

Normal Sinus Rhythm

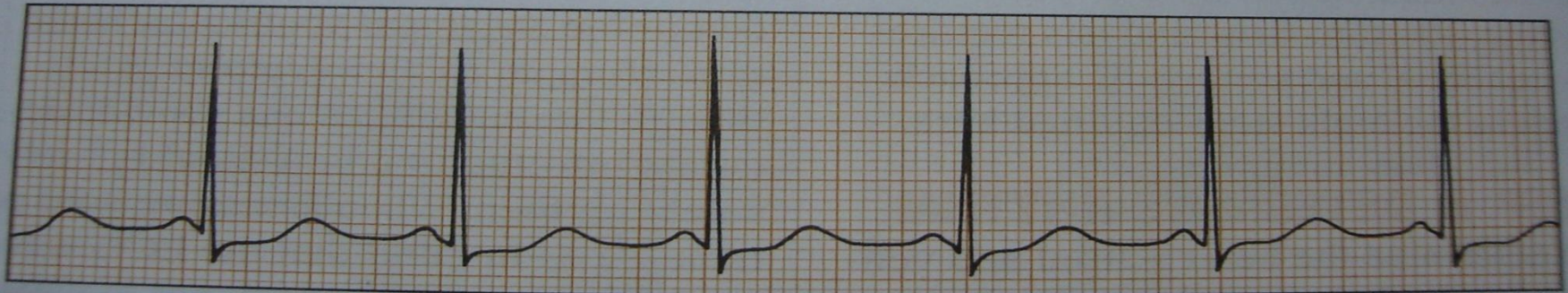
- **Rate:** 60 to 100 beats per minute
- **Rhythm:** Regular
- **P waves:** Precede every QRS complex and are consistent in shape
- **PR interval:** 0.12 to 0.20 second
- **QRS complex:** 0.04 to 0.10 second

READING RHYTHMS



Recognizing normal sinus rhythm

Normal sinus rhythm, shown below, represents normal impulse conduction through the heart.

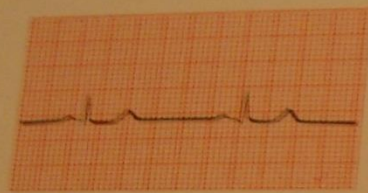


This rhythm strip illustrates normal sinus rhythm.

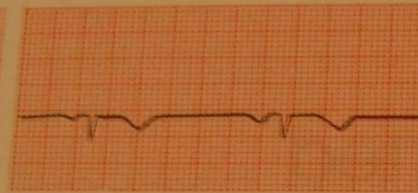
- *Rhythm:* atrial and ventricular
- *PR interval:* normal; 0.10 second

NSR

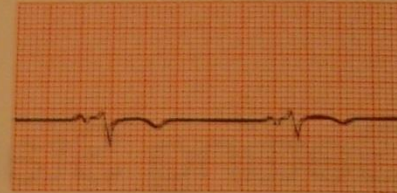
2 □ Getting Started



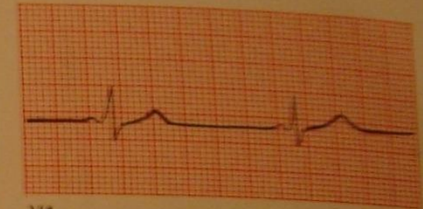
I



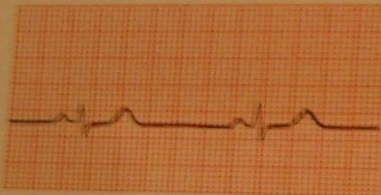
aVR



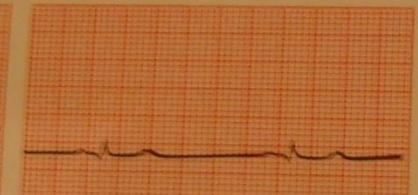
V1



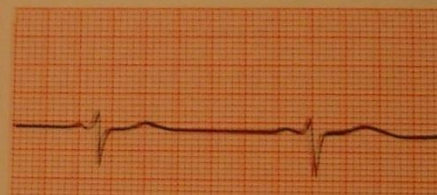
V4



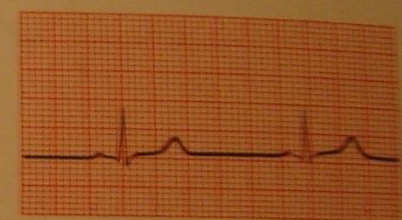
II



aVL



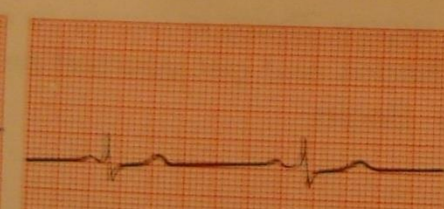
V2



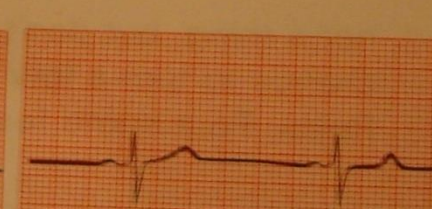
V5



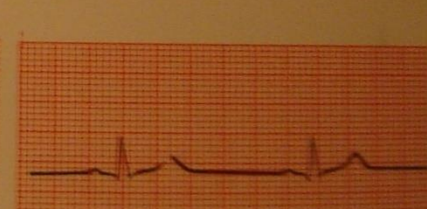
III



aVF



V3



V6

Mechanisms of arrhythmia

- Automaticity

- ◆ Normal (e.g. sinus tachycardia)
- ◆ Abnormal (e.g. reperfusion arrhythmias)

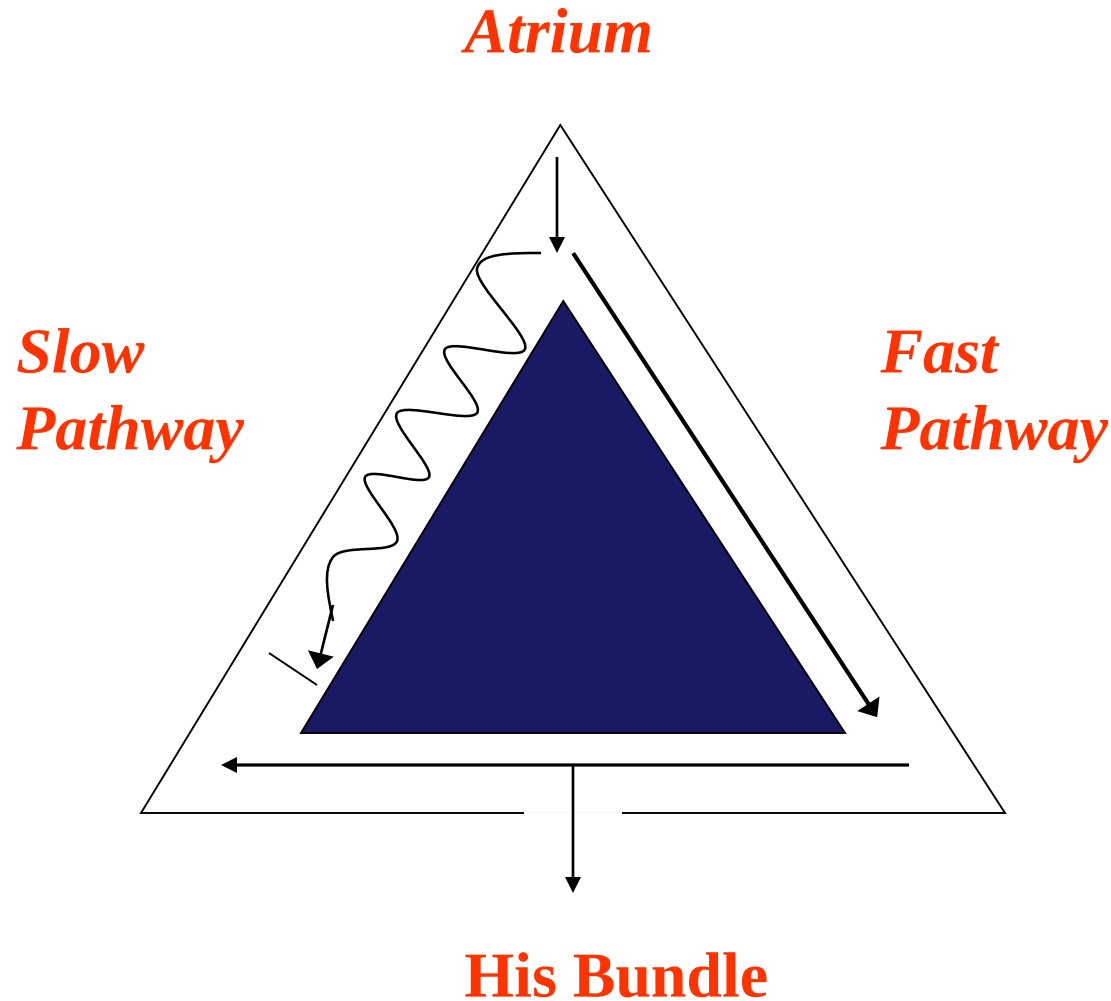
- Triggered activity

- ◆ Early afterdepolarizations associated with QT prolongation (torsades de pointes)
- ◆ Delayed afterdepolarizations associated with Ca^{2+} overload (e.g. digoxin)

- Reentry

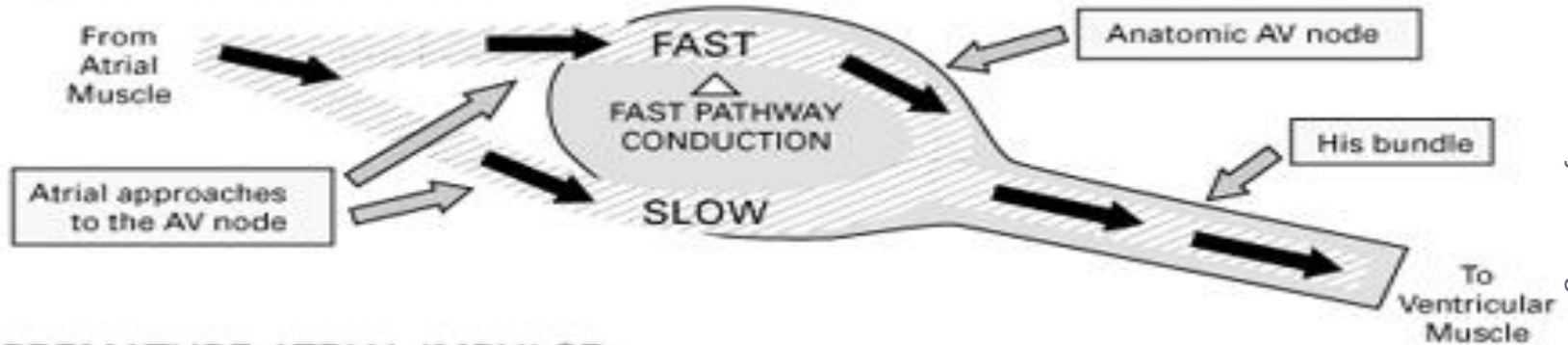
- ◆ Fixed obstruction (e.g. atrial flutter)

LONGITUDINAL DISSOCIATION WITHIN AV NODE

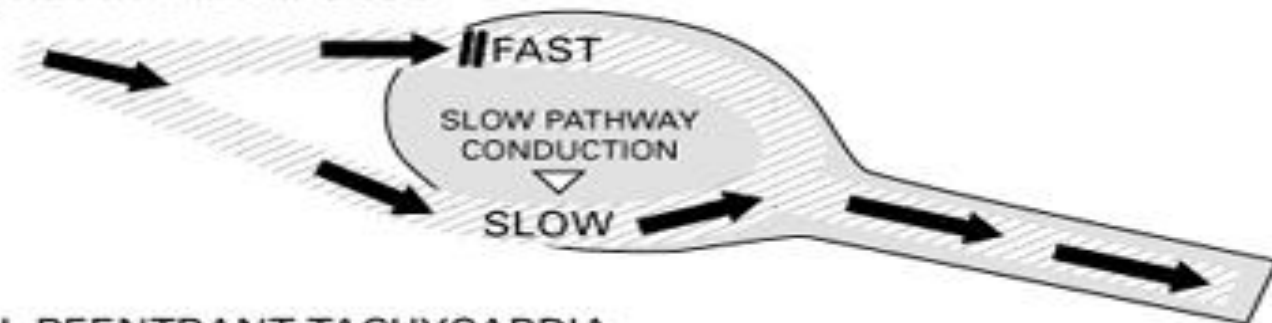


AVNRT MECHANISM

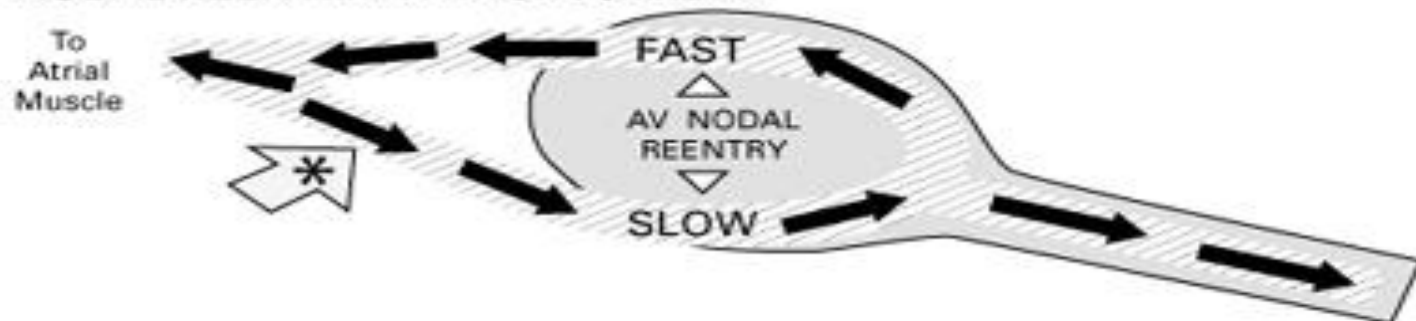
A. NORMAL SINUS RHYTHM



B. PREMATURE ATRIAL IMPULSE



C. AV NODAL REENTRANT TACHYCARDIA



Type of sinus arrhythmia

- **Sinus arrhythmia**
- **Sinus bradycardia**
- **Sinus tachycardia**
- **S A block**
- **S A arrest**
- **Sick sinus syndrome**

Sinus arrhythmia

Sinus arrhythmia occurs when the SA node discharges irregularly. It occurs as a normal phenomenon, especially in the young, and decreases with age.

- Sinus arrhythmia is commonly associated with the phases of respiration: during inspiration, the SA node fires faster; during expiration, it slows.**

Respiratory phases

increases vagal tone, slows the
the P-P interval. (See *Breathing and sinus arrhyth-*



ECG findings

Rate: 60 to 100 beats per minute

Rhythm: Irregular; phasic increase and decrease in rate, which may be related to respiration

P waves: Precede every QRS; have consistent shape

PR interval: Usually normal

QRS complex: Usually normal

Conduction: Normal through atria, AV node, bundle branches, ventricles

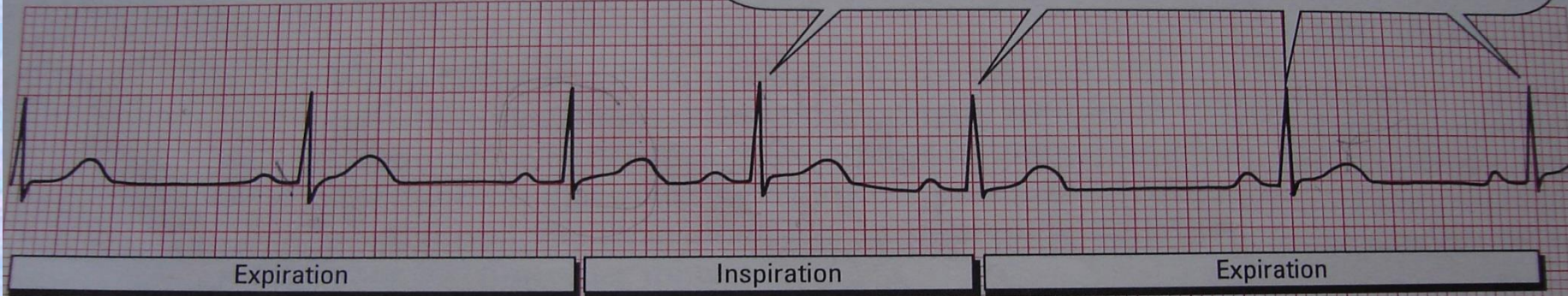
Sinus arrhythmia

spiration and decreases during expiration. If the arrhythmia

Sinus arrhythmia

The following rhythm strip illustrates sinus arrhythmia. Look for these distinguishing characteristics:

The cyclic irregular rhythm varies with the respiratory cycle.



Rhythm: irregular
Rate: 60 beats/minute
P wave: normal

- *PR interval:* 0.16 second
- *QRS complex:* 0.06 second
- *T wave:* normal

- *QT interval:* 0.36 second
- *Other:* phasic slowing and quickening.

Intervention

Does not require treatment.

Causes of Sinus bradycardia

- 1. Normal in athletes**
- 2. ACS(INF MI)**
- 3. Hyperkalemia**
- 4. ICP**
- 5. Hypothyroidism**
- 6. Hypothermia**
- 7. Vagal stimulation**
- 8. Valsalva maneuver**
- 9. Ocular pressure (glaucoma)**
- 10. Coughing, or vomiting**
- 11. Hypoxia**
- 12. Response to several medications, including digitalis, beta-blockers, calcium channel blockers.**

ECG findings

- **Rate:** Less than 60 beats per minute
- **Rhythm:** Regular
- **P waves:** Precede every QRS, consistent shape
- **PR interval:** Usually normal (0.12 to 0.20 second)
- **QRS complex:** Usually normal (0.04 to 0.10 second)
- **Conduction:** Normal through atria, AV node, bundle branches, and ventricles

Sinus bradycardia

(Text continues on page 72.)

Sinus bradycardia

The following rhythm strip shows sinus bradycardia. Look for these distinguishing characteristics:

A normal P wave precedes each QRS complex.

The rhythm is regular with a rate below 60 beats/minute.

- *Rhythm*: regular
- *Rate*: 48 beats/minute
- *P wave*: normal
- *PR interval*: 0.16 second
- *QRS complex*: 0.08 second
- *T wave*: normal
- *QT interval*: 0.50 second
- *Other*: none.

Clinical finding

- 1. Hypotension**
- 2. Altered mental status**
- 3. Dizziness**
- 4. Syncope**

Treatment & Care

- ❖ Sinus bradycardia does not require treatment unless the patient is symptomatic.
- ❖ If the arrhythmia is accompanied by hypotension, restlessness, diaphoresis, chest pain, or other signs of hemodynamic compromise or by ventricular ectopy, atropine 0.5 mg intravenously (IV) is the treatment of choice.
- ❖ Pacemaker

Causes of Sinus Tachycardia

- **Exercise**
- **Stress**
- **Fever**
- **Blood loss, Anemia**
- **ACS(ant MI)**
- **CHF-cardiogenic shock-pericardite**
- **Pulmonary embolism**
- **Hyperthyroidism**
- **Drug effects(dopamine-epinephrine-atropine)**

ECG findings

1. **Rate:** *Greater than 100 beats per minute*
2. **Rhythm:** *Regular*
3. **P waves:** *Precede every QRS; have consistent shape; may be buried in the preceding T wave*
4. **PR interval:** *Usually normal, may be difficult to measure if P waves are buried in T waves*
5. **QRS complex:** *Usually normal*
6. **Conduction:** *Normal through atria, AV node, bundle branches, and ventricles*

Sinus tachycardia

Sinus tachycardia

The following rhythm strip illustrates sinus tachycardia. Look for these distinguishing characteristics:

A normal P wave precedes each QRS complex.

The rhythm is regular with a rate above 100 beats/minute.



- *Rhythm*: regular
- *Rate*: 120 beats/minute
- *P wave*: normal

- *PR interval*: 0.14 second
- *QRS complex*: 0.06 second
- *T wave*: normal

- *QT interval*: 0.34 second
- *Other*: none.

Clinical finding

- **Asymptomatic**
- **Hypotension- syncope**

Treatment & Care

Treatment of sinus tachycardia is directed at the cause.

Because the ventricles fill with blood and the coronary arteries perfuse during diastole, persistent tachycardia can cause decreased stroke volume, decreased cardiac output, and decreased coronary perfusion secondary to the decreased diastolic time.

Carotid sinus pressure may slow the heart rate temporarily.

B-Blockers are used to treat tachycardia in patients with acute MI without signs of HF.

Causes of S A block

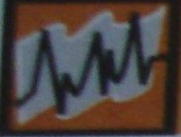
- **ACS(INF MI)**
- **SSS**
- **SA fibrosis**
- **Infection**
- **Vagal tone ↑**
- **Dig-procainamide**
- **CMP**
- **HBP**

ECG findings

- 1. Rhythm :regular except miss PQRST***
- 2. Rate :normal***
- 3. P wave : normal***
- 4. PR interval : normal(0.12-0.20)***
- 5. QRS : normal(0.08-0.11)***
- 6. T wave : normal or abnormal***
- 7. QT interval: normal(0.34- 0.43)***

SA block

READING RHYTHMS



Recognizing sinoatrial exit block



This rhythm strip illustrates sinoatrial (SA) exit block.

- *Rhythm*: regular, except for pauses
- *Rate*: underlying rhythm, 60 beats/minute) before SA block; length or frequency of the pause may result in bradycardia
- *P wave*: periodically absent
- *PR interval*: 0.16 second
- *QRS complex*: 0.08 second; missing during pause
- *T wave*: normal; missing during pause
- *QT interval*: 0.40 second; missing during pause
- *Other*: entire PQRST complex missing; pause ends with sinus rhythm or atrial escape rhythm

Clinical finding

- **If short pause asymptomatic**
- **Prolonged pause COP↓
(hypotension- syncope)**

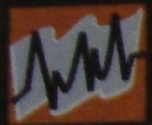
intervention

- **No intervention in asymptomatic**
 - 1. In symptomatic patient treatment underlying**
 - 2. Atropine**
 - 3. Pacemaker**

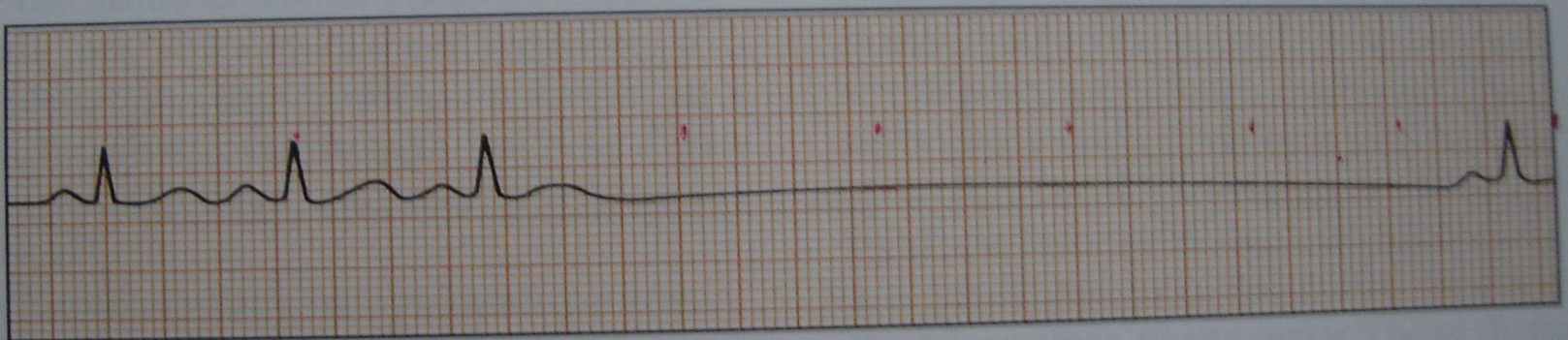
SA arrest

SINUS ARREST AND SINOATRIAL EXIT BLOCK 51

READING RHYTHMS



Recognizing sinus arrest



This rhythm strip illustrates sinus arrest.

- *Rhythm*: regular, except for the missing PQRST complexes
- *Rate*: underlying rhythm, 75 beats/minute
- *P wave*: normal; missing during pause
- *QRS complex*: 0.08 second; missing during pause
- *T wave*: normal; missing during pause
- *QT interval*: 0.40 second; missing during pause

Causes of sick sinus syndrome

- 1. ACS (INF MI)**
- 2. Fibrosis of SAN (senile)**
- 3. Trauma of SAN (surgery)**
- 4. Drug (Dig- b blocker ca blocker)**

ECG findings

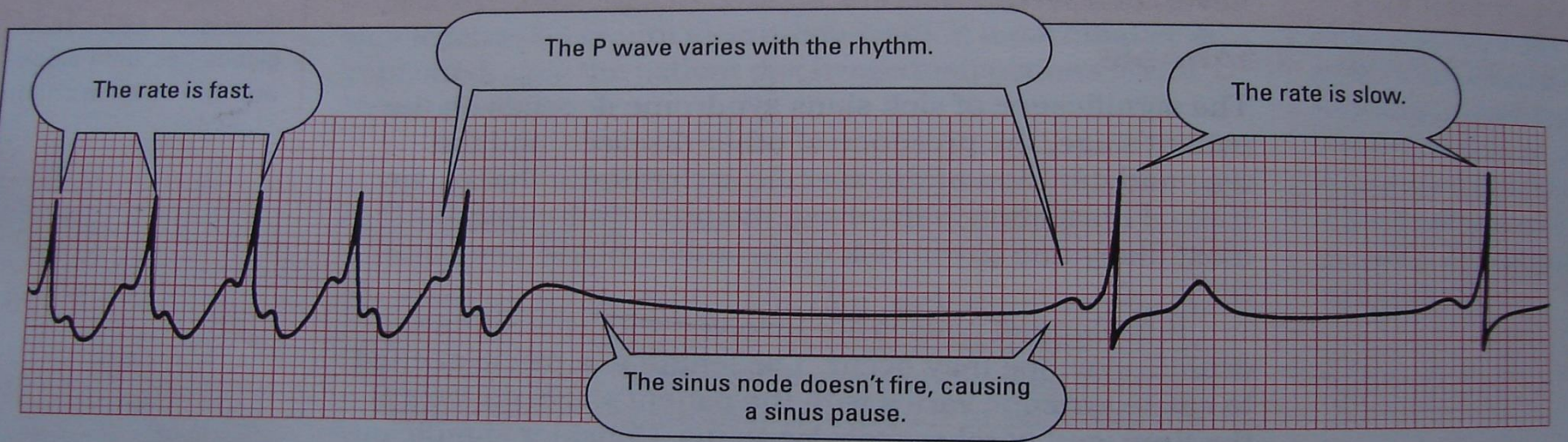
- 1. Rhythm : irregular***
- 2. Rate : fast and slow(40-150)***
- 3. P wave : varies***
- 4. PR interval :varies***
- 5. QRS : normal(0.08-0. 11)***
- 6. T wave : varies***
- 7. QT interval: Varies***

Sick sinus syndrome

ercise.

Sick sinus syndrome

This rhythm strip illustrates sick sinus syndrome. Look for these distinguishing characteristics:



- *Rhythm*: irregular
- *Rate*: atrial — 60 beats/minute; ventricular — 70 beats/minute

- *P wave*: configuration varies
- *PR interval*: varies with rhythm
- *QRS complex*: 0.10 second
- *T wave*: configuration varies

- *QT interval*: varies with rhythm changes
- *Other*: none.

Clinical finding

- 1. Hypotension**
- 2. Altered mental status**
- 3. Dizziness**
- 4. Syncope**

intervention

- **Atropine**
- **Epinephrine**
- **Pacemaker**