Arrhythmias

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Presenter Disclosure Slide

American College of Surgeons ♦ Division of Education

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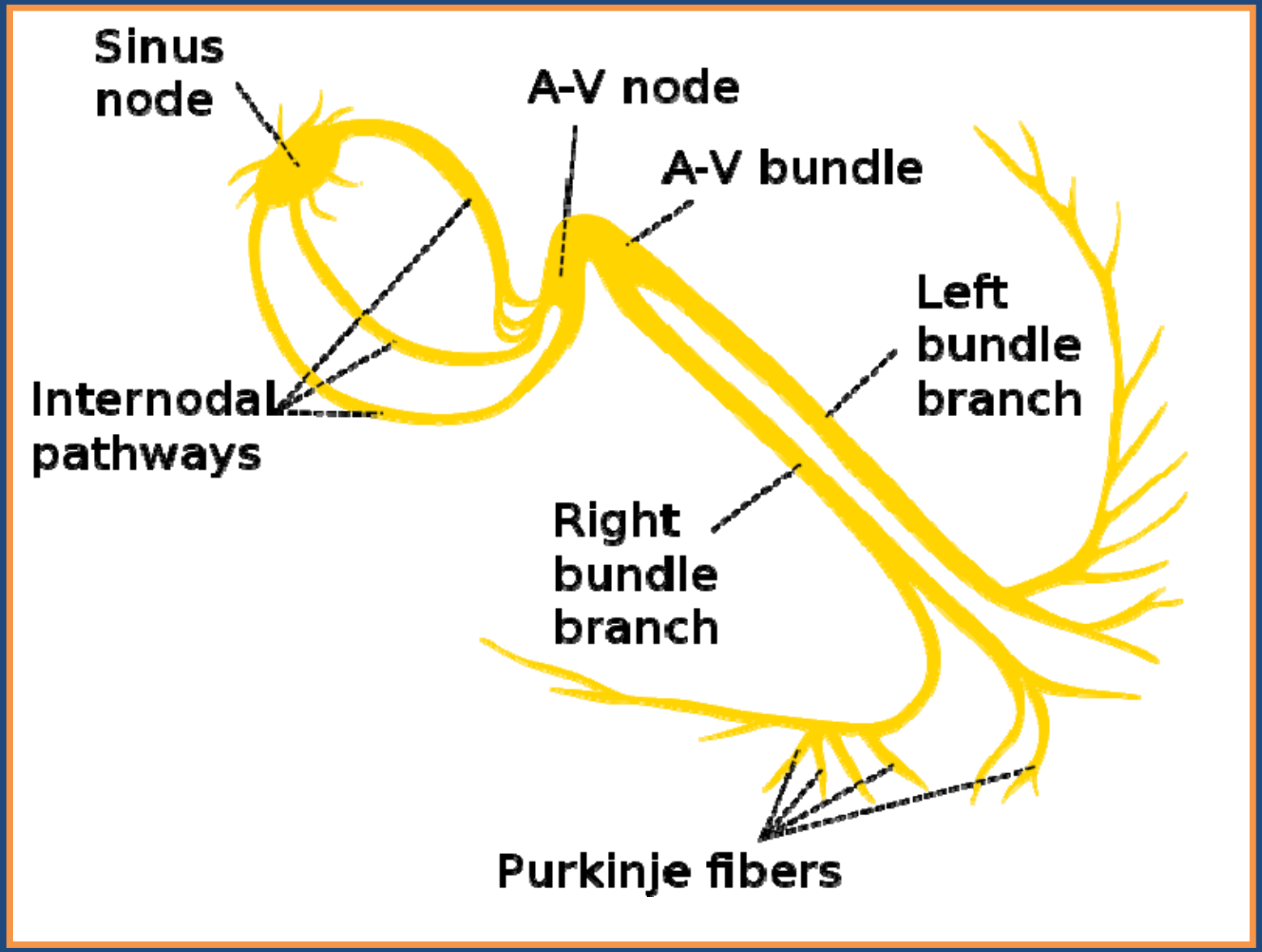
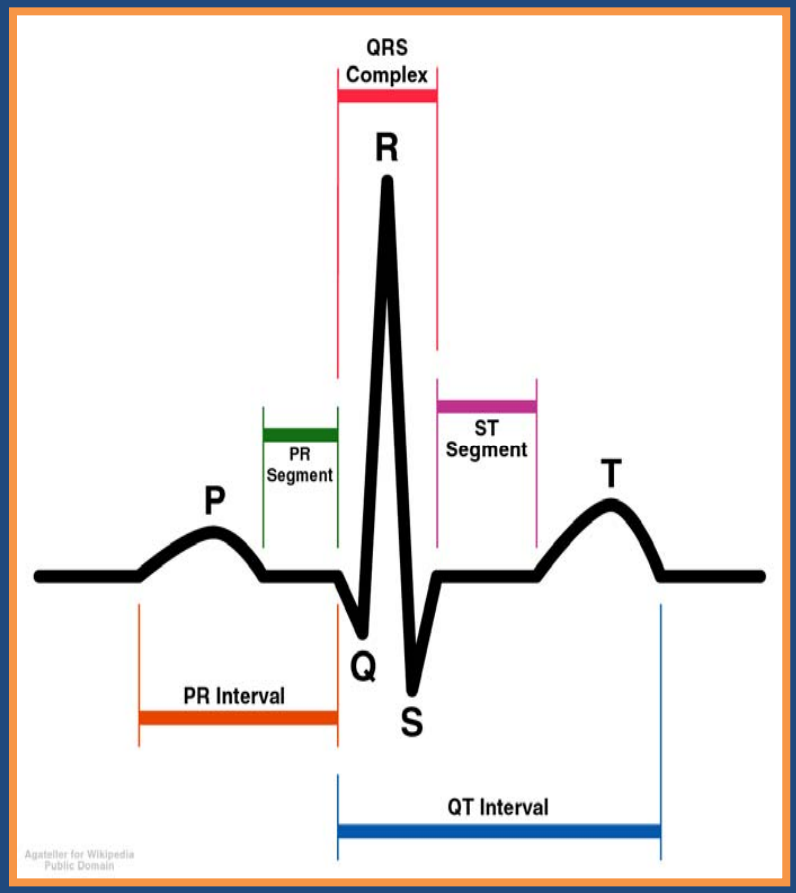
Nothing To Disclose

Overview

- Normal Conduction
- Electrocardiogram (ECG)
- Bradycardia
- Tachyarrythmias
- 2010 American Heart Association Guidelines
- ACLS

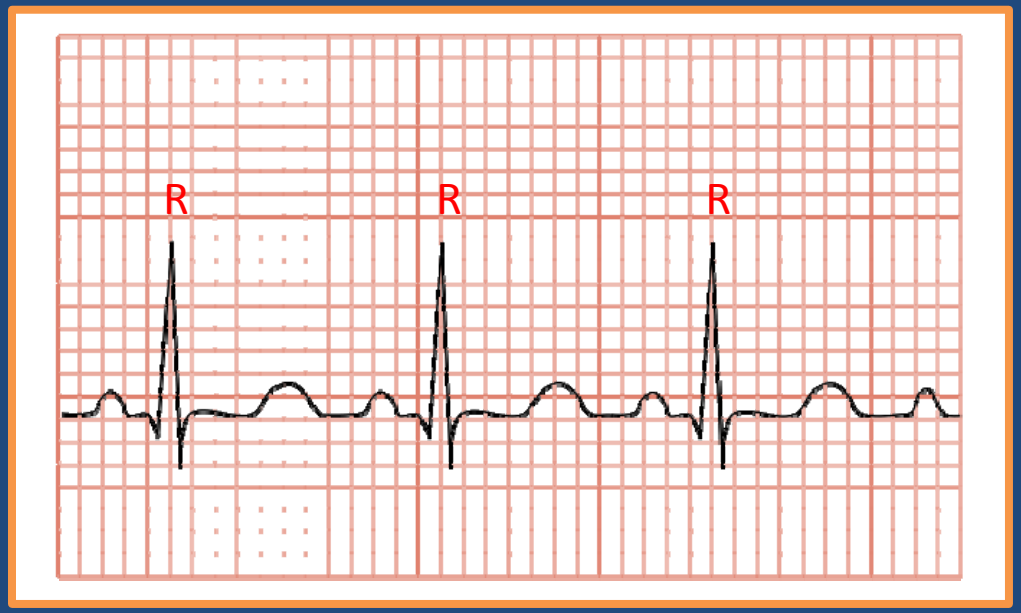

Sinus node
A-V node
A-V bundle
Left bundle branch
Internodal pathways
Right bundle branch
Purkinje fibers

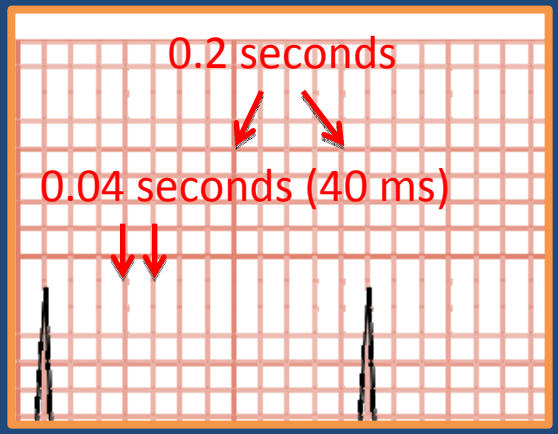
ECG



- PR onset of P to onset of QRS
- QRS
- QT interval-start of Q to end of T
- ST-end of S to start of T
- R-R is the ventricular rate
- P-P is the atrial rate

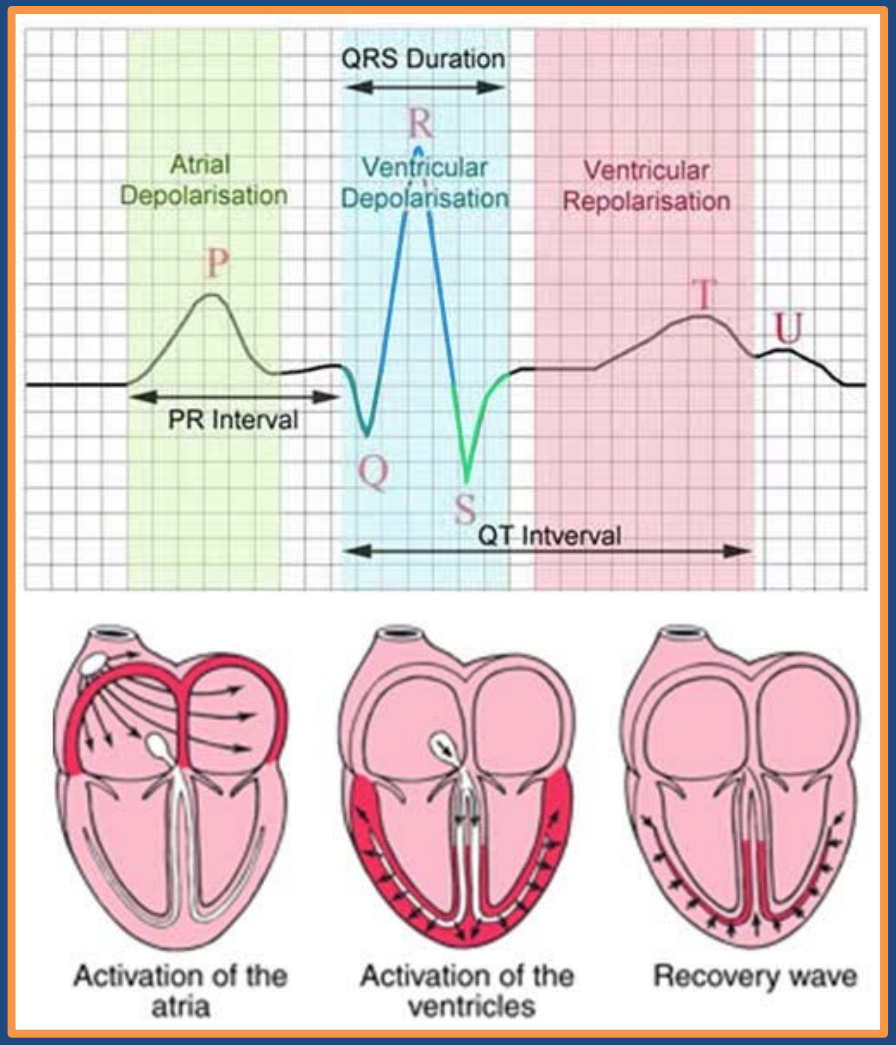
- One beat every 5 sq HR is 60 bmp
- One beat every 1 sq HR 300 bmp
  - 150 is every other square
  - 100 is every 3rd square
- What is the HR here ?





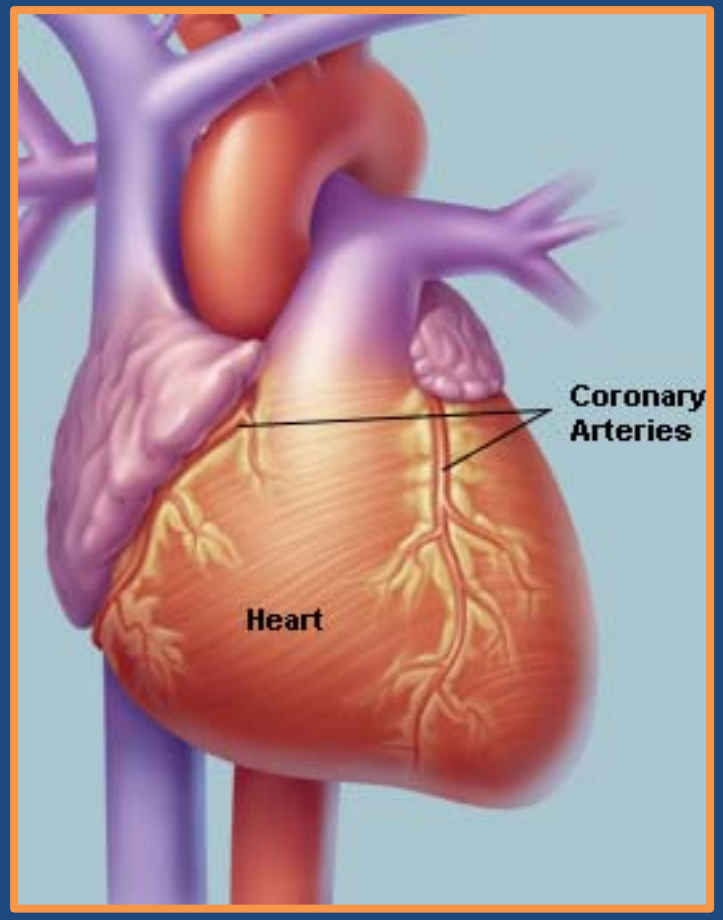
Question

- If there is a QRS complex in every large square of a 12 lead ECG the HR is:
  A. 150 beats/min
  B. 60 beats/min
  C. 100 beats/min
  D. 300 beats/min

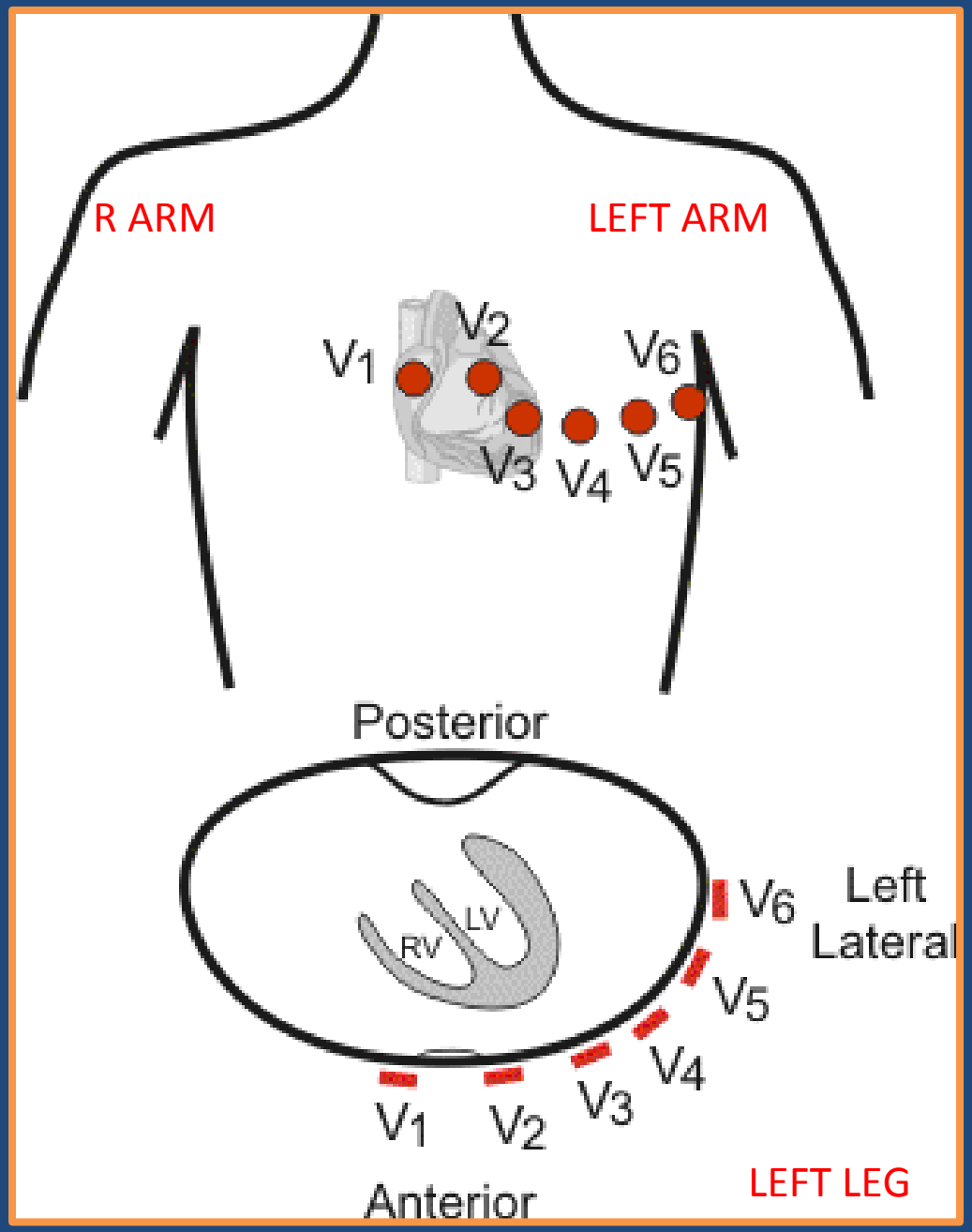


- PR interval-SA node to the venticular muscle
  - 120-200 ms (3-5 small sq)
- QRS depolarization
  - < 120 ms (3 sm sq)
- ST elevation
  - Failure or re-polarisation from ischemia

ECG

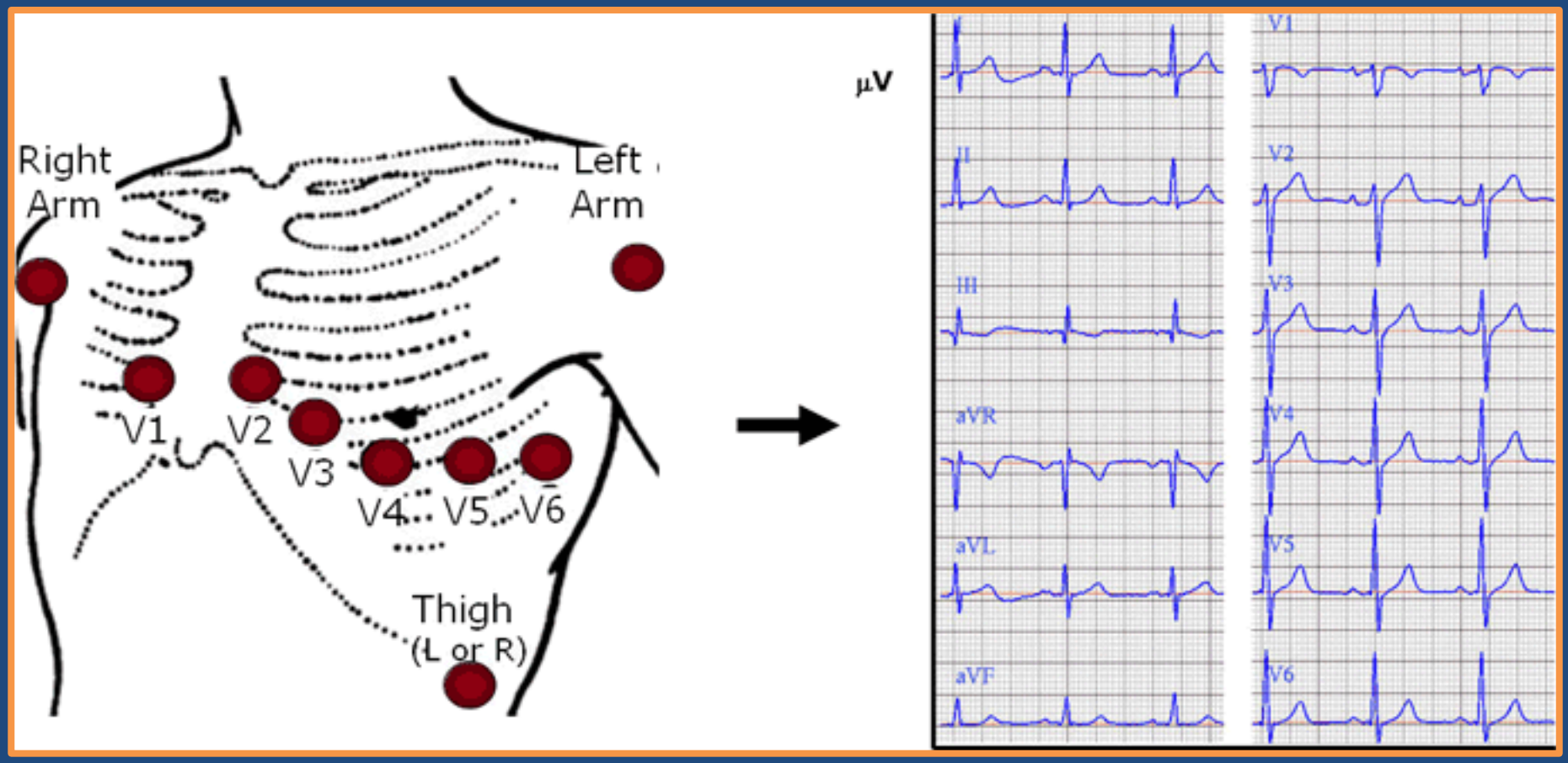


- Right to Left
- Superior to inferior
- Anterior to posterior (lateral)


R ARM
LEFT ARM
V1
V2
V3
V4
V5
V6
Posterior
RV
LV
V6
V5
V4
V3
V2
V1
Left
Lateral
Anterior
LEFT LEG

ECG

- Bipolar limb leads (I-III, Frontal plane)
  - I RA-LA (right to left)
  - II RA-LL (sup/inf)
  - III LA-LL (sup/inf)
- Augmented unipolar leads (aVR-AVF)
  - aVR RA to LA & LL (rightward)
  - aVL LA to RA & LA (leftward)
  - aVF LL to RA & LA (Inferior)



LEADS I, II, aVL: LATERAL SURFACE of the heart

LEADS II, III and aVF: INFERIOR SURFACE

LEAD aVR: Right atrium

Sinus Bradycardia

- Normal PR (120-200, 3-5 small squares)
- HR <60 (< 1 every 5 squares)
- Often normal and asymptotic
- Medications (Precedex)
- Vaso-vagal

AV nodal block

- Hyperkalemia, hypermagnesmia, digoxin, b-blockers
- 1st degree > (0.2 seconds-one large box)
- Monitor

AV nodal block, 2nd degree

- Type 1-progressive prolongation of the PR interval, until a beat is dropped
  - Stable, usually asymptomatic, stop medication
- Type 2-stable PR, beat is randomly dropped
  - Often P:QRS 3-4:1
  - Infranodal conduction disturbance
  - Unstable (Anterior wall MI)
  - Can progress to third degree block

3rd Degree Block

- Complete dissociation of p-wave and QRS
  - P-wave is regular and marches through
  - Q waves can be narrow or complex
  - Anterior and inferior wall MI
  - Often requires permanent pacemaker

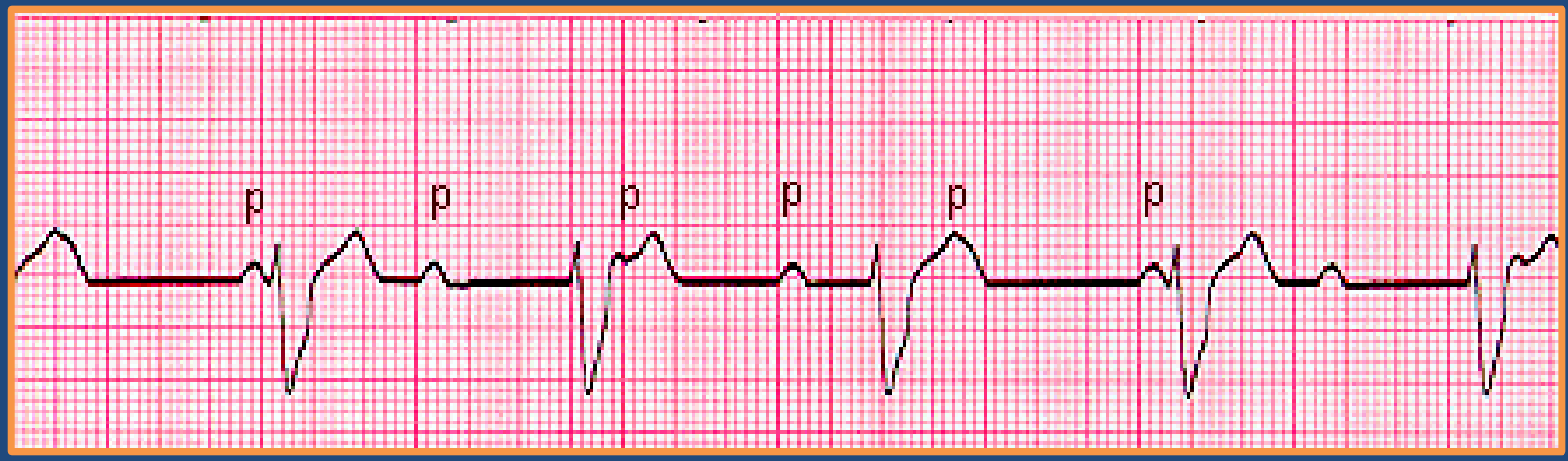
Summary and Key Points Bradycardia

- Sinus Bradycardia (HR <60, <1 every 5 lg sqs,)
  - Lg sq = 0.2 seconds (5=1 second)
- 1st degree block (stable, PR > 0.2 sec-1 lg sq)
- 2nd Degree Type 1 (p-waves at regular intervals, progressive prolongation until missed QRS)
- 2nd Degree Type 2 (regular p-waves sudden dropped QRS, 3-4:1)

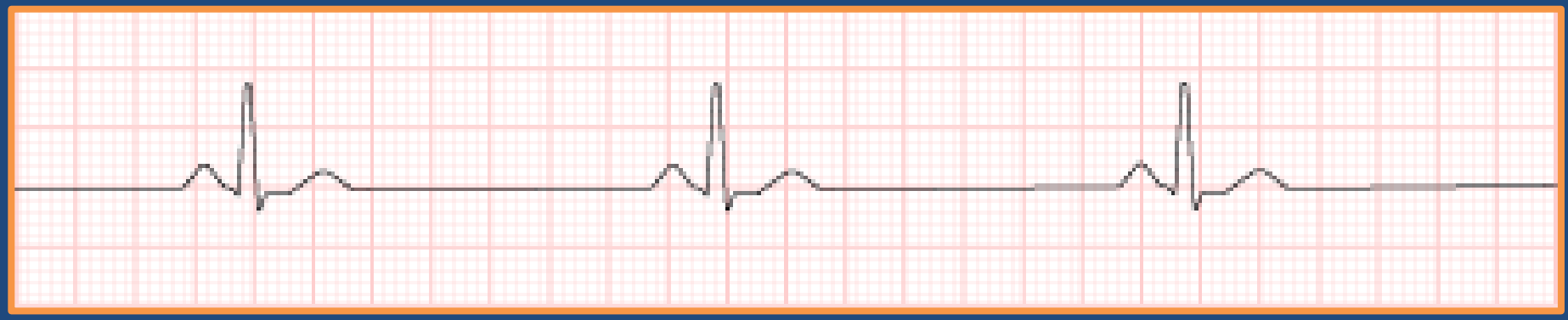
Summary and Key Points Bradycardia

- 3rd Degree: Complete dissociation of the P and QRS waves
- Second Degree Type 2 and 3rd degree, more unstable and can be the presentation of anterior and inferior wall MI


I
aVR
V4R
V2
V5
NO DATA
II
aVL
V3R
V3
V6
NO DATA
III
aVF
V1
V4
V7
NO DATA
V7


p
p
p
p
p
p

What is this?



Treatment of Bradycardia

- Stable
  - Observation, treatment of cause, pacemaker
- Unstable
  - Atropine (0.5 mg bolus, repeat every 3-5 mins)
  - Transcutaneous pacemaker
  - Dopamine/epinepherine
  - Transvenous pacemaker

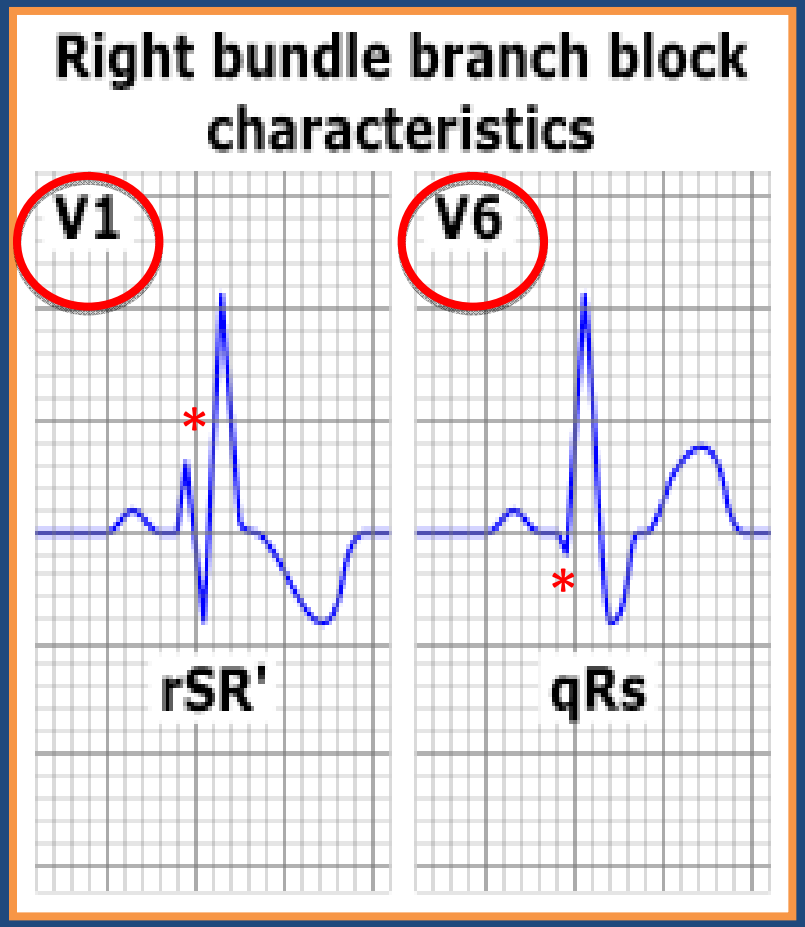
Question

- 82 yo women POD 2 after a sub-total colectomy for bleeding, she develops 2 nd degree type 2 HB which progresses to 3rd degree (HR 30 barely arousable); TX?
  A. Atropine 0.5 mg IV push
  B. Synchronized cardioversion at 100 J
  C. Transcutaneus pacemaker
  D. Transvenous pacemaker

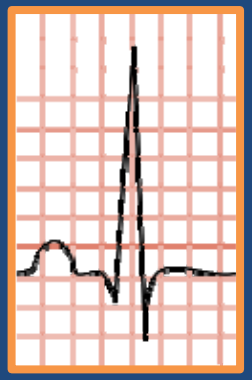
Bundle Branch Block

- BBB can be an indication of ischemic disease
- If tachycardia they can be confused with malignant rhythms and ischemia

Right Bundle Branch Block

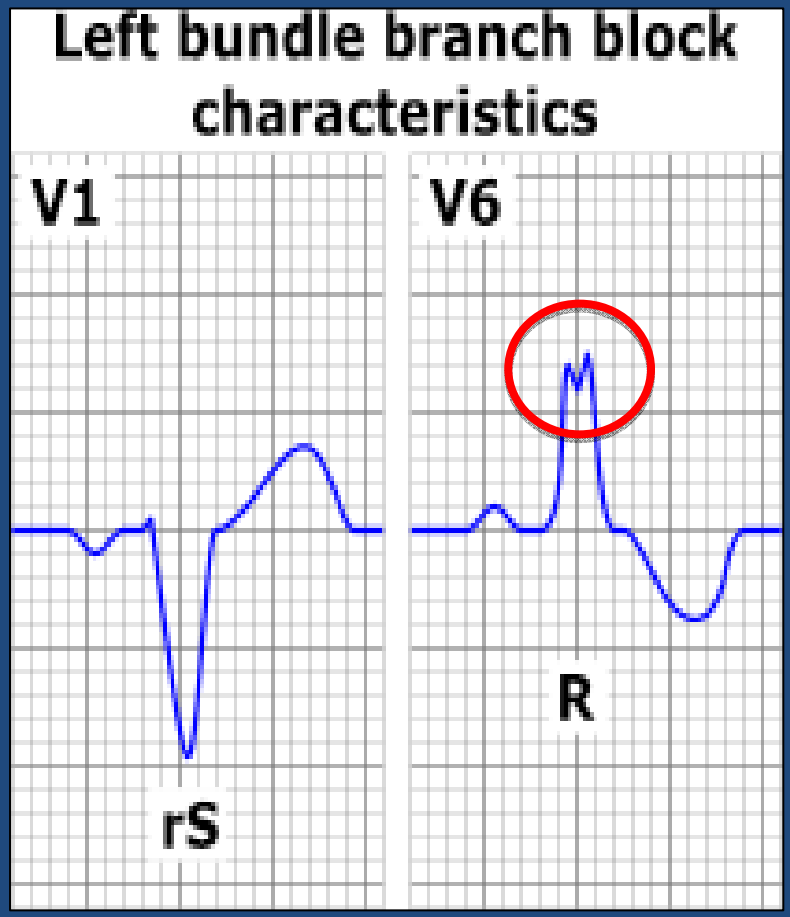


- No RB depolarization
- Right dplz from left
- r-wave before the QRS in V1 (rSR in V1)
- Smaller q wave in V6



QRS

Left Bundle Branch Block



- No LB conduction, depolarizes from the right
- R dplz small Q wave in V1
- Second R wave in V6
- W-wave in V6

Question

- 2nd Degree heart block type 2 is characterized by:
  A. Complete dissociation between the P-wave and the QRS
  B. Progressive lengthening of the PR interval until the QRS wave is dropped
  C. Sudden non conducted P-wave (dropped QRS), without a change in the PR interval
  D. A PR interval > 0.2 seconds

Tachycardia
Sinus Tachycardia

- HR >100 bpm
- Sinus (narrow regular QRS)
- Re-entry tachycardia, nodal tachycardia
  - HR 120-200, regular rate
  - Younger healthy patients
  - 2 x more common in women
  - Can be wide complex (if conducted back through ventricular tissue)
  - Often stopped with Valsalva


CLINICAL PRACTICE

Evaluation and Initial Treatment of Supraventricular Tachycardia

Tachycardia

- Atrial fibrillation
  - Irregular, no p-waves, HR variable
- Atrial Flutter
  - Regular, saw-tooth pattern of p-waves
- Fib and flutter
  - 1-2 % of the population, can be associated with slow conduction, often unstable
- MAT
  - P-waves present and irregular, stable

Adensoine

- Terminates AV nodal re-entry tachycardia
- Will not terminate afib/flutter, but can slow enough to make diagnosis
- 1st dose 6 mg IV given rapidly
- 2nd dose 12 mg IV

Treatment

- Unstable-synchronized cardioversion
  - Consider amiodarone load while/before cardioversion
  - Afib/flutter
    - 120-200 J
  - Narrow and regular (re-entry)
    - consider adenosine 1st
    - 50-100 J

Question

- A 25 yr women reports feeling faint POD 1 after an appendectomy. Her HR is 175, regular and narrow complex, this is most likely
  A. Sinus tachycardia
  B. Atrial fibrillation
  C. Atrioventricular nodal re-entry tachycardia
  D. Multifocal Tachycardia

Question

- In a patient with stable, new onset afib, HR (100-110), after correction of electrolytes, is it your practice to:

a) Monitor the patient

b) Rate control with B-blocker

c) Rate control with Calcium Channel Blocker

d) Give amiodarone to convert the patient

e) Synchronized cardioversion with sedation

Question

- What percentage of your patients who develop afib end-up getting amiodarone

a)<15%

b)25-50%

c)> 50%

d)>75%

Post Operative Atrial fibrillation

- Often transient-but recurs in 40%
- Increases ICU, and HLOS
- 2X increase in rate of cerebral infarction
- 2X increase in 30 day mortality
- Data on Cardiac Post-operative afib, and on chronic, less on non-cardiac post-op and trauma related afib


REVIEW ARTICLE

Management of postoperative atrial fibrillation

Prevention

- B-blocker
  - PeriOperative Ischemia Study Evaluation (POISE), and a systematic review of 33 trials:
    - In non-cardiac surgery prophylactic b-blockade
      - Decreases the rate of CV events but INCREASES death rate and CVAs; more bradycardia and hypotension
      - Especially in patients with low CV event risk
      - Still indicated in Cardiac Surgery
      - Use with extreme caution in non-cardiac surgical patients
      - Re-start if on pre-op when stable
      - Difference between myocardial hypo-perfusion and other end-organ hypo-perfusion

Prevention

- Statins
  - Decreased significantly reduce rate of MI and afib in high risk patients
  - Absolutely restart as soon as possible post-operatively
  - May become a cardio-protective pre-treatment in the future
- Magnesium

Treatment

- More studied in chronic afib, outpatient settings
- Often self-limited will convert with electrolyte/fluid correction (both under and over resuscitation)
  - K >4.5 Mg >2.5 in patients at high risk
- B-blockers vs. Calcium Channel Blockers

– B-blockers better at controlling ventricular response
– More likely to result in conversion to NSR (post-operative patients
– Target rate (90-115/min) higher than outpatient target

Amiodarone

- Effective in converting both atrial fibrillation and flutter
- Low Tordsades risk
- Not a negative inotropic agent
- Safe in critical illness
- Cardioversion
  - Flecainide, Ibutilide (Class 1)
  - Amiodarone (Class 2a)

Treatment

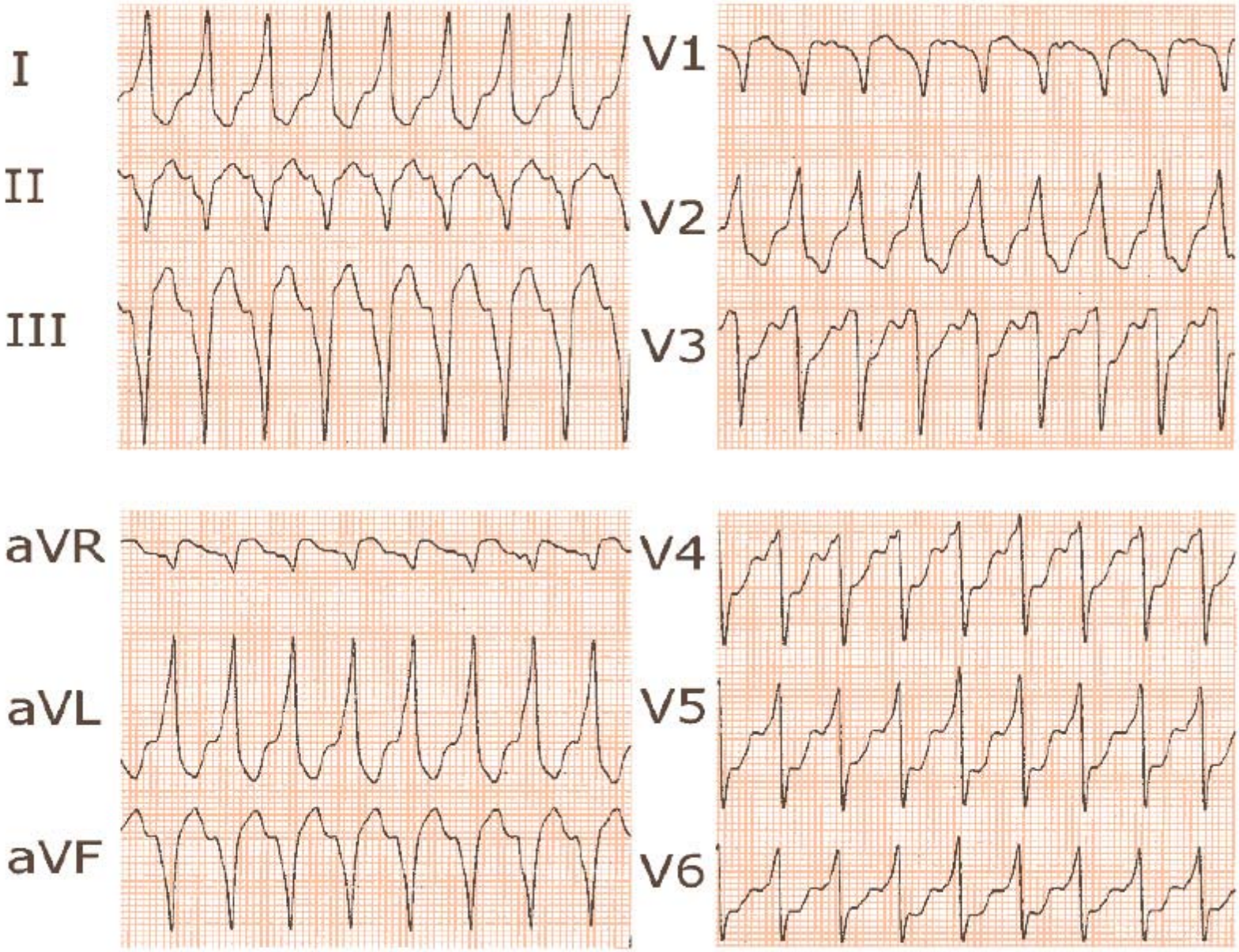
- Anticoagulation
  - Consider starting after 48 hrs in patients who do not convert
  - 33% reduction in CVA risk vs. bleeding risk

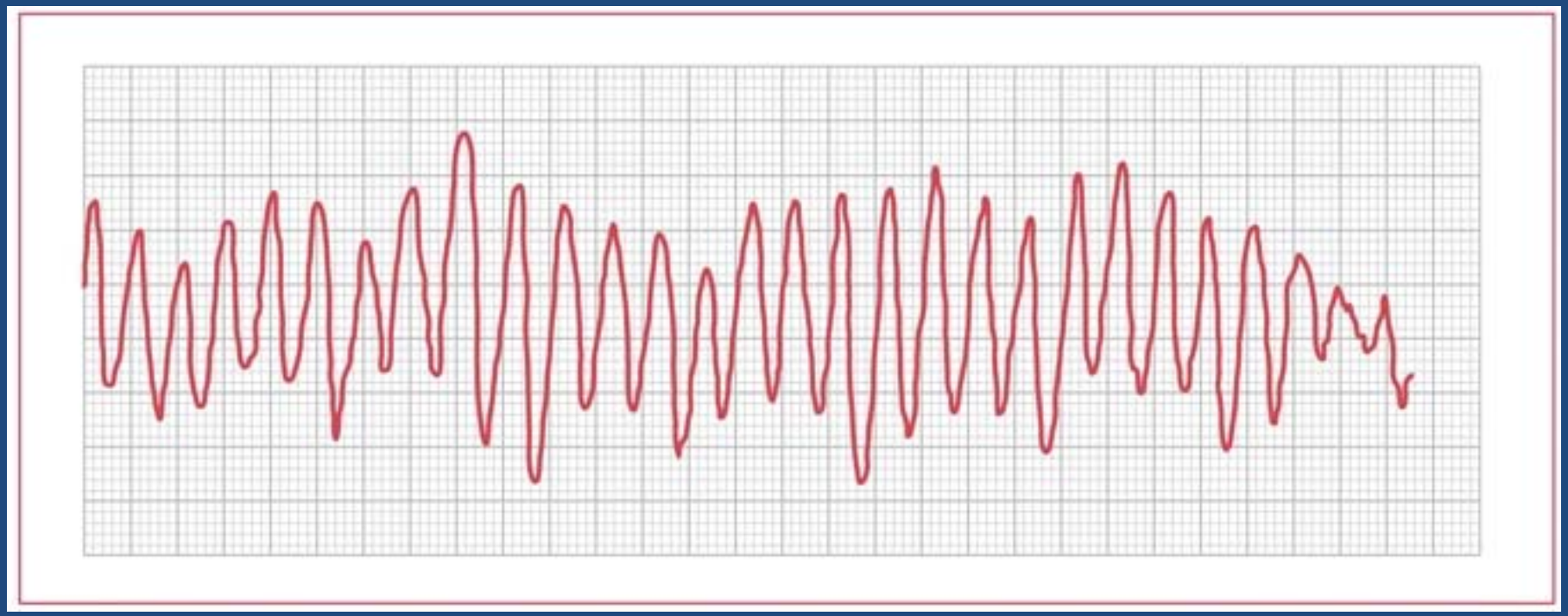
Unanswered Questions

- Cardioversion of patients who are rate controlled, but remain in new onset post-operative afib?
- How long to continue therapy (either b-blockers or amiodarone) started for post-op afib?
- Anticoagulation in patients with intermittent afib, but who have converted to NSR?

Ventricular Arrhythmias
Ventricular Tachycardia

- Wide complex (120 ms (3 small boxes))
- >3 beats, can be stable or unstable
- Morphology different then prior ECG
- Abnormal T-waves
- Usually regular
- Causes: ischemic disease, hypothermia, electrolyte abnormalities


I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6



Torsades de Points

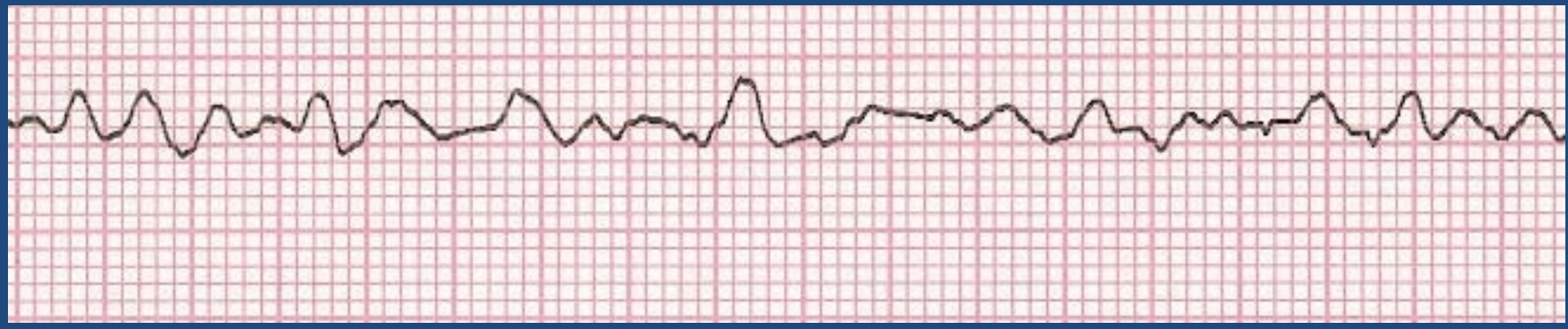
- Evolves from an increasingly prolonged QT interval
- Often caused by medications
- Rapid VT, varies in amplitude, twists around a baseline
- Treatment: oxygen, remove inciting medication


18:54
18:58
19:06
19:06
19:06
19:06

Treatment of Ventricular Tachycardia

- Unstable: Synchronized cardioversion , if loss of vital signs ACLS
- Procainimide, amiodarone, sotalol

Ventricular Fibrillation



ACLS Protocol

- Shock Bi-phasic maximum dose (120-200 J)
- 2 full minutes of CPR
- Epi, advanced airway, capnopgraphy, check pulse and rhythm
- Shock
- 2 full minutes of CPR
- Amiodarone

Question

- 67 yo POD 3 after a left hemicolectomy of colon CA, is found pulseless and un-responsive. A code is called, rhythm v-fib; TX?
  A. Intubation, synchronized cardioversion, Epi, 2mins CPR
  B. Intubation, vasopressin, Epi, CPR 2 mins, shock
  C. CPR 2 minutes, Intubation, Shock, CPR 2 minutes, epi
  D. Shock, CPR 2 minutes, repeat Shock, intubation