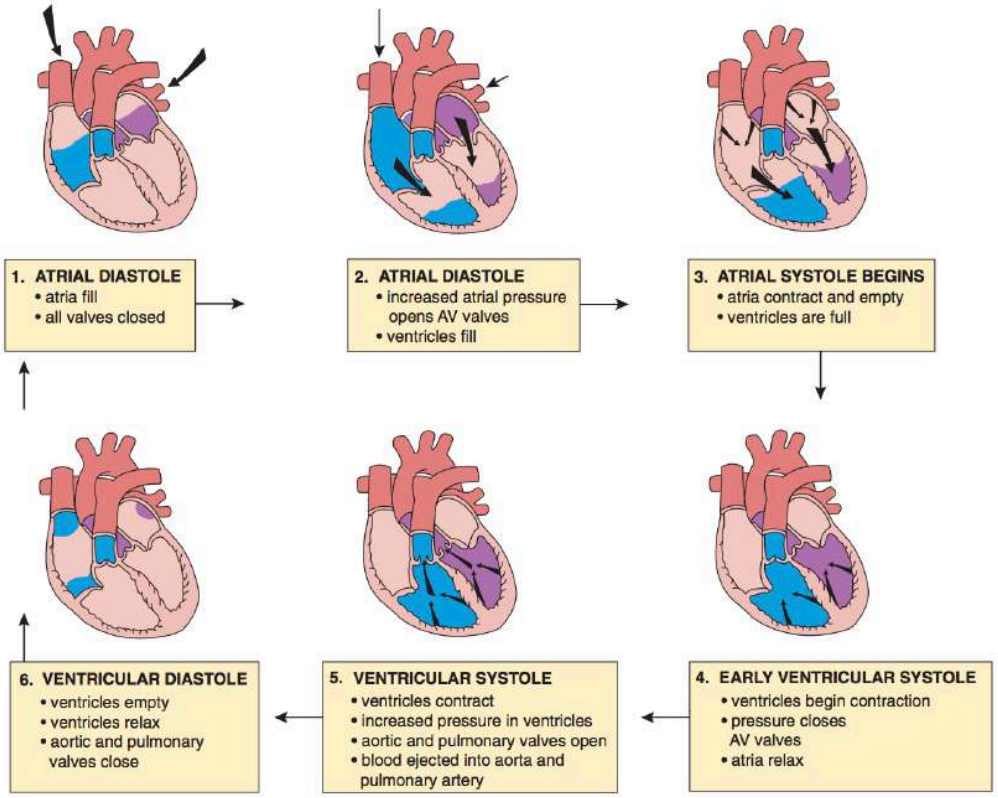
401068 – Paramedicine Practice 2

Week 0: ECG Interpretation 1 – Sinus, Atrial and Junctional Rhythms

Reviewing the Cardiac Conduction System:



- The prime function of the electrical conduction system is to transmit electrical impulses from the SA node to the atria and ventricles, causing contraction.

- The AV node channels electrical impulses from the atria to the bundle of His while slowing their progression so that they arrive in a timely manner. The delay also allows the atria to contract and empty and the ventricles can fill before they contract.

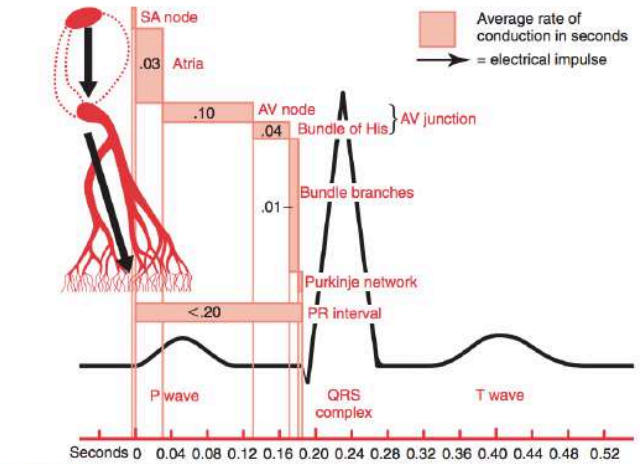


FIGURE 1-5 The average rate of conduction of the electrical impulse through various parts of the electrical conduction system.

Dominant and Escape Pathways of the Heart:

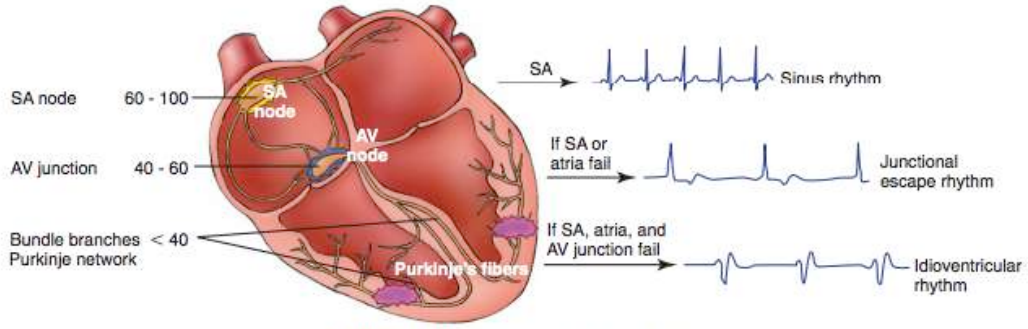


FIGURE 1-13 Dominant and escape pacemakers.

- SA Node = Chief pacemaker and has automaticity
- AV Node = Takes over during SA node failure (40-60bpm)
  - Reacts to what comes from the SA node, if nothing, fires itself
- Bundle branches = Only the ventricles beat (20-40bpm)

Mechanisms of Abnormal Impulse Generation / Conduction:

- Under certain circumstances cardiac cells start generating extraneous electrical impulses.
  - This is referred to as **ectopy** as it originates outside the normal conduction pathway.
  - These dysthymias are identified according to the location of the ectopic pacemaker (atria, junctional, ventricular)

1. **Enhanced Automaticity:**
   - Occurs when the firing rate is increased beyond their inherent rate
   - Causes spontaneous depolarisation
   - Common causes:
     - Electrolyte imbalance
     - Atropine
     - Hypoxia
     - Myocardial ischemia

2. **Re-entry:**
   - A condition in which the progression of an electrical impulse is delayed or blocked (or both), in one or more segments of the electrical conduction system while being conducted normally through the rest of the conduction system.
   - Results in premature depolarisation, producing ectopic beats and rhythms.
   - Common causes:
     - Myocardial ischemia
     - Hyperkalaemia

- Accessory conduction pathway:
  - The electrical impulse (after anterograde progression) enters the accessory pathway and continues in a **retrograde** fashion to re-enter the pathway system much sooner than expected causing premature depolarisation.

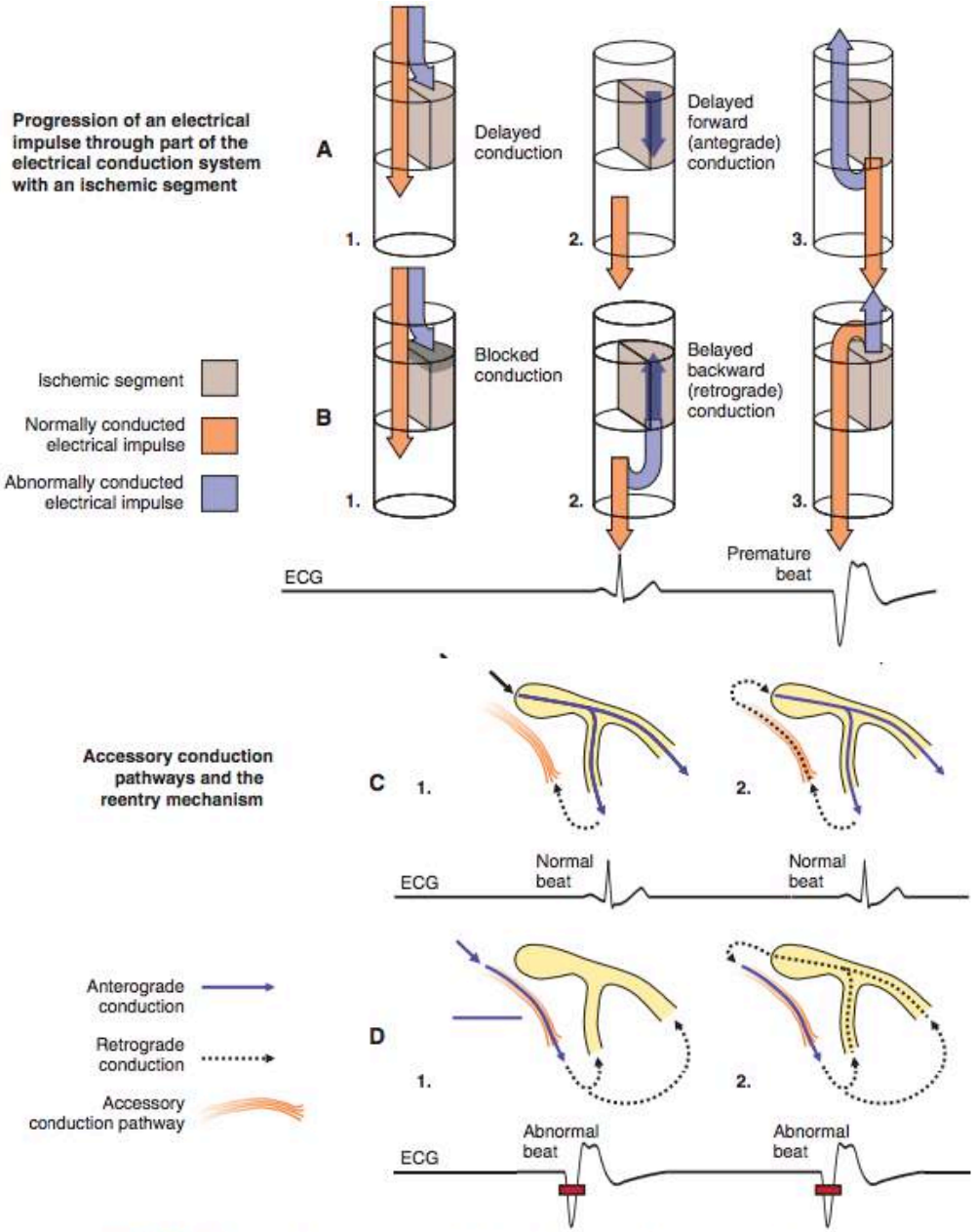
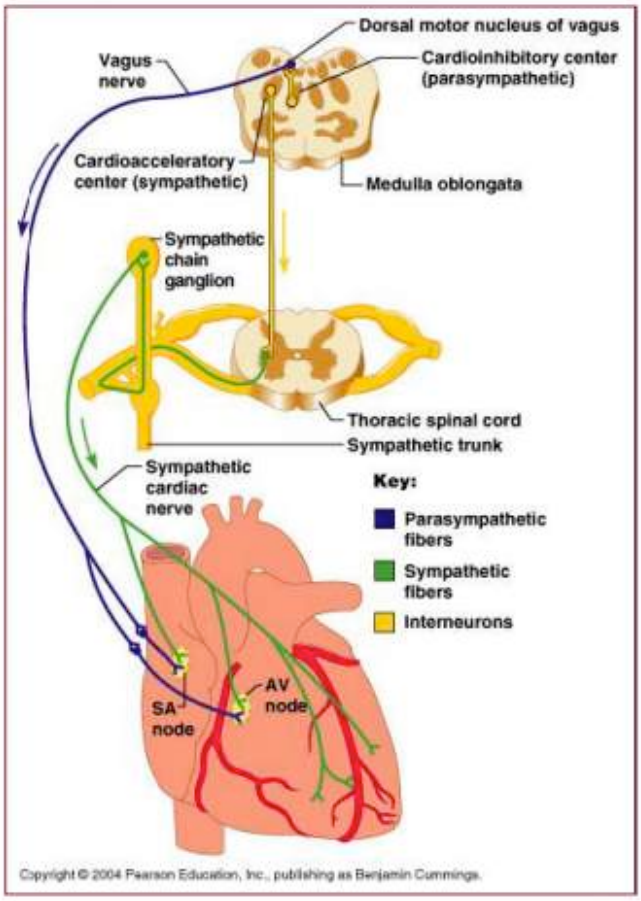


FIGURE 1-14 Examples of reentry mechanism. **A**, Delayed conduction. **B**, Blocked and delayed conduction. **C**, Anterograde conduction through the electrical conduction system. **D**, Retrograde conduction through the electrical conduction system.

3. **Triggered Activity:**
   - An abnormal condition of myocardial cells in which the cells may depolarise more than once after stimulation by a single electrical impulse.

Autonomic Innervation of the Heart:

- Vagus nerve = parasympathetic
- Sympathetic = goes to the ventricles (e.g. adrenaline)



8 Steps of Systematic Interpretation:

1. **Determine the heart rate**
   - Number of QRS complexes in 6 seconds and multiply by 10
   - Count the number of large squares between peaks of QRS and divide into 300. Number progression = 300, 150, 100, 75, 60, 50, 43, 38

2. **Determine the regularity**
   - Comparing R-R intervals

3. **Identify and analyse the P, P', F or f waves**
   - Identify the P, P', F or f waves
     - Normal p-wave = Positive, smoothly rounded, 0.5 – 2.5mm high and < 0.1 seconds
     - P' wave = Inverted, wide, absent
     - F wave = atrial flutter = sawtooth shaped waves
     - f wave = fibrillation = irregularly shaped, chaotic and dissimilar
   - Determine the atrial rate and regularity

        - P-wave rate and QRS rate should be the same if normal conduction occurs.

4. **Determine the PR or RP' intervals and AV conduction ratio**
    - Determine the PR intervals
        - Measure the onset of the p-wave and the onset of the first wave of the QRS complex
        - Normal PR interval is 0.12 – 0.2 seconds
    - Assess the equality of the PR intervals
    - Determine if all p-waves are followed by a QRS complex
    - Determine the AV conduction ratio
        - If all p-waves are followed by a QRS complex, the AV conduction ratio is 1:1

5. **Identify and analyse the QRS complexes**
    - Identify the QRS complexes
    - Note the duration and the shape of the QRS
        - Normal < 0.12 seconds
        - Shape will be abnormal if there is a disturbance in the conduction pathway
        - An abnormal QRS, > 0.12 seconds and wide indicates abnormal ventricular electrical impulse
    - Assess the equality of the QRS complexes
        - Equal in duration and shape
    - Determine if there is a P wave associated with each QRS complex
        - If P-waves are present the cause is most likely supraventricular

6. **Determine the site of origin of the dysrhythmia**
    - Normal p-wave = origin in SA node
    - Negative p-wave before QRS = lower atrial / proximal AV junction
    - Negative p-wave follows QRS = distal AV junction
    - P-waves not associated with QRS = AV junction
    - Wide, bizarre QRS = ventricular origin

7. **Identify the dysrhythmia**

8. **Evaluate the clinical significance of the dysrhythmia**