

**Northwest Community EMS System
Paramedic Training Program
JUNCTIONAL DYSRHYTHMIAS
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Reading assignments:

Aehlert Vol. 1 pp 784 - 788
SOP: Bradycardia with a pulse

KNOWLEDGE OBJECTIVES:

Upon reading the text assignments, completion of the class and study questions, reviewing the SOPs, and working with their small group, each participant will independently do the following with a degree of accuracy that meets or exceeds the standards established for their scope of practice:

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, and
 - f) QRS duration.

3. correlate the cardiac rhythm with patient assessment findings to determine the emergency 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) Dopamine
 - c) Glucagon

5. explain the indications, contraindications, process steps, and patient monitoring priorities when performing transcutaneous pacing (TCP).

NWC EMSS Paramedic Training Program
JUNCTIONAL RHYTHMS and DYSRHYTHMIAS
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I. **AV Junction as a pacemaker**

A. **Etiology**

1. The junction can function as the pacemaker or initiate an isolated escape beat when the sinus node fails to fire on time, or it may trigger early ectopic beats (PJC).
2. Junctional complexes usually appear secondary to depression of the SA node.
3. The intrinsic pacing rate of the AV node is 40-60 beats per minute.
4. Thus, if the AV node originates the 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:** > 100
- c. **Junctional bradycardia:** < 40

6. A **junctional escape beat** is an isolated junctional complex that comes late in the cycle of a rhythm initiated by a higher pacemaker when the rate of the dominant pacemaker becomes less 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. Absent or altered P wave
2. **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 just prior to the ventricles.
 - (1) It is usually inverted in Lead II due to retrograde (backwards) depolarization of the atria.
 - (2) If present: There will be a short PR interval of < 0.12 seconds
 - b. The P wave may be 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 if the atria depolarized after the ventricles.
3. The QRS complex is usually normal or similar in configuration to normally conducted beats as the ventricles conduct the impulse normally.

II. **Junctional rhythm**

A. **Description**

1. AV junction becomes an escape pacemaker after 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 occur after the QRS complex (retrograde). This is technically referred to as an R-P interval.
 - c. May not be seen at all: Buried within the QRS complex
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: 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 pacing, atropine
 - 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. **(Paroxysmal) Junctional Tachycardia (PJT)**

A. **Description**

1. Rare
2. Originates in the AV junction; overrides the SA node
3. Occurs as attacks with a sudden onset (paroxysms) that may last minutes to hours and terminate abruptly.
4. Same configuration as accelerated junctional rhythm, just faster
5. Often called PSVT 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
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 (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 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
 - a. Bigeminal
 - b. Trigeminal
 - c. Quadrigeminal

STUDY 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. In a junctional complex, the location of the P wave relative to the QRS will depend on the _____ of antegrade and retrograde conduction.

6. If the atria depolarize first, the P wave will be _____ the QRS.
 - A. in front of
 - B. buried in
 - C. after

7. If the ventricles depolarize before the atria, the P wave will be _____ the QRS.
 - A. in front of
 - B. buried in
 - C. after

8. 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

9. A P wave preceding a QRS complex in a junctional complex will generally have a negative / positive deflection in Lead II.

10. The PR interval in a junctional complex is _____ seconds.
 - A. 0.12 - 0.20
 - B. longer than 0.20
 - C. shorter than 0.12

11. The QRS duration in a junctional complex is narrow (normal) / wider than 0.10 seconds.

12. Which is more common? PAC / PJC

13. List three causes of PJC's

14. If a junctional beat comes later than the regularly expected sinus beat, it is called a junctional _____ beat.
15. Treatment for symptomatic junctional rhythms may include interventions to speed the heart rate. The non-drug treatment of choice is _____.
The first drug to be administered is _____.
16. A rhythm composed of junctional complexes that occurs at a rate between 61-100 is called:

17. A rhythm composed of junctional complexes that occurs at a rate greater than 100 is called

18. List two mechanisms that may be responsible for causing the above rhythm.

19. If a differentiation cannot be made between paroxysmal atrial tachycardia and paroxysmal junctional tachycardia, the term paroxysmal _____ tachycardia is used.
20. Paroxysmal junctional tachycardia is commonly a result of _____ toxicity.