Management of Pregnancy Heart Disease

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Ahmanson-UCLA Adult Congenital Heart Disease UCLA Adolescent/Young Adult CHD Program
UCLA School of Nursing
NOTHING TO DISCLOSE
Growing Population of Females With Heart Disease

• Medical and surgical advances have resulted:
  • 80% - 95% of babies born with CV anomalies expected to reach adulthood
  • Pregnancy is the most common non-cardiac issue, cardiology providers see in practice
Objectives

Review the hemodynamic effects of pregnancy, labor & delivery

Describe maternal and fetal risks in the setting of cardiovascular conditions

Understand the importance of pre-pregnancy counseling and evaluation for women with heart disease

Discuss management options for women considered moderate to high risk

Understand importance of providing preconception counseling to women of childbearing age with heart disease in your practice or setting.
Pregnancy & Heart Disease
Defining the Population

- Congenital Heart Disease (CHD)
  - Unrepaired
  - Palliated and/or corrected

- Valvular Heart Disease (VHD): usually result of CHD or Rheumatic heart disease:
  - Mitral, Aortic stenosis
  - Mitral, aortic regurgitation

- Arrhythmias:
  - Long QT
  - Residual effect of heart disease

- Myocardial diseases
  - Cardiomyopathy
  - Hypertrophic Cardiomyopathy

- Pulmonary hypertension

- Marfan’s Syndrome

Post surgical intervention

- Cardiac transplantation
- Valvular Heart Replacement
Pregnancy and Heart Disease
Scope of the problem

Congenital Heart Disease
- 6 in 1000 live births have CHD
- >85% expected adult survival
- Today there are more adults with CHD than children
- Recognized by AHA/ACC as new subspecialty in cardiology

Cardiac Transplantation
- Number of transplants in women is increasing:
  - Survival of Pediatric CTX population in growing
  - Fertility is not affected by immunosuppression

- Number of reported pregnancies is growing
Pregnancy and Heart Disease: questions: Can I? Should I?
Pregnancy and Heart Disease: Challenges in Management

Normal Physiologic State of Pregnancy
### Cardiovascular Changes Associated with Pregnancy

| **Blood Volume:** | Increased (40-50%) |
| **Cardiac Output:** | Increased (30-40%) peaking by middle of 2nd trimester, then stabilizes; |
| **Heart Rate:** | Increased 10-20 bpm |
| **Blood Pressure:** | Systolic: ↓ Diastolic: ↓ |
| **PVR/SVR:** | Decreased |
| **Hematologic:** | Coagulation system: pregnancy a "hypercoagulable state"; Increased levels of fibrinogen, factor VII-X |
Physiologic Changes in Pregnancy

- Plasma Volume (ml)
- Heart Rate (bpm)
- Stroke Volume (ml)
- Cardiac Output (l/min)

Plasma Volume:
- 3750
- 3500
- 3250
- 3000
- 2750
- 2500
- 2250

Heart Rate:
- 90
- 80
- 70
- 60

Stroke Volume:
- 90
- 80
- 70

Cardiac Output (l/min):
- 8
- 6
- 4

Gestation (Weeks):
- Non-Pregnant
- 4
- 8
- 12
- 16
- 20
- 24
- 28
- 32
- 36
- Post-delivery

Graph lines:
- Red: Plasma Volume
- Blue: Heart Rate
- Green: Cardiac Output and Stroke Volume
Hemodynamic Effects of Labor, Delivery & Puerperium

Labor: during each contraction
- ~3-fold increase in O₂ consumption
- SV & CO ↑ by 20-30%
- Mean arterial BP ↑ esp. Stage II
- Reflex bradycardia
- Blood volume ↓ 30%

**Important to Note:** An autotransfusion of blood from the uterus occurs during each contraction
- Bolus of 300 to 500 ml.
- Greater in the left lateral position

**Note:** 2/3 cardiac deaths occur during peripartum period
<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Signs</th>
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<tbody>
<tr>
<td>Exercise capacity</td>
<td>Hyperventilation</td>
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<tr>
<td>Easy fatigability</td>
<td>Peripheral edema</td>
</tr>
<tr>
<td>Dyspnea</td>
<td>Distended neck veins</td>
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<tr>
<td>Lightheadedness</td>
<td>Full pulse</td>
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<td>Palpitations</td>
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</table>
Some common complaints during pregnancy: the "Discomforts of Pregnancy"

Nausea and vomiting: usually dissipates by 15 weeks
Heartburn/ GERD: presents as chest pain;
Headaches
Edema: lower extremity edema is very common
Leg cramps: especially in lower leg
Faintness and light-headedness
Breast tenderness
Management Principles

• PRE-CONCEPTUAL CONSSELLING

• ASSESSMENT AND STRATIFICATION OF MATERNAL RISK

• MANAGEMENT OF PREGNANCY AND COMPLICATIONS OF HEART DISEASE

DETERMINING TIMING, MODE AND PLACE OF DELIVERY
ASSESSMENT AND STRATIFICATION OF MATERNAL RISK

Traditional Method

- Expert opinion and case reporting
- Cumulative data from single center experience
- NYHA I  II  III  IV

Maternal and fetal mortality are each proportional to functional class: I & II <1%, III ~7% and IV~ 30%

- Result is general categories
  - Low risk
  - Moderate risk
  - High risk
ASSESSMENT AND STRATIFICATION OF MATERNAL RISK

Guidelines

• ACC/AHA 2008 Guidelines for the Management of Adults With Congenital Heart Disease

• ESC 2011 Guidelines on the Management of Cardiovascular Diseases during Pregnancy

• World Health Organization Classification

• Registries
  • ZAHARA (Applies to CHD)
  • Registry Of Pregnancy And Cardiac disease (ROPAC)

• Transplantation
  • National Transplantation Pregnancy Registry (NTPR)
  • UK Transplant Pregnancy Registry
PREGNANCY RISK STRATIFICATION MODELS:

• CARPREG “Predictors of Risk for Pregnancy-Related Complications in Women With Heart Disease” Siu SC et al, Circulation 1997

• ZAHARA I,II “Pre-pregnancy risk assessment and counselling of the cardiac patient” Pieper, P. G. Netherlands Heart Journal, 2011

- **N** NYHA > II
- **O** Obstruction left heart
  - Mitral valve < 2 cm
  - Aortic valve < 1.5 cm
  - Gradient > 30 peak
- **P** Prior cardiac event before pregnancy
  - Failure
  - Arrhythmia
  - Transient ischemic attack
  - Stroke
- **E** Ejection fraction < 40%

**Risk Score Based upon number of predictors:**
- 0 = 5%
- 1 = 27%
- > 1 = 75%
HIGH RISK CONDITIONS IN PREGNANCY

- Decreased LVEF (<35%)
- Uncorrected cyanotic CHD, or inadequately corrected severe CHD
- Severe aortic stenosis or Aortic Coarctation
- Severe mitral stenosis
- Prosthetic valves
- Marfan’s syndrome with dilated aorta (>40mm)
- Pulmonary HTN (PAP >3/4 systemic) (e.g. Primary PHTN, Eisenmenger’s syndrome)
Adverse Maternal, Fetal Events

**Maternal**

*Primary cardiac events*
- Cardiac decompensation (Heart Failure)
- Thromboembolism: PE, Stroke
- Ventricular fibrillation/tachycardia
- Sudden death

*Secondary events*
- Worsening of NYHA Class >2
- Need for urgent invasive procedures: (valvuloplasty, pacing)

**Fetal**

- Fetal wastage
- Prematurity
- Inter-ventricular hemorrhage
- Congenital malformation
Pregnancy in Heart Disease Management
Preconception Counseling and Evaluation

• Plays important role
• All females of childbearing years:
  • Menstrual and contraceptive history should be part of H&P
  • Contraceptives should be listed as medications
  • Receive pre-conception counseling that includes discussion of contraceptive
• Female desiring pregnancy should undergo full diagnostic evaluation to estimate risk.
  • If clinical problems exist, they should be corrected prior to conception to ensure optimized health of mother
• Long-acting contraceptives and/or sterilization given to those who are at highest risk for morbidity/mortality.
Pregnancy and HD: Diagnostic Evaluation

• Pre-pregnancy counseling “critical” for all females w/ HD
  • Understand potential risk to mother and fetus
  • Genetic counseling & evaluation
  • Review of medications; change teratogenic drugs
  • Assess need for correction of clinical problems prior to conception e.g. arrhythmias, residual shunts
  • Control non-cardiac disease – e.g. anemia, thyroid disorders

• Preconception evaluation
  • H & P
  • Echocardiogram (resting and stress – CPX)
  • Electrocardiogram
  • Additional diagnostics
    • Catheterization
    • EP studies
    • MRI/CT

• Laboratory work
  • Full evaluation including clotting function (platelets, PT, PTT)
  • BNP
  • Chromosomal studies
Pregnancy & HD: Assessing the Potential/Actual Risk:

- **Primary Cardiac Defect:** acyanotic vs cyanotic (degree)
- **Surgical intervention:**
  - Palliative
  - Corrective
    - Integrity of prosthetic valves
    - Patency of baffles/conduits
- **Medications** (e.g. ace inhibitors, anticoagulants)
- **Co-morbidities** (e.g. diabetes, -morbidities (e.g. diabetes, thyroid)
- **Presence of devices:** pacemaker, internal defibrillator
- **Residual and/or sequelae associated w/the lesion/surgery**
  - Cyanosis
  - Arrhythmias
  - Pulmonary hypertension
  - Systemic hypertension
  - Obstruction
  - Ventricular dysfunction
• Consider Therapeutic AB if “High-risk” group
  • First trimester AB < 12wks: D&C under local anesthesia
  • Second trimester AB: Medical abortion and involve medical or surgical procedures; carries higher risk of placental retention, hemorrhage and infection
  • Late term AB (> 24 wk.): risk is equal to delivery
How to apply data to clinical practice?

• We know who are high risk;
• We know who are low risk;
• But the range of moderate to intermediate risk is wide;
• Haven’t defined who among moderate or intermediate have the potential to develop complication during pregnancy;
• There are no models of care on management!
Ahmanson/ UCLA AACHD
UCLA Department of Obstetrics: Determining Maternal Risk: A Model for Advising and Managing Pregnancy in CHD

- AACHD program established 1981
- Reproductive services began 1984-85
- High risk obstetrics begun 1992
- Reorganized into multi-disciplinary team approach - 2003
UCLA AAC HD 4-Category Risk Model for Pregnancy Management

Definition of pregnancy risk is based upon published reports

- **Low risk (Category A):** No residual effects; carries no additional risk; may be managed as general population; may deliver in community

- **Intermediate (Category B):** Clinically stable at time of conception; poses a potential risk for endocarditis, embolization, arrhythmias, hypertension; ventricular dysfunction; delivery determined by clinical status
UCLA AACHD 4-Category Risk Model for Pregnancy Management:

- **Unknown (Category C)**  Reported data is limited; risk mild to moderate if clinically stable at time of conception; should be managed/delivered in high risk tertiary care center

- **High: (Category D)**  High maternal and fetal morbidity and mortality; Pregnancy is contra-indicated; always managed and delivered in high risk center
## Pregnancy Risk: Congenital Heart Disease

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>Atrial septal defect</th>
<th>Unoperated</th>
<th>Repaired</th>
<th>Operated</th>
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<tbody>
<tr>
<td>LOW</td>
<td>Surgically-repaired</td>
<td>ASD, VSD</td>
<td>Fontan for SV, TA</td>
<td>Atrial septal defect with no obstruction</td>
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<td>Ventricular septal</td>
<td>Coarctation of aorta</td>
<td>Atrial repair for TGA</td>
<td>ASD/VSD (small left to right shunts)</td>
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<tr>
<td></td>
<td>Defect</td>
<td>PS (moderate)</td>
<td>Rastelli for PA</td>
<td>Mild PS</td>
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<td>Patent ductus arteriosus</td>
<td>Ebstein’s anomaly (without cyanosis);</td>
<td>CTX</td>
<td>* presence of residual effects after operation</td>
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<td>Pulmonic stenosis</td>
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<td>Tetralogy of Fallot</td>
<td>Congenitally correct TGA</td>
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<td>Congenital complete heart block</td>
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<td>Aortic valve stenosis (gradient &lt;25 mm Hg)</td>
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<td>Marfan’s (&lt;40 mm)</td>
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<td>B INTERMEDIATE</td>
<td>Coarctation of aorta</td>
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<td>Ebstein’s Anomaly</td>
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<table>
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<tr>
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<td>Cyanotic HD</td>
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<td>Severe aortic or mitral stenosis</td>
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<td>Eisenmenger Synd</td>
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<td>Vent. dysfunction</td>
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<td>OTHER</td>
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<td>Prosthetic VHR</td>
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Pregnancy and HD
General Considerations

• Antepartum care
  • Minimize the demands on the cardiovascular system as pregnancy progresses (e.g. work, exercise)
  • Regular rest (on left side)
  • Control heat/humidity
  • Restrict Na and calories
  • Fetal Echocardiogram (18-22 wks) if transmission is suspect
Medical Problem in CV disorders
Medical Problem in CV disorders

• Arrhythmias
• Obstruction to outflow (stenosis)
• Anticoagulation for prosthetic valves
• Ventricular dysfunction (heart failure)
• Cyanosis – arterial saturation <85%
• Pulmonary hypertension
Arrhythmias in pregnancy

- **AFib/Flutter**: usually RHD or congenital heart disease, especially post Fontan or Mustard repair

- Sustained tachyarrhythmias such as atrial flutter or atrial fibrillation should be treated promptly

- **Ventricular tachycardia**: usually dilated cardiomyopathy, long QT syndrome or drug effect, electrolyte abnormalities, or incised RV (e.g. postop TOF); AICD may be required

- Electrical cardioversion is safe in pregnancy

- **Complete Heart Block**: usually isolated or with CHD (e.g. CCTGA); requires insertion of pacemaker
Anticoagulation for prosthetic valves

• Types of valves:
  • Tissue (bioprosthesis):
    porcine or bovine —
    • Require no anticoagulation
    • Females of child bearing age
  • Mechanical: 3 classification:
    • Tilting disc
    • Bileaflets (St. Jude)
      • Require life-long anticoagulation
Pregnancy and Prosthetic Valve Replacement

Pregnancy: is normally a hypercoaguuable state;

Patient on anticoagulation are at risk:

- Valve thrombosis risk is higher (7% - 23% (13% avg)
- Bleeding
- Miscarriage rate is higher
- Premature labor
- Infant: intracranial bleed
Anticoagulation & Pregnancy

**COUMADIN** crosses placental barrier;

- **FETAL WASTAGE: SAB & STILLBIRTHS**
- **FETAL CEREBRAL HEMORRHAGE**
  - CNS anomalies: optic atrophy, mental retardation, microcephaly,
  - Coumadin Embryopathy (~10%) nasal bone hypoplasia, chondrodysplasia punctata
  *Greatest Risk period is conception to 13th week**

**Heparin**: doesn’t cross placenta, less fetal problems; more concern w/ clotting of valve

- **UFH**: unstable, difficult to manage;
- **LMW “Lovenox”**: less risk w/ bleeding, easy to administer, but costly and must have access to Anti-Xa assay;
Pregnancy and Prosthetic Valve Replacement

• Pregnancy is generally discouraged
• If desire, plan is to transfer to UFH or LMH by week 6

• Choose course of treatment
  • **Heparin/LMWH through 1st trimester**, change to Coumadin until beginning of 3rd trimester, change to heparin 6-12 hrs. before delivery
  • **Subq Heparin/ LMWH (Lovenox) throughout pregnancy**
  • Coumadin throughout pregnancy
UCLA ACHD Protocol

• For Lovenox: Within 4-6 wks. of conception, convert to LMW heparin starting at 1mg/kg BID
• Goal: Anti-Xa level between .80-1.2. Avg dose 80mg q day. Require frequent (weekly) lab testing
• At 38 wks, admit to L&D and convert to IV heparin;
• At 2nd stage: DC IV heparin
• Regional anesthesia (epidural) only if PTT normal 4-6 hr after stopping heparin
• Vaginal delivery: avoid forceps(tears); vacuum assist if PTT not normal; aggressive uterine massage; C-section maybe considered.
• 2hr after delivery start IV heparin bolus then 5000 u (Goal: PTT 2-2.5 x control);
• Coumadin: restart next day, discharge on suq heparin until INR is 2.5
Obstruction to outflow: Aortic Stenosis

- Stenosis occurs: valvular, subvalvular, supravalvular
- Bicuspid disease associated with aortic disease & dissection
- Mild-moderate AS usually tolerated
- Pregnant women with severe aortic stenosis have poor outcomes because they have fixed SV, CO; hypertrophied ventricle is sensitive to falls in preload leads to heart failure, ischemia, syncope and death

- Avoid
  - volume depletion or afterload reduction
  - negative inotropic agents
- Balloon valvuloplasty, vs. open heart surgery?
Obstruction to outflow: aortic stenosis

- **Severe AS is poorly tolerated.**
  - $\text{AVA} < 0.7 \text{ cm}^2$, Mean PG $> 50 \text{ mmHg}$.
  - Mortality up to 17%.

- **Symptomatic patients or Mean gradient $> 50 \text{ mmHg}$$
  - $\rightarrow$ Delay conception until after surgical or interventional correction.
  - Consider balloon valvuloplasty, Ross procedure, tissue valve (no need for anticoagulation).

- **Symptomatic patients before end of 1\text{st} trimester**
  - Terminate pregnancy.
  - B-Blockade, Bed rest.
  - Palliative aortic balloon valvuloplasty or AVR.
  - Early Delivery.
Pregnancy: Following Cardiac Transplantation

Report from the 2011 National Transplant Pregnancy Registry

• 102 pregnancies in 57 heart transplant recipients;
• 64.7% of pregnancies resulted in live births;
• Miscarriage rate: 31.4%

Issues:  Fertility
          Immunosuppression
          Hemodynamic changes
Heart Transplantation: Pregnancy Risks

**Maternal**
- Hypertension (39%)
  - 50% with cyclosporine
  - 30% with tacrolimus
- Rejection during pregnancy
  - 21% with CsA
  - 2-4% with CsA and Tacrolimus
- Congenital CMV infection (highest in pregnancies occurring < 6 months after transplantation)
- Preclampsia
- Medications
  - Azathioprine:
  - Tacrolimus:

**Fetus/ Infant**
- Intrauterine growth restriction (approximately 20%);
- Premature labor < 37 weeks - 40% of live birth (higher in those treated with tacrolimus versus cyclosporine);
- Low birth weight (<2500 g)
- Prenatal infections,
- Birth defects: positive with Mycophenolate exposure
- Long term: Loss of mother

Report from 2011 National Transplant Pregnancy Registry
PREGNANCY SAFETY CATEGORIES

• Category A
  • Adequate human studies failed to demonstrate a risk to the fetus

• Category B
  • Animal studies show no risk to the fetus and no adequate studies in pregnant women OR animal studies have shown an adverse effect, but studies in pregnant women failed to demonstrate a risk to the fetus

• Category C
  • Animal studies show adverse effect to fetus and no adequate studies in humans, BUT potential benefits may outweigh potential risks

• Category D
  • Evidence of human fetal risk but potential benefits may warrant use of the drug despite potential risks.

• Category X
  • Studies in animals or humans have demonstrated fetal abnormalities and/or there is evidence of fetal risk, and the risks clearly outweigh potential benefits
Immunosuppression: Effect on Pregnancy

- **Prednisone (Category C)**
  - Associated with PROM
  - Crosses placenta
  - Fetal growth restriction
  - Low birth weight
  - Safe in breastfeeding

- **Sirolimus (Category C)**
  - Prenatal exposure
  - Decreased fetal weight
  - Delayed skeletal ossification
  - Unknown safety with breastfeeding

- **Cyclosporine (Category C)**
  - Requires higher doses
  - Crosses placenta
  - Fetal Growth restriction
  - Premature birth
  - Low birth weight
  - Avoid breastfeeding

- **Tacrolimus (Category C)**
  - Maternal effects
    - Possible miscarriage
    - Frequent monitoring drug levels (q 2-4 wks)
    - Crosses placenta
    - Prenatal exposure
    - Transient perinatal hyperkalemia
    - Increased incidence of diabetes
    - Avoid breastfeeding

- **Azathioprine Category D**
  - Crosses placenta
  - Growth restriction
    - Myelosuppression: Leukopenia
    - Fetal malformations
    - Avoid breastfeeding

- **Mycophenolic Acid products (Category C)**
  - Risk (20%): congenital malformation
  - Unknown safety in breastfeeding
  - Stop drug >6 wks prior to conception and throughout pregnancy
Cardiac Drugs and Pregnancy
A Delicate Balance

Beta blockers
Ace inhibitors (Category D risk)
Anti-arrhythmic
Anticoagulants/antiplatelet
Immunosuppression following CTX
CONGENITAL HEART DISEASE: It Truly Takes a Village

These special deliveries take team work!

Cardiology
MFM/OB
Anesthesia
Nursing
General Principles of Management Pregnancy & Heart Disease

- UCLA Team approach:
  - Cardiologist team: ACHD faculty and fellows, ACNP/CNS
  - Obstetrical team: perinatologist (MFM), anesthesiologist knowledgeable in cardiac anesthesia; residents, perinatal CNS/Manager; neonatologist
  - Additional: ICU nurse manager, cardiac surgery team; ethics and legal consultants
  - Annual perinatal lectures for house staff and nursing
  - For moderate-high risk patients: multi-disciplinary team conference prior to induction
Mode of Delivery: Vaginal Delivery

Indications for C-section

- Obstetrical reasons: e.g. Preclampsia, placenta previa/abruption; fetal distress,
- Anticoagulation with Coumadin (Warfarin)
- Severe fixed obstructive cardiac lesions
- Severe pulmonary HTN
- Maternal decompensation
- Marfan’s with dilated aorta or dissection
Adjunct Therapies & Drugs

Adjunct Therapies:
- Cardioversion
- Pacemaker
- ICD (implantable defibrillator)

Drugs
- Obstetrical drugs for pre-eclampsia and to stop pre-term labor e.g. magnesium, Labetalol

CPR
- Turn mom to left lateral decubitus w/ R hip elevate 15 degrees
General Principles of Management
Pregnancy & Heart Disease

**Category A** – treat as general population
  - Vaginal delivery
  - Endocarditis prophylaxis not required

**Category B** – if clinically stable throughout pregnancy, may be delivered in community hospital; if clinically symptomatic or becomes symptomatic consider management and delivery in tertiary center or hospital with high risk obstetrics
  - Vaginal delivery
  - Endocarditis prophylaxis

**Category C, D** - Must be managed delivered at tertiary center with experience in pregnancy and heart disease.
  - Vaginal delivery
  - Endocarditis prophylaxis
  - Planned induction > week 37
  - Maternal cardiac and fetal monitoring
  - Labor on left side
  - Vaginal delivery: shortened second stage; no pushing - Epidural

•
Clinical Management for “high risk” mother
Development of Delivery Plan at 32 wks.

LABOR
• Admission date for induction of labor
• Arterial O2 saturation
• Monitoring (TBD)
  • Cardiac: Remote tele-monitor; vs monitor
    w/ ICU RN in attendance
  • Arterial line
  • Hemodynamic: arterial line, central line TBD
• Fluid limits/allowances
• Medications
• Labs: BNP
• Prevent thromboembolism
  • IV air bubble filters if have shunts
  • Leg vein care

• Recommendations from multidisciplinary meeting

Delivery
• Vaginal; assist w/forceps (avoid valsalva)
• Anesthesia
  • Epidural preferred
• Pacemaker/ICD management: magnet on standby for surgery

• Post-partum Care
• Clinically stable patient:
  Transfer to PP floor w/ remote telemonitoring for 24-48 hrs.
• Category D or patient who is symptomatic
  • Transfer to ICU observation and management
Principles of Management: labor and delivery

• **Category D:**
  • Management dictated by cardiac status and pregnancy course; planning begins after week 26
  • Multi-disciplinary conference (26wks)
  • Early admission – dictated by clinical status;
  • Location: L&D w/ cardiac RN; ICU fetal monitoring required
  • MD-Team notified of patient pending admission
  • O2 sat; arterial line
  • Monitoring
  • EKG
  • Hemodynamic monitoring (bedside echo)

• If on anticoagulants, change to IV heparin
• Prevent thromboembolism
  • IV air bubble filters if have shunts
  • Leg vein care

**Delivery**
• Induction: 37 wk. or earlier
• Mode of delivery: TBD by maternal status; often C-section
• Anesthesia: TBD
• Notification of standby teams: CTS (VAD)

**Post Partum**
• ICU admission
• Close follow-up after discharge
Pregnancy in CHD
Challenges for Management

Summary

• Understand the impact normal pregnancy can have on cardiac lesions and their residual effects following operative repair.

• Pre-conception counseling and evaluation is essential in defining potential and actual pregnancy risk.

• In order to ensure safety to mother and fetus, it takes a coordinated multidisciplinary team approach to manage the women with CHD.
These special deliveries take special Team Work! The UCLA Team
Pregnancy in CHD
Challenges for Management
Summary

• Understand the impact normal pregnancy can have cardiac lesions and their residual effects following operative repair.

• Pre-conception counseling and evaluation is essential in defining potential and actual pregnancy risk.

• In order to ensure safety to mother and fetus, it takes a coordinated multidisciplinary team approach to manage the women with CHD.

• Identifying the challenges will guide us in ensuring....
Health Happy Babies, and
Healthy moms to care for them!
References


CLINICAL CASE
Case study: Pulmonary Hypertension

- 30 yr old s/p VSD repair at 11 yrs in Mexico
- No follow-up as adult, had daughter at age 18 w/ no problems
- Referred at 19 wks to MFM when community OB service noticed chest scar
- Echo: RVEF 50%, Mild RV enlargement, Estimated RVSP 51 mm Hg, Mild to mod TR, small residual VSD
- Clinically asymptomatic except was getting more tired
- Social hx: Not married to FOB,
Case study: Pulmonary Hypertension

• OB visits q wk with BNP and SaO2
• Began Revatio 20 mg TID
• Cardiology: seen at 22 wk, repeat echo at 32 wks unless signs of decompensation
• Obtain advanced directive:
  • Power of attorney for health decisions
  • Salvage mother or fetus; fetus over mother
  • If she dies, designates FOB to take infant
Case Study: Pulmonary Hypertension

- Multidisciplinary meeting at 24-26 wks
  - Outline monitoring for signs of decompensation:
    - Dx and Laboratory studies: BNP wkly, Echo at beginning of 3rd trimester, or earlier if signs of sOB, DOE,
    - drop in SaO₂,
    - Increase in BNP

- Follow-up: Cardiac q 2-4 wk; OB q 1-2 wks
- Obtained advanced directive:
  - Power of attorney for health decisions
  - Salvage mother or fetus
  - If she dies, designates FOB to take infant
- Revise delivery plan at 32 wks
  - IOC at 36-37
Case study: Pulmonary Hypertension

- Plan for admission if decompensates:
  - Admit to: L&D vs CCU
- Initiate Nitric oxide
  - Increase Revatio 20 mg BID
  - Labs: Platelets, T&C, BNP,
  - O2 to maintain SaO2 > 85%
  - DVT, IE prophylaxis
  - Monitoring: cardiac, arterial line, pulse oximetry
  - Delivery/anesthesia TBD
  - Post partum: CCU for recovery

- Remains stable
  - Admission 36-37 wk to L&D w/ remote cardiac monitoring; CCU RN during active labor
  - Nitric oxide initiated
  - Increase Revitio 20 mg Bid
  - Pulse Oximery
  - DVT, IE prophylaxis
  - Delivery: vaginal, Epidural
  - Post partum: CCU for 24-72 hr for observation
Case study: Pulmonary Hypertension

- **Outcome**
  - Clinically stable; admitted week 36+5 to L&D w/ remoted ECG monitoring
  - IV with bubble filters (small VSD)
  - Nitric oxide initiate, Revaito increased
  - Oxygen w/ humidification
  - DVT /IE prophylaxis
  - Echocardiogram repeated remained unchange, BNP on admission 110,
  - Vaginal delivery at 37 w/ Epidural
  - CCU admission post delivery
Case study: Pulmonary Hypertension

Discharged at PP Day 4