Cardiac Disease in Pregnancy: When Do You Worry?

-Hannah Raasch, MD, FACC
Cardiologist, Salt Lake Clinic
Office: 385-282-2600
Personal Cell: 801-455-9067
hannah.raasch@imail.org
Circulatory Changes in Pregnancy

- Heart rate increases by 10-15 bpm.
- Hct decreases due to a disproportionate increase in plasma volume that exceeds the rise in red cell mass.
- Cardiac output increases 30-50% secondary to increase in blood volume and heart rate.
- Blood pressure decreases by 10-15 mmHg owing to a decrease in systemic vascular resistance caused by the creation of a low resistance circuit by the placenta and vasodilatation.
Circulatory Changes in Pregnancy

- During the third trimester, cardiac output is influenced by body position, where the supine position causes caval compression by the gravid uterus. This leads to a decrease in venous return, which can cause supine hypotension of pregnancy.

- Stroke volume normally increases in the first and second trimester and decreases in the third trimester due to partial vena cava obstruction.

- During delivery, cardiac output, heart rate, blood pressure, and systemic vascular resistance increase with each uterine contraction.
Circulatory Changes in Pregnancy

• Immediately postpartum, the delivery of the placenta increases afterload by removing the low resistance circulation and increases the preload by returning placental blood to the maternal circulation.

• This increase in preload is accentuated by the elimination of the mechanical compression of the inferior vena cava.

• Blood loss is typically 300-400 mL during vaginal delivery and 500-800 mL during cesarean delivery.

• Postpartum, the cardiac output is typically reduced for 2-6 weeks.
Valvular Disease in Pregnancy

• Many of the normal symptoms of pregnancy, such as dyspnea on exertion, orthopnea, ankle edema, and palpitations, are also symptoms of cardiac decompensation. However, angina, resting dyspnea, paroxysmal nocturnal dyspnea, or a sustained arrhythmia are not expected with pregnancy and warrant a further diagnostic workup.

• Almost all pregnant women develop physiologic murmurs, which are usually soft, midsystolic murmurs heard along the left sternal border usually caused by functional pulmonary stenosis due to increased transvalvular flow.

• Systolic murmurs more than 2/6 in intensity, continuous murmurs, and murmurs that are associated with symptoms require further evaluation.
High Risk Valvular Conditions

- Severe aortic stenosis with or without symptoms
- Aortic regurgitation with NYHA class III or IV symptoms
- Mitral stenosis with NYHA class II, III, or IV symptoms
- Mitral regurgitation with NYHA class III or IV symptoms
- Aortic valve and/or mitral valve disease resulting in pulmonary hypertension with a pulmonary pressure greater than 75% of systemic pressures
- Aortic valve and/or mitral valve disease with left ventricular ejection fraction less than 40%
Rheumatic Mitral Stenosis

- Rheumatic mitral stenosis most common valvular problem in pregnancy
- Beta-blockers can be used to increase diastolic filling period
- Furosemide can be used to manage volume status
Valvular Disease in Pregnancy

- Mitral stenosis and aortic stenosis specifically are associated with increased neonatal complications such as premature birth, intrauterine growth restriction, respiratory distress syndrome, intraventricular hemorrhage, and death.

- A short, pain-free labor and delivery helps to minimize hemodynamic changes.

- Valvular disease patients should undergo a vaginal delivery with adequate pain control as cesarean delivery results in greater hemodynamic changes and blood loss.

- Delivery aided by forceps or vacuum-assisted techniques help avoid the sudden rise in systemic vascular resistance and drop in systemic venous return that occurs with maternal pushing.
Anticoagulation for Mechanical Valves

American Heart Association/American College of Cardiology 2013

• Class I. Therapeutic anticoagulation with frequent monitoring is recommended for all pregnant patients with a mechanical prosthesis (Level of Evidence: B).

• 2. Warfarin is recommended in pregnant patients with a mechanical prosthesis to achieve therapeutic INR in the second and third trimesters (Level of Evidence: B).

• 3. Discontinuation of warfarin with initiation of intravenous UFH (with an aPTT >2× control) is recommended before planned vaginal delivery in pregnant patients with a mechanical prosthesis (Level of Evidence: C).

• 4. Low-dose aspirin (75–100 mg) once per day is recommended for pregnant patients in the second and third trimesters with either a mechanical prosthesis or bioprosthesis (Level of Evidence: C).

• Class IIa1. Continuation of warfarin during the first trimester is reasonable for pregnant patients with a mechanical prosthesis if the dose of warfarin to achieve a therapeutic INR is ≤5 mg/day, after full discussion with the patient about risks and benefits (Level of Evidence: B)*

• 2. Dose-adjusted LMWH at least twice per day (with a target anti-Xa level of 0.8 U/ml to 1.2 U/ml, 4 to 6 h post-dose) during the first trimester is reasonable for pregnant patients with a mechanical prosthesis if the dose of warfarin is >5 mg/day to achieve a therapeutic INR (Level of Evidence: B)*

• 3. Dose-adjusted continuous intravenous UFH (with an aPTT at least 2× control) during the first trimester is reasonable for pregnant patients with a mechanical prosthesis if the dose of warfarin is >5 mg/day to achieve a therapeutic INR (Level of Evidence: B)*
Arrhythmias in Pregnancy

- Ectopic beats and non-sustained arrhythmias are noted in more than 50% of pregnant women.
- Sustained tachycardias are noted in 0.2-0.3% of pregnancies.
- The incidence of arrhythmias increases in the third trimester.
SVT in Pregnancy

- Treatment of supraventricular tachycardias in pregnancy is the same as for the non-pregnant population.
- Carotid massage or Valsalva maneuvers are first line.
- Initial pharmacological therapy is adenosine.
- Second choice is verapamil but only after the first trimester of pregnancy and in acute circumstances.
- A low dose of β-blockers can be effective treatment for supraventricular or ventricular extrasystoles or tachycardia.
Beta-Blockers in Pregnancy

- Although beta-blockers are generally felt to be safe in pregnancy large, population-based studies have identified small increased risk of small for gestational age infants, preterm birth, perinatal mortality among pregnancies exposed to beta-blockers prior to 20 weeks gestation.

- Additional risks reported include neonatal bradycardia and hypoglycemia.
Caution should be applied since the hyperemic uterine muscle as well as the amniotic fluid are excellent conductors of electricity.

However, the uterus is usually not involved in the cardioversion trajectory, and only a minimum amount of current reaches the uterus.

Adverse fetal consequences can occur if there is placement of the pads over the apex beneath the left breast and/or the relatively large third trimester uterus.

Small fetal heart has a high fibrillation threshold.
Peripartum Cardiomyopathy

• 1 in 15,000 live births

• Defined as the development of heart failure in the last month of pregnancy or in the first 5 months after delivery without any identifiable etiology and with objective assessment of left ventricular dysfunction.

• Risk factors associated with peripartum cardiomyopathy are maternal age older than 30 years, gestational hypertension, and twin pregnancies.

• An autoimmune mechanism has been suggested on the basis of high titers of autoantibodies against human cardiac tissue proteins in the sera of patients with peripartum cardiomyopathy that are absent in patients with idiopathic cardiomyopathy.
Causes of MI in Pregnancy

- Spontaneous Coronary Artery Dissection—often left main/LAD
- Atherosclerosis
- Clot without evidence of atherosclerosis
- Takotsubo cardiomyopathy
# Medications in Pregnancy

<table>
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<tr>
<th>OK</th>
<th>NOT OK</th>
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<tr>
<td>-Hydralazine</td>
<td>-Amiodarone—long half-life and potential to cause thyroid abnormalities and bradycardia in fetus</td>
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<tr>
<td>-Methyldopa</td>
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<tr>
<td>-Beta-blockers</td>
<td>-ACE inhibitors/ARBs—neonatal renal failure, oligohydramnios, hypotension, respiratory distress, limb defects, PDA, death</td>
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<td>-Calcium channel blockers</td>
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<tr>
<td>-Digoxin</td>
<td>-Nitroprusside—some debate about high cyanide levels in fetus</td>
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<td>-Adenosine</td>
<td>-Spironolactone</td>
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<td>-Procainamide</td>
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Thank You!

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