Fetal Arrhythmia

New Zealand Maternal Fetal Medicine Network

This guideline was developed by the New Zealand Maternal Fetal Medicine Network, with input from Greenlane Paediatric and Congenital Cardiac Services, Starship Children's Hospital.

Background

An irregular heart rate is noted at some point in 1 – 3% of all pregnancies. 90% of these are of no clinical significance.
A sustained bradyarrhythmia or tachyarrhythmia can, however, lead to congestive heart failure, hydrops, fetal demise, and the possibility of neurologic morbidity.

Objective

To guide the accurate diagnosis, investigation and management of women presenting with a fetal arrhythmia.

Definition

Fetal arrhythmias can be divided into 3 categories:

- **Irregular/Ectopic beats**
  a. 85% of all arrhythmias
  b. Usually secondary to atrial extrasystoles
  c. More common in 3rd trimester
  d. 1 – 3 % develop into sustained tachycardia
- **Tachyarrhythmias**
  a. HR > 180, although usually not clinically significant until > 200 BPM
  b. 5 – 8% of all arrhythmias
  c. 5% with associated congenital heart disease (CHD)
  d. Two most common types of tachyarrhythmias

i. **SVT:**

1. HR 220 - 300 BPM (60 – 90%)
2. Usually re-entrant tachycardia secondary to an accessory pathway

ii. **Atrial Flutter:**

1. HR 250 – 500 BPM (10 – 30%)
2. slower ventricular rate secondary to variable AV block (2:1 or 3:1 conduction)

- **Bradyarrhythmias**
  a. HR < 110 BPM
  b. 5 – 8% of all arrhythmias
  c. Types of bradyarryhthmias

i. **Structural**

1. 50% of congenital A-V block (AVB) secondary to CHD
   a. Atrial isomerism and congenitally corrected TGA are most common associated anomalies

ii. **Anti-Ro/Anti-La Antibodies**

1. 1:15,000 – 20,000 live births
2. 2% of antibody positive women will develop some degree of AVB

Differential Diagnosis

- Infection – maternal or fetal
- Hypoxia
- Fetal anaemia
- Maternal drugs
- Maternal thyrotoxicosis
- Maternal cathecholamines

Important History

- Maternal drugs
- Autoimmune conditions
- History of CHD

Ultrasound

- **M – Mode Doppler**
  - Detects atrial and ventricular wall motion
- **Pulsed Wave Doppler**
  - Determines the P-R interval
  - Best sites to obtain from are;
    - Left ventricular inflow-outflow
    - IVC-descending aorta
    - SVC-ascending aorta
- Pulmonary artery-Pulmonary vein

Investigation

- Maternal vitals
- Maternal TFT's +/- thyroid antibodies
- Urinary cathecholamines if suspicion of maternal Cushing's Disease
- Ultrasound
  - MCA Doppler
- M-mode or pulsed wave for waveform assessment (as above)

Prognosis

- **Irregular/Ectopic Beats**
  - Excellent prognosis if does not progress to sustained tachycardia
- **Tachyarryhthmia**
  - > 90% survival with correct choice of medication with SVT and Flutter
  - Most infants have meds stopped in 1st year of life
  - 30% with recurrent SVT
  - > 75% of arrhythmias can be converted to sinus rhythm with antenatal treatment
  - Presence of hydrops does not affect cardiac conversion significantly if appropriate medications chosen (75% conversion to sinus rhythm)
  - Factors associated with worse prognosis
    - Hydrops
    - Associated abnormalities esp. CHD
    - Metabolic derangements
    - Inappropriate med choice

- **Bradyarryhthmia**
  - High morbidity and mortality
    - Hydrops is most important prognostic factor – almost always fatal and consideration to non-intervention should be given.
    - Presence of CHD next most important – greater than 80% mortality in presence of AVB
    - Other factors worsening prognosis;
      - HR < 55 BPM
- Negative antibodies

Treatment

NO CONTROLLED TRIALS OF TREATMENT

- **General options for treatment are:**
  1. Observe
  2. Deliver then treat
  3. Transplacental fetal therapy (maternal ECG, electrolytes and drug levels as part of process)
  4. Direct fetal therapy
- **No treatment if:**
  1. intermittent (arrhythmia present < 50% of time)
  2. no cardiac or valvular dysfunction
  3. advanced gestation (> 37 weeks)

- **Irregular/Ectopic Beats**
  - Confirm standard views of cardiac anatomy have previously been obtained to rule out CHD (echo not needed)
  - Weekly auscultation or Doppler to rule out conversion to tachyarrhythmia
- **Tachyarrhythmia (see drug chart below)**
  - Non-Hydropic Infant
    - Transplacental Flecainide Therapy 1st line
    - Sotalol and Digoxin are equivalent 2nd line agents for SVT. Sotalol or digoxin and Flecainide recommended for A Flutter
  - Hydropic Infant
    - Flecainide 1st line for SVT
      - Not for atrial flutter as does not slow AV conduction time
    - Sotalol for A Flutter
    - Sotalol or Amiodorone 2nd line
- **Bradyarrhythmia**
  - ? benefit of steroids
    - Will not affect 3rd degree AVB, but some studies show may prevent progression of 1st and 2nd degree block (other studies show no benefit). Steroid effect on mother to be considered.
  - Monitor for AV valve regurgitation (MVR specifically) and umbilical artery blood flow
  - Indications for intervention or delivery are
    - HR < 55
    - Evidence of deterioration in cardiac function
    - hydrops

Terbutaline for HR < 55 has not shown any improvement in fetal or neonatal death

Drug Chart

Medication	Mechanism of Action	Initial Maternal Dosage	Utility	Use in neonate	Precautions
Digoxin	Slows AV nodal conduction via increased vagal tone	0.25 mg TDS for 2 days and then re-check levels and maintain at 0.25 mg daily or BD depending on levels	Not effective in hydropic infants	Only as adjunctive Rx with other antiarrhythmics	Not recommended in WPW. ½ dose if used with amiodarone. Monitor blood levels
Sotalol	K^+ channel blocker and Beta blocker. Slows AV nodal and accessory pathway conduction	80 mg BD	Preferred rx for atrial flutter with hydrops; combines well with digoxin	Avoid IV use. Potent antiarrhythmic useful with most tachycardias	Severe QT prolongation possible. Avoid other meds with same effect
Flecainide	Na^+ channel blocker. May increase AV nodal conduction. Very effective at blocking accessory pathway conduction	100 mg TDS	Proven effect in fetal hydrops without AF. Monitor blood levels	Good for WPW, must be used with conduction slowing agent in AF	Monitor blood levels to avoid toxicity. Need AV blocking agent when used with AF. Do not refrigerate
Amiodarone	K^+ channel blocker. Slows conduction velocity and prolongs refractory period in all cardiac tissues	600 mg TDS for 2 – 7 days then reduce	Promising in Rx of hydropic fetus without AF	Effective for all forms of tachycardia. Can use IV	Rare hypotensive collapse with IV use. Monitor TFT's regularly

Taken from Skinner, Detection and Management of Life Threatening Arrhythmias in the Perinatal Period, 2010

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