. However, this was found later in pregnancy when several maternal conditions may affect uteroplacental circulation negatively.

Objective
We therefore aimed to relate pre-pregnancy maternal cardiac function to uteroplacental flow parameters in the first trimester of pregnancy.

Methods
We included 138 pregnant women with CHD from the prospective ZAHARA III study (Zwangerschap bij Aangeboren HARtAfwijkingen, pregnancy in congenital heart disease). Pre-pregnancy clinical and echocardiographic data were collected. Clinical evaluation, echocardiography (with focus on RV function by tricuspid annular plane systolic excursion (TAPSE)) and uteroplacental Doppler flow (UDF) measurements were performed at 12, 20 and 32 weeks gestation. Univariable and multivariable regression analyses were performed.

Results
TAPSE before pregnancy was negatively associated with the pulsatility index (PI) of the uterine arteries at 12 weeks at multivariable analysis (β=-0.026, p=0.036). Women with lower TAPSE before pregnancy (≤20mm vs 20mm) had higher uterine artery PI at 12 weeks (1.5 vs. 1.2, p=0.047) as shown in figure 1. Uterine artery PI at 12 weeks was associated with obstetrical complications (particularly hypertensive disorders) (β=0.322, P=0.002).

Conclusion
RV dysfunction before pregnancy impacts normal placentation resulting in increased resistance in the uterine arteries flow in the first trimester of pregnancy. This is, in turn, associated with maternal, fetal and neonatal risks. Early monitoring of uteroplacental flow might be useful in women with pre-existing subclinical RV dysfunction to identify high risk pregnancies.
Unplanned Pregnancy on a Novel Oral Anticoagulant (NOAC)

Ineke van Herwijnen, Joanne Hale, David Howe, Samantha Fitzsimmonds, Aisling Carroll, Rajeswari Parasuraman
Princess Anne Hospital, UK

This focuses on a complicated cardiac patient who developed an extensive DVT and was treated with a novel anticoagulant post pregnancy, who then conceived another pregnancy on this.

This patient had a complicated cardiac history with congenitally corrected transposition of the great arteries with dextrocardia, pacemaker for intermittent AV block but normal biventricular function with mildly dilated systemic ventricle on her MRI pre pregnancy. She was 19 when she booked her pregnancy.

She was smoking 40-60 cigarettes a day and had reportedly cut down to 10 by 22 weeks. She had no additional risk factors for DVT apart from smoking and the pregnancy.

She developed an extensive left femoral DVT at 37+5 weeks gestation. She had an antenatal implantation of an IVC filter, which was removed following delivery.

Postnatally she was commenced on Rivaroxiban and was counselled extensively on contraception to prevent another pregnancy whilst on this.

She unknowingly conceived on Rivaroxiban age 21 and was converted to enoxaparin at 22 weeks of pregnancy (late booking of pregnancy). She had a USS at this point which demonstrated a partially thromosed external iliac vein but this was felt to be residual thrombus. There was an in depth anomaly scan which showed that the appearance of the fetus was normal. She completed the pregnancy without any further thrombotic complications and had a successful ventouse delivery at 39+1.

There is no controlled data for Rivaroxiban in pregnancy, animal studies have shown no increased risk of structural malformations but increased post implantation pregnancy loss has been shown in rabbits and some association with growth restriction. There have also been concerns regarding the bleeding risk following miscarriage and labour. A German centre identified 63 exposed pregnancies with most women discontinuing this in the first trimester; this limited study did not show an increased malformation risk.
Cardiac, Obstetric and Neonatal Outcomes in Women with Bioprosthetic Heart Valves Delivering at a Tertiary Cardiac Centre

**Frances Hills**¹, Gemma Malin¹, William Smith², Suzanne Wallace¹

¹Nottingham University Hospitals NHS Trust, UK
²Nottingham University Hospitals NHS Trust, UK

**Background**

Bioprosthetic heart valves are considered safer for women undergoing pregnancy than mechanical valves. However, there is a paucity of published data for this group. A recent systematic review identified only 2 studies with this population.

**Objective**

To assess the obstetric, neonatal and cardiac outcomes for all women with bioprosthetic heart valves cared for in our tertiary centre.

**Methods**

We searched our clinic database from inception (January 2012) to September 2017. Data were extracted from the electronic patient record for the following: valve location, gestation and mode of delivery, obstetric complications, endocarditis prophylaxis, birth weight, neonatal unit admission, neonatal complications, cardiac function and complications.

**Results**

Five women had six pregnancies. Three had bioprosthetic pulmonary valves due to tetralogy of Fallot. One had an aortic valve replacement and ventricular septal defect (VSD) repair to treat aortic valve prolapse associated with a VSD. The other had a mitral valve replacement performed abroad aged 19 but had no details of the diagnosis. All had normal biventricular function in early pregnancy with unrestricted exercise tolerance. Five babies were born at 38-39 weeks, two by emergency caesarean section due to poor progress in labour, the remainder delivered vaginally. The sixth was born by planned caesarean at 36 weeks due to severe aortic bioprosthetic valve stenosis developing in pregnancy. This lady alone received antibiotic prophylaxis, and developed endometritis postnatally. She had aortic root replacement 18 months later. Two women had postpartum haemorrhages. The lady with mitral valve replacement developed endocarditis postnatally, complicated by thromboembolic stroke and requiring mechanical valve replacement. Two babies had birth weight below 2.5kg, one requiring phototherapy for neonatal jaundice.

**Conclusions**

In our small case series of women undergoing pregnancy with bioprosthetic valves, one had a thromboembolic stroke secondary to endocarditis. There was a higher than expected rate of complications.
For childhood survivors of cancer with subsequent anthracycline-induced cardiotoxicity, the management can be challenging, especially during pregnancy.

A 26 yo G0P0 F with a history of asthma, obesity, and Hodgkin’s disease treated 13 years prior with modified BEACOPP (including 240 mg/m² doxorubicin) and 36 Gy of mantle field radiation presented to the Cardio-Oncology clinic for follow-up of her known anthracycline-induced cardiotoxicity (known EF 45%, GLS -15.2%) after becoming pregnant. With serial monitoring, the patient’s cardiac function improved (EF 55%, GLS -18.4%) before delivery at 38 weeks via Caesarian. During this time she experienced multiple bouts of palpitations; subsequently confirmed to be SVT, successfully treated with low dose metoprolol tartrate. She successfully delivered at 38 weeks without complications. After delivery she had multiple bouts of asthma exacerbations and was transitioned to metoprolol succinate 25 mg daily and Ramipril 10 mg daily. The patient and child have done well since.

Separately, a 27 yo F G2P1 w PMH of Hodgkin’s lymphoma s/p RCHOPx6, completed 5 months prior, presented to the ED at 9 weeks gestation with shortness of breath and palpitations. During that visit she had a miscarriage of twins and was found to have an EF of 15%. After following with cardiology she was started on Ramipril, spironolactone, Corlanor®, and carvedilol (didn’t tolerate Entresto® due to hypotension). In 3 months, EF improved to 40% and by 7 months it was 55%. At approximately 3 months the patient was found to be pregnant again, despite taking Depo-Provera®. She subsequently had another miscarriage a week later. The patient has done well since.
Follow-up after Pregnancy in Pulmonary Arterial Hypertension

Magdalena Kaznica-Wiatr¹, Agata Lesniak-Sobelga¹, Piotr Błaszczak², Maria Olszowska¹, Jaroslaw D. Kasprzak³, Grzegorz Kopec¹, Piotr Podolec¹

¹John Paul II Hospital, Institute of Cardiology, Faculty of Medicine, Jagiellonian University Medical College, Poland
²Cardinal Wyszynski Hospital, Poland
³Medical University, Poland

Aim
Was to assess long term follow-up in patients with PAH after delivery.

Results
Among 5 pregnant women with PAH two died (one 18 months after spontaneous abortion, second 26 days after delivery), third was lost for follow-up; two patients are alive.

In the first alive patient Eisenmenger syndrome due to aorto-pulmonary window, in second idiopathic pulmonary arterial hypertension were diagnosed (tab.1.). Both patients were receiving PAH treatment before pregnancy (first bosentan, second bosentan and sildenafil), both received sildenafil after being pregnant. During pregnancy one of them was administered treprostinil (from 22nd week of gestation), because of PAH progression. In the second case treprostinil was started few hours before delivery in case of right heart failure in peripatrum period. Caesarean section was performed in both at gestational week 33 and 37 under general anaesthesia. After delivery first patient received bosentan, second one treprostinil. Now both patients are alive (5-years and 3-years after delivery). In first patient bosentan therapy is still continued, second one is treated with treprostinil (current dose 43 ng/kg/min, on March 2017, Lenus Pro pump was implanted) and sildenafil (since February 2017). WHO FC class are II and I. NT-pro BNP levels are within normal limits (91 pg/mL and 65pg/ml), distance in 6-minute walking test 420 and 557 m.

Conclusion
Considering high mortality, pregnancy in PAH is contraindicted, but in some cases in a specialist centres with multidisciplinary approach and PAH specific treatment successful pregnancy, labour and successful follow-up are possible.
Improvement of Left Ventricular Function Following Bromocriptine Therapy in PPCM:

Tangerang General Hospital PPCM Registry

Dwita Rian Desandri\textsuperscript{1}, Ina Nadia\textsuperscript{1}, Dian Yaniarti\textsuperscript{1}, Evan Hindoro\textsuperscript{3}, Siti Elkana Naulli\textsuperscript{2}, Amiliana Mardiani Soesanto\textsuperscript{1}

\textsuperscript{1}Faculty of Medicine Universitas Indonesia, Indonesia
\textsuperscript{2}Tangerang General Hospital Indonesia, Indonesia
\textsuperscript{3}Belitung Timur General Hospital Indonesia, Indonesia

Background
Bromocriptine treatment has been associated with high rate of LV recovery in PPCM patients. But we still have no data regarding this effect in PPCM patients in Indonesia.

Objective
To compare the effect of bromocriptine added to standard heart failure treatment in PPCM patients in Indonesia.

Methods
Thirty four patients were included in this retrospective cohort study, divided into 14 patients in standard treatment group and 20 patients in standard treatment plus bromocriptine group. Bromocriptine was given right after onset of PPCM diagnosis and continued until three weeks, added to standard optimal heart failure treatment. The primary end point was left ventricular ejection fraction (LVEF) from onset of diagnosis to range of 6 – 12 months after.

Results
LVEF was increased from 29.8±11.73\% to 42.0±15.21\% in standard treatment group only (p 0.016), with wide confidence interval (CI 95\% 2.63 to 21.65). In bromocriptine group, LVEF was significantly increased from 30.4±9.48\% to 39.6±12.25\% (p 0.003, CI 95\% 3.50 to 14.89). Full LVEF recovery was achieved in three patients (21.4\%) in standard treatment group and two patients (10\%) in bromocriptine group. Standard therapy plus bromocriptin group has shown narrower confidence interval.

Conclusion
Both group were associated with improvement of LV function, however standard therapy plus bromocriptin group has shown more beneficial effect.
### Baseline Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Standard Therapy (n=14)</th>
<th>Standard therapy + Bromocriptine (n=20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years), mean ± SD</td>
<td>28.5 ± 6.85</td>
<td>28.1 ± 6.33</td>
</tr>
<tr>
<td>PPCM History, n (%)</td>
<td>4 (28.5)</td>
<td>2 (10)</td>
</tr>
<tr>
<td>Severe Preeclampsia, n (%)</td>
<td>3 (21.4)</td>
<td>6 (30)</td>
</tr>
<tr>
<td>NYHA functional status, n (%):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Class II</td>
<td>1 (7.1)</td>
<td>3 (15)</td>
</tr>
<tr>
<td>- Class III</td>
<td>13 (92.8)</td>
<td>17 (85)</td>
</tr>
<tr>
<td>Medications, n (%):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Loop diuretics</td>
<td>13 (92.8)</td>
<td>19 (95)</td>
</tr>
<tr>
<td>- ACE I / ARBs</td>
<td>11 (78.5)</td>
<td>20 (100)</td>
</tr>
<tr>
<td>- Beta blockers</td>
<td>12 (85.7)</td>
<td>19 (95)</td>
</tr>
<tr>
<td>- MRA</td>
<td>11 (78.5)</td>
<td>16 (80)</td>
</tr>
<tr>
<td>- Digoxin</td>
<td>1 (7.1)</td>
<td>2 (10)</td>
</tr>
<tr>
<td>- Warfarin</td>
<td>4 (28.5)</td>
<td>8 (40)</td>
</tr>
<tr>
<td>- Aspirin</td>
<td>0 (0)</td>
<td>1 (5)</td>
</tr>
<tr>
<td>- Clopidogrel</td>
<td>1 (7.1)</td>
<td>2 (10)</td>
</tr>
</tbody>
</table>

Table 1.1 Differences of Left Ventricular Ejection Fraction parameters in pre-treatment and post-treatment following standard therapies of Peripartum Cardiomyopathy (PPCM)

<table>
<thead>
<tr>
<th>LVEF (%)</th>
<th>Mean ± SD</th>
<th>Mean differences ± SD</th>
<th>CI95%</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-treatment</td>
<td>29.8 ± 11.73</td>
<td>12.1 ± 16.4</td>
<td>2.63 to 21.65</td>
<td>0.016</td>
</tr>
<tr>
<td>Post-treatment</td>
<td>42.0 ± 15.21</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1.2 Differences of Left Ventricular Ejection Fraction parameters in pre-treatment and post-treatment following standard therapies plus Bromocriptine of Peripartum Cardiomyopathy (PPCM)

<table>
<thead>
<tr>
<th>LVEF (%)</th>
<th>Mean ± SD</th>
<th>Mean differences ± SD</th>
<th>CI95%</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-treatment</td>
<td>30.4 ± 9.48</td>
<td>9.2 ± 12.16</td>
<td>3.50 to 14.89</td>
<td>0.003</td>
</tr>
<tr>
<td>Post-treatment</td>
<td>38.6 ± 12.25</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Maternal Mortality in the Post-delivery Period in Patients with Pulmonary Hypertension

Vifan Lu, Cynthia Taub
Montefiore Medical Center, USA

Background
Pregnancy in women with pulmonary hypertension (PH) has long been regarded as high risk for maternal complications including death. This study is to investigate maternal mortality in the post-delivery period in patients with pulmonary hypertension and its risk factors.

Methods
Hospital discharge records from Statewide Planning and Research Cooperative System (SPARCS) in New York state between 2008-2014 linked to New York State death certificate were analyzed retrospectively. The study cohort consisted of PH patients with hospital records of labor and delivery. PH was identified with ICD-9 codes 415.0, 416.0, 416.8, 416.9, and further categorized into PH associated with congenital heart disease (CHD), PH associated with cardiomyopathy (CM) or valvular heart disease (VHD), and isolated PH (ICD-9 codes refer to Table 1). Labor and delivery was identified with ICD-9 codes 72-75, V27 or 650–659. Last delivery dates were retrieved with procedure date associated with delivery-related procedures.

Results
Among 1,098,694 patients with records of delivery, 656 PH patients were identified, including 68 PH patients with CHD, 358 PH patients with isolated PH and 230 PH patients with CM or VHD (Table 2). 20 deaths were found after delivery. The average age at death was 31.7 ± 7.5 years. 7 patients had mortality within 1 month of delivery, 10 within 6 months of delivery, and 10 deaths beyond 1 year. PH with CHD showed higher mortality within the first 6 months of delivery, while PH with CM or VHD showed higher mortality in the long term (Figure 1).

Conclusion
Mortality within 6 months of delivery in patients with pulmonary hypertension was not negligible and indicates close follow-up for a prolonged period is needed for the high-risk patient population. Subtypes of PH could be associated with different mortality patterns post-delivery.
Maternal and Obstetrical Outcomes with Cardiomyopathy in Pregnancy

Nasim Sobhani¹, Anushree Agrawal², Hayley Schultz³, Ahmed Kheiwa², Molly Killion¹, Nisha Parikh², Ian Harris², Juan Gonzalez¹

¹University of California, San Francisco, USA
²University of California, San Francisco, USA
³University of California, San Francisco, USA

Background
Maternal cardiac disease (MCD) is a leading cause of maternal morbidity and mortality amongst pregnant women in the United States. MCD encompasses a diverse group of diseases and risk stratification may differ with specific diagnoses within this group.

Objective
To compare maternal and obstetrical outcomes in women with cardiomyopathy (CM) and women with other MCD

Methods
This was a retrospective study of women with MCD who delivered between 2008 and 2017 at a tertiary care institution with a multidisciplinary team managing antepartum, intrapartum, and postpartum care of women with MCD. Maternal and obstetrical outcomes were abstracted from the chart and compared between women with CM (with or without preserved ejection fraction) and those with other MCD using t-tests, chi-squared tests, and logistic regression.

Results
Of 330 pregnancies complicated by MCD, 39 (11.8%) had CM. Compared to women with other MCD, those with CM were more likely to have a preterm delivery (48.7% vs 16.2%, p < 0.0001, adjusted OR 5.05), with mean 36.6 weeks at delivery compared to 38.2 weeks. Women with CM were more likely to have an antepartum admission (24.1% vs 9.6%, p = 0.002, aOR 5.62), a cesarean delivery (46.2% vs 27.2%, p = 0.006, aOR 2.26), and a longer length-of-stay (9 vs 5.2 days, p = 0.012). Women with CM had a higher risk of ICU admission (31.6% vs 10.7%, p = 0.014), although this difference did not persist after controlling for age, race, and body mass index. There was no difference in the rate of preeclampsia between the two groups.

Conclusions
Among women with MCD, those with CM have a higher risk of adverse maternal and obstetrical outcomes. These women should be managed at a tertiary care center capable of multidisciplinary care and appropriate counseling and patient education.
Bromocriptine Role in Peripartum Cardiomyopathy: A Systematic Review

Nalagafiar Puratmaja, Agita Maryalda Zahidin

1Pasar Minggu General Hospital, Indonesia
2Kabil Community Health Care, Indonesia

Background
Peripartum cardiomyopathy (PPCM) is an idiopathic and rare disorder presenting with acute heart failure (AHF) due to left ventricle systolic dysfunction. The disease develops in the last trimester of pregnancy or in the months following delivery. Bromocriptine, a dopamine-D2-agonist and prolactin release inhibitor, has been associated with improved clinical outcomes in PPCM. Nonetheless, the role of bromocriptine is still questionable and an update of bromocriptine impact on clinical trial outcomes in PPCM patients is required.

Objectives
This study aims to review the role of bromocriptine in PPCM systematically with secondary purpose was to investigate the safety of the drug through the latest research available.

Methods
A systematic review regarding bromocriptine role in PPCM was performed. Four scientific databases (PubMed, EbscoHost, ProQuest, and Cochrane) were included in literature searching strategy. Preliminary search was completed using specific keywords and filters. Selected articles then screened by the authors independently to identify studies involving clinical use of bromocriptine in PPCM patients. After full-text assessment, three relevance studies reviewed using Centre for Evidence-Based Medicine (CEBM) critical appraisal tool.

Results
Three articles (two randomized controlled trials and one cohort study) with a total of 179 patients were included in the analysis. Investigation reveals that the use of bromocriptine improved left ventricular ejection fraction in PPCM patients with lower morbidity and mortality rate. The Longer group of bromocriptine administration (8 weeks), as adjuvant to standard heart failure treatment, likely related to higher rate of left ventricular recovery at 6-month follow-up. There was no side effect reported after bromocriptine administration.

Conclusion
This study concluded that bromocriptine is a useful and safe agent to treat PPCM.
Pulmonary Arteriovenous Malformation in Pregnancy: A Case Report

Cecilia Gobbi1, Elisa Gherbesi1, Mattia Squilace1, Marco Schiavone1, Giovanni Malanchini1, Margherita Calcagnino1, Paola Perolo1, Manuela Wally Ossola2, Carla Bonanomi1, Federico Lombardi1

1Fondazione IRCCS Ca’ Granda Ospedale Maggiore Policlinico, University of Milan, Italy
2Fondazione IRCCS Ca’ Granda Ospedale Maggiore Policlinico, University of Milan, Italy

Introduction
Pulmonary arteriovenous malformations (PAVM) are anomalous communications between arteries and veins of the pulmonary vasculature, resulting in right-to-left shunt of deoxygenated blood, such as in cyanotic congenital heart disease. As known, maternal desaturation during pregnancy provides high risk for both maternal and foetal outcome. This kind of vascular malformations could be asymptomatic and unmasked only by particular conditions such as hemodynamic modifications of pregnancy.

Case report
Hypoxemia (oxygen saturation 87%) and polycythemia (Hb 17, RBC 5.71) was observed in a 25-year-old primigravida woman.

Chest computed tomography revealed pulmonary arteriovenous malformations (PAVM) at the left upper lobe which drains into left superior pulmonary vein.

Echocardiography with bubbles confirmed severe extracardiac right-left shunt and 6 minute walking test shows desaturation worsening.

Given the new finding of this malformation, informed by a multidisciplinary team of possible maternal and foetal serious complications in case of progression of pregnancy and the risks for the fetus due to transcatheter embolization treatment, the patient decided for pregnancy interruption.

Than disclosure of PAVM by transcatheter embolization was performed, also in order to improve future pregnancy outcome.

Subsequent 6MWT showed an improvement of median oxygen desaturation (93% vs 83%) and dyspnea (Borg scale 6 vs 2).

Conclusions
PAVM in pregnancy can increase morbidity and mortality rates especially in the 2nd and 3rd trimester. Volume overload increases right-to-left shunting and worsens desaturation; it could life-threatening for mother and fetus.

A multidisciplinary approach is required for optimal risk stratification and the management of pregnancy.
Obstetric and Perinatal Outcome in Women with Congenital Heart Disease
Anniek Hoek¹, Anne Siegmund², Wouter Breebaart¹, Dr. B.J. Bouma³, Dr. P.G. Pieper², Dr. M.A. Oudijk¹

¹Academic medical centre Amsterdam, Netherlands
²University medical centre Groningen, Netherlands
³Academic medical centre Amsterdam, Netherlands

Background
Pregnant women with congenital heart disease (CHD) have an increased risk of adverse maternal and neonatal complications. Pregnant women with complex heart diseases are supervised by a multidisciplinary team, creating an action-plan concerning pregnancy and delivery in order to reduce the risk to a minimum. Large studies concerning obstetric and perinatal outcome in women with CHD are lacking.

Objective
Do women with CHD have a higher risk of adverse obstetric and perinatal outcome during delivery compared to women without CHD?

Methods
We conducted a retrospective multicenter observational study, using the ZAHARA (Zwangerschap en Aangeboren HARtAfwijkingen, pregnancy and congenital heart disease) I-III databases. Women were categorized into 5 groups according to the WHO (World Health Organization) classification for maternal complications during pregnancy. These groups were compared with a control group.

Results
1166 women with CHD and 69 control patients were included from multiple Dutch and Belgian tertiary medical centres. Mode of delivery was associated with higher WHO groups, elective caesarean section rates are higher as compared to the control group (2.9%) and significant in WHO II-III (11.1%, p=0.036) and III (22.9%, p=0.001). The prevalence of small for gestational age (SGA) is significantly higher in all WHO groups as compared to the control group (lower WHO group OR 4.0, CI 95% 1.24 – 13.0 and higher WHO group (≥II-III) OR 3.6, CI 95% 1.1 – 12.0). A higher WHO group (WHO ≥II-III) is also associated with preterm birth (OR 3.4, CI 95% 1.2 – 9.6) and perinatal death (OR 1.018, CI 95% 1.006 – 1.03) as compared with the control group.

Conclusion
The prevalence of SGA is higher in all WHO groups. In addition, higher WHO groups are associated with increased rate of elective caesarean sections for cardiac reasons and perinatal complications as SGA, preterm birth and perinatal death.
Outcomes and Management of Arrhythmogenic Right Ventricular Cardiomyopathy in Pregnancy: A Case Report

Marco Schiavone¹, Elisa Gherbesi¹, Cecilia Gobbi¹, Mattia Squillace¹, Margherita Calcagnino¹, Manuela Wally Ossola², Carla Bonanomi¹, Federico Lombardi¹

¹Fondazione IRCCS Ca’ Granda Ospedale Maggiore Policlinico, University of Milan, Italy
²Fondazione IRCCS Ca’ Granda Ospedale Maggiore Policlinico, University of Milan, Italy

Background

Arrhythmogenic right ventricular cardiomyopathy (ARVC) is an inherited cardiomyopathy with an estimated prevalence of 1:5000. Few cases of ARVC during pregnancy are described in literature and there is evidence to advise patients with ventricular arrhythmias or heart failure not to become pregnant.

Case Report

A 32-year-old pregnant woman was referred to our clinic during the 32nd gestational week due to a family history for ARVC (brother). The lady was completely asymptomatic.

We recorded an ECG (fig.1): sinus rhythm interrupted by PVCs, right BBB, epsilon wave in V2, inverted T waves in V1-V4.

An echocardiogram revealed a dilated right ventricle, mild tricuspid and mitral regurgitation.

A 24-hour Holter ECG monitoring showed frequent PVCs and a few runs of NSVT. A therapy with Metoprolol was started.

While admitted she underwent a genetic testing, which revealed the same homozygous mutation of DSG2 gene described for her brother. Antenatal corticosteroids were administered to prevent foetal lung immaturity.

An elective caesarean section was then planned, during the 37th gestational week; no complications occurred. After delivery, she was transferred to the ICU for monitoring: Metoprolol was suspended and Sotalol was started, Cabergolin was administered to suppress lactation.

To complete the assessment, she underwent a CMR which revealed fibro-fatty infiltration and reduced function of both ventricles (fig.2).
At discharge the patient was asymptomatic at rest and there were no signs of heart failure.

**Conclusion**

This case strongly suggests that the absence of signs and symptoms of heart failure at a first evaluation plays a major role to predict maternal and foetal outcome. Neither heart failure nor other major cardiac complications occurred during pregnancy, delivery and puerperium, although both ventricles were involved. Our experience is consistent with the evidence that suggests a favourable outcome in asymptomatic patients treated with optimal anti-arrhythmic medical therapy during pregnancy.
Maternal Cardiopathies in Pregnancy: Management and Outcomes of a Six-year Experience in an Italian Tertiary Care Center.

Viola Arosio¹, Sara Ornaghi¹, Isabella Marzia Maini¹, Davide Corsi², Felice Achilli², Patrizia Vergani¹

¹Foundation MBBM, University of Milan-Bicocca, Italy
²San Gerardo Hospital, University of Milan-Bicocca, Italy

Background
Maternal cardiopathies complicate 0.2-4% of pregnancies in Western countries and are the first cause of indirect maternal death. Also, substantial maternal and feto-neonatal morbidity associates with cardiac disease.

Objective
To evaluate prevalence, and obstetric and cardiologic management and outcomes of maternal cardiopathies in our population.

Methods
Observational retrospective study including pregnant women with cardiac disease delivered at our Institution between 2011-2017. Maternal cardiopathies were assessed according to WHO modified classification. An additional class, WHO X, was added to allow for categorization of otherwise unclassifiable cardiopathies.

Results
During the study period, 164 (0.9%) patients were diagnosed with cardiac disease. Of these, 155 (94.5%) women had a singleton gestation and were distributed among WHO classes as follows: 24 (15.5%) in class I, 22 (14.2%) in class II, 28 (18%) in class II-III, 2 (1.3%) in class III, 6 (3.9%) in class IV, and 73 (47.1%) in class X. Cardiopathies included in class X are listed in Table 1. Cardiac evaluation was more frequently performed in class II-III, III, and IV patients compared to class I, whereas no differences were identified among class I, II, and X (Table 2). Adverse cardiology outcomes were experienced by 16 (10.3%) women, 11 of whom were in class X. Also, patients in class X showed similar rates of ICU admission for cardiac complications to class III and IV women. No maternal death occurred; however, one near-miss event, i.e. cardiac arrest, was identified in class X. Twenty-seven (37.5%) class X patients delivered by pre-labor cesarean section (our Institution’s average: 11%), 25.9% of which were performed for cardiology reasons.

Conclusions
Maternal cardiopathies are a substantial cause of maternal and neonatal morbidity and mortality. Increased knowledge among care providers, a multidisciplinary team approach, and, possibly, a revised disease classification, are all pivotal elements for improving both obstetric and cardiology outcomes.
Table 1. Cardiac diseases included in class X.

<table>
<thead>
<tr>
<th>Cardiopathies</th>
<th>N=73</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous peripartum cardiomyopathy with complete resolution</td>
<td>1 (1.4%)</td>
</tr>
<tr>
<td>Coronaropathy (treated)</td>
<td>1 (1.4%)</td>
</tr>
<tr>
<td>Pericardial effusion/pericarditis</td>
<td>6 (8.2%)</td>
</tr>
<tr>
<td>Left ventricular hypertrophy</td>
<td>9 (12.3%)</td>
</tr>
<tr>
<td>Mild valvular insufficiency</td>
<td>12 (16.4%)</td>
</tr>
<tr>
<td>Patent ovale foramen</td>
<td>17 (23.3%)</td>
</tr>
<tr>
<td>Left-sided superior vena cava (with dilation of the coronary sinus)</td>
<td>2 (2.7%)</td>
</tr>
</tbody>
</table>

Alterations of rhythm:
- Atrio-ventricular block                            | 3 (4.1%) |
  - without PM                                        | 0     |
  - with PM                                            | 3 (100%) |
- Sino-atrial node disease                           | 1 (1.4%) |
  - without PM                                        | 0     |
  - with PM                                            | 1 (100%) |
- Right bundle branch block/left anterior fascicular block | 6 (8.2%) |
- Brugada syndrome                                   | 2 (2.7%) |
  - without ICD                                       | 0     |
  - with ICD                                           | 2 (100%) |
- Long QT syndrome                                   | 2 (2.7%) |
- Wolf-Parkinson-White syndrome                      | 2 (2.7%) |
- Others                                             | 3 (4.1%) |

Cardiovascular complications without history of cardiovascular disease | 6 (8.2)

PM: pacemaker; ICD: implantable cardioverter-defibrillator; others: intraventricular conduction focal anomaly with altered repolarization (n=1), electrocardiography abnormalities (n=2); cardiovascular complications without history of cardiovascular disease: acute heart failure, NSTEMI heart attack, peripartum cardiomyopathy, paroxysmal supraventricular tachycardia, deep venous thrombosis. For patients with more than one diagnosis, the cardiac condition with the highest clinical relevance was considered.

Table 2. Obstetric and cardiology manage outcomes.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Class I</th>
<th>Class II-III</th>
<th>Class IV</th>
<th>Class V</th>
<th>Cardiology assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal obstetric complications</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abortion</td>
<td>3 (12.5%)</td>
<td>1 (4.5%)</td>
<td>0</td>
<td>0</td>
<td>1 (1.4%)</td>
</tr>
<tr>
<td>Gestational diabetes</td>
<td>2 (8.3%)</td>
<td>5 (22.7%)</td>
<td>1 (3.4%)</td>
<td>1 (12.5%)</td>
<td>7 (9.6%)</td>
</tr>
<tr>
<td>Gestational hypertension</td>
<td>0</td>
<td>3 (13.6%)</td>
<td>4 (13.8%)</td>
<td>0</td>
<td>4 (5.5%)</td>
</tr>
<tr>
<td>Pre-eclamps</td>
<td>3 (12.5%)</td>
<td>1 (4.5%)</td>
<td>1 (3.6%)</td>
<td>0</td>
<td>14 (19.2%)</td>
</tr>
<tr>
<td>Ante partum bleeding</td>
<td>2 (8.3%)</td>
<td>3 (13.6%)</td>
<td>1 (3.6%)</td>
<td>0</td>
<td>7 (9.6%)</td>
</tr>
<tr>
<td>Post partum hemorrhage</td>
<td>4 (16.7%)</td>
<td>0</td>
<td>2 (7.1%)</td>
<td>1 (12.5%)</td>
<td>12 (16.4%)</td>
</tr>
<tr>
<td>Feto-neonatal complications</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stillbirth</td>
<td>1 (4.2%)</td>
<td>0</td>
<td>1 (3.6%)</td>
<td>0</td>
<td>1 (1.4%)</td>
</tr>
<tr>
<td>Prematurity &lt;37 weeks</td>
<td>5 (25%)</td>
<td>5 (23.8%)</td>
<td>6 (22.2%)</td>
<td>2 (25%)</td>
<td>19 (26.7%)</td>
</tr>
<tr>
<td>SGA neonate</td>
<td>5 (25%)</td>
<td>2 (9.5%)</td>
<td>3 (11.1%)</td>
<td>0</td>
<td>10 (14.1%)</td>
</tr>
<tr>
<td>Neonatal resuscitation</td>
<td>2 (8.3%)</td>
<td>2 (9.1%)</td>
<td>4 (13.8%)</td>
<td>1 (12.5%)</td>
<td>14 (19.7%)</td>
</tr>
<tr>
<td>NICU admission</td>
<td>2 (8.3%)</td>
<td>4 (18.2%)</td>
<td>9 (31%)</td>
<td>1 (12.5%)</td>
<td>16 (22.5%)</td>
</tr>
<tr>
<td>Congenital cardiopathy</td>
<td>1 (4.2%)</td>
<td>1 (4.5%)</td>
<td>2 (7.1%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Neonatal death</td>
<td>1 (4.2%)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3 (4.2%)</td>
</tr>
<tr>
<td>Delivery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Induction of labour</td>
<td>5 (20.8%)</td>
<td>6 (27.3%)</td>
<td>5 (17.9%)</td>
<td>1 (12.5%)</td>
<td>19 (26.0%)</td>
</tr>
<tr>
<td>Epidural anesthesia</td>
<td>5 (20.8%)</td>
<td>10 (45.5%)</td>
<td>17 (60.7%)</td>
<td>8 (100%)</td>
<td>30 (56.6%)</td>
</tr>
<tr>
<td>GA delivery</td>
<td>37.19±15.13</td>
<td>37.57±2.5</td>
<td>36.83±3.50</td>
<td>37.38±1.06</td>
<td>36.42±2.87</td>
</tr>
<tr>
<td>Mode of delivery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operative delivery</td>
<td>3 (13.6%)</td>
<td>13 (61.9%)</td>
<td>21 (75%)</td>
<td>6 (75%)</td>
<td>35 (48.6%)</td>
</tr>
<tr>
<td>- vacuum extractor</td>
<td>0 (0%)</td>
<td>1 (4.8%)</td>
<td>1 (4.8%)</td>
<td>2 (25%)</td>
<td>1 (1.4%)</td>
</tr>
<tr>
<td>- pre-labor CS</td>
<td>3 (13.6%)</td>
<td>8 (38.1%)</td>
<td>19 (67.9%)</td>
<td>4 (50%)</td>
<td>27 (37.5%)</td>
</tr>
<tr>
<td>- CS in labor</td>
<td>0 (0%)</td>
<td>4 (19%)</td>
<td>2 (7.1%)</td>
<td>0</td>
<td>6 (8.3%)</td>
</tr>
<tr>
<td>- Urgent-emergent CS</td>
<td>0 (0%)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1 (4%)</td>
</tr>
<tr>
<td>Pre-labor CS for cardiology reasons</td>
<td>0 (0%)</td>
<td>3 (13.6%)</td>
<td>15 (58.9%)</td>
<td>4 (100%)</td>
<td>7 (25.9%)</td>
</tr>
<tr>
<td>Maternal cardiac complications</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incidence</td>
<td>0</td>
<td>1 (4.5%)</td>
<td>3 (10.7%)</td>
<td>1 (12.5%)</td>
<td>11 (15.1%)</td>
</tr>
<tr>
<td>* during pregnancy</td>
<td>0</td>
<td>0</td>
<td>1 (33.3%)</td>
<td>0</td>
<td>6 (54.5%)</td>
</tr>
<tr>
<td>ICU admission</td>
<td>0</td>
<td>0</td>
<td>1 (3.6%)</td>
<td>1 (12.5%)</td>
<td>8 (11%)</td>
</tr>
</tbody>
</table>

Data presented as average ± SD (min-max) or N (%). Abortion: <22 weeks of gestation or fetal weight <500g; postpartum hemorrhage: ≥500mL for vaginal birth and ≥1000mL for CS; stillbirth: ≥23 weeks of gestation or fetal weight ≥500g; SGA: small for gestational age; NICU: neonatal intensive care unit; GA: gestational age; CS: cesarean section; ICU: intensive care unit. Pearson chi-square and One-Way ANOVA with Bonferroni’s and Tukey’s post-hoc analysis to adjust for multiple comparison (shown as a,b,c).
Acute Liver Failure as a Mimicker of Peri-partum Cardiomyopathy: A Case Report

Erinjit Toor¹, Winnie Sia², Jonathan Windram³
¹University of Alberta, Canada
²University of Alberta, Canada
³University of Alberta, Canada

Background
Peripartum cardiomyopathy (PPCM) can have a variable clinical presentation. We report a patient with PPCM that presented with acute liver failure.

Objective
Recognize atypical presentations of PPCM

Case presentation
29 female, gravida 5 Para 5, three weeks post-partum presented to the emergency room (ER) with 3 day history of fatigue, left sided flank pain and dry cough. She denied orthopnea, dyspnea, hemoptysis, chest pain but had mild pedal edema. She had an uncomplicated spontaneous vaginal delivery at term. Her blood pressure was 123/82 mmhg, heart rate of 115 bpm, urine protein to creatinine ratio was elevated at 223 mg/mmol (normal 30 mg/mmol), aspartate transaminase (AST) 727 U/L and alanine transaminases (ALT) 488 U/L. A chest X-ray showed trace bilateral pleural effusions and CT scan abdomen showed left pyelonephritis. A presumptive diagnosis of pyelonephritis was made with possible post-partum pre-eclampsia. She was admitted to Internal Medicine and treated with intravenous fluids and ceftriaxone. Her AST and ALT continued to increase, peaking at AST 1698 U/L and ALT 1151 U/L (normal 50 U/L) with prolonged prothrombin time (1.7). Gastroenterology service was consulted and she was treated for acute liver failure with intravenous N-acetylcysteine. Investigations for liver diseases, including an Ultrasound abdomen were negative. To investigate for congestive Hepatopathy, an echocardiogram was done showing severe biventricular systolic dysfunction with severe mitral and tricuspid regurgitation. There was no identifiable cause of heart failure and hence a diagnosis of peri-partum cardiomyopathy was made.

Discussion
Our patient case demonstrates that PPCM may not present with the typical signs and symptoms of heart failure. Some presenting symptoms may be nonspecific such as fatigue, pedal edema leading to a delay in diagnosis.

Conclusion
High degree of suspicion for cardiac etiology should be employed for unexplained liver failure near term or in post-partum patients to avoid diagnostic errors.

Mattia Squillace¹, Elisa Gherbesi¹, Giovanni Malanchini¹, Cecilia Gobbi¹, Marco Schiavone¹, Valerio Pravettoni³, Margherita Calcagnino¹, Manuela Wally Ossola², Carla Bonanomi¹, Federico Lombardi¹

¹Fondazione IRCCS Ca’ Granda Ospedale Maggiore Policlinico, University of Milan, Italy
²Fondazione IRCCS Ca’ Granda Ospedale Maggiore Policlinico, University of Milan, Italy
³Fondazione IRCCS Ca’ Granda Ospedale Maggiore Policlinico, University of Milan, Italy

Background
The use of aspirin (ASA) desensitization for patients with coronary artery disease (CAD) is growing, but no data are available on rapid desensitization protocol in patients with ASA sensitivity and CAD during pregnancy.

Case presentation
A 42-years-old pregnant woman affected by CAD, with prior percutaneous coronary intervention (PCI) with two overlapping bio-resorbable vascular scaffolds (Absorb) for unstable angina, was referred to our tertiary centre during the seventh gestational week for a clinical evaluation.

Dual Antiplatelet Therapy (DAPT) with Clopidogrel and Indobufen was stopped by her cardiologists when her pregnancy became known (9 months after PCI).

We decided to restart DAPT considering the high risk (11%) of late (30 days-1 year) and very late (1-2 year) stent thrombosis related to stents’ type (Absorb), number and procedural techniques (two stents in overlap), diabetes and pregnancy.

Some years before the patient had an adverse reaction to ASA (labial angioedema).

Even if desensitization procedures are widely used in cardiological clinical practice, they are not recommended during pregnancy for the risk of anaphylactic reaction and hypotension that could lead to foetal and maternal damages. After a multidisciplinary evaluation that included anesthesiologists, allergologists, obstetricians, hematologists and cardiologists, we decided to start a rapid desensitization protocol (figure) in an intensive care unit with maternal and foetal monitoring.

The procedure took place during the 10th week and was well tolerated.

The Caesarean section, on aspirin treatment, was performed during week 37th. No major nor minor bleeding occurred (blood loss 300 ml). Clopidogrel was restarted the day after childbirth without acute adverse events.

Conclusions
Desensitization procedures are at high risk during pregnancy. This case shows that a rapid ASA desensitization protocol during pregnancy could be safe and effective in a tertiary centre with a multidisciplinary team, thus making it a valuable option in similar clinical settings.
Magnesium Orotate for the Treatment of Pregnant Patients with Unoperated Atrial or Ventricular Septal Defect

Ilshat Gaisin¹, Dina Abbazova¹², Larisa Shilina¹², Zhanna Vavilkina², Ekaterina Smirnova²

¹Izhevsk State Medical Academy, Russia
²Clinical Diagnostic Centre, Russia

Background
According to guidelines, women with un-operated atrial or ventricular septal defect (ASD/VSD) have small increased risk of maternal mortality or moderate increase in morbidity. Nevertheless, maternal cardiac complications occur in 12% of completed pregnancies. Offspring complications are more frequent than in the general population. Magnesium orotate (MO) is a non-steroidal anabolic plus Mg2+ approved for pregnant patients.

Objective
To evaluate the safety and efficacy of MO in pregnant women with not closed ASD/AVD.

Methods
We studied 48 consecutive women with un-operated ASD (n=30) or AVD (n=18), aged 28±7 years. Patients were randomized to control group with conventional follow-up (n=24) and MO-group (n=24); in addition to standard therapy, they received MO (Wörwag Pharma). The primary endpoints were a major adverse cardiovascular event (MACE), and pregnancy outcomes.

Results
At baseline, there were no significant differences between control and MO-group. No maternal mortality and no thrombo-embolic event occurred in both groups. In 11 control patients, at least one MACE occurred (45.8%): 7 worsened HF (29.2%), 2 had atrial flutter (8.3%), 1 had a ventricular tachyarrhythmia (4.2%), and 1 patient developed PAH (4.2%). In MO-group, no patient developed a MACE (p=0.008). MO reduced the HF occurrence during pregnancy (p=0.0035). Improvements were noted in control-adjusted changes in HF signs (–58.5%; p=0.0022) and in frequency of ectopic beats (–35.6%; p=0.028). Perinatal mortality rate was 0 in the cohort, premature birth occurred in 6 controls (25%) followed by being small for gestational age (12.5%) vs. 0 in MO-group (p=0.035). MO had no maternal and offspring adverse effects.

Conclusions
Long-term MO therapy for pregnant patients with not closed ASD/AVD prevents MACEs, improves symptom status, and contributes to successful obstetric and foetal outcomes. This study provides the evidence that metabolically acting MO may be a new additional therapy for pregnant patients with congenital heart disease.
Coxsackievirus Infection during the First Trimester of Pregnancy Leads to Ventricular Septal Defect

Vipul Sharma, Lisa Goessling, Connor Mullen, Alma Muller, Brian Dailey, Daniel Perry, Adam Miller, Horacio Carvajal, Anoop Brar, Pirooz Eghtesady
Washington University in St. Louis, USA

Purpose
Coxsackievirus B (CVB), known to be the most common cause of myocarditis, target cardiomyocytes through Coxackie and Adenovirus Receptor, which is highly expressed in the fetal heart. We hypothesized that CVB infection during early pregnancy may play a role in the pathogenesis of congenital heart disease.

Methods
Pregnant C57Bl/6J mice were infected with 2.5x106 TCID50 CVB3 (Nancy strain) between embryonic days (E) 5-11. Presence of the virus was confirmed by RT-PCR and infectivity assay. MicroCT and histology were done to assess the fetal heart phenotype. To understand changes at the molecular level after infection, RNA was collected from fetal hearts using laser microdissection and analyzed by RNA-Seq. The results were confirmed by immunohistochemistry and qPCR. To determine if virus serotype alters the outcome, CVB1, CVB4, and a combination of CVB3 and CVB4 were used for infection.

Results
Offspring of pregnant mice infected with CVB3 developed ventricular septal defect (VSD), double outlet right ventricle (DORV), and non-compaction of ventricular myocardium (Table A). Infection at E9 led to the highest incidence of VSD compared to infection earlier (E5, E7 or E8) or later (E11) in gestation (Table B). Infection with CVB1, CVB4, or CVB3+4 showed that CVB3 in combination with CVB4 induces more VSDs than infection with any one serotype (Table A).

Transcripts found to be differentially expressed between hearts with VSDs compared with controls were mediators of the Transforming growth factor β and Extracellular matrix signaling pathways. Consistent with the former, expression levels of BMP2 and Smad1/5/9 mRNA were elevated in fetal hearts with VSDs following CVB3 infection. This correlated with suppressed proliferation of cardiomyocytes (MF20 positive cells) in these mice.

Conclusion
There is a critical window during pregnancy where CVB infection leads to abnormal cardiac development likely through reduction of cardiomyocyte proliferation.
### A. Percentage incidence of cardiac defects with different CVB serotypes

<table>
<thead>
<tr>
<th>CVB serotype</th>
<th>VSD</th>
<th>DORV</th>
<th>Non-Compaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVB1 (n=33)</td>
<td>42.4</td>
<td>0</td>
<td>36.4</td>
</tr>
<tr>
<td>CVB3 (n=119)</td>
<td>30.2</td>
<td>2.5</td>
<td>21</td>
</tr>
<tr>
<td>CVB4 (n=13)</td>
<td>15.4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CVB3+4 (n=22)</td>
<td>54.5</td>
<td>0</td>
<td>31.8</td>
</tr>
</tbody>
</table>

### B. Percentage incidence of cardiac defects with CVB3 infection at different gestational age

<table>
<thead>
<tr>
<th>CVB3</th>
<th>VSD</th>
<th>DORV</th>
<th>Non-Compaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>E5 (n=5)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>E7 (n=26)</td>
<td>23.1</td>
<td>3.8</td>
<td>15.4</td>
</tr>
<tr>
<td>E8 (n=20)</td>
<td>10</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>E9 (n=44)</td>
<td>47.7</td>
<td>2.3</td>
<td>38.6</td>
</tr>
<tr>
<td>E11 (n=24)</td>
<td>29.2</td>
<td>4.2</td>
<td>0</td>
</tr>
</tbody>
</table>
An Interesting Case of Systolic Heart Failure Associated With Severe Pre-term Pre-eclampsia and HELLP Syndrome

Simran Sharma, Amila Premawardhana, Baskar Sekar, Richard Wheeler
University Hospital of Wales, UK

Introduction
Heart disease in pregnancy is the leading cause of maternal mortality in developed countries. Heart failure in the peripartum period can have many contributing pathologies including valvular heart disease, congenital heart disease, peripartum cardiomyopathy and pre-eclampsia. Early diagnosis and instigation of appropriate treatment improves maternal outcomes. In particular, heart failure related to pre-eclampsia and to peripartum cardiomyopathy can present diagnostic challenges with important implications as management and prognosis differs significantly. Our case highlights these challenges.

Case
We present the case of a 30 year old gravida 2 para 1 woman. She had a medical history of Rheumatoid Arthritis controlled on immunomodulators.

At 33 weeks of pregnancy she developed mild pre-eclampsia and treatment with oral labetalol was commenced. Despite this she progressed to fulminating pre-eclampsia within a week with a blood pressure of 160/100 and a protein-creatinine ratio of 900. Her investigations revealed deranged liver function and platelets consistent with HELLP syndrome.

She developed significant breathlessness and hypoxia due to pulmonary oedema, requiring intubation and ventilation. An emergency Caesarean section was performed following which she was transferred to intensive care where she was treated with intravenous diuretics and anti-hypertensives.

Transthoracic echocardiography performed showed a non-dilated left ventricle with severe systolic dysfunction and severe mitral regurgitation with no structural valvular pathology.

She was extubated the next day and made a rapid recovery without further intervention. A repeat echocardiogram 3 days following showed full recovery of left ventricular systolic function and improvement of mitral regurgitation.

Discussion
Pre-eclampsia related heart failure is usually associated with diastolic dysfunction and preserved ejection fraction. Severe systolic dysfunction is usually associated with peripartum cardiomyopathy however, as in our case, can be rarely described in severe pre-term pre-eclampsia. As the treatment, prognosis and implications for future pregnancies of these conditions varies significantly establishing the correct diagnosis is paramount.
Contraceptive Choices in Maternal Cardiac Disease

Nasim Sobhani1, Ahmed Kheiwa2, Molly Killion1, Hayley Schultz3, Nisha Parikh2, Ian Harris2, Anushree Agrawal2, Juan Gonzalez1

1University of California, San Francisco, USA
2University of California, San Francisco, USA
3University of California, San Francisco, USA

Background

Maternal cardiac disease (MCD) is associated with increased maternal, neonatal, and obstetrical complications. Unplanned pregnancies are especially challenging, given the inability to optimize maternal health prior to conception. Active and effective contraceptive use is particularly important in this population.

Objective

To identify factors associated with specific contraceptive plans in women with MCD in the immediate postpartum period.

Methods

This is a retrospective study of women with MCD who delivered at a single institution from 2008 to 2013. Charts were abstracted for demographics, specifics of MCD, obstetrical outcomes, and contraceptive plans. Contraceptive plans were separated into four categories: 1) sterilization, 2) long-acting reversible contraceptive (LARC), 3) non-LARC, and 4) none. Chi-squared tests and t-tests were used for analyses of categorical and continuous variables respectively, and logistic regression for adjusted odds ratios.

Results

Among 142 women, 32.4% had no contraceptive plan, 24.7% planned to use non-LARC, 29.6% planned to use LARC, and 13.2% planned to use sterilization. Only 16.7% planning LARC received it prior to discharge, while 76.3% of those planning sterilization had this completed prior to discharge. There were no differences in frequency of complex MCD, congenital MCD, cesarean delivery, or preterm delivery amongst the four categories. There was a significantly higher percentage of nulliparous women planning non-LARC (51.4%) and a significantly lower percentage of nulliparous women planning sterilization (5.3%). There was a significantly higher percentage of obese women planning sterilization compared to other groups (46.7%), but this difference did not persist when controlling for maternal age and parity.

Conclusion

Nulliparity was the only factor associated with contraceptive plan, while severity of MCD and mode and timing of delivery were unrelated to contraceptive plan. Nearly one-third of women with MCD had no contraceptive plan at discharge, suggesting that more attention should be given to contraceptive counseling for this high-risk population.
Amniotic Fluid Embolism – A Life Threatening Complication of Pregnancy

Tal Cahan¹,², Michal Simchen¹,²
¹Sheba medical center, Israel
²Tel Aviv University, Israel

Objective
Amniotic fluid embolus (AFE) is a life-threatening event occurring around labor and delivery, presenting as cardio-respiratory collapse and disseminated intravascular coagulation (DIC).

Materials and Methods
A retrospective single center cohort study was performed. All cases of AFE were and pregnancy outcomes in subsequent pregnancies of AFE survivors are described.

Results
Through 2003–2017 approximately 140,000 women gave birth at Sheba Medical Center. Of these, 14 women suffered suspected AFE, for an estimated incidence of 1: 10,000.

Clinical presentation included cardiovascular collapse, respiratory distress and DIC. Heart failure of varies severity involving left or right ventricle, was diagnosed in 75% (9/14) cases.

Eleven cases occurred in the third trimester, around labor, three during D&E procedures following 2nd trimester miscarriage. In 9 of the 11 antepartum cases, labor began as an attempted vaginal delivery. Five ended in an urgent Cesarean Section (CS), three ended in Vacuum Extraction (VE) - all with the common indication of suspected AFE. The remaining 2 cases were elective CS and a normal vaginal delivery.

Three cases of serious maternal outcome occurred - one case of maternal death and one case of anoxic brain damage. In the third case the patient has not recovered consciousness despite no evidence of anoxic brain damage on various imaging modalities.

Treatment included cardiac resuscitation, use of iontropic agents, blood product transfusion, and hysterectomy. Minority of patients were treated by extra corporal membrane oxygenation (ECMO).

No signs of residual Heart failure were seen in AFE survivors.

Ten subsequent pregnancies occurred in survivors - five resulting in a normal term delivery, all without recurrence of AFE.

Conclusions
AFE is a life-threatening complication resulting in cardio-respiratory collapse, need of cardiac resuscitations and ECMO support in some cases. No residual heart disease was documented in AFE survivors. Subsequent pregnancies are not associated with a complicated outcome.
Premature Delivery for Decompensation in an Aortic Prosthetic Valve

Jonathan Windram1, Rshmi Khurana2, Winnie Sia2, Nazneem Wahab3, Erin Toor2
1Mazankowski Heart Institute, University of Alberta, Canada
2Royal Alexandra Hospital, University of Alberta, Canada
3Royal Alexandra Hospital, University of Alberta, Canada

Background
We present the case of a 28 year old Iraqi woman of 25 weeks gestation (G2P1) with a 21mm Perimount tissue aortic valve replacement who presented with symptoms of syncope, chest pain and dyspnea with mild exertion which had been increasing throughout pregnancy.

Objective
To illustrate the management of symptomatic stenosis of a prosthetic aortic valve.

Case Presentation
She had undergone an aortic valve replacement for stenosis of a bicuspid aortic valve i9 years previously and 2 years later had undergone a successful pregnancy. Her trans-thoracic echocardiogram revealed normal left ventricular size and systolic function but the peak and mean gradients across the prosthetic aortic valve were elevated at 55 and 32 mmHg with a calculated valve area of 0.8 cm2.

Based upon her symptoms and echocardiographic findings, she was admitted for bed rest and further investigations. A trans-esophageal echocardiogram was performed to better evaluate her aortic valve. This revealed a normal valve but with small valve area of 1cm2 on planimetry consistent with severe stenosis due to patient prosthesis mismatch.

She wished to continue with the pregnancy and remained in the hospital for continued bed rest as she remained symptomatic with minimal exertion. Following multi-disciplinary input a caesarean section was performed in the cardiac operating theatre at 28 weeks.

She underwent valve replacement 6 months following delivery. At surgery her tissue aortic valve was noted to be small with an internal diameter of 19 mm. There was also significant pannus ingrowth into the sewing ring of the prosthesis and the cusps with reduced mobility of one of the cusps. A root enlargement was performed and a 21 mm On-X valve was placed.

Conclusion
This case illustrates the multidisciplinary management required in a patient with severely symptomatic prosthetic aortic valve stenosis due to pannus ingrowth.
Gasometric Study - Maternal & Fetal - in a Cyanotic Cardiopathy

Felipe Favorette Campanharo1,2,3, Daniel Born1,2,4, Gabriel Dotta1,2,4, Marisa V Diniz1,2,3, Ariana Q Oliveira1,2,4, Ana Paula C C Leão1,5, Rita de Cassia X Balda1,5, Sue Y Sun1,3, Rosiane Mattar1,3

1UNIFESP - Federal University of São Paulo, Brazil
2Cardiac Problems in Pregnancy, Brazil
3Obstetrics, Brazil
4Cardiology, Brazil
5Pediatrics - Neonatology, Brazil

Introduction

Cyanotic women - SpO₂ 85% - especially those with significant pulmonary hypertension, have a unique cardiovascular physiology and are classified WHO 4 - pregnancy contraindicated! When occurs - and interruption is not an option - high risk obstetric follow up and experienced cardiology team is recommended.

Objective

Case report - Pregnant patient with Eisenmenger syndrome - and study maternal-fetal gas exchange.

Case Report

Patient 28y, primigravida, presented 23w pregnancy. Medical history included severe pulmonary hypertension (Echo PASP 72mm Hg ) due ventricular septal defect. Submitted to an enoxaparin, sildenafil, AAS and supplementary oxygen regimen. Bosentan was suspended. Hospital admitted week 31st due FGR / oligoamnion - maternal fetal monitoring. Week 35th submitted to elective C/S with general anesthesia. Blood samples were withdrawn from mother and umbilical cord for gasometric analysis. A healthy female newborn Apgar 8/9 weighting 1740g (small for gestacional age) was delivered. Postpartum no "surprises" - Both were home discharged on day 14.

Maternal Blood Gas

Arterial
pH 7,38 / pCO₂ 34 / PO₂ 68 - Supplementary O₂ / HCO₃ 20 BE - 4 / SO₂ 91%

Venous
pH 7,36 / pCO₂ 29 / PO₂ 50 / HCO₃ 16 BE - 7 / SVO₂ 80 %

Fetal Blood Gas - Umbilical Cord
pH 7,31 / pCO₂ 52 / PO₂ 20 / HCO₃ 26 BE - 1 / SVO₂ 31 %

Conclusion

Fetus has evolved to divert a large proportion of the circulation away from the lungs (elevated pulmonary vascular resistance) towards the placenta, which serves as the organ of gas exchange and a major buffer in reducing oxygen exposure to fetus. NORMAL PO₂ maternal artery is about 90-100 mmHg compared to 32-35 mmHg in the fetal umbilical vein. Maternal hypoxemia poses a HUGE challenge to adequate fetal oxygenation.
Post-Partum Hypocinetic Dilatative Cardiomiopathy in Patient with Left Branch Block: a Case Report

Antonella De Virgilio, Antonella De Virgilio, Lusiana Foltran, Giuseppa Corrao, Enrico Busato, Irene Pascoli

UOC Ginecologia e Ostetricia Ospedale Ca’ Foncello Treviso, Italy

Background
Peripartum cardiomyopathy (PPCM) is a rare disease in which left ventricular dysfunction and symptoms of systolic and congestive heart failure occur during the peripartum period in previously healthy women. Incidence ranges from 1 / 1,300 to 1 / 15,000 pregnancies and is associated with high morbidity and mortality.

Objective
Identification of population with risk factors for the development of PPCM in order to get a proper treatment

Methods
We describe the case of a woman with known LBB heart disease and mitral valve prolapse. During the second pregnancy, concluded with programmed caesarean section, the patient began to feel asthenia, cardiopalm and dyspnea; after childbearing she also had short-term retrosternal oppressive pain during an effort; no symptoms of rest, apart from the feeling of cardiac tachycardia (with FC about 90-100bpm); the ECG during pregnancy highlighted the well-known BBSn. She was admitted to the Cardiology Department where the first episode of congestive primitive dilatative hypocinetic myocardiopathy with severe depression of left ventricular systolic function and supraventricular paroxysmal tachycardia (with possible focal origin) was diagnosed. Therapy with sartan (ACE-I suspended for cough) and beta-blocker at low doses (no tolerated doses above current for symptomatic hypotension) were administered and a biventricular pacemaker was applied. The patient was dropped in good hemodynamic compensation and she underwent to periodic clinical and instrumental controls.

Conclusion
The diagnosis of PPCM should be considered whenever in a woman during peripartum signs of unpalatable heart disease occur. Often the first signs and symptoms of heart failure can be underestimated and considered "parafisiologic" in pregnancy (sloping edema, dyspnea). Clinical progress is extremely variable, ranging from complete resolution of the clinical picture to non-responsive cardiogenic shock to medical therapy, to death. The diagnosis of PPCM is made by exclusion and echocardiography is the elective diagnostic tool.
Embracing #MatExp for Women with Cardiac Disease: Preliminary Experience with Holistic Birth Plans

**Gemma Malin**, Naomi Taylor, Suzanne VF Wallace  
Nottingham University Hospitals NHS Trust, UK

Background
Multi-disciplinary (MDT) care plans are recommended to improve safety for women with cardiac disease. In the UK there is increasing emphasis on improving the maternity experience (#MatExp) for women in childbirth. This predominantly has involved ‘low risk’ women.

We were keen to improve birth experience for women with cardiac disease whilst maintaining safety. Within our service, all women with cardiac disease are discussed by the MDT, with detailed birth plans created for the women at increased risk of complications in the perinatal period. We have evolved these from a ‘tick sheet’ traditional style, and now include maternal preferences, and holistic elements (e.g. early skin-to-skin contact). Birth plans are emailed to women for their input prior to being finalised.

Objectives
Evaluate maternal satisfaction with the birth plan process.
Assess compliance with the holistic birth plan including maternal preferences.

Methods
To assess the impact of the change in our birth planning process, we invited qualitative feedback from women who had been involved in the formulation of their birth plans, who had subsequently given birth in our unit.

We reviewed the medical records of women who had made a holistic birth plan, to assess compliance with both medical recommendations and maternal preferences.

Results
Feedback was positive. The comments demonstrated that women felt ownership of their birth plans and that e-mail was a convenient way for these to be delivered.

Review of the delivery records for 5 women who had holistic elements of care within their birth plan demonstrated that both the medical and holistic birth plan components were carried out.

Conclusion
Individualised birth plans incorporating a holistic approach to care, formulated in collaboration with women, can be used successfully in women cardiac problems in pregnancy. Although our preliminary numbers are small, we plan to continue to monitor satisfaction and compliance.
Clinical Characteristics of Women with Heart Disease Treated With Betablockers During Pregnancy

Raquel Prieto¹, Pablo Ávila¹, Carolina Devesa¹, Virginia Ortega², Raquel Yotti¹, Francisco Fernández-Avilés³
¹Gregorio Marañón University Hospital, Spain
²Gregorio Marañón University Hospital, Spain

Background

Betablockers (BB) can be used in pregnancy only if benefits overcome risks.

Objective

To study the characteristics of women who received BB during pregnancy, comparing the subgroups of patients with a history of structural and non-structural heart disease.

Methods

Study of historical cohort of pregnant women with heart disease followed at a cardiology outpatient clinic of a tertiary hospital between January 2010 and June 2016; women referred during puerperium or due to hypertensive disorders were excluded. Clinical data, modified OMS (m-OMS) classification, treatment and cardiovascular (CV) complications (need of diuretics, hospital admission, pulmonary oedema, arrhythmia, thromboembolic events or death) were recorded. Statistical analysis was performed with SPSS.

Results

During this period 114 patients (age 33.7 ±5.2 years) completed pregnancy, of whom 19 (16.7%) had been treated with BB. Women treated with BB had more frequently history of heart failure (5.3% vs 31.6%, p=0.001), acquired heart disease (17.9% vs 57.9%, p=0.001) and higher m-OMS classification (III-IV) (15.8% vs 36.8%, p=0.034). There were more C-sections in the BB group (30.9% vs 57.9%, p=0.025) as well as more preterm births (37 weeks) (9.5% vs 26.3%, P=0.041) and a non-significant tendency to lower birthweights (3104±538 g vs 2978±555 g, p= 0.401); this group had also more CV complications (13.7% vs 63.2%, p=0.001). In the BB group women with structural heart disease were more frequently classified as m-OMS III-IV (0% vs 53.8%, p=0.044), with no differences in incidence of preterm labour, C-section or low birthweight compared to patients without a history of structural heart disease.

Conclusion

Pregnant women treated with BB have a profile of higher risk of CV complications during pregnancy. We found a non-significant tendency to lower birthweight, but also a higher incidence of preterm births in this subgroup, with no differences according to the history of structural heart disease.
Third Trimester Type B Aortic Dissection in a Woman with Marfan Syndrome

Line Leduc¹, Annabelle Cumin², Annie Dore³, François-Pierre Mongeon³, Anne-Marie Laberge⁴

¹Division of Maternal-fetal Medicine / Sainte-Justine University Hospital, Canada
²Obstetric Medicine / Sainte-Justine University Hospital, Canada
³Adult Congenital Heart Disease Center / Montreal Heart Institute, Canada
⁴Division of Medical Genetics / Sainte-Justine University Hospital, Canada

Marfan syndrome (MS) increases the risk of aortic dissection during pregnancy particularly when the aortic root diameter is above 40 mm.

Objective
We report a case of Stanford type B aortic dissection in a patient with MS at 31 weeks’ gestation.

Clinical case
A first pregnancy was allowed in a 30 y.o. woman with MS and a 34 mm aortic root. She had a familial history of type A aortic dissection in her non-pregnant sister (aortic root diameter 42 mm). Metoprolol 25 mg twice daily was started in the first trimester and serial echocardiograms were performed in early 2nd trimester and monthly in the 3rd trimester. Her obstetrical course was uneventful until 31 weeks’ gestation when she presented with an acute pain of type B aortic dissection extending from the left subclavian artery to the right common iliac artery. She was stabilized with IV morphine and labetalol. Betamethasone was given for fetal lung maturity and she underwent caesarean section 2 days later under epidural analgesia. A little girl was born with a birth weight of 1580 g and Apgar score of 5, 8, and 9.

Conclusion
Type B aortic dissections in MS are rare during pregnancy. Usually, our pregnancy counseling is based on a greater risk of type A aortic dissection if the aortic root diameter is above 40 mm. This patient’s only risk factor was a familial history of dissection at a diameter 45 mm. Her descending aorta was not dilated prior to pregnancy. Her aortic root diameter was not predictive of a high risk of type A dissection. Therefore, a first-degree familial history of aortic dissection at a young age and at a low diameter may indicate a higher risk of aortic dissection during pregnancy. This risk factor may challenge our traditional diameter-based risk assessment and modify our pregnancy counseling.
Introduction

"Cardiac disease" is a generic term that encompasses a wide range of situations, severity and is one the main causes of indirect maternal mortality around world. As general rule, the most frequent conditions are compatible with an obstetric delivery route - with many benefits from vaginal delivery, however sometimes C/S is formally indicated. The Robson´s system classifies all deliveries in one of the ten groups based on five parameters: Obstetric history, labor onset, fetal position, number fetus, and gestational age. It may lead to a better understanding operative delivery in these patients.

Objective

To evaluate delivery route in women with cardiopathy using Robson´s 10 group classification (RTGC).

Methods

Preliminar retrospective observational study. Clinical records of births were evaluated from 2011-2014, and each case of C/S on cardiac patient was classified in RTGC, according to obstetric characteristics.

Results

67 pregnant cardiac patients were included, among them 34 (50.7%) underwent cesarean sections and were classified in table below:
<table>
<thead>
<tr>
<th></th>
<th></th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nulliparous</td>
<td>6 (17.64)</td>
</tr>
<tr>
<td>2</td>
<td>Nulliparous</td>
<td>3 (8.17)</td>
</tr>
<tr>
<td>3</td>
<td>Multiparous</td>
<td>6 (17.64)</td>
</tr>
<tr>
<td>4</td>
<td>Multiparous</td>
<td>3 (8.17)</td>
</tr>
<tr>
<td>5</td>
<td>Previous CS</td>
<td>10 (29.41)</td>
</tr>
<tr>
<td>9</td>
<td>All abnormalities</td>
<td>6 (17.64)</td>
</tr>
</tbody>
</table>

**Conclusions**

This high-risk population had high C/S delivery rates, but lower than those described in national and international studies. The use of RTGC demonstrated the need for intervention in patients grouped 1 to 4 - Who represented more than half of C/S cases. It may help reduce maternal morbidity related to the obstetrical procedure.
Cardio Version in Pregnancy.

Mahnaz Akunjee, Jean Arokiasamy
Surrey and Sussex NHS Healthcare Trust, UK

About 1% of all pregnancies are complicated by maternal cardiac diseases. It is the leading cause of indirect maternal and the leading overall cause of maternal mortality according to MBBRACE-UK.

The report also mentioned that 2 women per 100,000 died from heart disease. Among the various cardiac pathologies complicating pregnancy, arrhythmias are the most common. Most of them are diagnosed for the first time during pregnancy. Tachyarrhythmias are the commonest form of arrhythmias reported during pregnancy.

Risk factors for this are the presence of organic heart disease, various hormonal and hemodynamic changes during pregnancy. Fortunately most of these arrhythmias are benign and require no intervention.

Treatment options must take into consideration hemodynamic status of mother, gestational age and the possible teratogenic effect of medications on the fetus. We are hereby reporting 4 cases of successful cardioversion performed in pregnancy.
Cor Pulmonale Secondary to Pulmonary Tuberculosis in Pregnancy

Pamela Grace Valera, Reforma Kareen
Philippine General Hospital, Philippines

Cor pulmonale is defined as alteration in structure and function of the right ventricle of the heart caused by a primary disorder of the lungs. Presented are two cases of gravidocardiac patients from cor pulmonale secondary to multi-drug resistant tuberculosis. The first case is a case of a 37-year-old gravida 4 para 3 (3-0-0-3) and the second case is that of a 24-year-old pimigravid, both of which were on their third trimester with no known cardiac disease, both initially presenting with dyspnea and heart failure symptoms.

The first patient was not in labor, managed conservatively and was discharged clinically improved; the latter was delivered abdominally who later succumbed to fatal arrhythmia.

Presented are the strategies in management and challenges encountered in managing a pregnant cardiac patient from cor pulmonale, specifically from pulmonary tuberculosis.

Key Words
Cor pulmonale, pulmonary heart disease; pregnancy complications, cardiovascular; pulmonary tuberculosis
Hyperthyroidism in the context of toxic goitre is known for its multi-systemic manifestation. Cardiac complications include cardiac tachyarrhythmia’s, as well as sequelae of both sinus and non-sinus tachycardias; including rate-induced cardiomyopathies.

We present a woman in her mid-thirties who had previously presented with features of hyperthyroidism, for which she was being treated using Carbimazole. As part of her early work-up, she was suspected of having a rate-related cardiomyopathy; which improved with both heart failure medication as well as with treatment of the hyperthyroidism. The patient remained clinically stable and was in process of being weaned off her cardiac medications successfully. However, despite having been counselled about the dangers of falling pregnant without seeking doctor’s approval first, the patient reported that she was pregnant: at less than 4 weeks’ gestation.

At that point, the last of the patient’s cardiac medications were stopped, and the patient referred to both gynaecologist and thyroid specialist to review the safety of her medication in early pregnancy. Though the patient was switched to another drug for anti-hyperthyroidism, this drug proved difficult to find across the city, and several more weeks passed before the patient was able to secure it. However, mild features of hyperthyroidism had re-commenced, and appeared to persist even with compliant use of the new thyroid medication; including a gradual increase of baseline heart rate to one bordering on early tachycardia. The patient continued to be followed-up closely by experts from the various disciplines above, but alarm bells were already sounding about the challenges that could be faced if she were to continue to regress clinically (cardiovascular and other-wise) whilst still being within this relatively early on in pregnancy.
A Systematic Review of Lifestyle Interventions to Decrease Blood Pressure in Postpartum Women

Nadia Jafar1, Yoshimi Fukuoka1, Meghali Singhal2, Nisha Parikh1

1University of California, San Francisco, USA
2University of California, Berkeley, USA

Background

Pregnancy is experienced by 85% of women and is referred to as a cardiometabolic stress test. If a woman experiences a complicated pregnancy, then she is at increased risk of developing hypertension and cardiovascular disease (CVD). Evidence-based lifestyle interventions for hypertension, including dietary modification and exercise, are largely untested in postpartum women.

Objective

The objective of this study was to evaluate the data on lifestyle interventions during the postpartum period and the efficacy of these interventions on reducing maternal blood pressure and other cardiovascular risk factors.

Methods

We conducted a systematic review based on the PRISMA guidelines to assess whether lifestyle interventions during the postpartum period can significantly decrease blood pressure and cardiovascular risk factors. Articles were identified using PubMed, Embase, and clinicaltrials.gov. The inclusion criteria were randomized controlled trials, quasi-experimental, cohort, or case-control studies; female postpartum subjects; lifestyle interventions; peer-reviewed papers in English; and blood pressure or hypertension as primary or secondary outcome.

Results

Among n= 636 studies screened, 5 studies met inclusion criteria. Lifestyle intervention significantly decreased systolic blood pressure (SBP) in one study [SBP decreased by -5.0 mm Hg (95% CI, -9.7 to 0.3)] and in another there was a significant decrease in DBP. Four studies revealed a significant effect on reducing metabolic risk factors. Several studies were underpowered to detect blood pressure decreases and did not include women at high risk for new onset hypertension.

Conclusions

Lifestyle interventions can decrease metabolic risk factors in postpartum women, but the effects on blood pressure are inconclusive. Due to the widespread scope of pregnancy complications and evidence linking these complications to subsequent risk of CVD, targeted and well-powered studies are warranted to determine if evidence-based lifestyle interventions reduce this risk.
Global Longitudinal Strain is Preserved in Pregnant Women with Advanced Maternal Age: A Speckle Tracking Echocardiography Study

Lili Zhang1, Sarabjeet Suri1, Afiachukwu Onuegbu1, Nidhi Madan2, Ali Zaidi1, Diana Wolfe3, Cynthia Taub1

1Montefiore Medical Center / Albert Einstein College of Medicine, USA
2NYC Health + Hospitals/Jacobi, USA
3Montefiore Medical Center / Albert Einstein College of Medicine, USA

Background
Speckle tracking echocardiography (STE) is a novel tool to evaluate subtle myocardial alterations. No previous study has examined myocardial changes by STE among pregnant women with advanced maternal age (AMA).

Objective
To determine if pregnant women of AMA had myocardial changes detectable by STE that indicate subclinical myocardial dysfunction.

Methods
We included women who visited a prenatal clinic at our institution from 2008 to 2015 and had a transthoracic echocardiogram during pregnancy. The AMA group was defined as women of age ≥35 years and the control group was women of ages 18-34 years. Women with pre-existing diagnoses of any heart conditions were excluded. Global longitudinal, circumferential and radial strain, strain rates and time to peak strain measurements by STE were summarized as means and standard deviations. Comparison of strain variables was performed using the Student’s t-test or one-way analysis of variance method.

Results
We analyzed 85 subjects, divided into AMA group (N=36) and control group (N=49 women). Mean age of AMA group was 38.4 (± 3.0) years. Mean age of the control group was 27.5 (± 4.5) years. LVEF was similar in both AMA and control groups (65.0% ± 4.0% versus 63.9% ± 4.4%, P=0.24) respectively. Global longitudinal strain (-21.9% ± 3.9% versus -21.3% ± 6.1%, P=0.587) and radial strain (-36.7% ± 24.9% versus -28.8% ± 24.1%, P=0.148) was similar in both groups. Circumferential strain was higher in patients with AMA (-27.5% ± 6.2% versus -23.8% ± 4.6%, P=0.002). Circumferential strain rate was also higher in patients with AMA in both systole (2.5 ± 0.7 versus 2.02 ± 0.5) and diastole (2.7 ± 0.7 versus 2.2 ± 0.6).

Conclusion
With AMA, there is no evidence of impaired subclinical myocardial dysfunction by speckle tracking echocardiography in our cohort. Further studies to explore circumferential myocardial deformation in AMA are warranted.
Long QT Syndrome in Pregnancy

Linda Njoroge, Mohamed Khayata, Isaac Rhea, Heather Blume, Honor Wolfe, David Hackney, Chantal ElAmm
Case Western Reserve University, Harrington Heart and Vascular Institute. University Hospitals Cleveland Medical Center, USA

Background
Physiological changes in pregnancy can provoke arrhythmias in inherited long QT syndrome (LQTS). Increased heart rate in pregnancy has been shown to be protective due to shortening of the QT interval while the postpartum period has been shown to pose the greatest risk of ventricular arrhythmias.

Case Report
A 26-year-old G8P4 with 2 elective abortions, 1 IUFD at 22 weeks for anencephaly and 4 living children was diagnosed with LQTS after sustaining VF arrest during induction of anesthesia for an elective procedure. She was defibrillated and subsequently had an ICD placed. She sustained reduced EF of 20-25% due to myocardial stunning post arrest. Family history was negative for LQTS. Genetic testing showed a novel variant of SNTA1 gene of uncertain clinical significance and was medically managed with ACE inhibitors and beta blockers. She had 1 successful pregnancy and delivery after her VF arrest and without any cardiac events. She was recently evaluated at maternal cardiac clinic during her 8th pregnancy and a first trimester echo showed recovered EF of 55-60%. Subsequent 2nd and 3rd trimester echocardiograms were stable. Beta blockers were continued throughout the pregnancy which was uneventful. She presented at 38 weeks gestation for scheduled induction of labor. Telemetry monitoring during delivery and up to 48 hours after showed no arrhythmias. The infant did not have any evidence of bradycardia or ectopy.

Conclusion
The LQT2 genotype is associated with the highest number of cardiac events in the postpartum period. 30% of patients however have mutations of unrecognized genes. Cardiac events post-partum are attributed to physiological stress and altered sleep patterns. Beta blocker therapy can reduce the risk of ventricular arrhythmias by as much as 98% in the postpartum period and does not adversely affect fetal growth.
Peripartum Cardiomyopathy at an Urban Tertiary Care Center: A Retrospective Study of Maternal and Fetal Outcomes from 1999-2015

Anna Bortnick¹, Christina Liu², Juliet Musi³, Julia Berkowitz⁴, Shayna Vega⁵, Qi Zheng⁶, Pedro Villablanca Spinetto⁷, Claudia Lama von Buchwald⁸, Diana Wolfe¹
¹Montefiore Medical Center/Albert Einstein College of Medicine, USA
²Albert Einstein College of Medicine, USA
³Westchester Medical Center, USA
⁴Geisel School of Medicine at Dartmouth, USA
⁵Michigan State University College of Human Medicine, USA
⁶Brigham and Women’s Hospital, USA
⁷New York University Langone Medical Center, USA
⁸Jacobi Hospital, USA

Background & Objective
Peripartum cardiomyopathy (PPCM) is associated with significant morbidity. We performed a retrospective study to understand outcomes in an urban cohort.

Methods
Inclusion criteria were; ejection fraction (EF) ≤45%, idiopathic cardiomyopathy, ≥16 years hospitalized with ICD-9 codes for PPCM or heart failure up to 5 months postpartum. Those without echocardiogram at diagnosis, having valvular disease, coronary disease, septicemia, substance abuse, chemotherapy, irradiation or HIV were excluded. From 192 records, 54 met criteria. 61.1% had repeat echo at ≥12-months.

RESULTS: Mean age was 31±7 years, 87.0% identified as Black or Hispanic/Latino and 64.8% had Medicaid. 57.4% had a body mass index ≥30 and 27.8% had hypertension. 55.6% delivered at term, 63.0% by Cesarean section. 51.9% had a documented selection of tubal ligation or long-acting reversible contraception.

The nadir means EF was 26.9 ± 10.5%. 68.5% were treated with beta-blockers, 63% with angiotensin converting enzyme inhibitors (ACEi) or angiotensin receptor blockers (ARB). At ≥12 months, mean EF improved to 43.0 ± 14.3% (p<0.0001). 5 underwent left ventricular assist device (LVAD) placement; notably, 2 had major bleeding due to menometrorrhagia, requiring transfusion and treatment with medroxyprogesterone or leuprolide, 2 underwent heart transplantation. There were no maternal deaths on the index hospitalization. Neonates born to mothers who developed PPCM had favorable outcomes. There was 1 fetal demise, 1 termination, 2 infants born with heart defects, and 2 with growth restriction.

Conclusion
Women had a high burden of co-morbidities, carried to term, and delivered by Cesarean section, likely for maternal indications. Mean EF improved, with preference for beta blockers/ACEi/ARB, and low use of aldosterone receptor antagonists, bromocriptine or anticoagulation. Two women with LVAD developed vaginal bleeding, possibly due to acquired von Willebrand deficiency. Findings from this study indicate opportunities to improve cardiac and gynecologic care in women with PPCM and those receiving LVAD.
The Course and Outcome of Twin Pregnancy in a Patient with Decompensated Dilated Cardiomyopathy – a Case Report

Gauri Bapayeva¹, Karlygash Togyzbayeva¹, Aigerim Bekenova², Milan Terzic¹,²
¹National Research Center of Mother and Child Health, University Medical Center, Astana, Kazakhstan, Kazakhstan
²Nazarbayev University, School of Medicine, Astana, Kazakhstan, Kazakhstan

Introduction
Decompensated dilated cardiomyopathy in pregnancy, especially twin/multiple one, is very difficult and a life-threatening condition.

Aim
To present the case with decompensated dilated cardiomyopathy in spontaneously achieved monochorionic biamniotic twin pregnancy with good outcome for pregnant patient and one twin, and lethal outcome of the other.

Case
Our patient 35 years old G4P1, was diagnosed with Dilated Cardiomyopathy NYHA class IV in 2011. She received symptomatic therapy and underwent implantation of Cardioverter-defibrillator in January 2016. In 2017 the patient achieved the spontaneous twin pregnancy. She received therapy for her heart condition (selective beta blockers, ACE inhibitors, acetylsalicylic acid, potassium sparing diuretics). The pregnancy was carefully followed up until the 25th gestational week and was uneventful. After that, due to deterioration of her condition, she was referred to our clinic. At admission, echocardiography detected decreased ejection fraction (EF) (38%). Feto-placental ultrasound scan revealed monochorionic biamniotic twin pregnancy with deteriorated blood flow through uterine arteries and umbilical vessels. Considering deterioration of EF to 30% and with dyspnea, and after maturation of fetal lungs, pregnancy was terminated at 31st week of gestation by elective Cesarean section. The first twin weighted 1300gr and had Apgar score 4/6, while the second one weighted 1200gr and had Apgar 4/5. Both twins were transferred to NICU and treated according to the contemporary protocol. Unfortunately, in spite of all up-to-date measures and therapeutic approach, the first neonate died due to RDS on 13th day after Cesarian section, while the second one was doing well, and in good condition. Postoperative period was uneventful for the patient, and she was discharged from the Clinic with the baby 25 days after surgery.

Conclusion
Dilated cardiomyopathy is a life threatening condition, especially in pregnancy. But even in multiple pregnancies, if appropriately treated; feto-maternal outcome could be good.
Fetal Echocardiographic Findings and their association with karyotype and postnatal outcome in surrogate motherhood pregnancies

Ioannis Giakoumakis¹, Diamantis Dafnis¹, Antonia Tzanakaki¹, Katerina Dimotaki¹, Ioannis Germanakis²

¹mediterranean Fertility Institute, Greece
²University Of Crete, Greece

To document the incidence of fetal CHD, irrespective of severity level, among surrogate motherhood pregnancies (SMP) followed in a Mediterranean island, and their possible association with karyotype findings and postnatal outcome.

Prospective study (2016-2017) of SMP of a single IVF centre. All surrogates underwent peripheral blood karyotyping and fetal echocardiographic study, according to our Institution protocol. Postnatal outcome was documented based on echocardiographic study and contact to families.

Twenty-two SMP (9 twins, 13 singleton) were included in the study. Fetal echocardiography had been performed on a total of 30 fetuses (1 early TOP prior to echocardiographic study due to T21 following increased NT). They were evaluated at a median gestational age of 22 weeks (14-35wk). Twelve surrogates (40%) had some type of abnormal findings, except one (a case of a pulmonary atresia and pericarditis detected during early fetal echocardiogram at 14 th GW), represented isolated or combinations of mild CHD types: More often corresponded small-moderate ventricular septal defects (n=6, 20%) or great artery abnormalities (n=6, 20%) including great artery disproportion / suspected coarctation of aorta (n=3, 10%), aberrant subclavian arteries from left (n=2, 6%) or right (n=1, 3%) aortic arch. All cases were associated with normal peripheral blood karyotype. Excluding the single case of severe CHD (decision for TOP), all cases had an excellent cardiac-related outcome: They were all asymptomatic, without abnormal heart murmur, normal peripheral pulses and normal feeding.

A considerable percentage of fetuses from the SMP appear to have some type of abnormal findings during fetal echocardiography. These findings predominantly included small ventricular septal defects and great artery anatomic variations, which have a favorable final clinical outcome and are not associated with abnormal karyotype. However, early fetal echocardiography offers the advantage of early detection of the most severe forms of fetal CHD, if routinely performed also in SMP.
Background

Cardiovascular events during peripartum period have become a critical issue in adult congenital heart disease (CHD) patients along with increasing number of high risk delivery. It highlights the importance of cardiovascular risk assessment for peripartum period in adult CHD patients.

Methods

Between 2008 and 2015, consecutive 253 CHD patients (simple 61%, moderate severe 26%, and complex 13%) who delivered in National Cerebral and Cardiovascular Center were retrospectively analyzed.

Results

Total of 53 (20.2%) patients developed adverse cardiovascular events. The most prevalent events were clinically significant heart failure (17.0%) and arrhythmia (7.9%). WHO classification was well correlated with these events in our cohort; 8.4% for those in WHO class I, 20.7% in WHO class II, 50.0% in class III, and 100% in WHO class IV (odds ratio per unit increase 3.6 [95% CI: 2.3-6.0; p=0.01]). Patients with cardiovascular events showed higher plasma brain natriuretic peptide (BNP) levels during 1st trimester (median 43.6 [interquartile range 26.3-66.7] vs. 21.0 pg/mL [14.4-39.7]; p=0.01) compared with those without events. Receiver operating characteristic analysis revealed the optimal cut-off value of BNP levels was 23.2 pg/ml (area under the curve (AUC) 0.735). Multivariate analysis indicated BNP levels $\geq$ 23.3 pg/ml, as well as severe pulmonary valve stenosis and baseline NYHA functional class $\geq$ II, was an independent predictor of cardiovascular events (odds ratio 2.6 [1.0-6.9]; p=0.04). Among patients in WHO class III whose risk of pregnancy is thought to be significantly increased, plasma BNP levels during 1st trimester was the only independent predictor of maternal cardiovascular events with which cut-off value of 59.1 pg/ml (AUC 0.842), whose odds ratio was as high as 19.5 [3.54-167.4] (p=0.0003).

Conclusions

Plasma BNP levels during 1st trimester seem to be useful to discriminate high risk pregnancy in CHD patients especially for those in WHO class III.
Influence of Maternal Beta Blockers on Fetal and Neonatal Heart Rate.

Jacky Nizard, Margaux Louchet, Laurence Foix l'Hélias, Guillaume Duthoit, Magalie Ladouceur

1 Hôpital Pitié Salpêtrière, France
2 Hôpital Européen Georges Pompidou, France
3 Hôpital Pitié Salpêtrière, France

Background
Maternal use of beta blockers is classically described as a cause for fetal bradycardia in all cardiotocography analysis guidelines.

Objective
To assess if fetal heart rate (fHR) is modified during pregnancy, delivery, and the neonatal period when exposed to beta blockers during pregnancy.

Methods
We collected data on 78 pregnant patients under beta blockers, who delivered from January 1st 2011 to December 31st 2015 from at least 20 weeks of gestation onwards. These were compared, when possible, with national data. We analyzed fHR following the French, American and FIGO guidelines, before and during labor, and calculated average and median hourly values for each fetus.

Results
Beta-blockers were indicated in 36 (46%) patients without significant hemodynamic cardiac lesion and 42 (53.8%) patients with significant cardiac lesion. Bisoprolol and propranolol were the most used drugs. Mean fHR before and during labor was abnormal (were diagnosed and 110 mean fHR 160bpm) in 4 cases, which were above 160bpm, no fHR were under 110bpm. Mean fHR were at 160bpm in 20 fetus and 11 were at 110 bpm. Mean gestational age at birth was 38+4. Admissions rate to neonatal intensive care unit was 4-fold higher than in controls (p<0.01). Children were more likely to have birth weight under 2500g (26.58% versus 7.10%, OR=3.75 95% CI 2.19-6.16; p<0.001). SGA was diagnosed in 22% of them, and was significantly associated with hemodynamically significant maternal cardiac lesions (p=0.03). Twenty seven percent of neonates (n=21) were diagnosed with hypoglycemia (2mmol/L on average) and 33% (n=26) with bradycardia within 13 hours of life.

Conclusion
As opposed to what is internationally believed, beta blockers do not seem to modify fetal heart rate during pregnancy, labor and delivery. They are nevertheless responsible of more neonatal adverse outcomes.
Heart Can Recover: Case Series of Peripartum Cardiomyopathy

Mohamed Khayata, Linda Njoroge, Isaac Rhea, Honor Wolfe, David Hackney, Chantal ElAmm

University Hospitals Cleveland Medical Center/Case Western Reserve University School of Medicine, USA

Background
Peripartum cardiomyopathy (PPCM) is a cardiomyopathy with ejection fraction (EF) usually less than 45% presenting towards the end of pregnancy or in the months after delivery in women without previous structural heart disease. We are describing 5 cases of PPCM and their outcomes after delivery.

Case series
1) A 19 year-old patient had PPCM during her first pregnancy with post-partum EF of 35%. Her EF improved one year later to 50%, and 4 years later she had a subsequent uncomplicated pregnancy. 2) A 26 year-old patient had PPCM after her first pregnancy (EF 25%). Ten months later, her EF recovered to 50%. Five years later, she became pregnant without recurrence of PPCM 3) A 36-year old patient had PPCM after her first pregnancy (EF 45%). A subsequent pregnancy was successful despite persistently depressed EF and complicated only by gestational diabetes. 4) A 30 year-old patient had preeclampsia in her third pregnancy with twins and developed PPCM after delivery (EF 20%). Ten months later, her EF improved (50%) and her following pregnancy was uneventful. 5) A 22 year-old patient had PPCM after her third pregnancy (EF 10%). Six months later, she presented with decompensated heart failure and required brief inotrope therapy. Eight months later, her EF had partially recovered to 20%. She eventually had an implantable cardioverter defibrillator placed due to her persistently low EF.

Discussion
The prognosis of PPCM has improved with more than 50% of patients recover to EF 50% within 12 months of delivery with optimal heart failure therapy. However, patients have the risk of worsening EF in subsequent pregnancies. Our cases show that patients with PPCM can recover with optimal medical therapy and may tolerate subsequent pregnancies if close monitoring is provided.
Treatment of Left Atrium Rupture after Mitral Balloon Valvuloplasty in 17 Week Pregnant Patient

Mustafa Akbulut¹, Adnan Ak¹, Tanzer Tokatlıoğlı¹, Serpil Taş¹, Ayşe Akbulut², Mehmet Altug Tuncer¹

¹Kartal Kosuyolu Research and Training Hospital, Turkey
²Iğdır State Hospital, Turkey

In pregnant mothers with symptomatic rheumatic mitral valve stenosis, they may need invasive procedures without developing hemodynamic complications that threaten both mother’s life and infant’s life.

Our case is a 24-year-old 17-week-primipar pregnant was a known rheumatic mitral valve disease and presented to emergency service with haemoptysis.

In the absence of severe mitral stenosis and without left atrial thrombus, percutaneous mitral balloon valvuloplasty was performed by invasive cardiology under semi-emergency conditions. During the percutaneous intervention, the guide wire ruptured left atrial appendix.

In this paper, we report the case in which the patient underwent emergency operation and successfully treated both left atrium injury and replaced mitral valve with bio prosthesis.
Subsequent Pregnancies in Japanese Women with a Prior History of Peripartum Cardiomyopathy

Chizuko Kamiya, Nao Konagai, Chinami Horiuchi, Hideo Ohuchi, Jun Yoshimatsu

1National Cerebral and Cardiovascular Center, Japan
2National Cerebral and Cardiovascular Center, Japan
3National Cerebral and Cardiovascular Center, Japan

Background
Peripartum cardiomyopathy (PPCM) is a rare disease, and the outcome of subsequent pregnancies in women with a prior history of PPCM is still unclear.

Objective
Subsequent pregnancies in women with a prior history of PPCM were reviewed to identify their outcomes and determine the effectiveness of medications on the outcomes.

Methods
Eleven pregnancies of ten women, diagnosed as PPCM in their previous pregnancy, were retrospectively reviewed. Outcomes were compared between 8 pregnancies with recovered cardiac function (LVEF≥50%; recovery-group) and 3 pregnancies with reduced cardiac function (LVEF<50%, non-recovery-group) at before their subsequent pregnancies.

Results
At diagnosis of PPCM, the mean LVEF was 35±11%, and 6 women had risk factors of PPCM, such as preeclampsia and twin pregnancy. The mean duration from the diagnosis of PPCM to the subsequent pregnancy was 4.4±2.1 (1-8.5) years. The mean LVEF at the subsequent pregnancy were 58±6% in recovery-group and 45±4% in non-recovery-group. B-blocker therapy was continued or restarted on 6 women (each 3 in the recovery- and non-recovery-group). There was 1 recurrence of PPCM (decreased her LVEF 45%) in the recovery-group, while 2 of 3 women in non-recovery-group showed more deteriorated left ventricular contraction during pregnancy. The mean delivery gestations were 38.0 ± 1.3 weeks in the recovery-group and 35.9 ± 1.0 weeks in non-recovery-group. Two were terminated early due to deteriorated LVEF. The deteriorated LVEF in 2 of 3 women was restored to the pre-pregnancy level after the delivery. There were no maternal death, heart failure and significant arrhythmia.

Conclusion
Women with recovered LVEF showed good pregnancy outcomes, while women with reduced LVEF showed deteriorated LV contraction during the subsequent pregnancy. Nevertheless, there was no heart failure case associated with careful follow-up, the usage of β blocker and early termination, if necessary.
**The Impact of Pregnancy on Aortic Root in Women with Repaired Conotruncal Anomalies**

**Chinami Horiuchi**¹, Chizuko Kamiya¹, Hideo Ohuchi², Nao Konagagai³, Jun Yoshimatsu¹

¹National Cerebral and Cardiovascular Center, Japan
²National Cerebral and Cardiovascular Center, Japan
³National Cerebral and Cardiovascular Center, Japan

**Background**

Dilatation of the aortic root is a long-term clinical problem in the congenital heart disease (CHD). The effect of pregnancy on aorta in women with conotruncal anomalies (CTA) has not been identified.

**Objective**

The purpose of this study was to survey the diameter of the sinus of Valsalva during pregnancy and after delivery in women with the repaired CTA, compared with pregnancy without the cardiac disease.

**Methods**

A retrospective review of clinical records on the consecutive pregnant women with the repaired CTA was performed, who were managed at our center from 2006 to 2015. The echocardiographic data were reviewed 1 year before pregnancy until 3 years after delivery, and compared with those of healthy pregnant women.

**Results**

There were 42 subjects and 49 deliveries with repaired CTA (CTA group), and 47 normal pregnant women (control group). Of those with the repaired CTA, 29 patients had repaired TOF, 8 patients had repaired d-TGA, 3 patients had repaired DORV, and a patient had repaired DOLV.

Women in the CTA group had a significantly greater aortic diameter at the baseline compared with those in the control group. Furthermore, the CTA group had a further growth of aortic diameter in the peripartum period. The growth of the aortic root in the control group had mean 0.6 ± 1.3mm (maximum of 3.4mm) and that in the CTA group mean 1.0 ± 2.2 (maximum of 7.0mm). In this study, the maximum diameter reached in the third trimester and remained a month after delivery in healthy women and women with repaired CTA.

**Conclusion**

Pregnancies in women with aortopathies have the dilated aortic root. We recommend that those women are routinely assessed the aortic root before and after pregnancy.
Two Successful Pregnancies in a Woman after Ventricular Septation for Single Ventricle: A Case Report

Tomomi Nishimura¹, Tokuko Shinohara¹², Seiji Asagai¹, Eriko Shimada¹², Kei Inai¹², Hisashi Sugiyama¹
¹Tokyo Women’s Medical University, Japan
²Tokyo Women’s Medical University, Japan

Ventricular septation (VS) for single ventricle has been considered one of the highly complicated surgical procedures. We experienced a case who managed two successful pregnancies in long-term after VS. She was a 32-year-old woman born with single left ventricle, double inlet left ventricle, and pulmonary hypertension, so that pulmonary arterial banding was done to avoid irreversible pulmonary arterial hypertension prior to her VS performed at age of 3. She was well and in NHYA class I, although taking small dose of carvedilol for asymptomatic non-sustained ventricular tachycardia (NSVT) for 3 years before her first pregnancy.

In her 1st pregnancy, at age of 26, she developed oedema in her extremities, which was the very first sign of clinical heart failure at 23 weeks of gestation. It was improved soon after admission to secure that proper resting was provided. Even with enough rest in the ward, visible oedema and asymptomatic NSVT were recognised along with time, which led to an elective Caesarean Section (CS) scheduled at 34 weeks. The operation was done uneventfully under combined spinal-epidural anaesthesia (CSEA). Baby’s weight was 2291g with Apgar score (AS) of 8/9. She made a good postoperative course without NSVT.

She decided to stay at her mother’s house with her son for good rest available during 2nd pregnancy at age of 29. Symptoms of clinical heart failure such as oedema never occurred. The same asymptomatic NSVT was recorded in 24-hr tape. Her admission date was later than before, and the elective CS with CSEA was performed at 37 weeks. The baby weighed 3080g (AS 8/9). Her cardiac condition was well and unchanged even at age of 32 with two healthy children.

Conclusion
It is possible for woman with a septated single ventricle to complete successful pregnancy and delivery. An appropriate patient-selection and professional expertise are needed.
Pregnancy in a Patient with Severe Stenosis of a Bioprosthetic Tricuspid Valve

Nejc Pavsic1, Tanja Blejec2, Miha Lucovnik2, Katja Prokselj1
1Department of Cardiology, University Medical Center Ljubljana, Slovenia
2Department of Perinatology, Division of Obstetrics and Gynecology, University Medical Center Ljubljana, Slovenia

Case report
A 31-year-old patient with Ebstein anomaly was referred to our adult congenital heart disease outpatient clinic in 11th week of her first pregnancy. In 2006, tricuspid valve replacement with bioprosthesis and atrial septal defect closure was performed in a foreign centre. Postoperatively, permanent pacemaker was implanted due to complete atrioventricular block and later replaced due to infective endocarditis and thrombi on pacemaker leads. Apart from anticoagulant therapy, currently low molecular weight heparin, she took no medications.

She complained only of mild exertional dyspnea. Physical examination revealed normal jugular venous pressure, normal heart sounds with a soft systolic and diastolic murmur in tricuspid area and no leg edema. Echocardiography showed dilated right ventricle with reduced systolic and moderate enlargement of right atrium (RA). The tricuspid bioprosthesis was severely stenotic (mean gradient 12 mmHg) with moderate regurgitation. Inferior vena cava was dilated.

The high risk of pregnancy was addressed and she decided to continue the pregnancy. Follow-up included monthly clinical visits with echocardiography and anti-Xa monitoring. Her clinical condition gradually deteriorated. She was hospitalized in 31th week of pregnancy due to progressive dyspnea and furosemide was initiated. Echocardiographically additional enlargement of RA and increase in mean trans-tricuspid gradient was observed. Following a multidisciplinary team decision, a planned caesarean section was performed in the 34th week of pregnancy. There were no maternal complications, however the baby boy (weight 2210 g, APGAR 3,7) required noninvasive ventilation due to neonatal respiratory distress.

Conclusion
Data on management of pregnancies in patients with either tricuspid stenosis or tricuspid valve bioprostheses are scarce. Maternal and fetal risks are considerable and pregnancy requires a multidisciplinary approach. In patients with mild heart failure diuretic treatment should be attempted, while balloon valvuloplasty is an option in severe heart failure. Full anticoagulation is advised due to low-flow and prothrombotic state.
Maternal and Obstetrical Outcomes in Simple and Moderate/Complex Congenital Heart Disease

Hayley Schultz1, Ahmed Kheiwa1, Nasim Sobhani2, Molly Killion2, Ian Harris1, Peter Yeh1, Jennifer Lucero2, Nisha Parikh2, Juan Gonzalez2, Anushree Agarwal1
1University of California, San Francisco, USA
2University of California, San Francisco, USA

Background
An increasing number of women with congenital heart disease (CHD) are becoming pregnant and thus exposed to hemodynamic stressors during pregnancy. Understanding the impact of the type and severity of CHD on outcomes in pregnancy is important in order to counsel women and plan for intervention.

Objective
To compare the obstetrical outcomes in women with simple and moderate/complex CHD.

Methods
This was a retrospective study of women with CHD who delivered between 2008 and 2017 at a tertiary care institution with a multidisciplinary team of cardiologists, obstetrics, and anesthesiologists managing their antepartum, intrapartum, and postpartum care. Obstetrical outcomes were compared between women with simple and moderate/complex CHD using t-tests or Wilcox rank-sum, chi-squared tests, and logistic regression as appropriate.

Results
Of 163 pregnancies complicated by CHD, 80 (49%) had moderate/complex CHD. As compared to pregnant women with moderate/complex CHD, simple CHD women were older (31.6 vs 29.1 years, p=0.011) and had more pregnancies (gravida 2.7 vs 1.8, p=0.0002). Women with moderate/complex CHD were more likely to have a preterm delivery (20% vs 8.4%, p =0.03), 13.9% of them being medically indicated (3.7% for simple CHD women). The length of inpatient stay after admission for labor was significantly longer for women with moderate/complex CHD (Median (25th, 75th percentile): 3 (2, 4) vs. 4 (2.5, 6) days, p=0.014), although there was no difference in the duration of inpatient stay postpartum (Median (25th, 75th percentile): 2 (2,3) vs. 2 (2,4) days, p=0.014).

Conclusions
Among women with CHD, those with moderate/complex lesions have a higher risk of preterm delivery and longer length of stay after admission for labor as compared to those with simple CHD. Multidisciplinary teams at a tertiary care center with knowledge and experience of the complex physiology of CHD during pregnancy is critical for managing, counseling and educating these patients.
**Q Fever Pericarditis in Postpartum Woman**

**Inna Rosenfeld**$^{1,2}$, Tatiana Levinas$^{1,2}$, Saleem Dabbah$^{1,2}$, Majdi Halabi$^{1,2}$

$^1$Ziv Medical Center, Israel  
$^2$Bar- Ilan University, Israel

**Background**

Acute Fever illness in postpartum period should a rapid investigation because a number life-threatening conditions such as endometritis, urosepsis and pulmonary embolism. We describe an unusual cause of fever in postpartum woman.

**Case report**

A 22 years old woman was admitted to hospital 2 weeks after an uncomplicated vaginal delivery. A woman complained on high fever that continued for 4 days before admission to hospital.

The treatment was started for suspected endometritis post-delivery with IV Antibiotics, but further investigation of blood and cervix culture was negative. Because new complains of chest pain that worsens in breathing, a CT of chest and abdomen was performed that demonstrated large pericardial effusion, left side pleural effusion with area of left lung consolidation. An emergency echocardiogram revealed large pericardial effusion with tamponade signs.

Pericardiocentesis was performed and 700 ml serous fluid was drained. Investigation of pericardial fluid for tuberculosis, culture, flowcytometry was negative. Autoimmune analysis of ANA, ANCA RF was negative too. An anti-inflammatory treatment for pericarditis with aspirin and colchicin was started. Aspirin was switched for prednisone due to continued fever and chest pain.

Further antibody blood analysis for Q fever was performed because pericarditis with large effusion with concomitant pneumonia on chest CT. An analysis revealed Q Fever in chronic phase. The treatment with Doxycycline and Plaquenil was added with graduate improvement. An epidemiologic investigation revealed that a woman live in rural area with sheep pens around.

**Conclusions**

The diagnosis of fever in postpartum period should prompt a complex investigation with assessment of multiple causes. A thorough anamnesis and analysis of complains are critical for diagnosis. Q fever should suspect in a patient with pericardial effusion, especially with concomitant pneumonia. Duration and drugs for treatment of Q fever depend on the stage of the disease.
Experience in Hypertrophic Cardiomyopathy in a Single Tertiary Center

Laura Galian Gay, Antonia Pijuan Domenech, Manel Casellas Caro, Maria Goya Canino, Laura Dos Subirà, Maria Teresa Subirana, Berta Miranda Barrio, Susana Manrique, Blanca Gordon, Toni Soriano, Pau Rello

1Hospital Universitari Vall d’Hebron, Spain
2Integrated Adult Congenital Cardiac Unit Vall d’Hebron-Sant Pau University Hospitals, Spain
3Hospital Universitari Vall d’Hebron, Spain

Introduction

Hypertrophic cardiomyopathy (HCM) is a hereditary disease that can be diagnosed for the first time during pregnancy. Women with HCM usually tolerate pregnancy well but complications can arise. Risk is increased in women who are symptomatic before pregnancy and in those with left ventricular outflow tract obstruction (LVOTO). Current clinical guidelines recommend using the modified World Health Organisation (WHO) classification to stratify the risk of cardiac complications. The risk for complications in HCM in usually considered II or III (small increased risk or significant risk).

Methods and results

Six consecutive patients with HCM were referred to the outpatient clinic of Pregnancy and Heart Disease in a tertiary referral centre. Three of them were visited in 2 different pregnancies. The WHO classification was determined in the first visit and was considered II for all of the patients except for a patient who had LVOTO that was considered to have risk III. A patient received pacemaker implantation and 2 alcohol septal ablations before pregnancy. 44% of patients were under medical treatment before pregnancy. 37.5% of complications occurred and consisted in ventricular tachycardia with syncope in a patient with non-obstructive apical HCM, heart failure in the postpartum period in a patient with LVOTO and resistant AF. Mean weeks of gestation were 37.7. Only a patient had premature births in both pregnancies. Vaginal delivery occurred in 77% of pregnancies. Offspring outcome was successful, with no mortality and only one case of premature birth, without severe complications.

Conclusions

HCM is considered a disease with a potential significant risk for complications during pregnancy. Heart failure, supraventricular and ventricular arrhythmias can appear. A narrow follow-up by a multidisciplinary team is recommended to achieve better results.

Paul Gibson1,2, Angela Kealey3, Amy Metcalfe2,4
1University of Calgary, Canada
2University of Calgary, Canada
3University of Calgary, Canada
4University of Calgary, Canada

Background
Cardiac disease has become the leading cause of maternal mortality in developed countries, and maternal myocardial infarction (MI) is an increasing cause of morbidity and mortality. These serious maternal events are poorly described in the existing medical literature. A recent systematic review of pregnancy-associated MI (PAMI) identified an incidence of 3.35 MIs/100,000 live births – but the large database studies in this analysis provided very limited information on the nature of the cardiac events or the treatment received. Conversely, existing non-consecutive case series of PAMI provide greater detail but are subject to significant publication bias.

Objective
Through identification of a consecutive, retrospective cohort of PAMIs in Alberta, Canada (2003-2016) we will determine the incidence of PAMI as well as the maternal mortality and case fatality rates. We will also describe the mechanisms and risk factors for PAMI, neonatal outcomes as well as the treatments for MI received in this population.

Methods
Utilizing a provincial database of Discharge Abstract (administrative) Data, a cohort of women with pregnancy-associated MI (antepartum, peripartum and up to 6 months after delivery) were identified using a validated diagnostic algorithm. Details of the maternal cardiac condition (and treatment) were then obtained via linkage with the Alberta Provincial Project for Outcome Assessment in Coronary Heart Disease (APPROACH) database - a rich repository of detailed clinical data regarding the assessment and treatment of most Albertans with coronary heart disease.

Results
25 cases of PAMI were identified in Alberta between 2003-2016, providing a crude incidence of 3.85/100,000 live births. 4% of the identified cases occurred antepartum, while 48% were peripartum and 48% occurred within the first 6 month postpartum. Details of the mechanisms of MI, risk factors and treatments will be presented.

Conclusion
PAMI is a major cause of maternal mortality and morbidity in Alberta.
The Distinct Impact of Hemodynamics and Beta-Blocker Drugs on Pregnancy Outcome

Nicolo’ Montali¹, Chiara Macchi², Francesca Maria Comoglio², Valentina Donvito³, Roberto Bordese⁴, Paola Re²

¹A.O.U. Città della Salute e della Scienza - CTO Hospital, Italy
²A.O.U. Città della Salute e della Scienza - St. Anna Hospital, Italy
³A.O.U. Città della Salute e della Scienza - St. Anna Hospital Medicina, Italy
⁴A.O.U. Città della Salute e della Scienza - Regina Margherita Hospital, Italy

Background
Reports in literature show an effect of beta-blockers on fetal growth.

Objective
To distinguish the effect of beta-blocker and of hemodynamically significative cardiovascular disease on pregnancy outcomes.

Methods
All pregnant women on beta-blockers followed-up in our clinic (January 2014-October 2017) were enrolled and divided in two subgroups, affected by cardiovascular disease with hemodinamic impact (HI), e.g. moderate/severe valvular disease, heart failure with impaired ejection fraction etc. and without hemodinamic impact (NHI), e.g. long QT syndrome, Marfan etc. Each group was compared also with a control group (CTRL) of consecutive deliveries in our center. Exclusion criteria: smoking, hypertension in pregnancy. Birthweight was assessed with INTERGROWTH-21st charts.

Results
Study population: 40 HI, 15 NHI, 65 CTRL. Groups did not differ for age at delivery, maternal BMI, pregnancy weight gain, chronic hypertension, comorbidities, mode of delivery, neonatal sex.

HI and NHI did not differ significantly for gestational age (GA) at birth, birth weight, birth weight centile, being small for GA. A significant difference was observed for low birthweight incidence. CTRL differed significantly from each study group for GA at birth (p 0.0001 CTRL vs HI; p 0.0042 CTRL vs NHI); birthweight (g 3313.0 ± 361 CTRL; 2726.2 ± 512.6 HI; 2919.3 ± 375.8 NHI; p 0.0001 CTRL vs HI; p 0.0003 CTRL vs NHI), birthweight centile (73.7 ± 7.6; 35.9 ± 29.0; 38.0 ± 25.7; p 0.0313 CTRL vs HI; p 0.0387 CTRL vs NHI), small for GA (p 0.0042 CTRL vs NHI), low birth weight (p 0.0001 CTRL vs HI; ns CTRL vs NHI; p 0.0426 HI vs NHI).

Conclusion
The presence of cardiovascular disease with HI leads to significantly lower birthweight compared with both NHI and CTRL. For all the other considered variables, beta-blockers seem to represent an independent risk factor for impaired fetal growth.
Maternal Outcomes in Women With Congenital Heart Disease in Comparison to Non-congenital Heart Disease Complicating Pregnancies.

Ahmed Kheiwa¹, Hayley Schultz¹, Nasim Sobhani², Ian Harris¹, Juan Gonzalez², Peter Yeh²,³, Jennifer Lucero²,³, Nisha Parikh¹, Molly Killion³, Anushree Agrawal¹

¹university of California San Francisco, USA
²university of California San Francisco, USA
³university of California San Francisco, USA

Background

Pregnant women with heart disease are at increased risk of maternal and fetal complications. With the recent advances in surgical techniques leading to a growing population of women with congenital heart disease, CHD is nowadays the most common heart disease complicating pregnancy in western communities.

Objective

We sought to present our experience with maternal complications for pregnant women with CHD in comparison to outcomes for non-congenital heart disease patients (Non-CHD)

Methods

This was a retrospective study of women with CHD who delivered between 2008 and 2017 at institution. Maternal and neonatal outcomes were compared between women with congenital heart disease versus non-congenital heart disease using t-tests or Wilcoxon rank-sum, chi-squared tests, and logistic regression as appropriate.

Results

Between 2008 and 2017, we identified 163 pregnancies complicated by CHD at age 30.3 ± 6.1. Maternal outcomes were identified and compared to 167 pregnancies complicated by non-congenital heart disease at age 32.7 ± 5.5. Non-congenital heart disease patients include patients with arrhythmia 33%, cardiomyopathy 19%, and mitral valve disease 15%. Preterm deliveries occurred in 23 pregnancies (14.1%) in patients with CHD, 51 patients (31.3%) underwent cesarean section, 15 pregnancies were complicated by preeclampsia (9.2%). Intra-uterine growth retardation occurred in 10 (6.1%). In comparison to patients with non-CHD, patients with CHD were younger (30.3 ± 6.1 vs 32.7 ± 5.5, p = 0.002), had less pregnancies (gravida 2.2 ± 1.5 vs 2.9 ± 2.1, p= 0.0014). There was no significant difference in incidence of preterm deliveries (14.1% vs 18.6%, p= 0.27), cesarean section (31.3% vs 27.5%, p=0.455), or IUGR (6.1% vs 4.2%, p = 0.425). Interestingly, the length of stay after admission for labor was similar between both groups (Median (25th, 75th percentile): 3 (2, 5) vs 3 (2, 5), p=0.889)

Conclusions

Women with CHD has a considerable risk of maternal and fetal complications, however their risk is not significantly higher than patients with Non-CHD in the setting of multidisciplinary management strategies in a specialized centers.
Background
Studies evaluating therapeutic interventions in pregnant women with cardiac disease differ in the manner outcomes are reported and measured. Core outcome sets (COS) are promoted to identify outcomes important to decision makers, improve outcome reporting and standardize definitions and measures.

Objectives
To develop a COS for studies on pregnant women with cardiac disease.

Methods
COS development involves the four steps:
Step 1 - A systematic review: We will conduct a systematic review of published trials and cohort studies on pregnant women with cardiac disease to identify reported outcomes and assess their reporting quality, which will provide us with a list of reported outcomes and details on how they have been measured.

Step 2 – Focus group interviews: This will involve in-person interviews with groups of current and former patients and healthcare providers, to independently identify outcomes considered important by them.

Step 3 – The Delphi Process: This will involve a three-round electronic Delphi survey of 50-100 stakeholders from high-, middle- and low-income countries as maternal outcomes show regional variation. Round 1 will be informed by outcomes identified in the above steps. Participants will rank the importance of the proposed outcomes using the 9-point Likert scale. Anonymized scoring of each outcome will be sent to participants after each round. Consensus for inclusion of an outcome will be defined by 70% of the participants scoring it between 7-9 and 15% scoring it as 1-3.

Step 4 – Consensus meeting: The final step will involve a consensus meeting engaging stakeholders to select the final outcomes. A second consensus meeting will help define these outcomes based on published guidelines.

Conclusions
The development of a COS for pregnant women with cardiac disease that will enable the conduct of high-impact prospective studies and facilitate meaningful comparison of results and in this area is currently underway.
Determining the Optimal Anticoagulant for Pregnant Women with Mechanical Heart Valves: A Clinical Decision Analysis

Rohan D'Souza1, Candice Silversides2, Mathew Sermer1, Kellie Murphy1, Beate Sander3
1Mount Sinai Hospital, University of Toronto, Canada
2Mount Sinai Hospital, University of Toronto, Canada
3University of Toronto, Canada

Background
The choice of the optimal anticoagulant in pregnant women with mechanical heart valves (MHVs) is challenging. Although vitamin-K antagonists (VKAs) are associated with better maternal outcomes, sequential treatment and low molecular weight heparin (LMWH) may be associated with better fetal/neonatal outcomes. Guidelines seldom incorporate patient preferences into their recommendations.

Objectives
To describe a novel three-step approach incorporating patient preferences, to determine the optimal method of anticoagulation in these women

Methods
The study involved three steps:
Step 1 - A systematic review: A systematic review of all published studies describing different anticoagulant regimens provided the most up-to-date estimates of maternal and fetal/neonatal outcomes.
Step 2 – Patient preference study: A prospective cross-sectional study that involved three direct valuation methods – visual analogue scale, time-trade off and standard gamble - was conducted. Pregnant women and their family members were interviewed separately and together to determine preferences (utility values) for combined maternal-fetal health states associated with anticoagulant use in pregnancy. This provided utility values between zero (death) and 1 (perfect health).
Step 3 – Decision Analysis: Event rates (step-1) and utility values (step-2) were incorporated into a decision analysis model to generate expected utilities, which were then multiplied by life expectancy to generate quality-adjusted life years that were used to compare strategies including VKAs, LMWH, unfractionated heparin (UFH), sequential treatment with VKAs and LMWH or UFH and no treatment. Sensitivity analyses were performed to test the robustness of model results.

Conclusions
Decision analysis that incorporates patient preferences in addition to rates of maternal and fetal/neonatal outcomes could help add perspective to the choice of anticoagulants in pregnant women with MHVs, while providing patients and clinicians with a tool for shared decision-making.
Policystic Ovary Syndrome - A Cause of Pulmonary Embolism?

Otilia Tica¹, Ovidiu Tica², Anca Sandor-Huniadi³, Mircea Ioachim Popescu¹
¹Faculty of Medicine and Pharmacy; Emergency County Clinical Hospital of Oradea, Romania
²Faculty of Medicine and Pharmacy, Romania
³Faculty of Medicine and Pharmacy, Romania

Introduction
Acute pulmonary embolism (PE) is found in young non-obese females that use new oral combined contraception pills as a treatment for polycystic ovary syndrome (PCOS). PCOS is one of the most common endocrine/metabolic disorders found in women.

Aim
To evaluate whether the new oral contraceptive pills (that contain low dose of estrogen and progestatin) are less or more related to acute PE compared to classical ones? To evaluate other risk factor for acute PE: constellation of PCOS.

Methods
A total of 328 patients admitted consecutively in our clinic were evaluated during hospitalization. We included female patients at a reproductive age with the diagnosis of acute pulmonary embolism. The follow-up period of 2.8 years performed included surveillances. Blood tests were performed for a more accurate stratification.

Results
Overall, 5.18% patients had PCOS at time of acute PE, of whom 76.47% had a chronic use of new oral contraceptive pills consumption (due to PCOS ) and 10.36% had a chronic use of classical oral contraceptive pills. All the women with acute pulmonary syndrome were tested for clot disorder (genetical or acquired trombofillia) but only 0.91% had both PCOS and clot disorder. Patients with newly diagnosed, history of and no PCOS were similar concerning age, hemodynamic status at presentation, chest pain, onset of dyspnea. Patients with PCOS had more frequently deep vein trombosis and had significantly higher D-dimer compared to other causes of acute pulmonary embolism patients. Recent trauma or surgery history was less common in patients with newly diagnosed or history of PCOS compared to patients without PCOS. Patients with history of PCOS less commonly received thrombolytic therapy compared to other acute pulmonary embolism patients.

Conclusion
New oral contraceptive pills are more related to acute pulmonary embolism than the classical ones. Polycystic ovary syndrome can cause by itself acute pulmonary embolism.
Introduction
Acute pulmonary embolism (PE) is found in young non-obese females that use new oral combined contraception pills prescribed for polycystic ovary syndrome (PCOS). PCOS is one of the most common endocrine/metabolic disorders found in women.

Purpose
To evaluate whether the new oral contraceptive pills (that contain low dose of estrogen and progestatin) are less or more related to acute PE compared to classical ones? To stratificate the risk factors that lead to PE.

Methods
A total of 317 patients admitted consecutively in our clinic were evaluated during hospitalization and after discharge periodically. The patients included have PCOS and pulmonary embolism. The follow-up period of 2.6 years performed included surveillance. Blood tests were performed for a more accurate stratification.

Results
Overall, 5.99% patients had PCOS at time of acute PE, of whom 75.70 % had a chronic use of new oral contraceptive pills consumption. Patients were tested for clot disorder (genetical or acquired thrombophilia) from which 46.37% had both PCOS and clot disorder. Deep vein trombosis was found more frequently associated with PCOS and recent trauma or surgical history was less common in patients with newly diagnosed or history of PCOS compared to those without PCOS. Significantly higher D-dimer values (compared to other causes of acute pulmonary embolism patients) were found among PCOS group. Patients with history of PCOS less commonly received thrombolytic therapy compared to other acute pulmonary embolism patients.

Conclusion
PCOS tuned out to be an ominous sign in patients with PE. Future recommendations concerning management PE in young female population should be included in clinical guidelines. Future research in this domain is mandatory.
Primary Experiences of Fetal Pulmonary Valvuloplasty in China

Chengbin Zhou¹, Chengcheng Pang¹, Wei Pan¹, Zhiwei Zhang², Fengzhen Han³, Yunxia Sun⁴, Jimei Chen⁵, Jian Zhuang⁵

¹Guangdong Cardiovascular Institute, Guangdong General Hospital, China
²Guangdong Cardiovascular Institute, Guangdong General Hospital, China
³Guangdong Cardiovascular Institute, Guangdong General Hospital, China
⁴Guangdong Cardiovascular Institute, Guangdong General Hospital, China
⁵Guangdong Cardiovascular Institute, Guangdong General Hospital, China

Objectives

Fetal pulmonary valvuloplasty (FPV) for fetuses with critical pulmonary valve stenosis with intact ventricular septum (CPS-IVS) has the potential to facilitate right ventricle growth in utero and improve the prospect of a biventricular outcome after birth. We summarized the primary experiences of FPV in China.

Methods

Between September 2016 and March 2017, two pregnant women were diagnosed with fetal CPS-IVS at 24 and 26 gestational weeks respectively. Both fetal RV/LV ratios were less than 0.65 and TV/MV were less than 0.7. Fetal tricuspid inflow time was less than 35% of cardiac cycle. Color Doppler ultrasound showed retrograde flow in the duct, tiny flow in pulmonary valve and severe tricuspid regurgitation in the fetuses. Two pregnant women consented to undergo FPV to salvage the hypoplastic right ventricles. Both procedures were performed under the ultrasound guidance at 28 gestational weeks. Percutaneous needles crossed the maternal abdominal and uterus wall and punctured into the fetal right outflow tract, and then passed through the pulmonary valve and dilated the valve with 4 mm balloon. After the successful dilatations, the good antegrade flow across pulmonary valve was demonstrated by ultrasound.

Results

Both fetuses were successfully delivered after 35 gestational weeks. There were RV/LV ratios 0.51 and TV/MV 0.59 in one child after birth. He received the surgical intervention with pulmonary valve commissurotomy and modified Blalock-Taussig shunt and oxygenation saturation was over 90% in neonate. There were RV/LV ratios 0.8 and TV/MV 0.8 in the other child. He underwent a balloon pulmonary valvuloplasty and had biventricular circulation. Two children had no severe hypoxia and heart failure until now.

Conclusions

This is the first case series of FPV in China. FPV is a feasible procedure for CPS-IVS. More cases are required to explore the indications and benefits of PFV.