Sinus Node Dysfunction

이화의대
반지은

- Conflict of interest : non declared

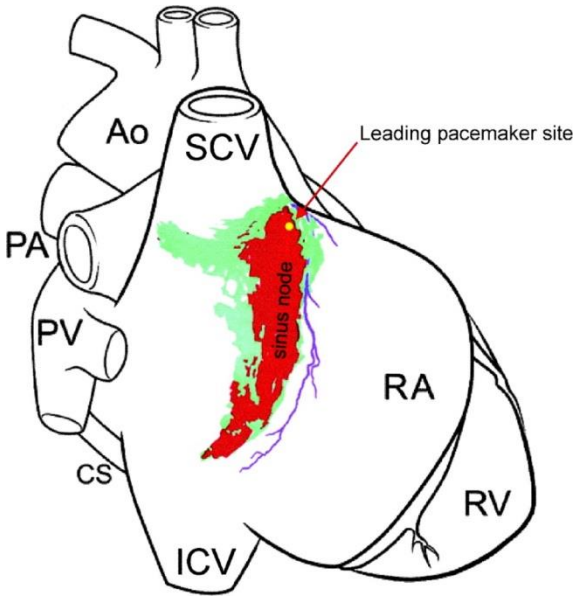
Brady arrhythmia

- Sinus node dysfunction * sick sinus syndrome
  - Sinus bradycardia
  - Sino-atrial block (SA block)
  - Sinus pause, Sinus arrest
  - Tachycardia bradycardia syndrome

- Atrio-Ventricular block (AV block)
  - 1st degree AV block
  - 2nd degree AV block (Mobitz type I, II)
  - 3rd degree AV block (complete AV block)

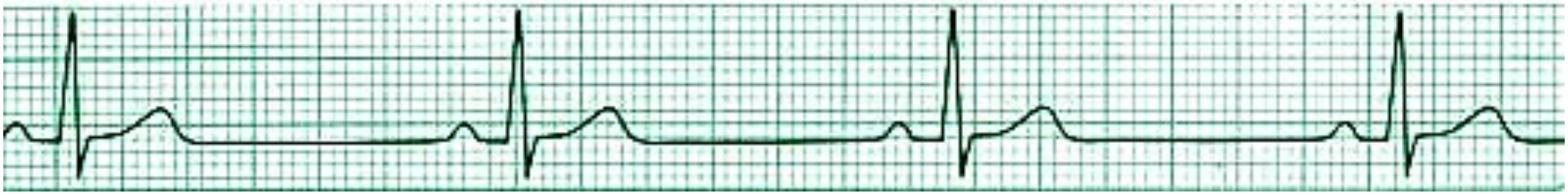
Sinus Node Dysfunction
* sick sinus syndrome

- Disordered automaticity or impaired conduction of the impulse from the sinus node into the surrounding atrial tissue



1. **Extrinsic SND**
   - drugs, ANS influences that suppress automaticity
     and/or compromise conduction
2. **Intrinsic SND**
   - degenerative SA node,
     fibrous replacement of the SA node
     or its connection to the atrium

Sinus bradycardia



Heart Rate	Rhythm	P Wave	PR interval (s)	QRS (s)
<60 bpm	Regular	Present before each QRS, identical	Normal, consistent (0.12 to 0.20)	Normal (< 0.12)

Sinus bradycardia

- Causes
  1. vagal stimulation
  2. medicines (e.g beta blocker, Ca-channel blocker, digoxin)
  3. hypothyroidism
  4. hypothermia

* Normally in some well-conditioned athletes

Inappropriate sinus bradycardia Chronotropic Incompetence

- HR < 60 that doesn't increase appropriately with exercise
- Usually defined as failure to attain 80% of maximal age predicted HR (MAHR) on exercise testing
- MAHR = 220-Age

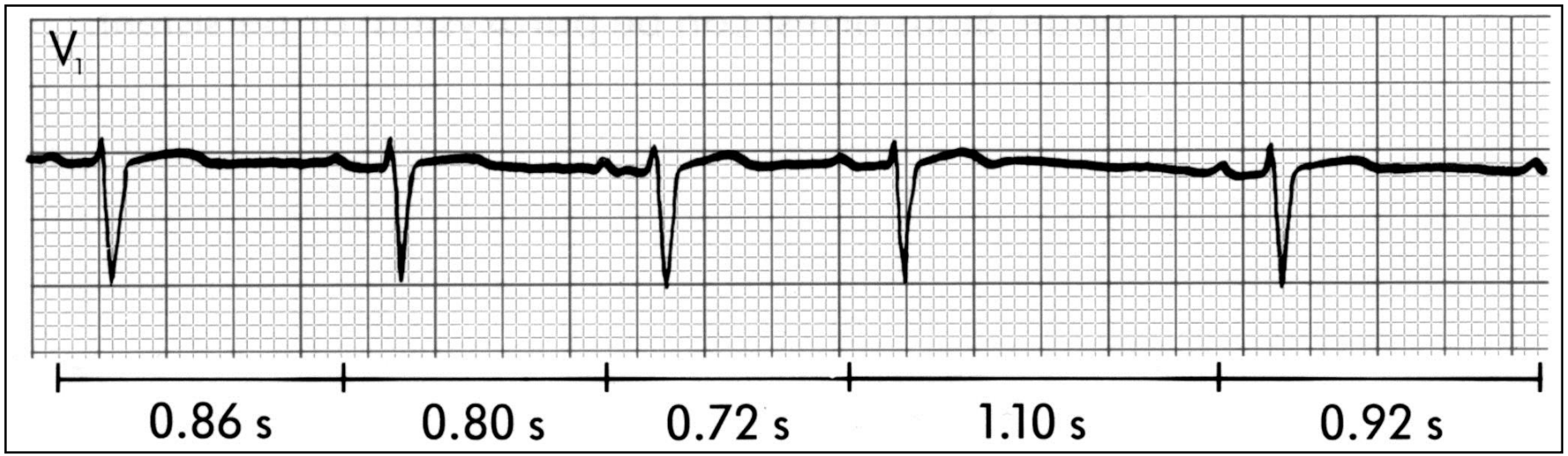
Sino-atrial block (Sinus exit block, SA block)

- The sinus impulse is blocked within the SA junction (between SA node and atrial myocardium)

- 3 types of SA block
  1. First-degree
  2. Second-degree : type I, type II
  3. Third-degree

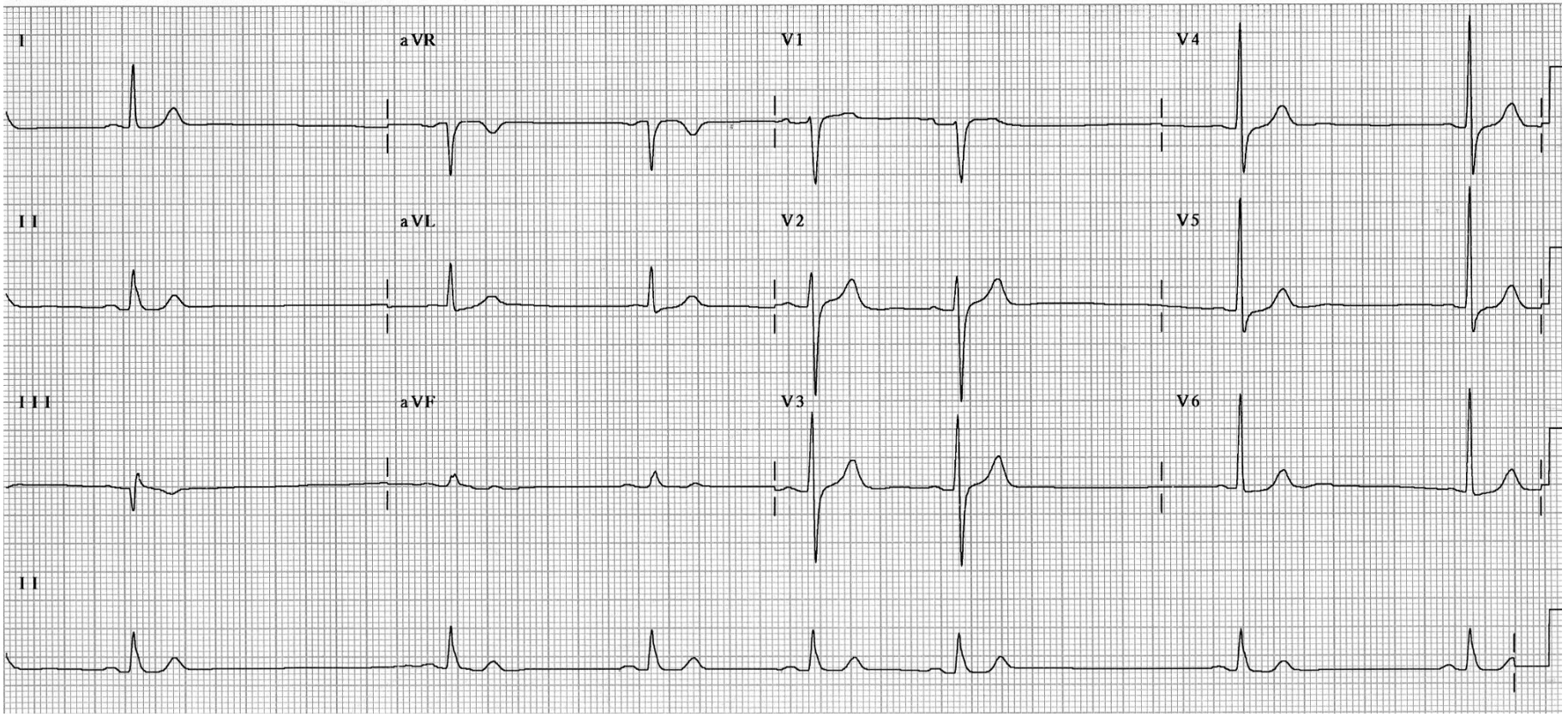
2nd degree Sinoatrial block, type I

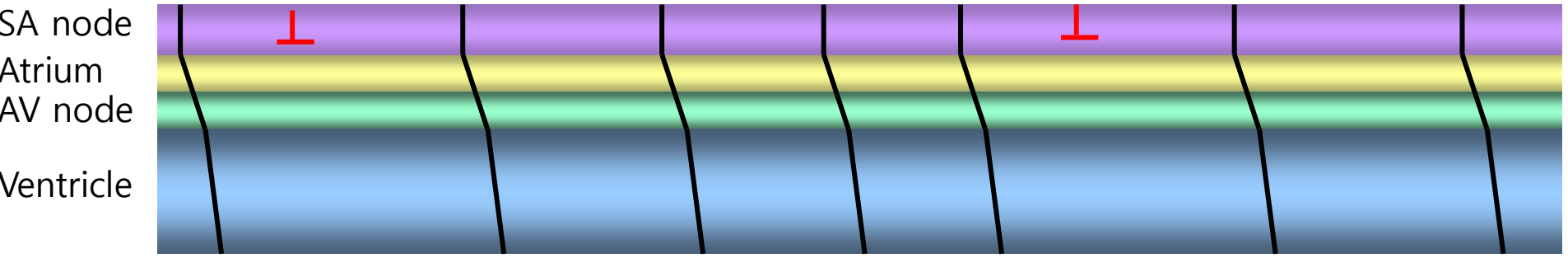
- ✓ PP cycle becomes progressively shorter
- ✓ No P waves & QRS complexes
- ✓ Pause is less than twice the preceding PP cycle



gradual lengthening of conduction time from the SA node to the atria

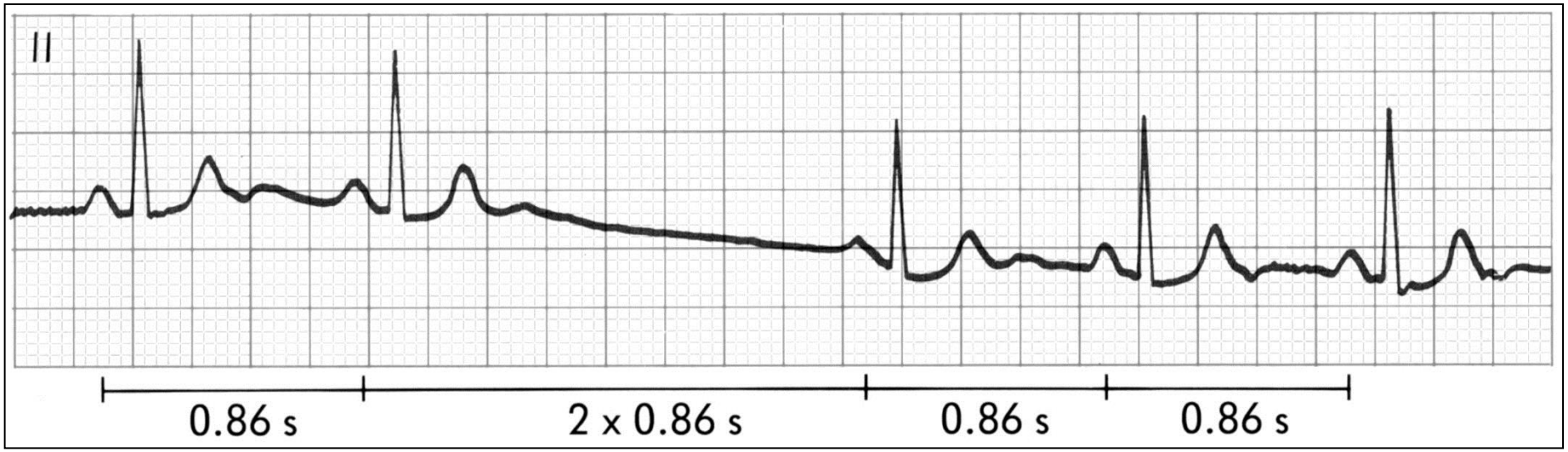
2nd degree Sinoatrial block, type I





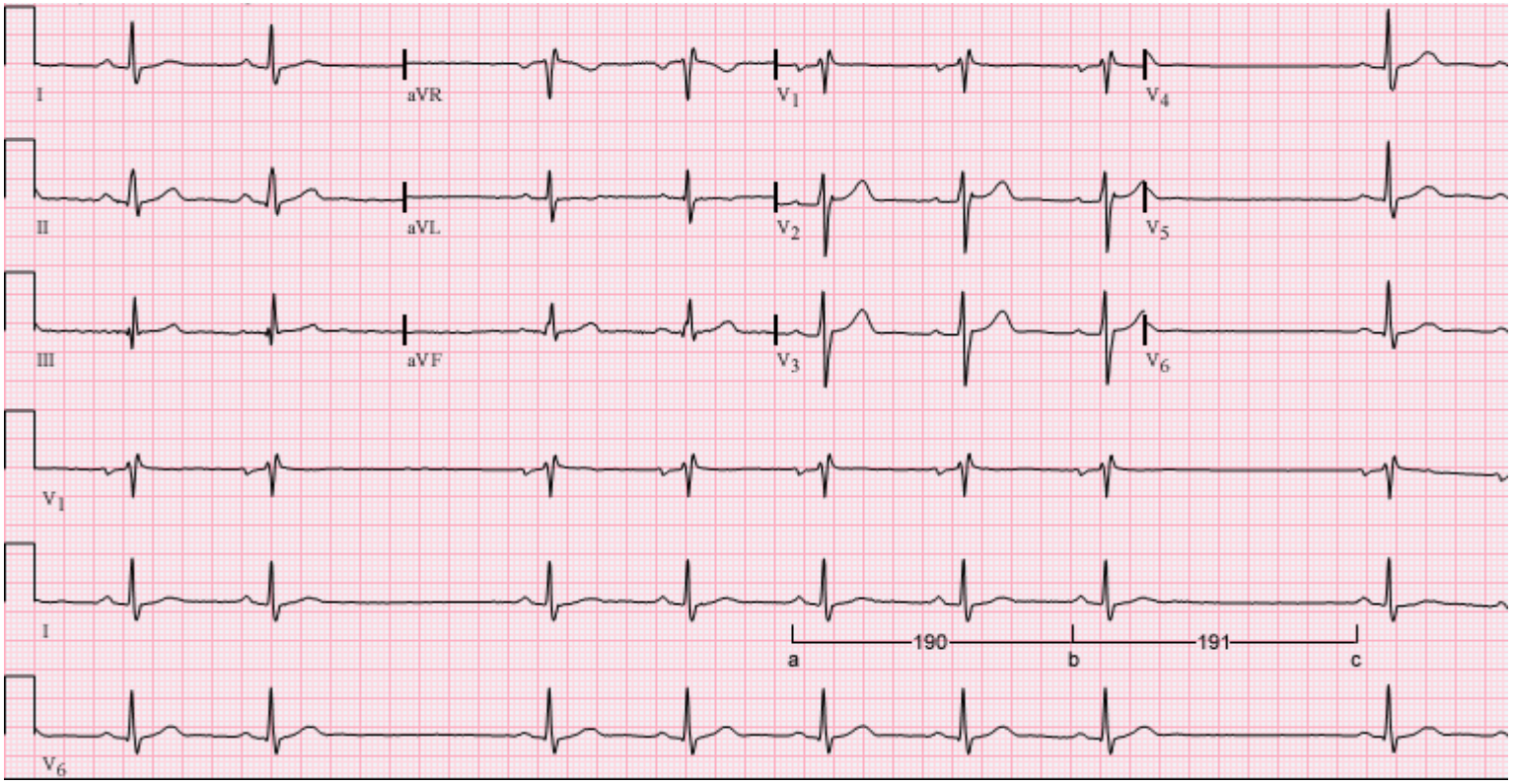
2nd degree Sinoatrial block, type II

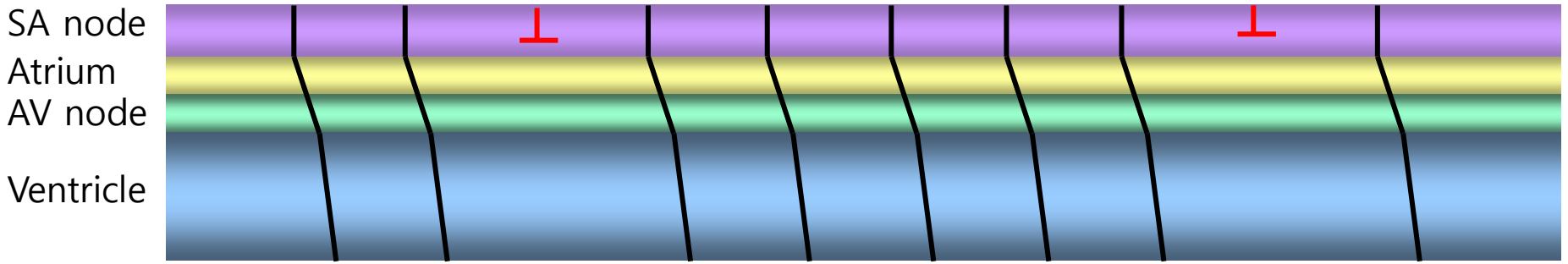
- ✓ PP cycle is constant
- ✓ No P waves & QRS complexes
- ✓ Pause is twice the preceding PP cycle



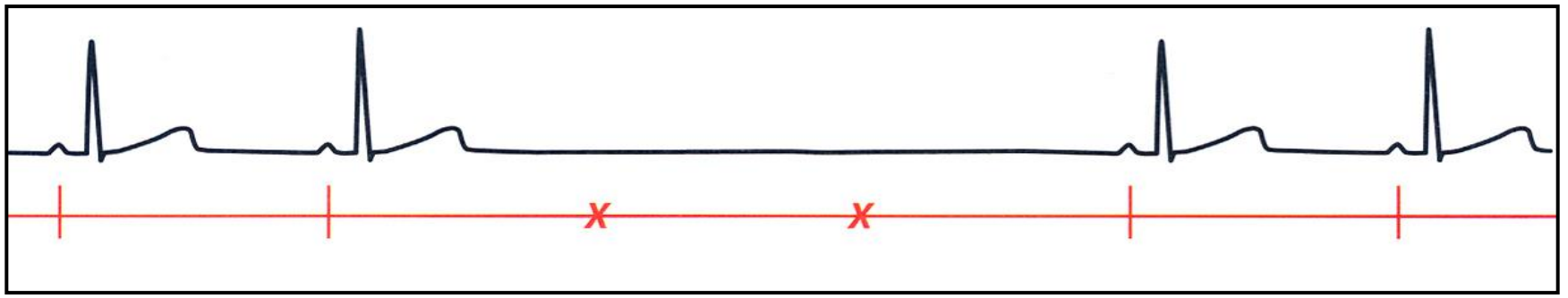
Normal or slow regular rhythm is followed by a pause that is a multiple of the P-P interval usually (2-4)

2nd degree Sinoatrial block, type II





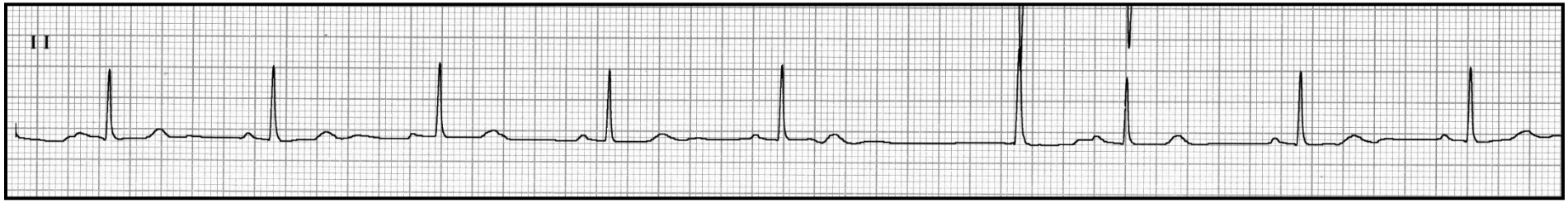
- ✓ Multiple of the PP interval

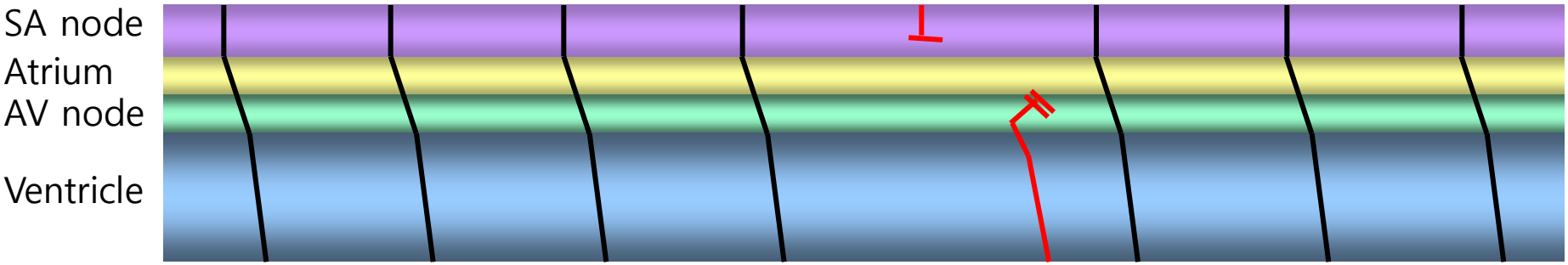


SA block 3 times the normal PP interval

SA block 4 times the normal PP interval

SA block with escape junctional beat



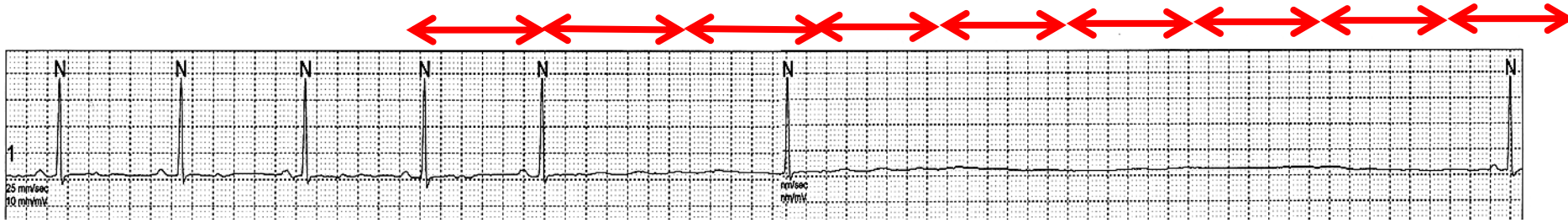


3rd degree Sinoatrial block

- very similar to a sinus arrest

* third degree SA block : a failure to conduct impulses
* sinus arrest : a failure to form impulses

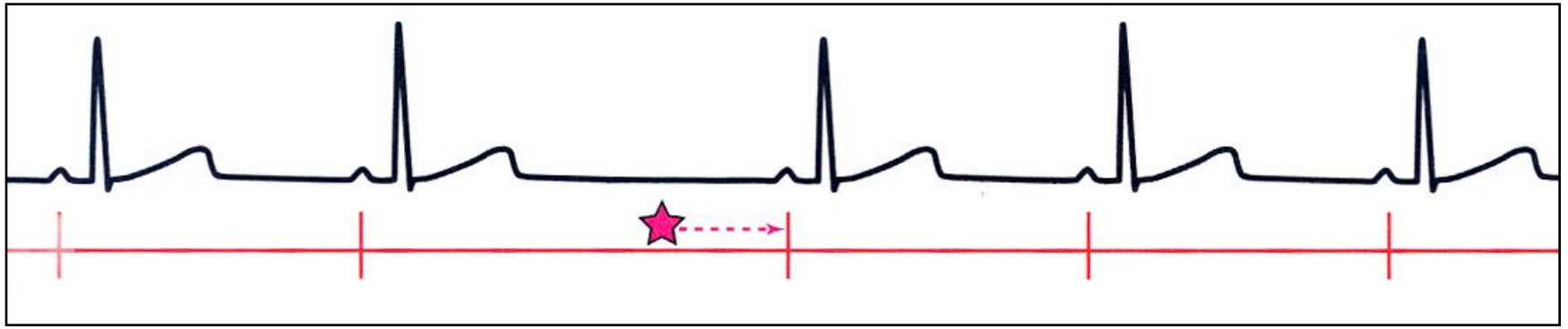
Sinus pause, arrest



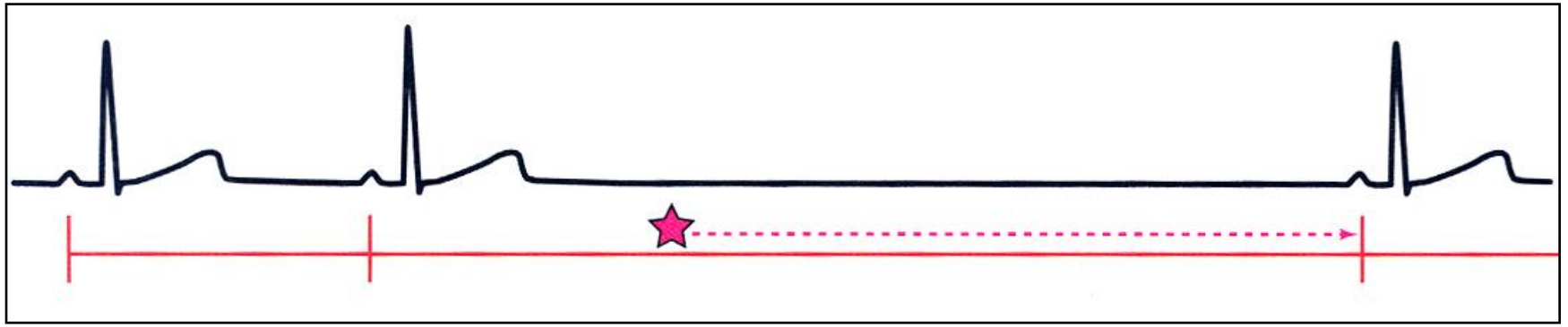
Heart Rate	Rhythm	P Wave	PR interval (s)	QRS (s)
N/A	irregular	Each QRS identical. New rhythm begins after a pause. The P to P interval is disturbed.	Normal (0.12 to 0.20)	Normal (< 0.12)

- The P-P interval during the pause is **not a multiple** of the P-P interval of the underlying rhythm.

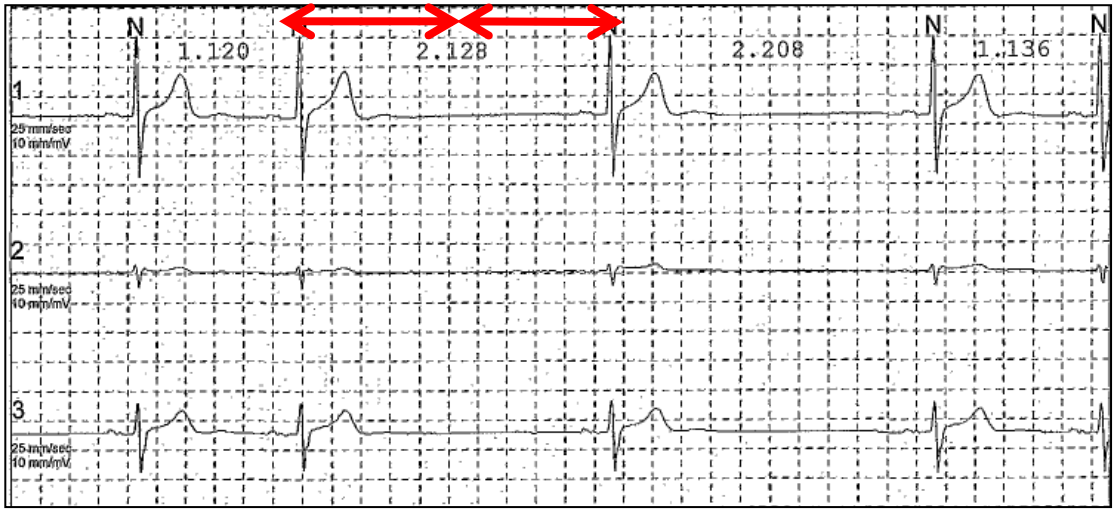
Sinus pause, arrest



Sinus pause is not a multiple of the PP interval

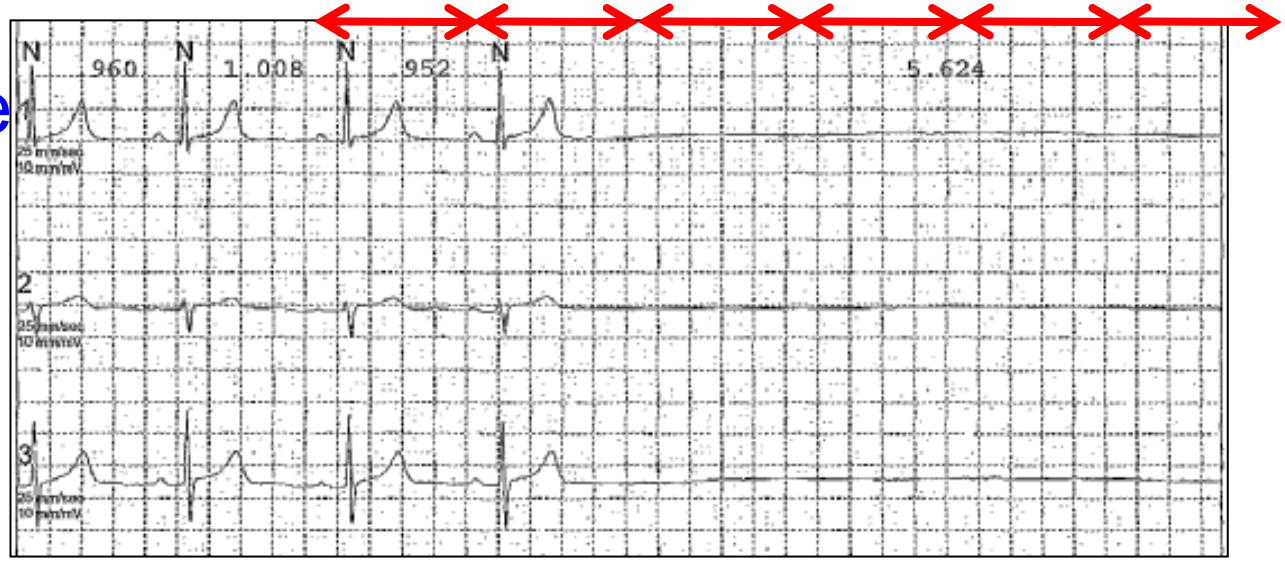


Sinus arrest is longer than a sinus pause
and is not a multiple of the PP interval

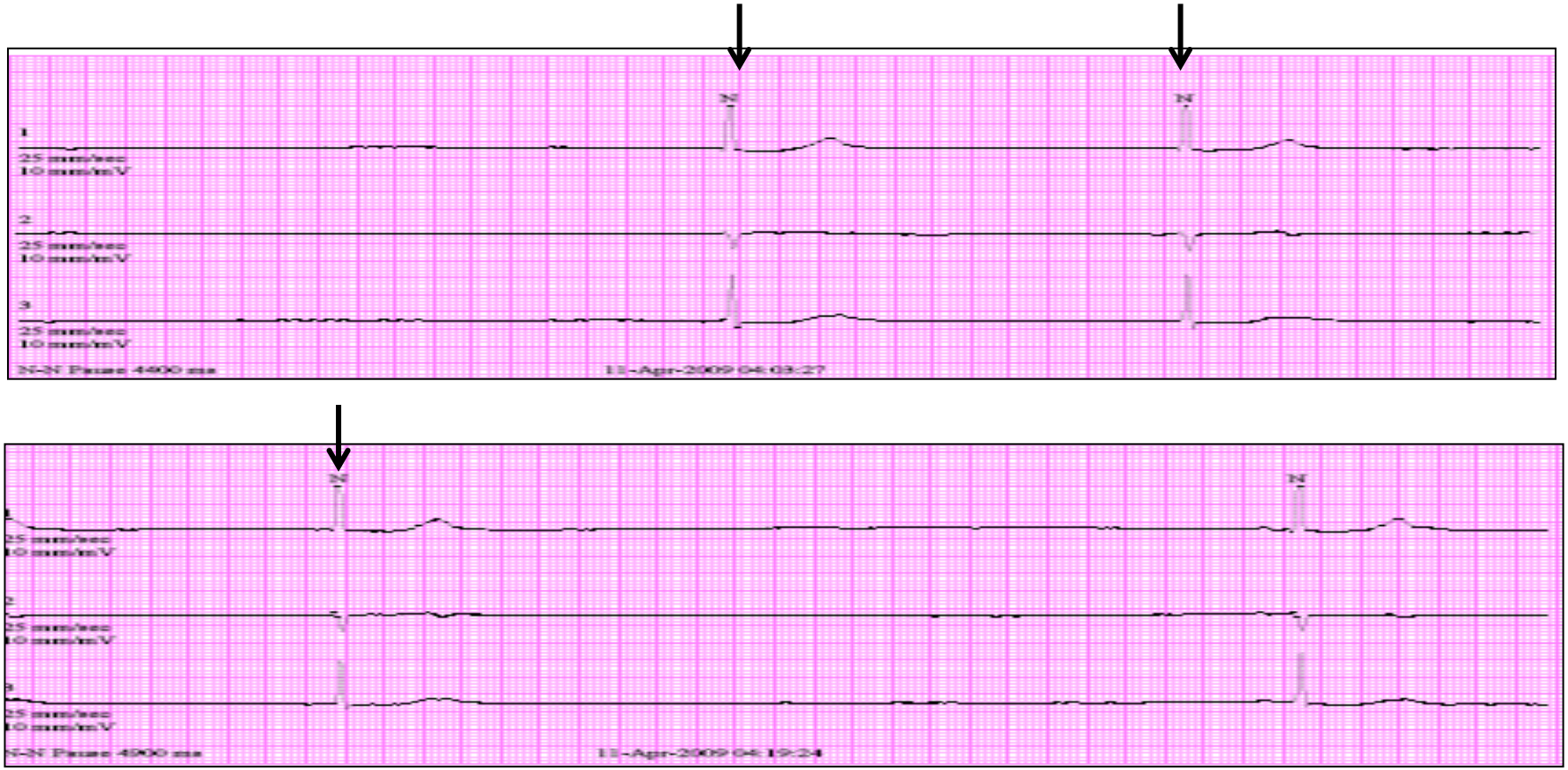


Sinus pause

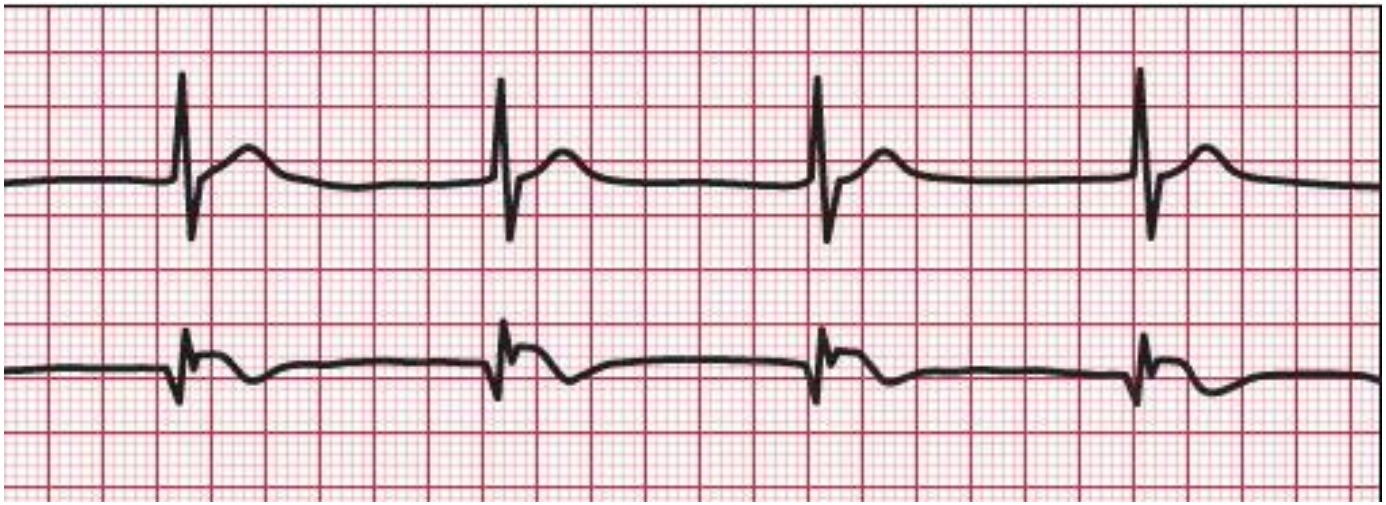
Long sinus pause /sinus arrest



Sinus arrest with junctional escape beat



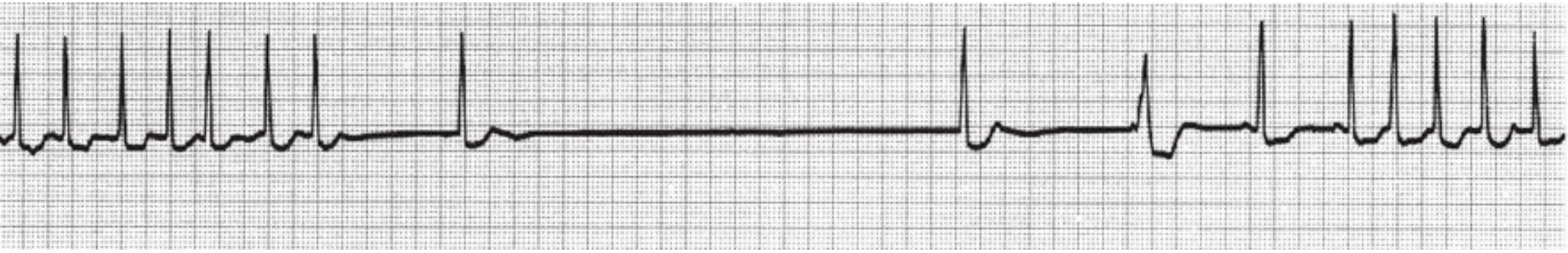
Junctional Rhythm



Heart Rate	Rhythm	P Wave	PR interval (s)	QRS (s)
40-60 bpm	regular	Variable (none, antegrade, or retrograde)	None, short or retrograde (<0.12)	Normal (< 0.12)

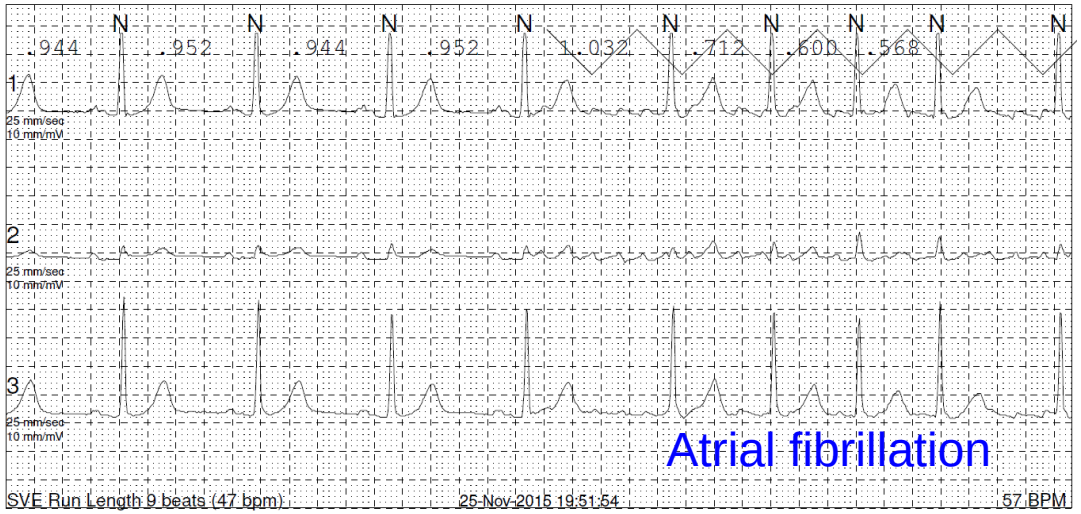
Tachycardia-Bradycardia syndrome

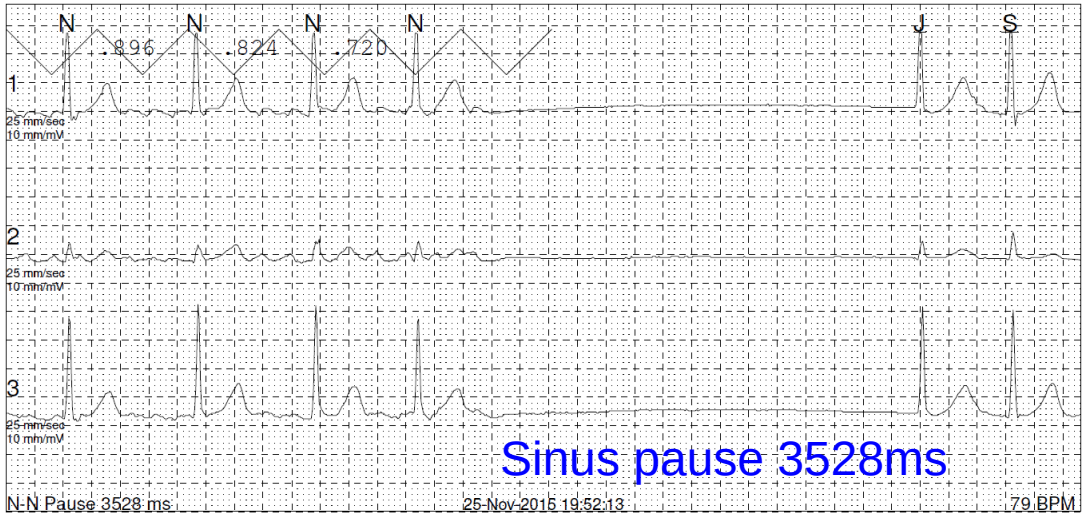
- a variant of sick sinus syndrome
- the arrhythmia alternates between slow and fast heart rates



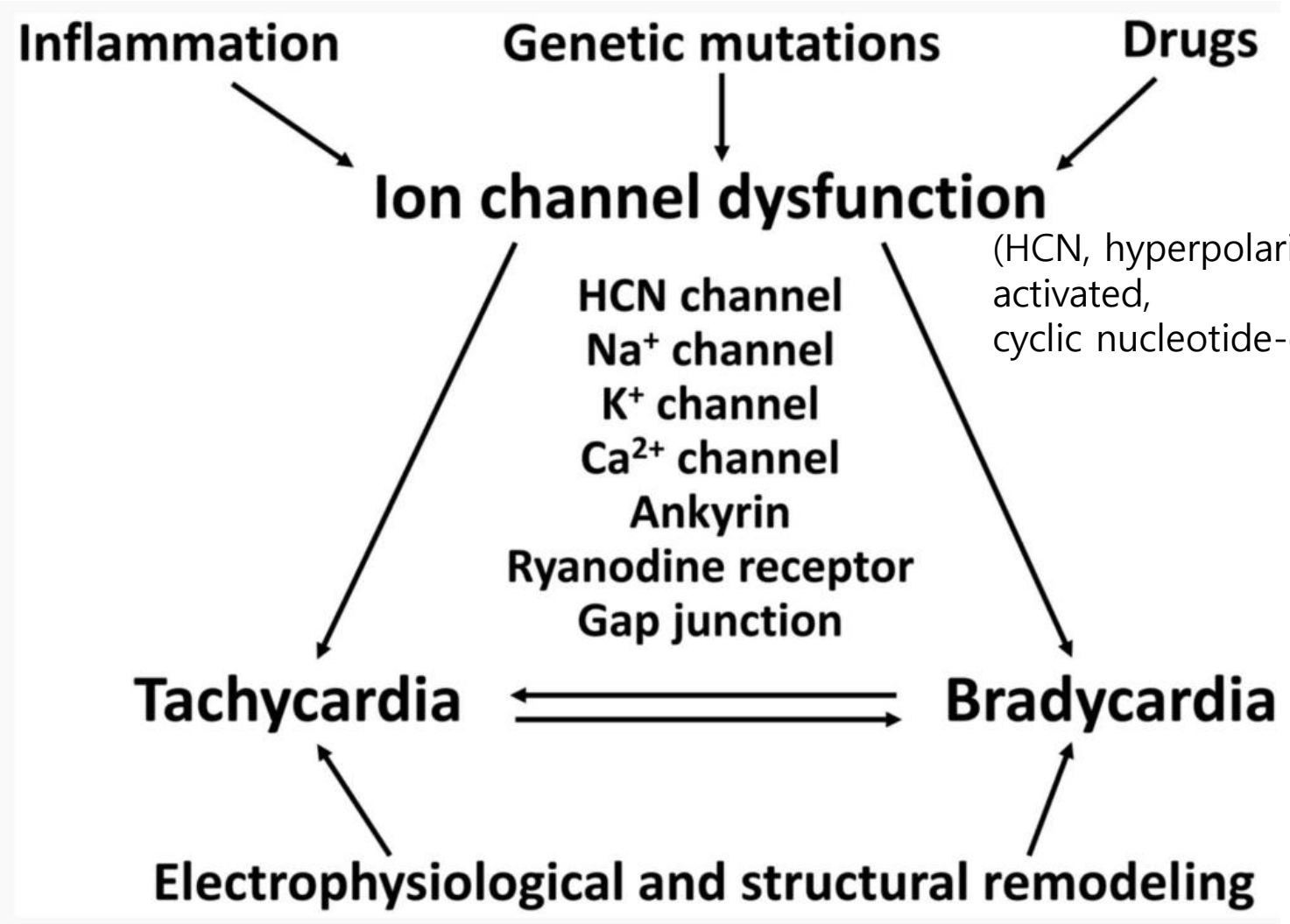
- Usually, symptomatic long pause after termination of atrial fibrillation, atrial flutter, or atrial tachycardia

Tachycardia-bradycardia syndrome





Molecular and electrophysiological mechanisms underlying TBS



Diagnosis Algorithm of SND

Symptomatic SA node dysfunction

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Surface ECG

↓

Ambulatory ECG recording

↓

Exercise testing

↓

Drug test (atropine, isoproterenol)

↓

EPS

EPS

- Indication

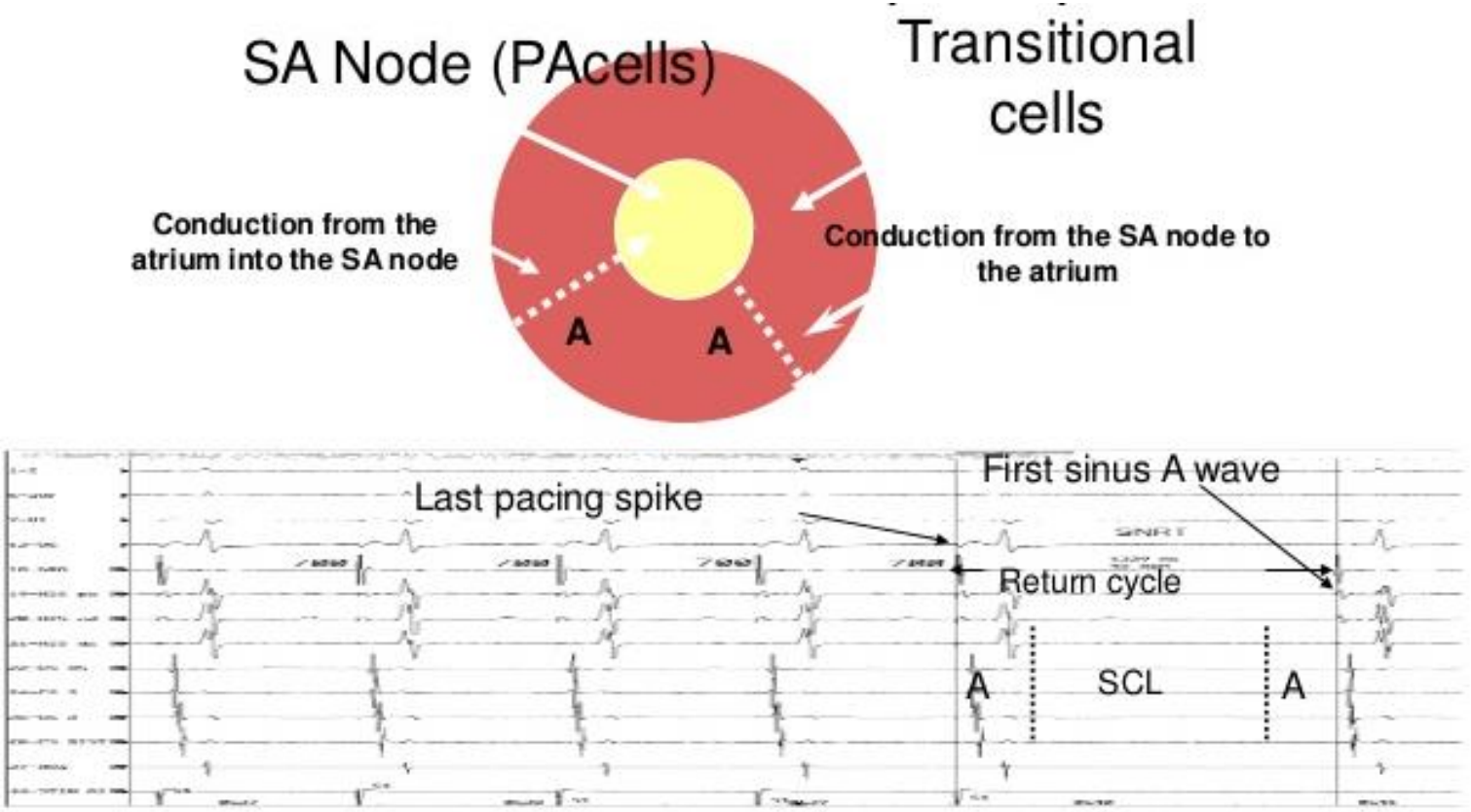
✓ The symptomatic pts who has no ECG findings suggestive SND

✓ The symptomatic pts whom ECG fail to correlate with Sx

✓ The pts who develops SND on usual doses of drugs

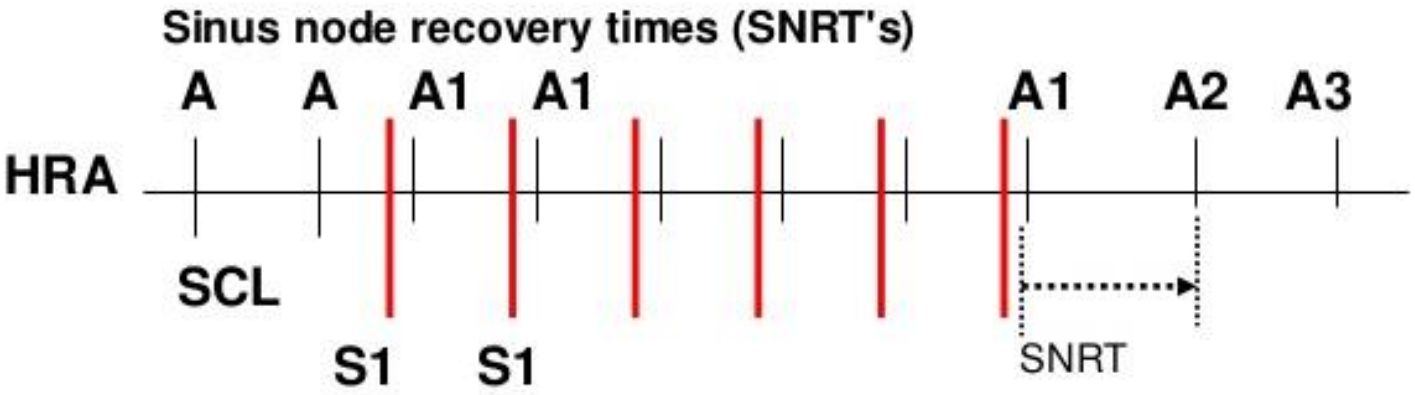
Sinoatrial conduction time (SACT)
Sinus node recovery time (SNRT)

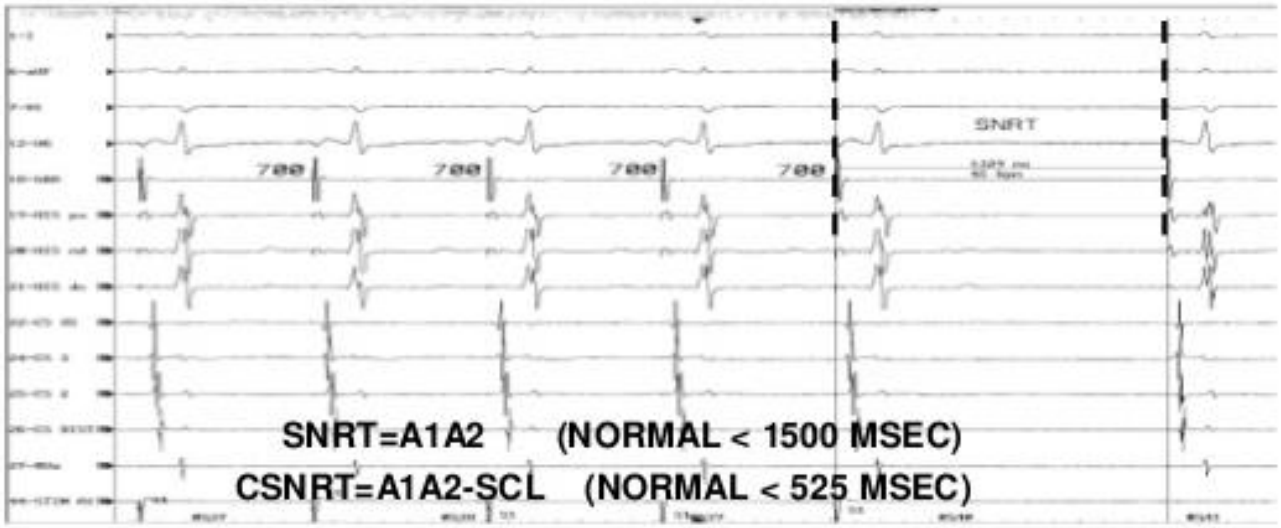
Sinoatrial conduction time (SACT)



- SACT(=A): 50-125 ms (normal)
- Prolonged SACT- suggest SA block

Sinus node recovery time (SNRT)





Symptomatic Sinus bradycadia, TBS

Recommendations for Permanent Pacing in Sinus Node Dysfunction 2012

Class I	Class IIa	Class IIb	Class III
1. SND with documented **symptomatic bradycardia**, including frequent sinus pauses that produce symptoms. (*C*) 2. **symptomatic chronotropic incompetence**. (*C*) 3. **symptomatic sinus bradycardia** that **results from required drug therapy** for medical conditions. (*C*)	1. **SND with HR<40 bpm** when a clear association between **significant Sx consistent with bradycardia** and the actual presence of bradycardia has not been documented.(*C*) 2. **unexplained origin** when **clinically significant abnormalities of sinus node function** are discovered or provoked in **EPS** studies. (*C*)	1. minimally symptomatic patients with chronic HR < 40 bpm while awake. (*C*)	1. SND in asymptomatic patients. (*C*) 2. SND in patients for whom the symptoms suggestive of bradycardia have been clearly documented to occur in the absence of bradycardia. (*C*) 3. SND with symptomatic bradycardia due to nonessential drug therapy. (*C*)

Thank you for attention!