

PEDIATRIC CARDIAC RHYTHM DISTURBANCES

-Jason Haag, CCEMT-P

CARDIAC RHYTHM DISTURBANCES

- General:
 - More often the result and not the cause of acute cardiovascular emergencies
 - Typically the end result of hypoxemia and acidosis resulting from respiratory insufficiency and shock

Principles of Therapy

- Should be treated as an emergency *only* if it compromises cardiac output or degenerates into lethal rhythm.
- Classified according to their effect on central pulses
 - Fast pulse rate = tachyarrhythmia
 - Slow pulse rate = bradyarrhythmia
 - Absent pulse = pulseless arrest

HEART RATE IN NORMAL CHILDREN

• Age	Awake	Mean	Sleeping
newborn to 3 mo	85-205	140	60-160
3 mo- 2 y	100-190	130	75-160
2 y- 10 y	60-140	80	60-90
> 10 y	60- 100	75	50-90

Fast Pulse Rate

- Sinus Tachycardia
- Supraventricular Tachycardia
- Ventricular Tachycardia
- General Guidelines:
 - Evaluate 12 lead ECG if practical
 - Determine the QRS duration
 - Normal (≤ 0.08 sec)
 - Wide (≥ 0.08 sec)

Sinus Tachycardia

- A rate of sinus node discharge higher than normal for age
- Develops in response to a need for increased cardiac output or oxygen delivery
- Common causes include anxiety, fever, pain, blood loss, sepsis, or shock
- History is compatible for S. tach

Sinus Tachycardia

- ECG: rate is greater than normal for age
 - < 220 bpm infants
 - < 180 bpm in children
- P waves present and normal
- HR varies with activity beat to beat
- HR slows gradually in Sinus tach

Sinus Tachycardia

- Therapy:

Directed at treating the underlying cause. (fever, shock, hypovolemia, hypoxia, abnormal electrolytes, drugs, pneumothorax, cardiac tamponade)

Attempts at decreasing heart rate by meds is inappropriate.

Supraventricular Tachycardia (SVT)

- Differentiate between S. tach and SVT
- History is incompatible
- Heart rate not variable with activity
- infants rate is usually > 220 bpm
children rate is usually > 180 bpm

(SVT : abrupt rate change to and from normal
Rhythm: QRS duration usually normal approx. \leq
0.08 sec))

Supraventricular Tachycardia

Adequate Perfusion

- Therapy: ABC, Oxygen, monitor/defib, EKG
Consider Vagal Maneuvers (ice water, straw)

Adenosine: rapid IV /IO bolus 0.1mg/kg (max first dose is 6 mg) repeated once at double dose (max second dose 12mg)

Consult cardiologist

Attempt cardioversion 0.5-1.0 J/kg may increase to 2 J/kg

Supraventricular Tachycardia

Poor Perfusion

- Therapy:
 - Consider vagal maneuvers (without delay)
 - Synchronized cardioversion - Initial energy 0.5–1.0 J/kg may increase to 2 J/kg if rhythm persist.

or

- Adenosine: rapid IV /IO bolus 0.1mg/kg (max first dose is 6 mg) if IV access repeated once at double dose (max second dose 12mg)

Supraventricular Tachycardia

Poor Perfusion

- Alternative meds:
 - Amiodarone loading dose 5mg/kg IV/IO over 20-60 min, repeat to max of 15mg/kg per day IV
 - or
 - Procainamide: loading dose 15mg/kg IV/IO over 30-60 min.

Ventricular Tachycardia

- VT with a pulse vs VT without a pulse
- VT without a pulse is treated like v. fib
- ECG: QRS wide for age > 0.08 sec rate is at least 180 bpm

Ventricular Tachycardia

Adequate Perfusion

Amiodarone 5mg/kg IV over 20-60 minute

or

Procainimide 15mg/kg over 30-60 minutes

or

Lidocaine: loading dose of 1 mg/kg rapid IV push followed by infusing 20-50ug/kg per minute

Attempt cardioversion 0.5-1.0 J/kg may increase to 2 J/kg

Ventricular Tachycardia

Poor Perfusion

- Therapy:

Immediate cardioversion 0.5-1.0J/kg

Amiodarone 5mg/kg IV over 20-60 minute

or

Procainimide 15mg/kg over 30-60 minutes

or

Lidocaine: loading dose of 1 mg/kg followed by infusing 20-50ug/kg per minute.

SLOW PULSE RATE

- Bradycardia
 - Heart rate < 60 bpm associated with poor perfusion should be treated
 - Cardiorespiratory compromise:
 - Poor perfusion
 - Hypotension
 - Respiratory difficulty
 - Altered consciousness

Bradycardia

- Therapy:
 - Perform chest compressions if heart rate < 60/min in infant or child and associated with poor perfusion
 - Initiate IV/IO access
 - Epinephrine 0.01 mg/kg of 1:10,000, 0.1ml/kg IV/IO repeat every 3-5 min
 - 0.1mg/kg 1:1000 ET

Bradycardia

Atropine: 0.02mg/kg (minimum dose 0.1 mg
maybe repeated once

Maximum single dose:

0.5 mg for child

1 mg for adolescent

Consider pacing

ABSENT PULSE

- Ventricular Fibrillation
- Asystole
- Pulseless Electrical Activity

Ventricular Fibrillation/Pulseless Ventricular Tachycardia

- Basically a quivering myocardium without organized contraction
- No identifiable P, QRS, T
- ABC, Oxygen, Monitor/Defib
- Assess rhythm

Ventricular Fibrillation/Pulseless Ventricular Tachycardia

- Attempt defibrillation attempt up to 3 times;
2J/kg 2-4J/kg, 4J/kg
- Epinephrine
Epinephrine, first dose 0.1 mg/kg 1: 10,000.
ET 0.1 mg/kg 1:1000
- Defibrillation 4J/kg

Ventricular Fibrillation/Pulseless Ventricular Tachycardia

- Amiodarone 5mg/kg bolus IV/IO
 - or
- Lidocaine 1mg/kg bolus IV/IO/TT(20-50ug/kg per min continuous infusion)
 - or
- Magnesium 25-50mg/kg IV/IO
(Torsades de pointes, hypomagnesemia)

ASYSTOLE

- Pulseless arrest associated with absent cardiac electrical activity
- Clinical confirmation (absent pulse, absent spontaneous respirations, poor perfusions)
- Confirm asystole in different leads
- Assess and support ABCs
- Epinephrine
 - Epinephrine, first dose 0.1 mg/kg 1: 10,000. ET
 - 0.1 mg/kg 1:1000

Pulseless Electrical Activity

- Organized electrical activity with inadequate cardiac output and absent pulse
- Assess and support ABCs
- Consider underlying cause (4 H- 4 T)
- Epinephrine first dose .01 mg/kg 1: 10,000.
ET 0.1 mg/kg 1:1000