

# ECG ABNORMALITIES

## INTRODUCTION

- 1–5% of normal newborn babies have irregularities in heart rhythm within the first 10 days of life. These are largely self-limiting and benign
- Need to distinguish between:
  - normal sinus arrhythmia (including pauses up to 1.5 sec)
  - benign arrhythmias (including premature atrial and premature ventricular contractions)
  - pathological arrhythmias [can be divided into tachyarrhythmias (SVT and VT) and bradyarrhythmias (congenital heart block and congenital long QT syndrome)]
    - pathological arrhythmias are more common in babies with congenital heart disease (especially post-operatively)

## PREMATURE ATRIAL BEAT

### Recognition and assessment

- Most common form of arrhythmia
- In a regular sinus rhythm at a normal rate, a P wave occurring before next expected P wave is a premature atrial beat
- Usually has a different morphology (P wave different in shape and size from normal P wave)
- Most premature atrial beats are benign

### Management

- 12-lead ECG – ensure rate, rhythm and QTc are calculated
- Check electrolytes (particularly for potassium)
- Check position of tip of central venous catheter (if present)
- Follow-up ECG aged 1 month (small risk of SVT)
- If premature atrial contractions persist, seek cardiology advice

## PREMATURE VENTRICULAR BEAT

### Recognition and assessment

- Premature abnormal QRS complex not preceded by premature P wave

### Investigations

- 12-lead ECG – ensure rate, rhythm and QTc are calculated
- Check electrolytes (particularly for potassium)
- Check position of tip of central venous catheter (if present)
- Echocardiogram to rule out structural abnormality of heart

### Immediate treatment

- Seek advice from paediatric cardiologist

## SINUS TACHYCARDIA

### Recognition and assessment

- Sinus rhythm (P wave precedes every QRS complex) with a heart rate above normal limit for age and gestation

### Causes

- Fever
- Infection
- Low haemoglobin
- Pain
- Prematurity
- Hypovolaemia
- Hyperthyroidism
- Myocarditis

- Drugs (e.g. caffeine and salbutamol)

### **Management**

- Treat the cause
- If myocarditis suspected – echocardiogram

## **SINUS BRADYCARDIA**

### **Recognition and assessment**

- Sinus rhythm (P wave precedes every QRS complex) with a heart rate below normal limit for age and gestation
- Calculate QT interval to rule out congenital long QT syndrome and signs of heart block
- in first 7–10 days of life, QT interval can be transiently prolonged – initial ECG not to be used in isolation to diagnose congenital long QT syndrome)

### **Differential diagnosis**

- Hypoxia (most likely cause)
- Vagal stimulation
- Post-intubation
- Hypovolaemia
- Hypothermia
- Metabolic derangement
- Hypopituitarism
- Obstructive jaundice
- Drugs passed from mother to baby (labetalol)
- Maternal SLE

### **Immediate management**

- Manage airway and breathing
- If intubation required, optimise ETT position
- If bradycardia occurs post-intubation, use atropine (see **Neonatal Formulary**)
- Correct hypovolaemia
- Correct metabolic derangement
- If persistent, obtain 12-lead ECG
- Evaluate and treat underlying cause

## **SUPRAVENTRICULAR TACHYCARDIA**

### **Recognition and assessment**

- Rapid regular tachyarrhythmia
- Heart rate >220 bpm
- ECG:
  - P waves commonly absent. When present they almost always have an abnormal morphology
  - narrow QRS complex
  - in fast sinus tachycardia, P waves can be very difficult to see
  - look for delta waves consistent with Wolff-Parkinson-White syndrome as this can affect the choice of anti-arrhythmic agent used
- For further information see **Supraventricular tachycardia** guideline

## **VENTRICULAR TACHYCARDIA**

### **Recognition and assessment**

- Heart rate >200 bpm
- Wide QRS complexes
- ≥3 repetitive complexes

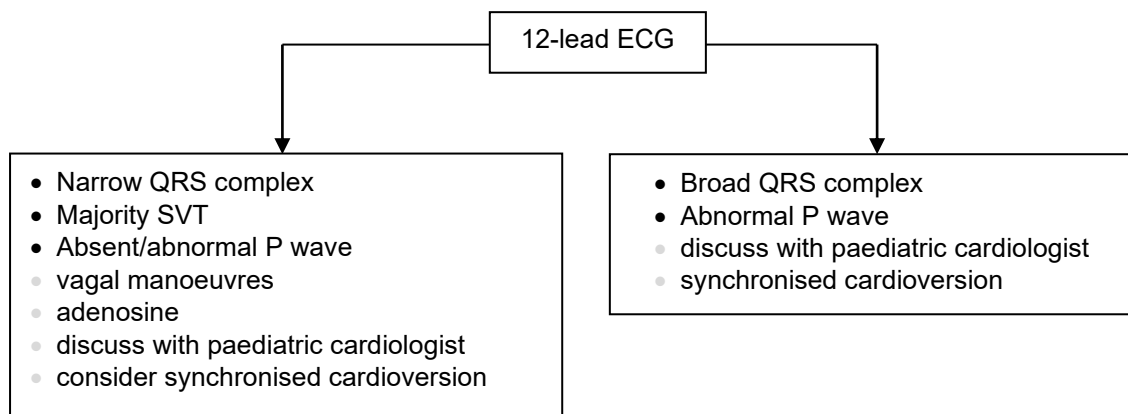
### **Immediate management**

- Manage airway and breathing
- Correct hypoxia

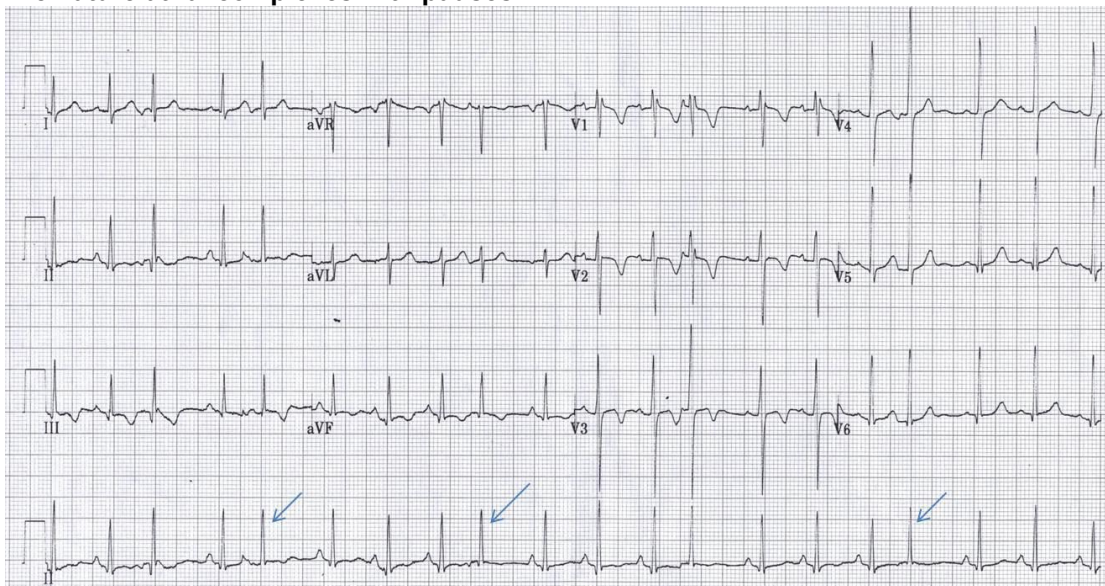
- Correct electrolyte disturbance
- Discuss with paediatric cardiologist
- Consider synchronised cardioversion (in very fast heart rates, defibrillators cannot synchronise with the patient and unsynchronised will be required) if intubated, with analgesia
- Amiodarone 5 mg/kg over 30 min IV (repeat if necessary)
- If no response, lidocaine 0.5–1 mg/kg IV. May be repeated after 5 min. Maximum cumulative dose 3 mg/kg

## TACHYARRHYTHMIA

- True heart rate?
- Is baby crying/in pain?
- Check airway and breathing
- Check saturation
- Consider arterial/capillary gas
- Check perfusion
- Check blood pressure
- Manage airway and breathing
- Correct hypoxia
- Correct electrolyte disturbance



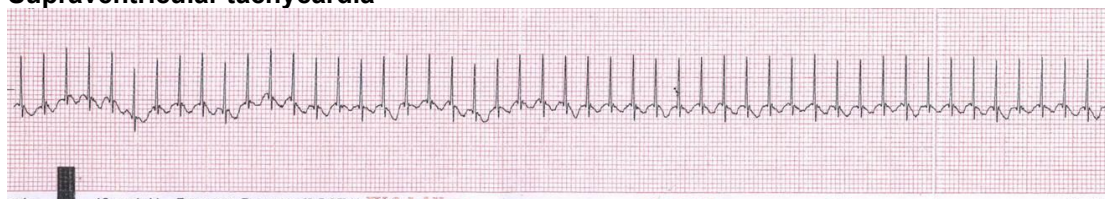
### Premature atrial complexes with pauses



**Premature ventricular complex**



**Supraventricular tachycardia**



**Broad complex tachycardia**

