

**Northwest Community Healthcare  
Paramedic Program**  
**JUNCTIONAL DYSRHYTHMIAS**  
Connie J. Mattera, M.S., R.N., EMT-P

**Reading assignments:**

Aehlert Vol. 1 pp 784 – 787, 799-803  
SOP: Bradycardia with a pulse

**KNOWLEDGE OBJECTIVES:**

Upon completion of the reading assignments, class, and homework questions, reviewing the SOPs, and working with their small group, each participant will independently do the following with at least an 80% degree of accuracy and no critical errors:

1. Identify on a 6-second strip the following rhythms:
  - a) Junctional rhythm
  - b) Accelerated junctional rhythm
  - c) Junctional tachycardia
  - d) Junctional escape beats
  - e) Premature Junctional Contractions (PJs)
2. Systematically evaluate each rhythm using the following criteria:
  - a) Rate
  - b) Rhythm: Regular/irregular
  - c) Presence/absence/morphology of P waves
  - d) R-R Interval, P-P Interval
  - e) P-QRS relationship
  - f) QRS duration
3. Correlate the cardiac rhythm with patient assessment findings to determine the EMS treatment for each rhythm according to NWC EMSS SOPs.
4. Discuss the action, prehospital indications, contraindications, dose, route, and side effects of the following:
  - a) Atropine
  - b) Norepinephrine (Dopamine backup alternate drug)
  - c) Glucagon
5. Explain the indications, contraindications, process steps, and patient monitoring priorities when performing transcutaneous pacing (TCP).

**NCH Paramedic Program**  
**JUNCTIONAL RHYTHMS and DYSRHYTHMIAS**  
**Connie J. Mattera, M.S., R.N., EMT-P**

I. **AV Junction as a pacemaker**

A. **Etiology**

1. The AV node (junction) can function as the heart's pacemaker or it may initiate an isolated escape (*late*) beat when the sinus node fails to fire on time, or it may trigger *early* ectopic beats (PJs).
2. Junctional complexes usually appear due to depression of the SA node.
3. **Intrinsic pacing rate of the AV node: 40-60 beats per minute**
4. If the AV node originates a rhythm within its normal intrinsic rates, it is called a **junctional rhythm**.
5. Like the sinus node, the junction may initiate rhythms faster or slower than its normal rate creating the following:
  - a. **Accelerated Junctional rhythm:** HR 61-100
  - b. **Junctional tachycardia:** HR > 100
  - c. **Junctional bradycardia:** HR < 40
6. A **junctional escape beat** is an isolated junctional complex that comes later than expected in the cycle of a rhythm initiated by a higher pacemaker when the rate of the dominant pacemaker becomes slower than the rate of the AV node.

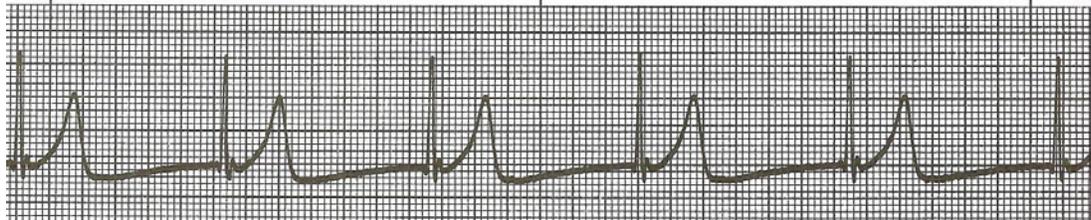
The junction can "escape in" when the electrical impulses of the SA node fail to reach the AV node within 1 to 1½ seconds as in the following:

- a. Increased vagal tone – sinus bradycardia
- b. Sinus arrest
- c. Sinus block
- d. Non-conducted PAC
- e. AV block

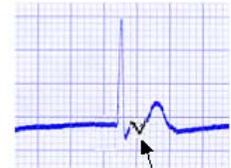
B. **Defining characteristics of a junctional complex in Lead II**



1. **P wave options:** Relationship of the P wave to the QRS depends on the timing sequence of atrial and ventricular depolarization.
  - a. The **P wave may come just before the QRS complex** if the atria depolarized prior to the ventricles.
    - (1) It is usually inverted in Lead II due to backwards (retrograde) depolarization of the atria but does not have to be.
    - (2) If present: There will be a **short PR interval of < 0.12 seconds** because the impulse was generated so close to the HIS-Purkinje network. It takes less time to conduct to the ventricles when the impulse originates in the AV node than if it originated in the sinus node.

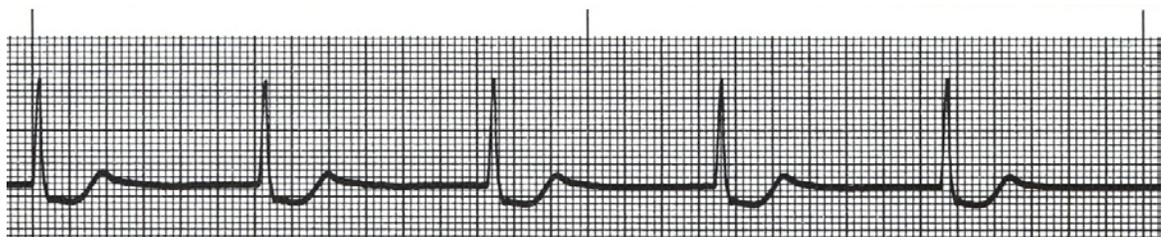


- b. **The P wave may be absent** (buried within the QRS complex) if the atria and ventricles depolarized at the same time.
  - c. **The P wave may appear after the QRS complex** (retrograde P) if the atria depolarized after the ventricles.
2. The **QRS complex is usually normal or similar in configuration to normally conducted beats** as the ventricles conduct the impulse normally.



RETROGRADE  
P' WAVE

## II. Junctional rhythm



### A. Description

- 1. AV junction becomes an escape pacemaker if the SA node fails to fire at rates of 60 or faster.
- 2. Serves as a safety mechanism to prevent idioventricular rhythm or cardiac standstill.

### B. Interpretation

- 1. Rate: 40 to 60 per minute
- 2. Rhythm: Regular
- 3. P waves
  - a. If precede QRS: May be inverted
  - b. May not be seen at all: Buried within the QRS complex
  - c. May occur after the QRS complex (retrograde). This is technically referred to as an R-P interval.
- 4. P-R interval
  - a. If no P before QRS - not discernable
  - b. If present: less than 0.12 seconds
- 5. QRS complex: Should be normal 0.04-0.10 seconds

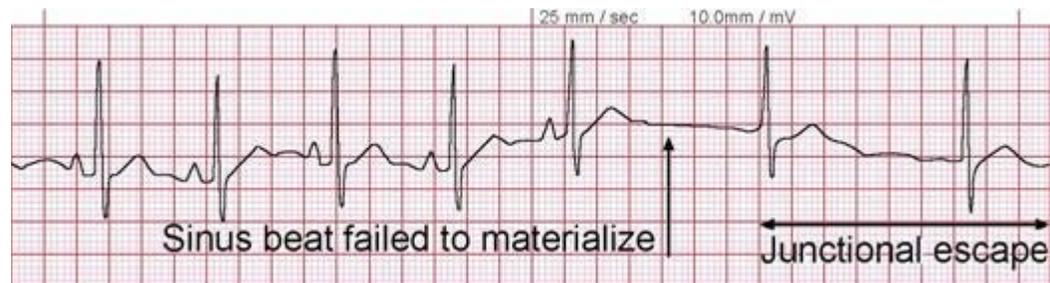


### C. Causes

- 1. Depression of SA node: Pt on beta/calcium blockers; digoxin
- 2. Increased vagal tone
- 3. Pathologically slowed SA node discharge
- 4. Damage to AV node in inferior wall MI
- 5. Electrolyte disturbances
- 6. Heart failure
- 7. Cardiomyopathy
- 8. Myocarditis
- 9. Valvular heart disease

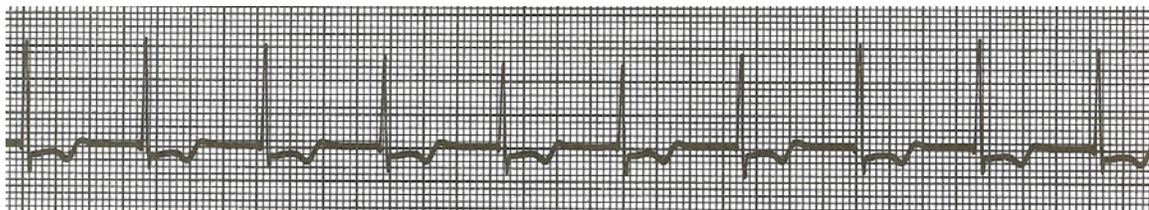
- D. **Clinical significance:** Slow rate and loss of atrial depolarization (atrial kick) before ventricular depolarization may cause a decrease in cardiac output.
- E. **Treatment**
1. Identify and correct underlying cause if possible
  2. Asymptomatic: IMC; observe
  3. Symptomatic: See Bradycardia with Pulse SOP
    - a. Increase HR with atropine, norepinephrine, pacing
    - b. Reverse consequences of reduced CO

III. **Junctional escape beats**



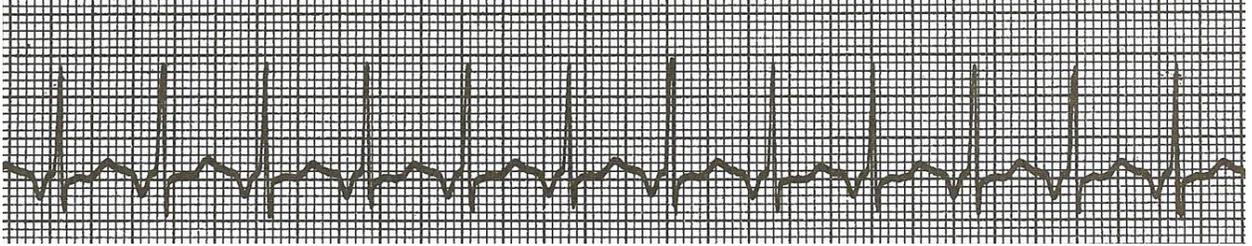
- A. Beat (junctional complex) comes later than next expected complex
- B. Commonly found after a pause in the underlying rhythm: sinus arrest or block, increased Vagal tone
- C. Escape beat meets criteria for junctional complex

IV. **Accelerated Junctional Rhythm**



- A. **Description:** Primary pacemaker is within the AV junction but rate is faster than the intrinsic rate of 60 and less than 100
- B. **Causes**
  1. Increased automaticity of AV junctional tissue often due to ischemia
  2. Reentry circuit in AV junctional tissue
- C. **Interpretation**
  1. Rate: 61-100 per minute
  2. Rhythm: Regular
  3. P waves: Junctional beat configuration
  4. P-R interval
    - a. May not be present
    - b. If present, less than 0.12 seconds
  5. QRS complex: Normal - 0.04 to 0.10 seconds
- D. **Clinical significance**
  1. Faster rate may maintain cardiac output and is generally well tolerated
  2. May not be efficient, as atrial depolarization and contraction is not optimal
  3. Given that the rhythm is often caused by ischemia, monitor for other dysrhythmias.
- E. Treatment: IMC

V. **Junctional Tachycardia**



A. **Description**

1. Rare
2. Originates in the AV junction; overrides the SA node
3. Occurs as attacks with a sudden onset that may last minutes to hours and terminate abruptly.
4. Same configuration as accelerated junctional rhythm, just faster
5. Often called PSVT (Paroxysmal supraventricular tachycardia) since the rapid rate makes it impossible to distinguish from paroxysmal atrial tachycardia. PAT is much more common.

B. **Etiology: Can occur at any age**

1. Increased automaticity of the AV tissue
2. Conduction of an ectopic impulse through a re-entry circuit involving the AV and atria
3. Can be seen with accessory pathway conduction: WPW Syndrome
4. Digitalis toxicity
5. Exogenous catecholamines or theophylline
6. Increased sympathetic tone
7. Overexertion; smoking
8. Ingestion of stimulants caffeine
9. Electrolyte or acid base imbalances
10. Hyperventilation; emotional stress

C. **Interpretation**

1. Rhythm: Regular except at onset and termination of paroxysms
2. Rate: > 100 -180 (can go up to 220) beats per minute
3. Pacemaker site: AV junction
4. P waves: Junctional configuration; often hidden
5. PR interval: Short or not seen
6. QRS: Normal

D. **Clinical significance:** Young patient with good cardiac reserve will tolerate well for a time. Patient often senses it as palpitations. Rapid rates will cause decreased cardiac output due to decreased ventricular filling time and loss of the atrial kick. Rapid rates may also impair filling of coronary arteries and result in angina and heart failure.

E. **Treatment**

1. Try to identify inciting cause
2. Reverse consequences of reduced CO
3. Treat per Narrow QRS Complex tachycardia SOP
  - a. Vagal maneuvers
  - b. Adenocard (adenosine)
  - c. Verapamil
  - d. Amiodarone per MD order if impaired LV function
  - e. If unstable: Synchronized cardioversion (sedate if time allows)

VI. **Junctional bradycardia - rare**

A. **Interpretation**

1. Rhythm: Regular
2. Rate: Less than 40 beats per minute
3. P waves: Junctional configuration
4. PR interval: Short or not seen
5. QRS: Normal

B. Treat per Bradycardia with a pulse SOP

VII. **Premature Junctional Contraction (PJC)**



A. **Description**

1. Originates in the AV junction as an ectopic pacemaker site
2. AV junction initiates an impulse *before* the next normal beat is due
3. Less common than PACs

B. **Etiology/causes**

1. Usually caused by enhanced automaticity of junctional tissue
2. Caffeine, alcohol
3. Heart disease (valves, CAD, failure)
4. Hypokalemia
5. Hyperthyroidism

C. **Interpretation**

1. Rhythm: Irregular due to early beat
2. Rate: 60 - 100 if underlying rhythm is sinus
3. P waves
  - a. Normal in sinus portion
  - b. Junctional P configuration with PJC
4. PR interval
  - a. 0.12 to 0.20 in sinus portion
  - b. < 0.12 with PJC
5. QRS: Normal
6. Usually followed by a noncompensatory pause

D. **Treatment**

1. IMC: Usually not treated further in the field
2. Use as clue for possible underlying abnormality
3. Multiple PJCs are possible in a regular pattern
  - a. Bigeminal – every other beat is a PJC
  - b. Trigeminal – every 3<sup>rd</sup> beat is a PJC
  - c. Quadrigeminal – every 4<sup>th</sup> beat is a PJC

**Homework Questions**

1. Junctional rhythms and dysrhythmias originate from the area in and around the
  - A. SA node.
  - B. AV node.
  - C. Bundle of HIS.
  - D. Purkinje fibers.
  
2. The AV node can serve as an escape pacemaker if the \_\_\_\_\_ fails to function properly as the primary or dominant pacemaker.
  
3. The intrinsic firing rate of Junctional pacemaker cells is \_\_\_\_\_ per minute.
  
4. When an impulse is originated from the AV node, it is conducted backwards to depolarize the atria. This type of conduction is called \_\_\_\_\_
  
5. If the atria depolarize before the ventricles, the P wave will be \_\_\_\_\_ the QRS.
  - A. in front of
  - B. buried in
  - C. after
  
6. If the ventricles depolarize before the atria, the P wave will be \_\_\_\_\_ the QRS.
  - A. in front of
  - B. buried in
  - C. after
  
7. If the electrical impulse from the AV node depolarizes both the atria and the ventricles simultaneously, the P wave will be \_\_\_\_\_ the QRS.
  - A. in front of
  - B. buried in
  - C. after
  
8. A P wave preceding a QRS complex in a Junctional complex will generally have a **negative / positive** (circle one) deflection in Lead II.
  
9. The a P wave preceded a QRS, the PR interval in a Junctional complex is \_\_\_\_\_ seconds.
  - A. 0.12 - 0.20
  - B. longer than 0.20
  - C. shorter than 0.12
  
10. The QRS duration in a Junctional complex is narrow (normal) / wider than 0.10 seconds (circle one).
  
11. Which is more common? PAC / PJC (circle one)
  
12. List three causes of PJs  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
  
13. If a Junctional beat comes later than the regularly expected sinus beat, it is called a Junctional \_\_\_\_\_ beat.

14. Treatment for symptomatic Junctional rhythms may include interventions to speed the heart rate.  
The first drug (dose) to be administered is \_\_\_\_\_  
The non-drug treatment is \_\_\_\_\_
15. List two mechanisms that may be responsible for causing Junctional tachycardia.  
\_\_\_\_\_  
\_\_\_\_\_
16. If a differentiation cannot be made between paroxysmal atrial tachycardia and paroxysmal Junctional tachycardia, the term paroxysmal \_\_\_\_\_ tachycardia is used.
17. Paroxysmal Junctional tachycardia is commonly a result of \_\_\_\_\_ toxicity.
18. What SOP should govern the treatment of Junctional tachycardia if the patient has chest pain, shortness of breath, or lightheadedness?  
\_\_\_\_\_

Identify the following rhythms:

