Cardiac disease in pregnancy

Dr. Andrew Kumwenda

BSc.(HB), MBChB (UNZA), Pg. Dip., MPhil.(Stellenbosch), MPH (UWC), MMed. (Obs-Gyn.) (UNZA), PhD candidate (Witwatersrand)

MBChB VII lecture,

School of Medicine, UNZA.

Friday 23rd Sep., 2021

Objectives

Be able to describe:

- Cardiovascular changes affecting cardiac disease
- Classification of cardiac disease
- Management of cardiac disease from conception to puerperium

Case scenario

- Mrs Melody Kaluba is known to have pre-existing cardiac disease.

i. What is the most common acquired cardiac lesion?

ii. What are the effects of cardiac disease on pregnancy?

iii. How should her labour be managed?

Incidence:

- Cardiac disorders complicate about 1% of pregnancies
- They contribute significantly to maternal morbidity and mortality rates
- Commonest cardiac lesion is of rheumatic origin followed by the congenital ones
- Rheumatic valvular lesions predominantly include mitral stenosis (80%)

Physiological considerations in pregnancy

- Pregnancy is a state of hypervolaemia
  - Blood and plasma volume increase by 30-40% & 40-50% respectively
  - However, RBCs and Hb increase by 20-30% and 18-20% respectively
  - This disproportionate increase in plasma and RBC/Hb volume produces a state of hemodilution and an apparent fall in Hb

Physiological considerations in pregnancy

- The marked pregnancy induced haemodynamic alterations can have a profound effect on underlying heart disease
- Primary event is probably peripheral vasodilatation (PV)
- PV leads to a fall in systemic vascular resistance (SVR) and to compensate for this the cardiac output is increased by as much as 50%
- Systemic vascular resistance decreases (20%)

Physiological considerations in pregnancy

- CO starts to ↑ from 5th wk, reaches its peak 40 – 50% at about 30 – 34 wks.
  - Thereafter, CO remains static till term though minimal fall at term has been observed
- CO ↑ is achieved mainly by an ↑ in stroke volume and by a lesser increase in heart rate

Intrapartum & postpartum haemodynamic changes

- Labour is associated with further ↑ in CO (15% in 1st stage and 50% in 2nd stage)
- Uterine contractions lead to auto-transfusion of 300-500mls of blood back into circulation
- Sympathetic response to pain and anxiety further elevate heart rate and BP

Intrapartum & postpartum haemodynamic changes

- CO is ↑ more during contractions and in between contractions
- Following delivery, there is an immediate rise in CO due to the relief of IVC obstruction and contraction of the uterus that empties blood into the circulation
- CO increases by 60% to 80% followed by a rapid decline to pre-labour values within 1 hour of delivery

Intrapartum & postpartum haemodynamic changes

- Transfer of fluid from the extravascular space increases venous return and stroke volume further
- These women with cardiovascular compromise are therefore most at risk of pulmonary oedema during second stage of labour and immediate postpartum
- CO nearly returns to normal 2/52 after delivery although it may take longer in pts with PE

Intrapartum & postpartum haemodynamic changes

- Women with underlying cardiac disease may not accommodate these changes and ventricular dysfunction leads to cardiogenic heart failure.

- In most women, heart failure develops peripartum

Effect of cardiovascular physiology on pregnancy

- Normal heart has got enough reserve power to withstand the extra load
- Damaged heart may not withstand the extra load if reserve power is poor, cardiac failure may occur with such.
- Cardiac failure usually occurs around 30wks, during labour and mostly soon after delivery

Effect of heart lesion on pregnancy

- Tendency of preterm delivery and prematurity
- IUGR – quite common in cyanotic heart diseases

Symptoms of cardiac disease in pregnancy

- These must be carefully assessed and investigated as the physiological and anatomical changes in pregnancy may mimic cardiac disease

- Symptoms include:
  - Breathlessness, nocturnal cough, orthopnea, PND
  - Syncope
  - Palpitations
  - Chest pain
  - Haemoptysis

Clinical findings:

- Cyanosis
- Clubbing of fingers
- Persistent neck vein distension
- Murmurs
- Cardiomegaly
- Persistent arrhythmia
- Persistent split second heart sound
- Criteria for pulmonary hypertension

Diagnostic studies

- In most women, non-invasive cardiovascular studies will provide data necessary for evaluation

  - CXR:
    - Cardiomegaly,
    - ↑ pulmonary vascular markings;
    - Enlargement of pulmonary veins

  - ECG:
    - T wave inversion,
    - Biatrial enlargement;
    - Dysrrhymias

Diagnostic studies

- ECHO:
  - Structural anomalies (ASD, VSD),
  - Valve anatomy, valve area; function,
  - Left ventricular ejection fraction,
  - Pulmonary artery systolic pressure

- Cardiac MRI:
  - When echo is inconclusive in delineating complex anatomy

Clinical classification of heart disease

- There is no applicable test for accurately measuring functional cardiac capacity
- The NYHA clinical classification is based on past and present disability and is uninfluenced by physical signs

NYHA clinical classification of heart disease

- Class I - uncompromised - no limitation of physical activity
- Class II - Slight limitation of physical activity. Comfortable at rest but breathless on severe exertion
- Class III - Marked limitation of physical activity. Breathless on mild exertion/ moderately compromised
- Class IV - Severely compromised. Inability to perform any physical activity without discomfort

Limitation of the NYHA classification

- It considers symptoms only and not the anatomical type and severity of pathology
- It does not predict pregnancy outcome

Prognosis

- Maternal
  - Prognosis depends on:
    - Nature of lesion
    - Functional capacity of the heart
    - Quality of medical supervision provided during pregnancy, labor and puerperium
    - Appearance of risk factors for CCF
      - Anaemia, infection, hypertension, arrhythmias; multiple pregnancy, hyperthyroidism; excessive weight gain

Prognosis

- Most deaths occur due to cardiac failure and maximum deaths occur following delivery.

- Other causes of death are:
  - Pulmonary edema,
  - pulmonary embolism,
  - Active rheumatic carditis,
  - subacute bacterial endocarditis;
  - Rupture of cerebral aneurysm in coarctation of aorta.

Prognosis

- Maternal mortality is lowest in rheumatic heart lesions and acyanotic heart diseases – less than 1%

- With elevation of pulmonary vascular resistance especially with cyanotic heart lesions, mortality may be raised to even 50% (Eisenmenger's syndrome)

- Fetal
  - ↑ fetal loss (45%) due to abortion in cyanotic heart lesions, IUGR and prematurity.
  - Fetal congenital cardiac disease is increased by 3-10% if either of the parents have a congenital lesion.

Predictors of adverse maternal outcomes

- Prior cardiac failure, arrythmias, TIA
- Baseline NYHA class > 2 or associated cyanosis
- Left valvular obstruction, mitral valve area <2cm^2, aortic valve area < 1.5cm^2, peak ventricular outflow gradient > 30mmHg by echo.

General management

- Principles
  - Early diagnosis and evaluation of anatomic type and functional grade.
  - Early detection of high risk factors and prevent cardiac failure
  - Multidisciplinary approach (obstetricians, cardiologists, neonatologists and anaesthetists)
  - Mandatory hospital delivery

Therapeutic termination

- Considering high maternal deaths:
  - Absolute indications are:
    - Pulmonary hypertension
    - Eisenmenger's syndrome
    - Pulmonary veno - occlusive disease
  - Relative indications
    - Parous woman with Class II & IV disease
    - Class I or II with previous H/O cardiac failure in early months or in between pregnancy
- TOP to be done before 12 wks by suction evacuation or D&E

Pre conception

- Pre conceptional counseling for known cardiac disease in order to assess risk and optimize treatment. (i.e. pre conceptional surgery, family planning)
- Use of NYHA classification to determine the patients functional capacity
- Explaining the cardiac anomaly and its impact on pregnancy, including up to a 4 % risk of infant with congenital heart disease

Pre conception

- Treatment with anticoagulation in valvular disease, atrial fibrillation, CHD with pulmonary hypertension.
  - Heparin in 1st trimester
  - Warfarin from 16 – 36 wks GA
  - Heparin at > 36 wks up to 7 days postpartum and then continue with warfarin

Antenatal care

- Should be at a tertiary hospital
- Combined care with cardiologists and anesthetists
  - Assess functional capacity
  - Screen and treat risk factors that precipitate cardiac failure
  - Exclude complications e.g. CCF, thrombosis
  - Admit for any complications
- Anticoagulation

Antenatal care

- Behavioral modifications : adequate bed rest, no smoking,
- US for fetal anatomy (CHD) at 18 – 20 wks GA
- Document clear labour plan in medical records

Role of anticoagulants

- Anticoagulants are necessary in those with CHD, pulmonary HTN, artificial valve replacements or atrial fibrillation
- Pt on warfarin to stop it once pregnancy is diagnosed and replaced with Heparin 5000iu up to 12th week. This is replaced with warfarin until 36 weeks
- Thereafter, it is replaced by Heparin up to 7 days postpartum. Warfarin is then to be continued.

Hospital admission

- Elective admission
  - Class I - at least 2 wks prior to EDD
  - Class II - at 28 wks
  - Class III & IV - As soon pregnancy is diagnosed.
- Emergency admission
  - Admit when functional grading is deteriorating or for any complications

Intrapartum

- The general principle of intrapartum management is to minimize cardiovascular stress.
- In most cases this will be achieved by the use of early slow incremental epidural anaesthesia and assisted vaginal delivery.
- Admit to a dependence unit- HDU. Vaginal delivery preferred. C/S for obstetric indications
- Consultations with anesthetist and pediatrician

Intrapartum

- Induction of labor for obstetric indications
- 1st stage of labor.
  - Semi recumbent position with a lateral tilt to minimize aorto-carval compression
  - Evaluation by doctor every 2hrs
  - Vitals every 30 min.
  - Oxygen 5-6 l/ min as needed

Intrapartum

- Adequate analgesia with pethidine or epidural if available – relief from pain and apprehension is important
- IV antibiotics – penicilin and gentamicin
- Minimize IVF - should not be infused >75 ml/hour to prevent pulmonary edema

Intrapartum

- Second Stage
  - Assisted second stage with forceps/ vacuum
- Third Stage of Labor.
  - AMTSL with oxytocin (no ergometrine)
- Furosemide after delivery.

Puerperium

- Close observation postnatally for 24hrs with hourly vitals in SOU if no complications
- Keep in postnatal ward at least 48 hrs to monitor for complications
- Patients on anticoagulation, heparin 6-12 hrs after vaginal delivery or 12 -24hrs after C/S
- Inform pediatrician of maternal history of cardiac disease so that new born is evaluated for CHD

Puerperium

- Contraception
  - Avoid oestrogen containing as it may precipitate thromboembolic phenomena
  - Avoid IUDs for fear of infection
  - Consider sterilization for life threatening disease

Surgically corrected heart disease

- Most clinically significant lesions are repaired during childhood
- Examples of defects not diagnosed until adulthood include: ASDs, pulmonic stenosis; bicuspid aortic valve and aortic coarctation
- In some cases, the defect is mild and surgery is not required

Surgically corrected heart disease

- With successful repair, many women attempt pregnancy
- In some instances, surgical corrections have been done during pregnancy

Valve replacement during pregnancy

- Although usually postponed until delivery, valve replacement during pregnancy may be life saving
- SGY on the heart or great vessels is associated with major maternal and fetal morbidity and mortality
- Hence SGY should be well timed and planned
- Indications for SGY in pregnancy include:
  - Failure of medical treatment; Intolerable symptoms; Intractable cardiac failure

Place of valvotomy

- It is better to withhold cardiac SGY during pregnancy
- SGY should be considered in cases of unresponsive failure with pregnancy beyond 12 weeks
- Best time for SGY is between 14 – 18 weeks
- Valve replacement; commissurotomy; ballon valvotomy can be carried out in early 2nd trimester

Place of valvotomy

- Tight mitral stenosis that requires intervention during pregnancy was previously treated by closed mitral valvotomy

- In the past two decades, percutaneous transcatheter balloon dilatation of the mitral valve has largely replaced surgical valvotomy during pregnancy

Some specific heart conditions to consider

- Congenital heart disease (CHD):
  - Atrial Septal Defect – most common CHD in pregnancy
  - Ventricular Septal Defect
  - Patent Ductus Arteriosus
  - Tetralogy of Fallot
  - Eisenmenger's Syndrome
  - Coarctation of Aorta
  - Marfan's Syndrome
- Acquired cardiac disease:
  - RHD
  - Cardiomyopathy