Fetal Cardiac Arrhythmia: Diagnosis and Management

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Disclosure

- No disclosures
Objectives

- Evaluation of fetal heart rate and rhythm
- Recognize abnormal heart rhythm
- Indications for referral
- Fetal tachycardia
- Fetal bradycardia
Fetal Cardiac Arrhythmia

- Occur in 1-3% of pregnancies
- 10-20% fetal cardiology referrals
- Majority are benign
- Can cause fetal morbidity (hydrops) and demise
- Potential to alter course with therapy
Fetal Cardiac Arrhythmia

- Fetal heart rate and rhythm are **MANDATORY** components of Fetal Echo
  
  AHA 2014
  
  AIUM 2013
  
  ASE 2004
Normal Cardiac Conduction

Wang P J , and Estes N A M Circulation. 2002;106:e206-e208  AHA .org
Normal Fetal Heart Rate & Rhythm

- Rhythmic contractions begin at 22 days post conception
- Average HR 170 bpm at 10 weeks, 150 bpm at 16 weeks, 140 bpm at 20 weeks, 130 bpm at term
- Normal range: 110-180 bpm
- Beat to beat variability of 5-15 bpm
Assessment of Fetal Rhythm

- Direct electrocardiographic assessment of rhythm (fetal EKG)-limited use due to poor quality
- Magnetocardiography- higher quality, limited availability
Echocardiography is the mainstay

2D, Pulse Doppler, M-mode, Tissue Doppler
Echocardiographic analysis of fetal cardiac rhythm

- Heart rate
- Demonstrate sequential atrioventricular contraction
  - 2-D
  - M Mode
  - Doppler
Echocardiographic analysis of fetal cardiac rhythm: 2-D echo
Echocardiographic analysis of fetal cardiac rhythm: M-Mode echo

Simultaneous M-mode recording of atrium and ventricle
Echocardiographic analysis of fetal cardiac rhythm: Doppler

Simultaneous Doppler tracing of left ventricular inflow and outflow
Echocardiographic analysis of fetal cardiac rhythm: Doppler

Simultaneous Doppler tracing of pulmonary vein (below) and pulmonary artery (above)
Sinus Rhythm!
Abnormal Fetal Rhythm

- Irregular
- Tachycardia
- Bradycardia
Irregular cardiac rhythm

- Premature atrial contractions (PAC’s)
- Premature ventricular contractions (PVC’s)
Irregular cardiac rhythm

- Premature beats occur in 1-3 % pregnancies
- Most are benign
- Rare- myocarditis, tumors, aneurysm, diverticulum, maternal stimulants
- Atrial ectopy (PAC) 10- fold more common
- Frequent or persistent ectopy (more than 2 weeks) needs further evaluation
Premature Atrial Contractions
Premature Atrial Contractions
PAC!

PAC’S: CONDUCTED AND NON-CONDUCTED
Ventricular Ectopies
Ectopy- Management

- Pharmacotherapy not recommended
- 0.5 to 1% risk of SVT with PAC’s
- Unknown risk of ventricular tachycardia with PVC’s
- Observation with weekly heart rate assessment, function assessment if myocarditis or other structural disease
- Referral for Fetal Echocardiogram
Fetal Tachycardia

- HR> 160 bpm
- Sinus (160-200 bpm)
- Pathologic mechanisms (180-280 bpm)
Pathologic Fetal Tachycardia

- Supraventricular Tachycardia
- Atrial Flutter
- Ventricular Tachycardia
Fetal Tachycardia
Fetal Tachycardia- Management

- Sustained tachycardia can result in Hydrops Fetalis
- In utero pharmacotherapy is usually successful
- Management depends on gestational age, fetal compromise, maternal and fetal risk factors, type of tachycardia
- Referral for fetal echocardiogram and cardiac evaluation – assess mechanism and therapy
Fetal Bradycardia

- Heart rate <100 bpm
- Sinus bradycardia
- AV block (high grade or complete)
Complete (3rd degree) AV block
3\textsuperscript{d} Degree AV block

A rate 140 bpm
V rate 60 bpm
3rd Degree AV block

- Autoimmune: Maternal collagen vascular disease (SLE, Sjögren’s)
- Associated with congenital heart disease
- Indices of poor prognosis: Ventricular rate <55 bpm, endocardial fibroelastosis, myocardial dysfunction, hydrops fetalis
- Worse prognosis when associated with CHD
- May require pacemaker at birth
Fetal Bradycardia- Management

- Referral for fetal cardiac evaluation and echocardiogram
- Sinus bradycardia- treat mechanism (maternal hypothyroidism, medications, autoimmune, long QT syndrome)
- Immune mediated AV block- Dexamethasone, IVIg, terbutaline, fetal pacing
- High risk for IUFD
Summary

- Assessment of fetal heart rate and rhythm is an important part of evaluation of the fetus.
- Though uncommon, fetal arrhythmia can cause significant fetal morbidity and mortality.
- Pharmacotherapy is often successful in managing most common forms of tachycardia.
- Early cardiac referral is important in management.
References

- Rychik J; Tian Z; Fetal Cardiovascular Imaging: A Disease Based Approach. Chapter: Abnormalities of the Conduction System

