PREGNANCY AND CONGENITAL HEART DISEASE

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COMMERCIAL DISCLOSURE

- None

Objectives

1. To discuss hemodynamic changes associated with pregnancy
2. To discuss risk stratification of pregnant patients with congenital heart disease
3. To discuss role of imaging

Introduction

- 0.2–4% of all pregnancies in western countries are complicated by cardiovascular diseases.
- CHD is the most frequent cardiovascular disease (75%) during pregnancy.
- Treatment of CHD has improved, resulting in an increased number of women with CHD reaching childbearing age.

Introduction

- Hemodynamic changes during pregnancy can adversely affect maternal and fetal outcome in the setting of CHD.

- **Imaging**

- helpful for prognostication

- guides intrapartum and peripartum decision making.

Hemodynamic changes during pregnancy

- Changes in the cardiovascular system to meet the increased metabolic demands.

- They include
  - increase in blood volume
  - increase in cardiac output
  - decrease in systemic vascular resistance and
  - decrease in blood pressure (BP)

Hemodynamic changes during pregnancy

- Plasma volume reaches a maximum of 40% above baseline at 24 weeks gestation
- 30–50% increase in cardiac output
- Uterine contractions, pain, anxiety, exertion, bleeding, and uterine involution - significant haemodynamic changes during labour and post-partum

Hemodynamic changes during pregnancy

- Severe obstructive lesions – cardiac output can remain relatively fixed
- Even limited exercise may put these patients at risk for sudden cardiac or cerebral hypoxia

Maternal cardiovascular risk

Modified WHO classification

Risk Class	Risk of pregnancy by medical condition
I	No detectable increased risk of maternal mortality and no/mild increase in morbidity
II	Small increased risk of maternal mortality or moderate increase in morbidity
III	Significantly increased risk of maternal mortality or severe morbidity. Expert counselling required.
IV	Extremely high risk of maternal mortality or severe morbidity; pregnancy contraindicated.

Thorne S, MacGregor A, Nelson-Piercy C. Risks of contraception and pregnancy in heart disease. Heart 2006;92:1520–1525

Maternal risk class - Application

Risk class I

- Successfully repaired simple lesions
- Uncomplicated, small or mild PS, PDA, MVP

Risk class II

- Unoperated ASD, VSD
- Repaired tetralogy of Fallot
- Most arrhythmias

Maternal risk class - Application

Risk class II or III

- Mild left ventricular impairment
- Hypertrophic cardiomyopathy
- Marfan syndrome without aortic dilatation
- Aorta <45 mm in aortic disease associated with bicuspid aortic valve
- Repaired coarctation

Maternal risk class - Application

Risk class III

- Mechanical valve
- Systemic right ventricle
- Fontan circulation
- Cyanotic heart disease (unrepaired)
- Aortic dilatation 40–45 mm in Marfan syndrome
- Aortic dilatation 45–50 mm in aortic disease associated with bicuspid aortic valve

Maternal risk class - Application

Risk class IV

- Pulmonary arterial hypertension
- Severe systemic ventricular dysfunction (LVEF <30%)
- Severe MS, severe symptomatic AS
- Marfan syndrome with aorta >45 mm
- Aortic dilatation >50 mm with bicuspid aortic valve
- Native severe coarctation

Imaging

- Echocardiography remains the mainstay
- Magnetic resonance imaging (MRI) - only performed if other diagnostic measures are not sufficient
- MRI – pre-pregnancy and/or during pregnancy

Imaging

- Limited data during organogenesis, but MRI is probably safe, especially after the first trimester.

- The long-term risks of exposure of the developing fetus to free gadolinium ions are not known - gadolinium should be avoided

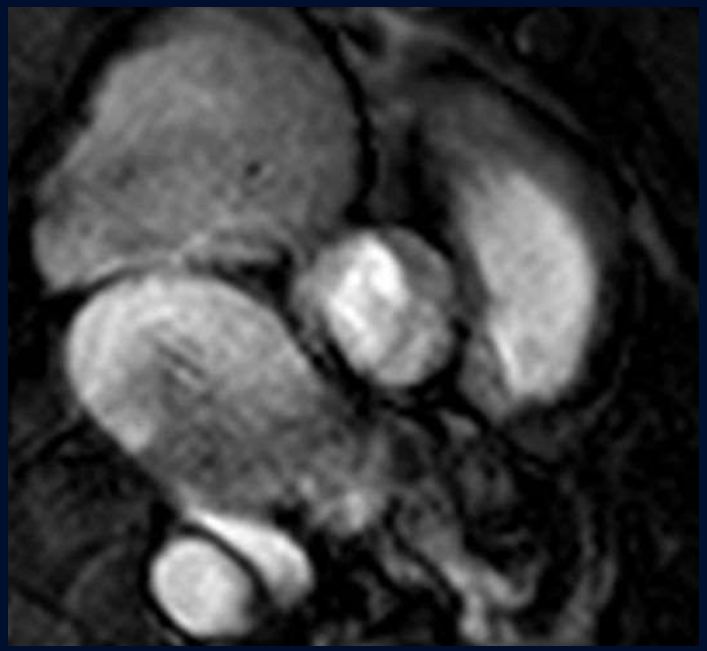
Imaging

- Computed tomography - usually not necessary
- Not recommended because of the radiation dose
- Exception - accurate diagnosis or definite exclusion of pulmonary embolism.

Coarctation of Aorta

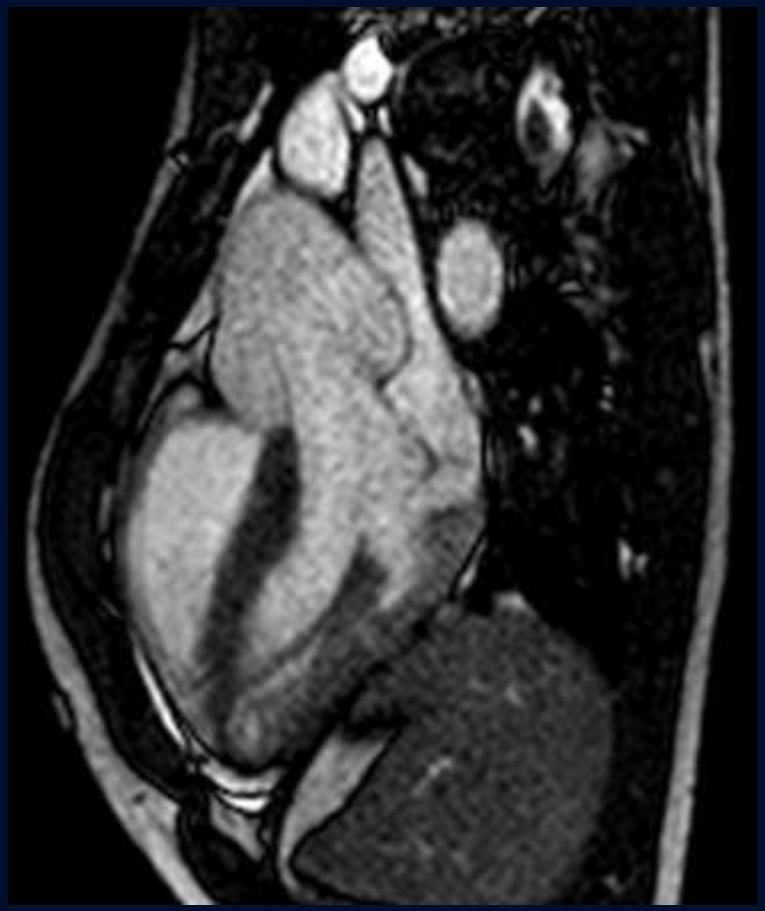
- Pregnancy well tolerated in patients with corrected coarctation of the aorta (class II)
- Unrepaired or residual coarctation – risk of aortic rupture, rupture of cerebral aneurysm

Bicuspid aortic valve



- Congenital AS - most often bicuspid aortic valve
- Associated with aortic dilatation and dissection
- Imaging of the ascending aorta before pregnancy - surgery considered when the aortic diameter is > 50 mm
- Cardiac output increases during pregnancy - aortic valve area, rather than valve gradient, may be better predictor of severity of AS

Marfan Syndrome

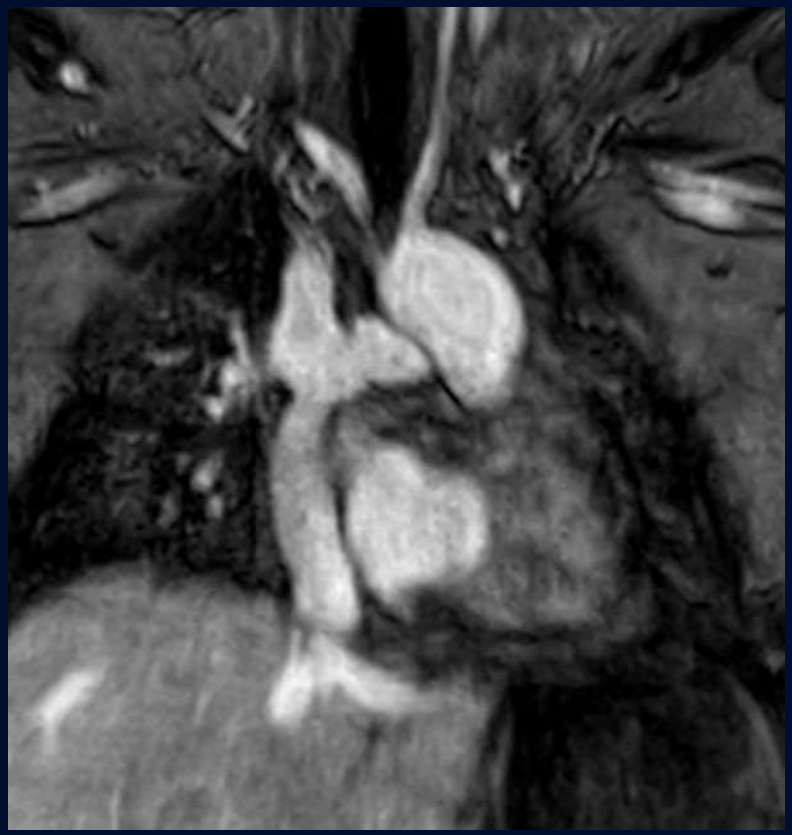


- Aortic root diameter > 40 mm and an increase in aortic root diameter during pregnancy - risk factors for dissection
- Following elective aortic root replacement - risk remains for dissection in residual aorta

Tetralogy of Fallot

- Repaired tetralogy of Fallot – tolerate pregnancy well (WHO risk class II)
- Unrepaired patients (class III)- surgical repair indicated before pregnancy
- Symptomatic women with marked dilatation of the right ventricle due to severe pulmonary regurgitation - pre-pregnancy pulmonary valve replacement

Fontan circulation



- Class III
- Higher maternal risk if Fontan circuit is not optimal - careful assessment pre-pregnancy
- Depressed function, moderate to severe AV regurgitation or protein-losing enteropathy – counsel against pregnancy

Conclusion

- Hemodynamic changes during pregnancy can adversely affect maternal and fetal outcome in the setting of congenital heart disease.
- Imaging plays an important role in making management decisions in accordance with set guidelines.
- MRI can be invaluable for quantitative and functional evaluation.