

Interpretation of EKGs

Session 2

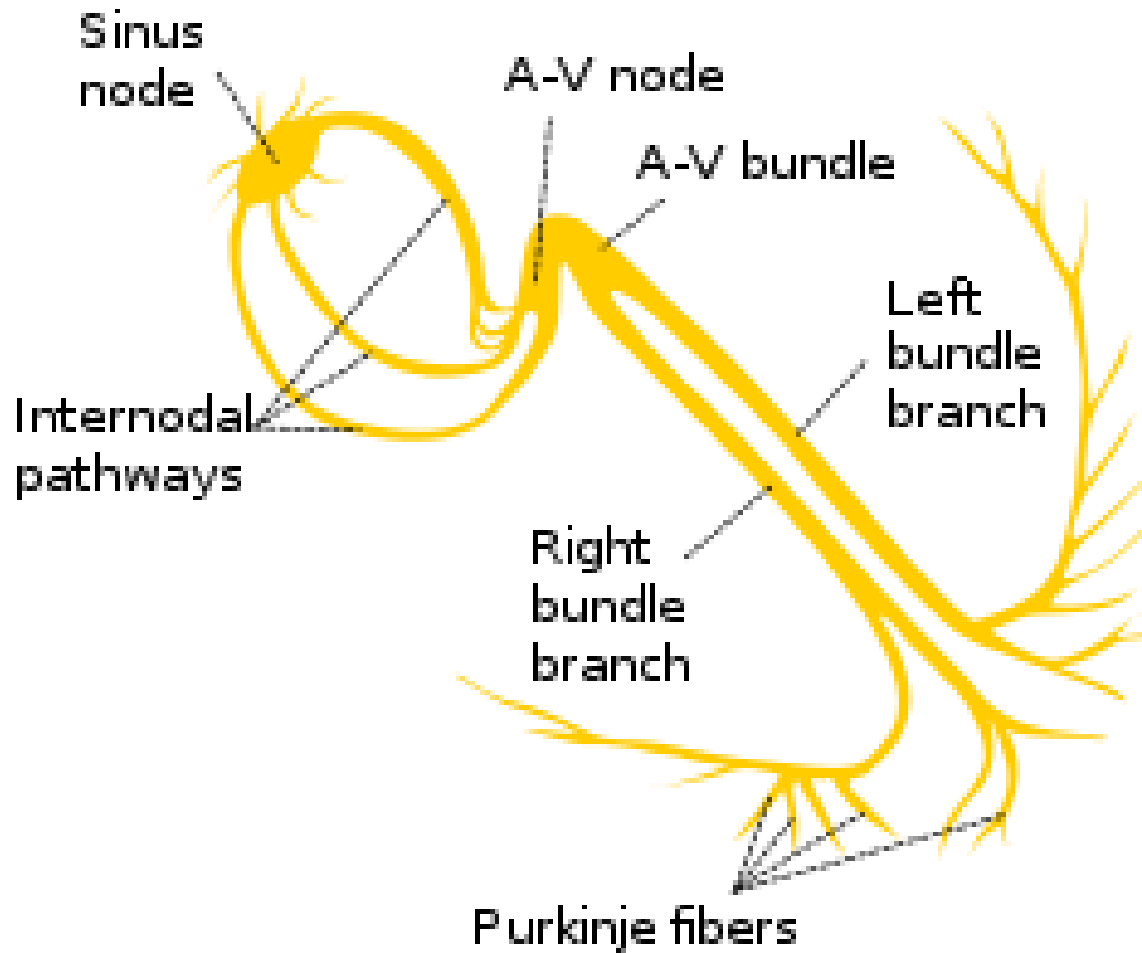
William Camm, MD

FLMI, FALU, CLU, ACS, ARA

Heart Blocks

- AV Blocks
 - 1st, 2nd and 3rd Degree
- Bundle Branch Blocks
 - RBBB, LBBB, IVCD, Complete HB
 - Hemiblocks
 - LAHB
 - LPHB
 - Bifascicular blocks: RBBB + LAHB or RBBB + LPHB

Conduction System

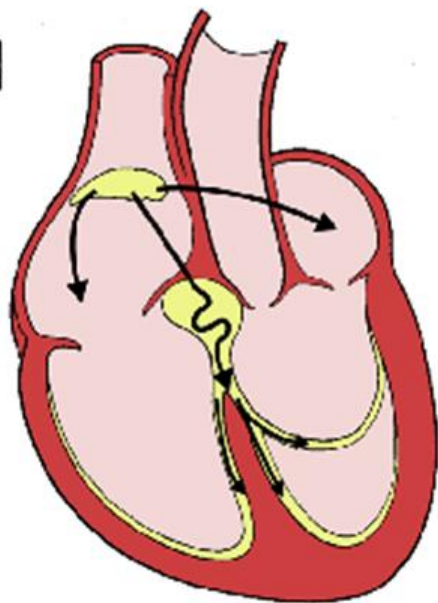


1st Degree AV Block

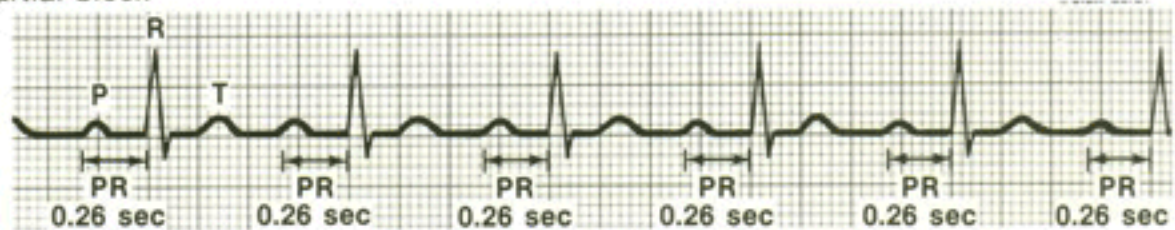
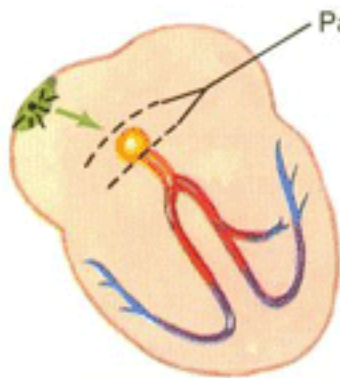
- PR interval >0.20 (1 large box or 5 small boxes)
 - MIB does not code until >0.24 (6 small boxes)
 - Ratings depending on PR interval
 - Usually do not see rating unless PR > 0.28
- Slowed conduction from SA node through AV Node

First degree AV blo

- Prolonged PR interval



1° AV Block



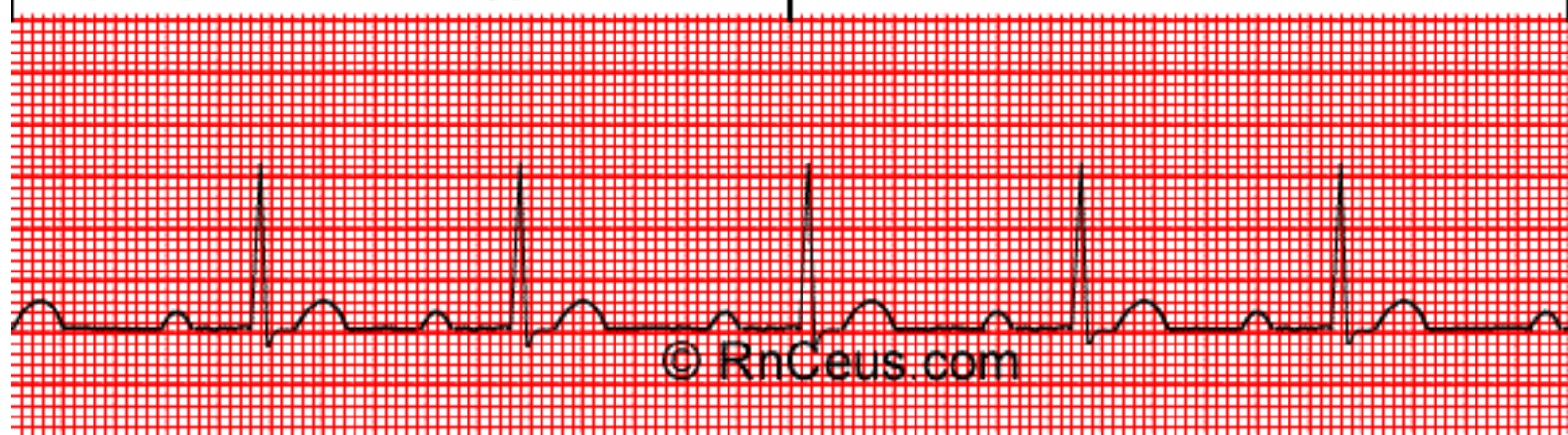
Rhythm: regular

Rate: (that of underlying rhythm)

PR is > than .2 seconds

QRS: usually normal

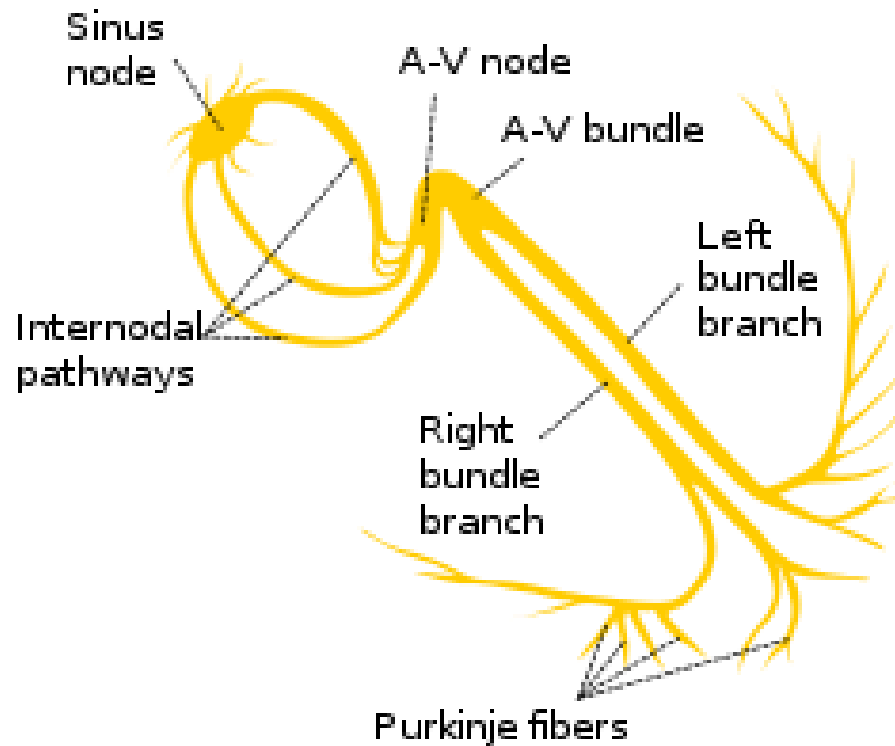
FIRST DEGREE A-V HEART BLOCK



2nd Degree AVB

- 2 Types
 - Wenckebach-Mobitz 1
 - Block in the AV Node-less serious
 - Mobitz 2
 - Block in the His Bundle-more serious
- Frequently seen with inferior MI

AV Node and Bundles

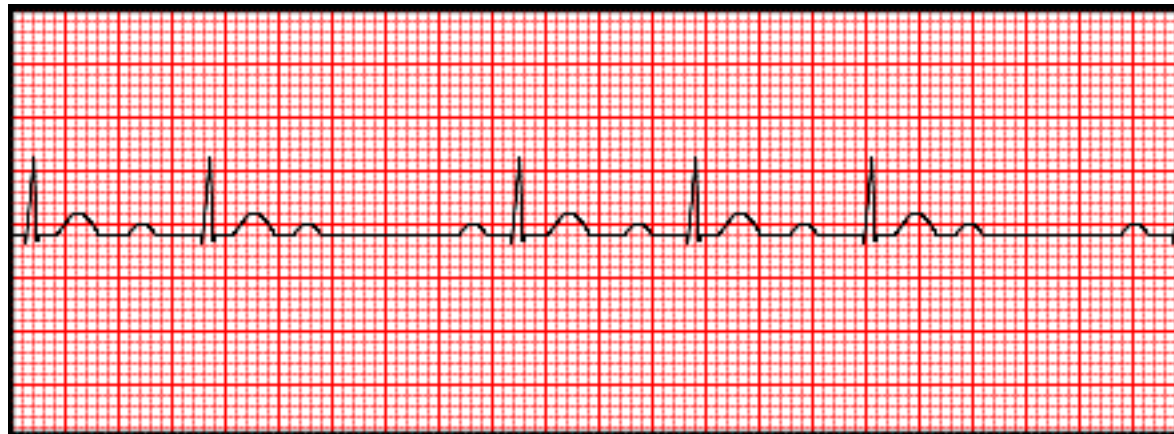
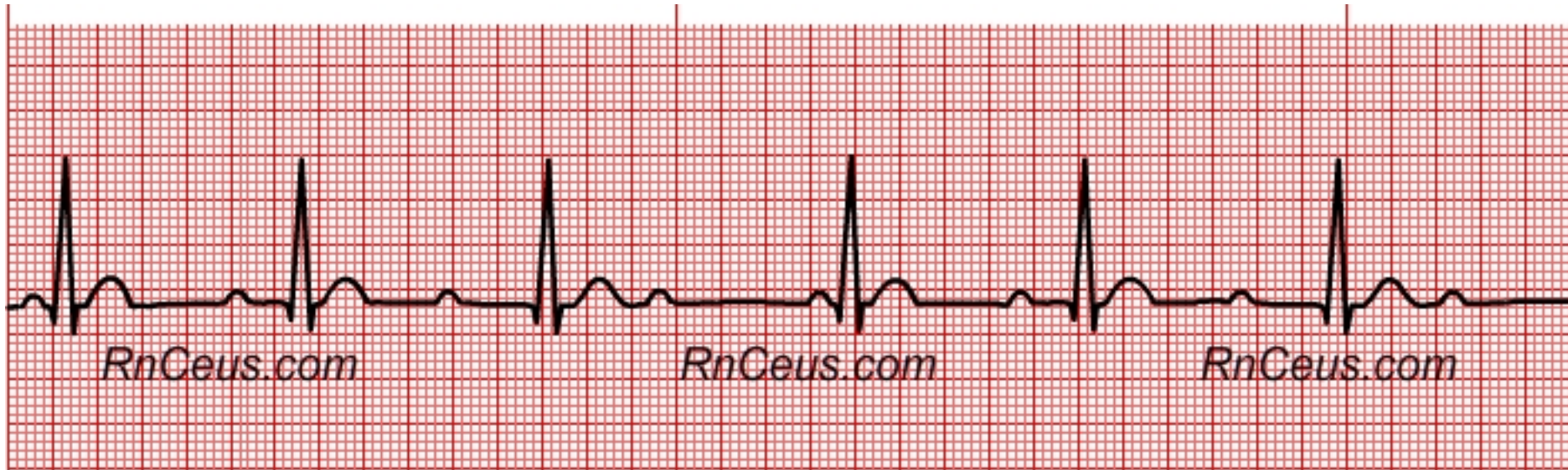


2nd Degree AVB

Wenckebach

- PR interval progressively lengthens until P wave eventually blocked
- Need to look at several consecutive PQRS complexes to assess
 - Hard to assess from 12 lead tracing
 - Need rhythm strip

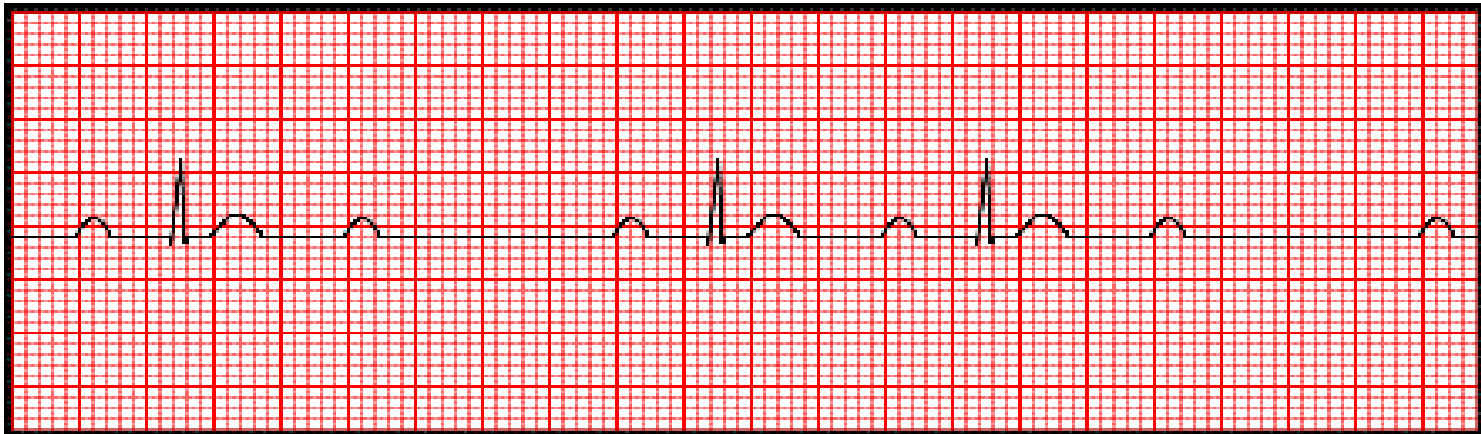
Wenckebach



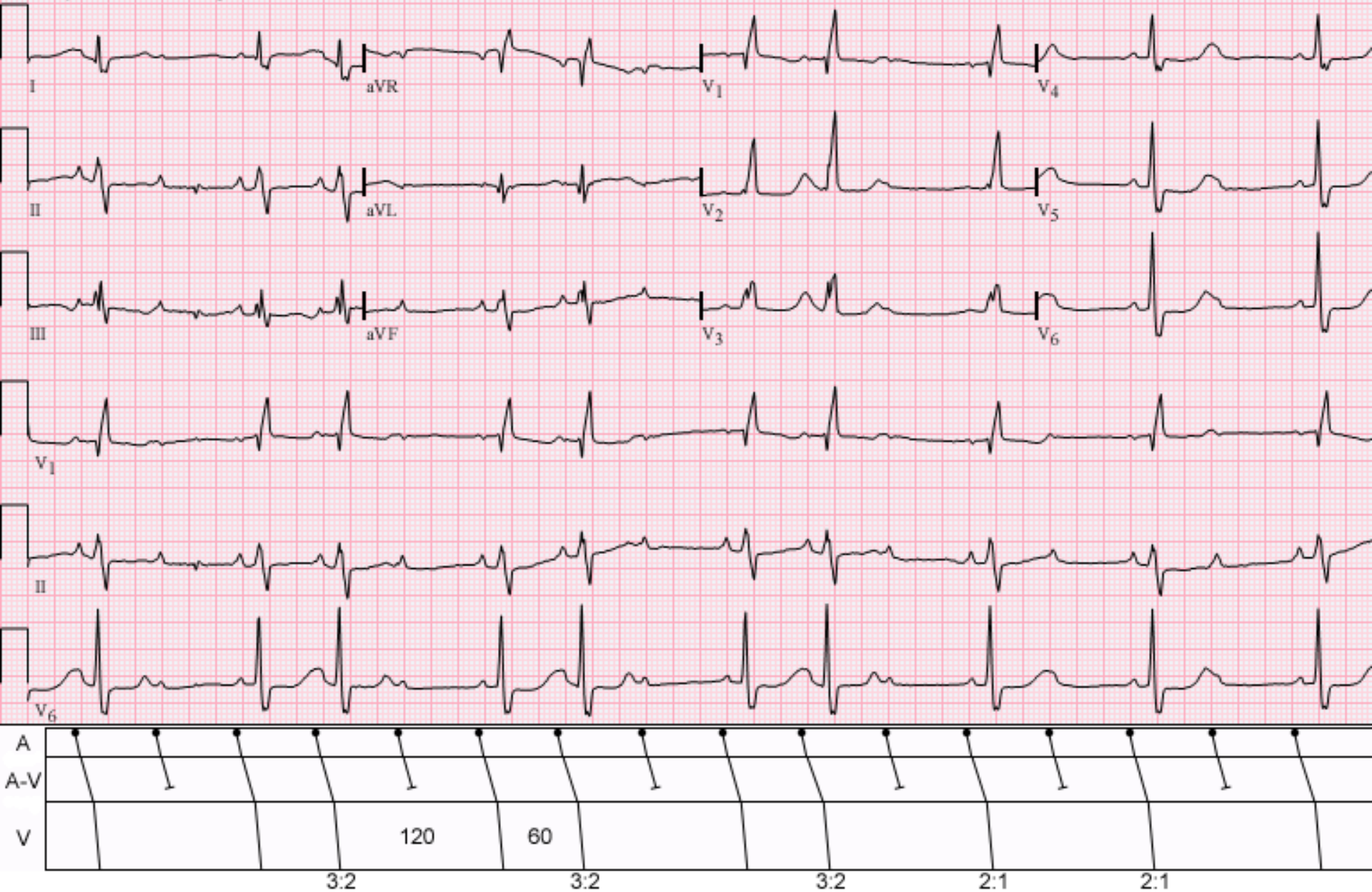
Mobitz 2

- P wave totally blocked producing a 2 to 1 block
 - Two P waves to one QRS most common
 - Only every other P wave getting through
 - Could be 3:1 or 4:1
- QRS can be prolonged whereas in Mobitz 1 the QRS looks normal
- More serious-can lead to complete HB

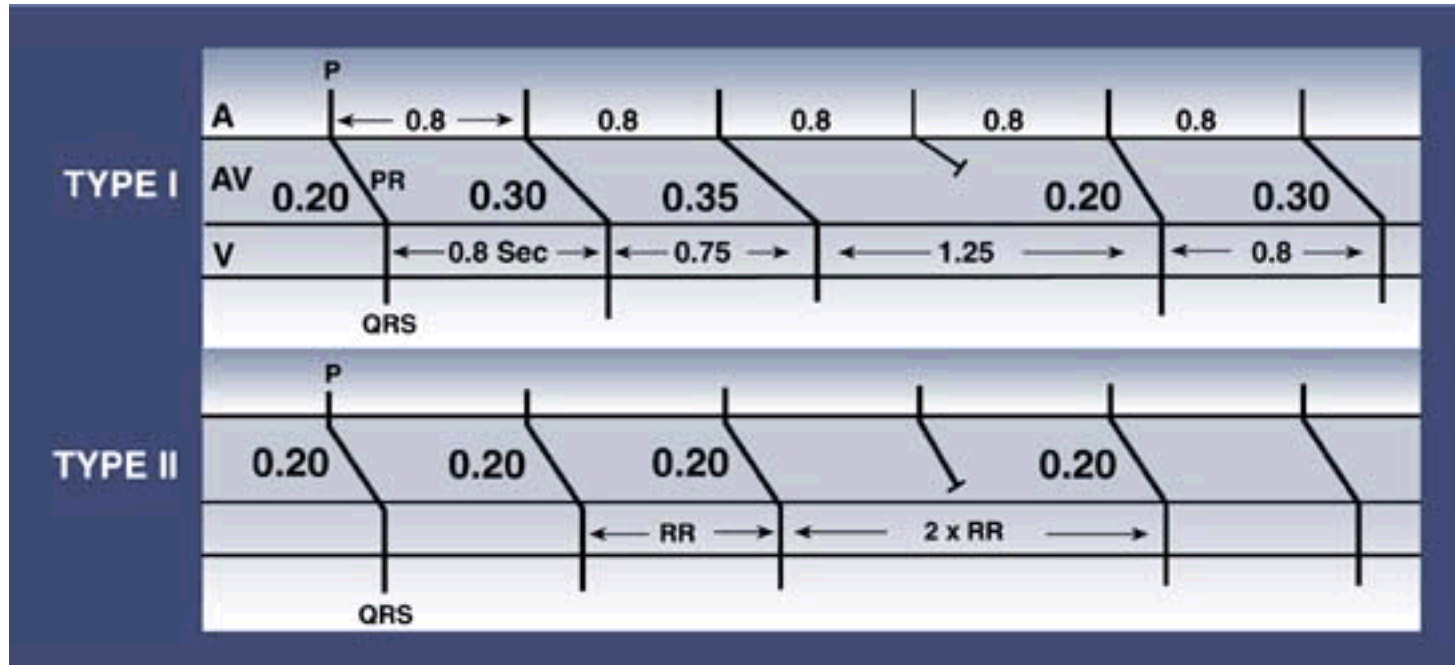
Mobitz 2



Courtesy of Jason E. Roediger, CCT, CRAT

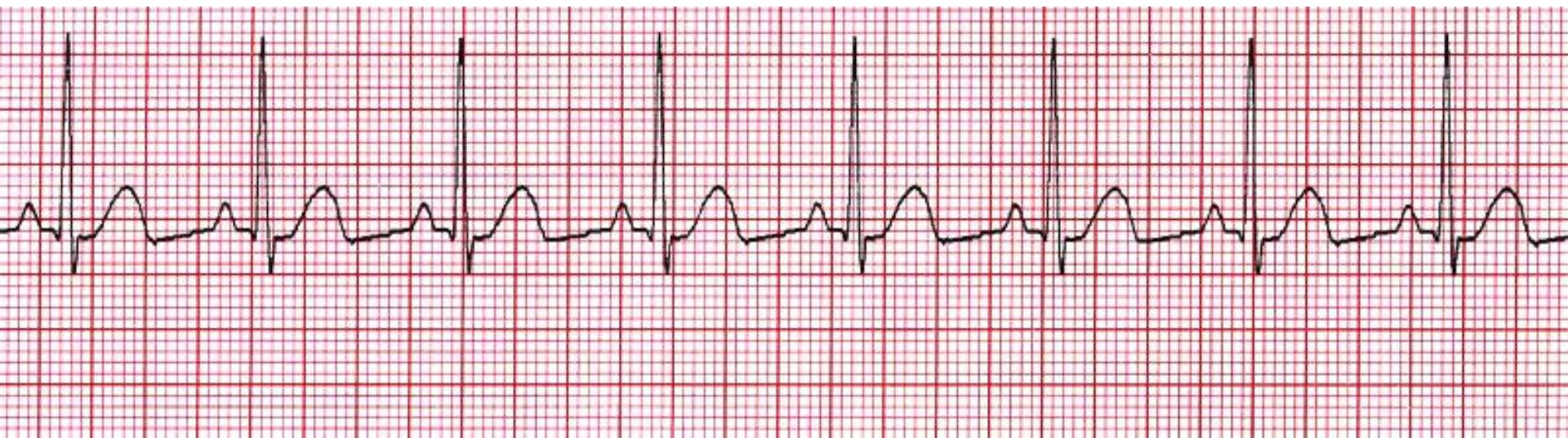


Mobitz 1 vs 2



On Every EKG

- Check PR interval
- Is it the same for each QRS complex?
- Does it progressively get longer?
- Is there a P wave without a corresponding QRS?
- What is the P rate vs the QRS rate?
 - Measure P to P rate just like QRS to QRS rate



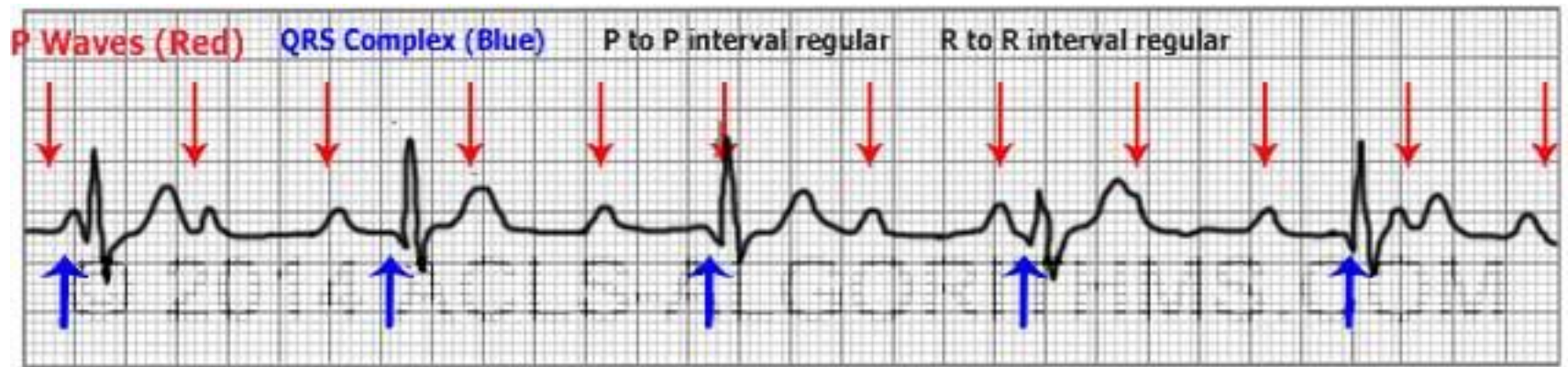
Complete Heart Block

3rd Degree AVB

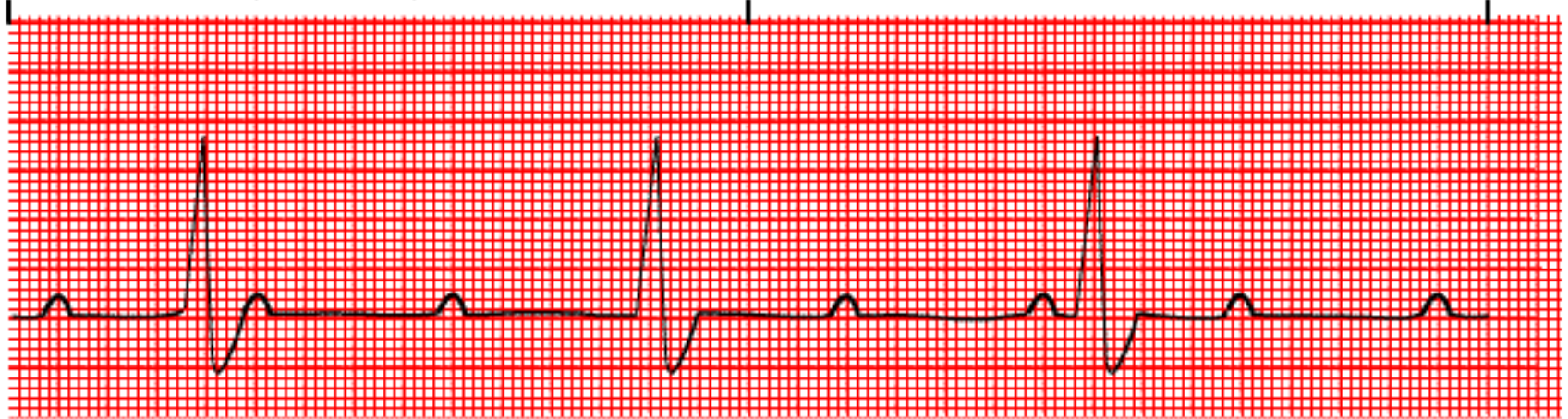
- Several types
 - High in the AV Node
 - Junctional pacemaker: rate may be ok
 - Bundle of His
 - Ventricular pacemaker: rate may be very slow
 - RBBB plus LBBB
 - RBBB plus LAHB plus LPHB
 - Rate very slow; syncope, low BP
 - Need external pacemaker

3rd Degree AVB

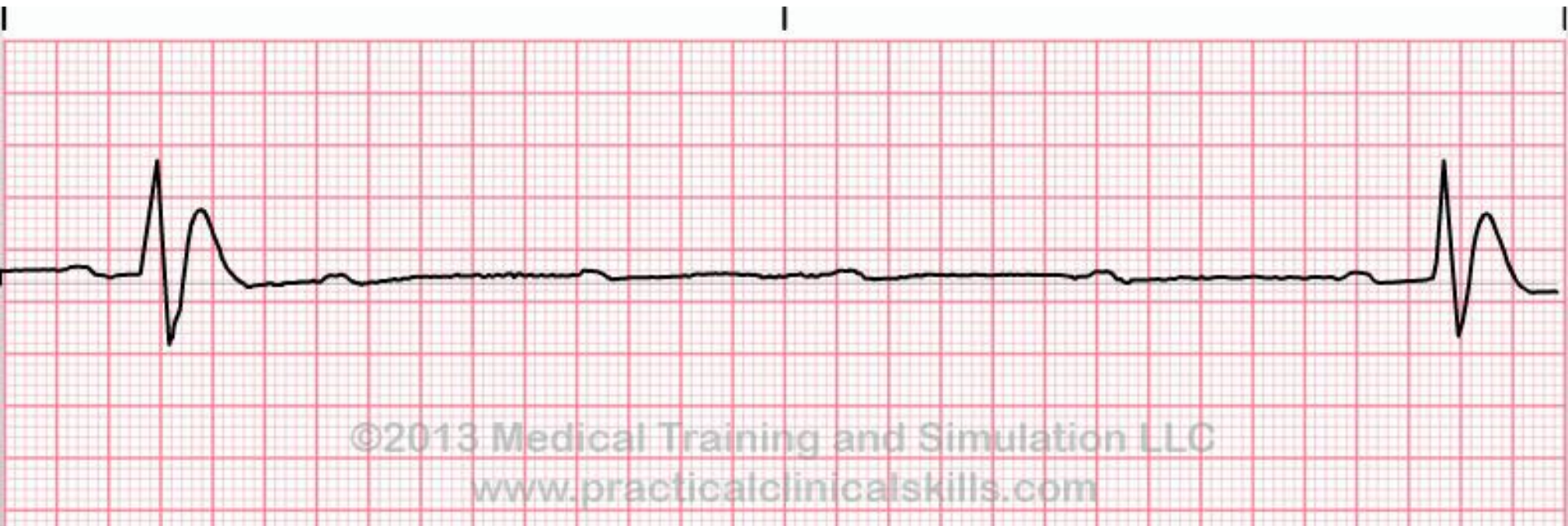
- Will rarely see in insurance unless there has been a pacemaker implanted
- Atrial rate and ventricular rate different
- AV dissociation



THIRD DEGREE (COMPLETE) AV BLOCK



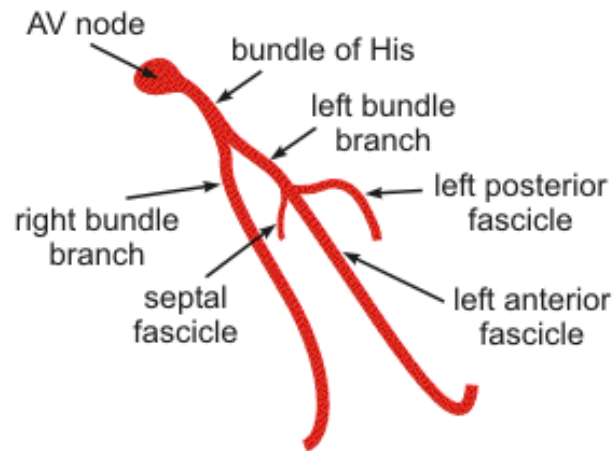
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Bundle Branch Blocks

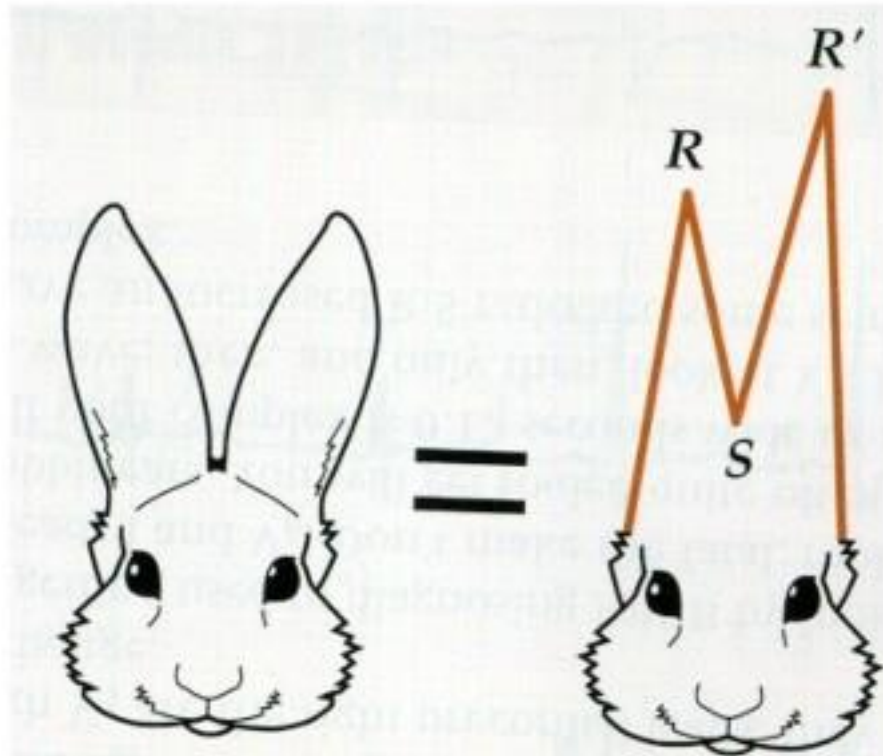
- Block in either the right or left bundle below the bundle of His



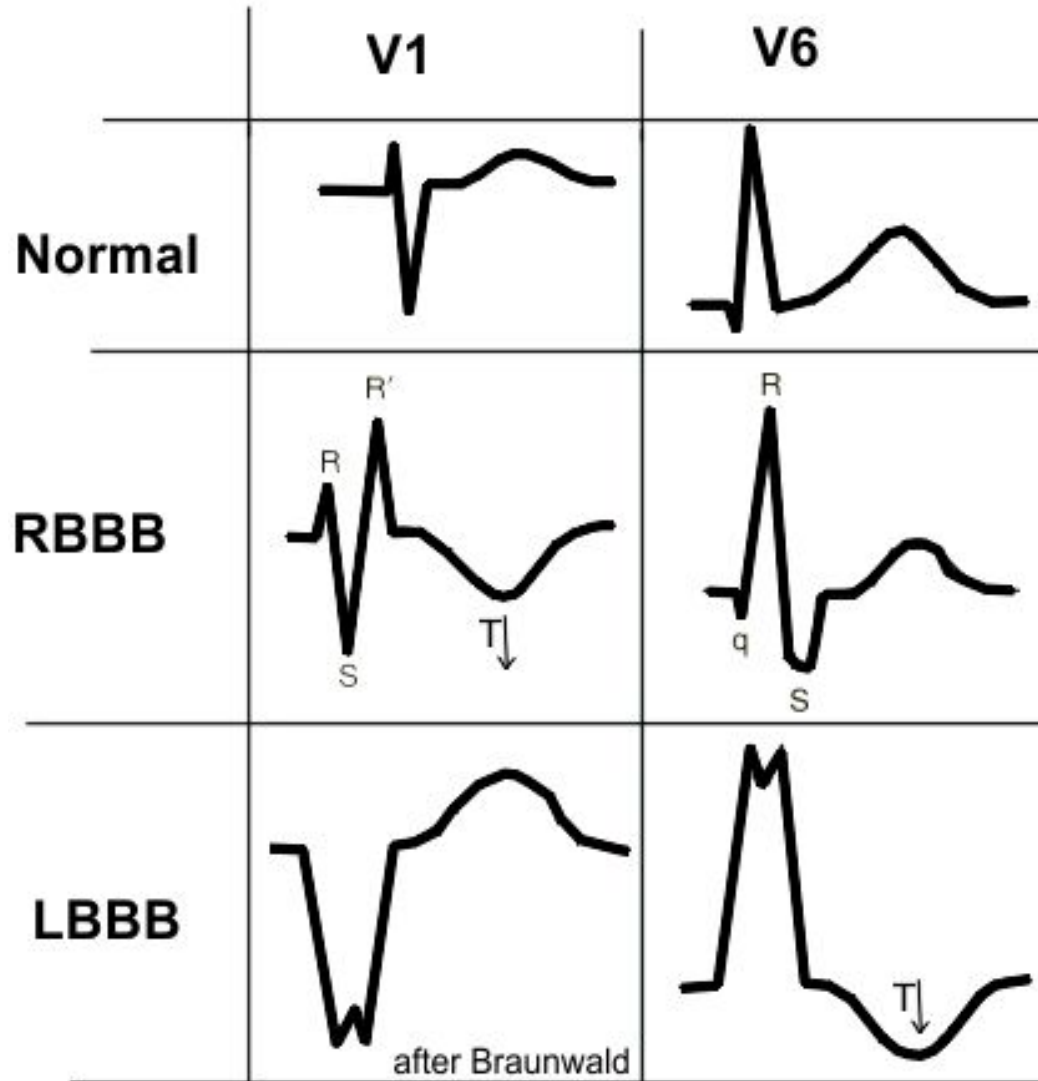
BBB

- Normal QRS < 0.11
- BBB: QRS > 0.12
- Look for the “rabbit ears”: RSR’
- RBBB: rabbit ears in V1-2
- LBBB: rabbit ears in V4-6

Figuur 2

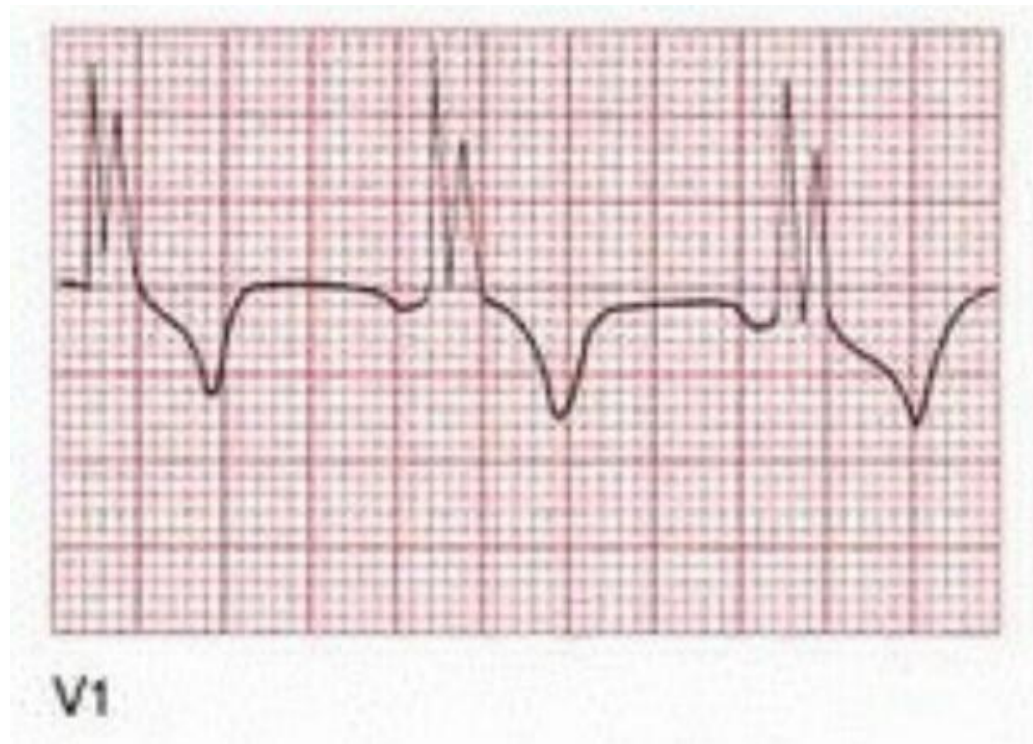


R S R'

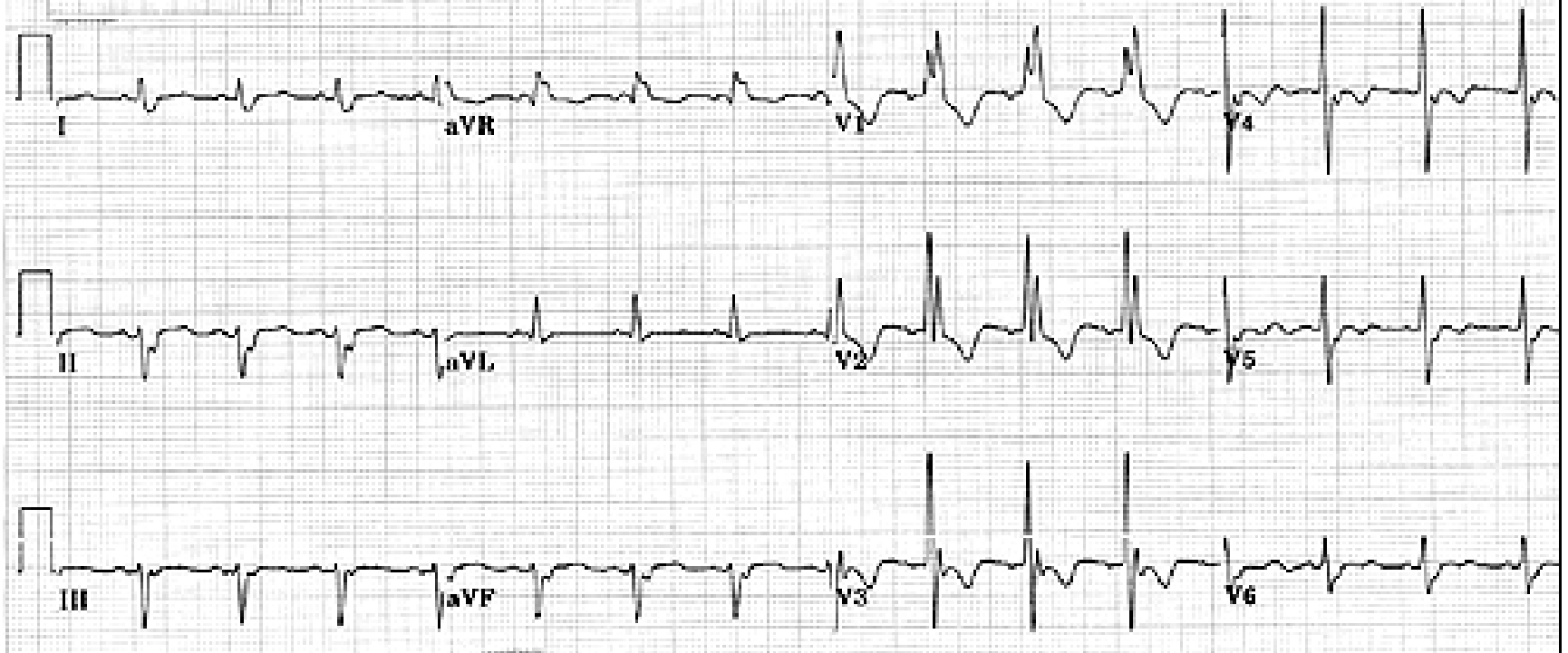


RBBB

- Rabbit ears in V1-2
- Deep S wave lead 1



18-JAN-1939 (57 yr)
Male Caucasian

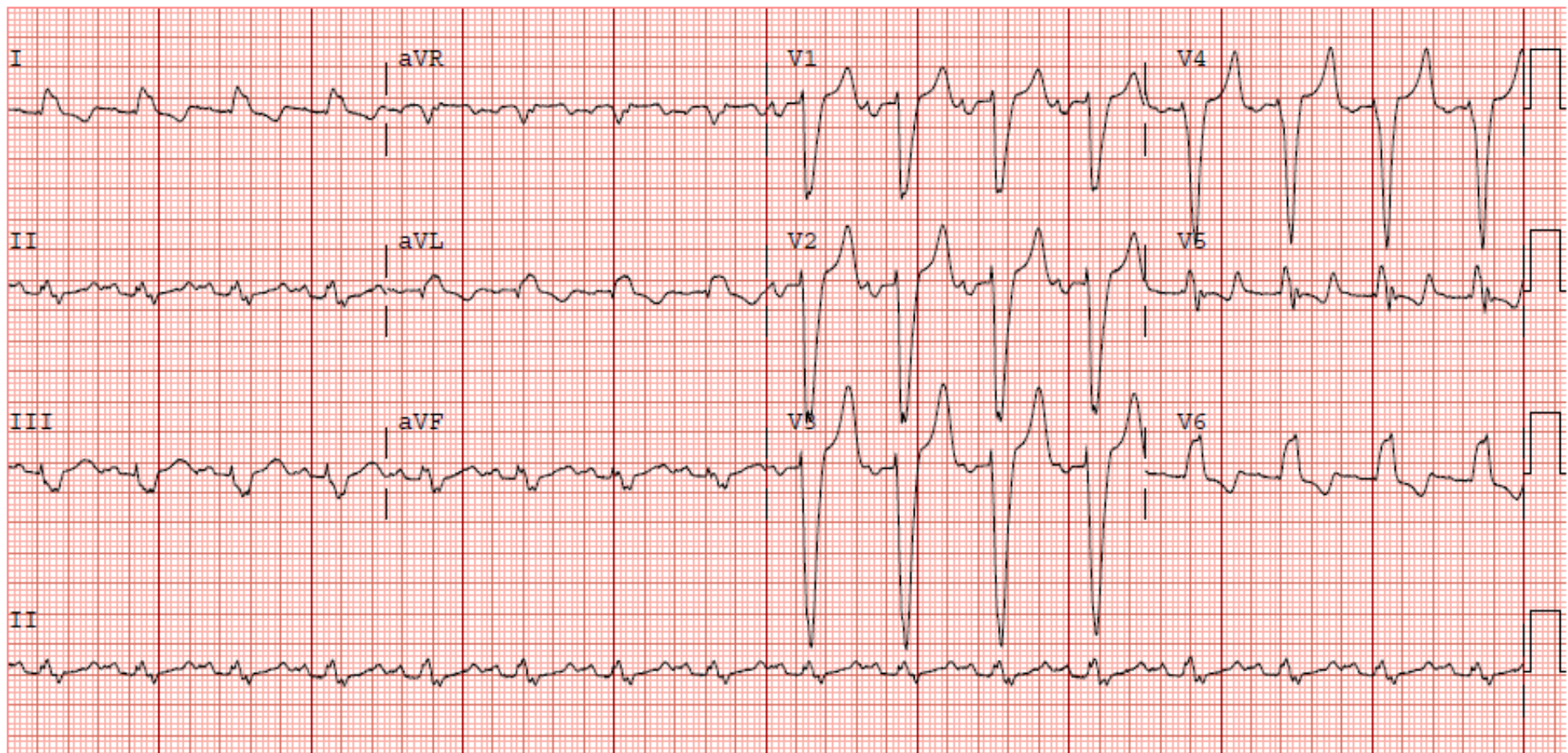


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LBBB

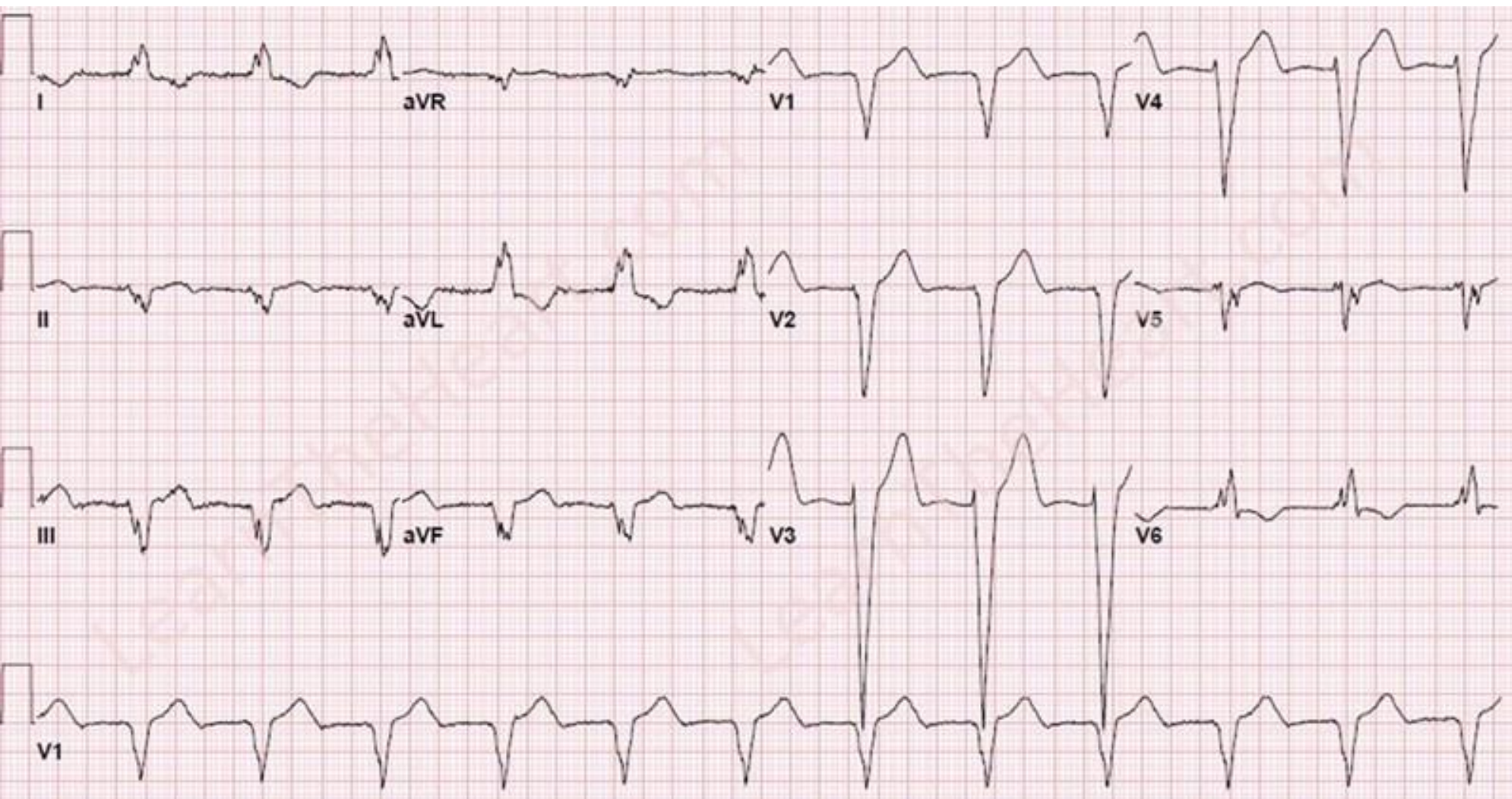
- Rabbit ears in V4-6
 - Frequently see in lead 1 and AVL
- QRS typically very wide in limb leads
- May look like old anterior MI in V1-4



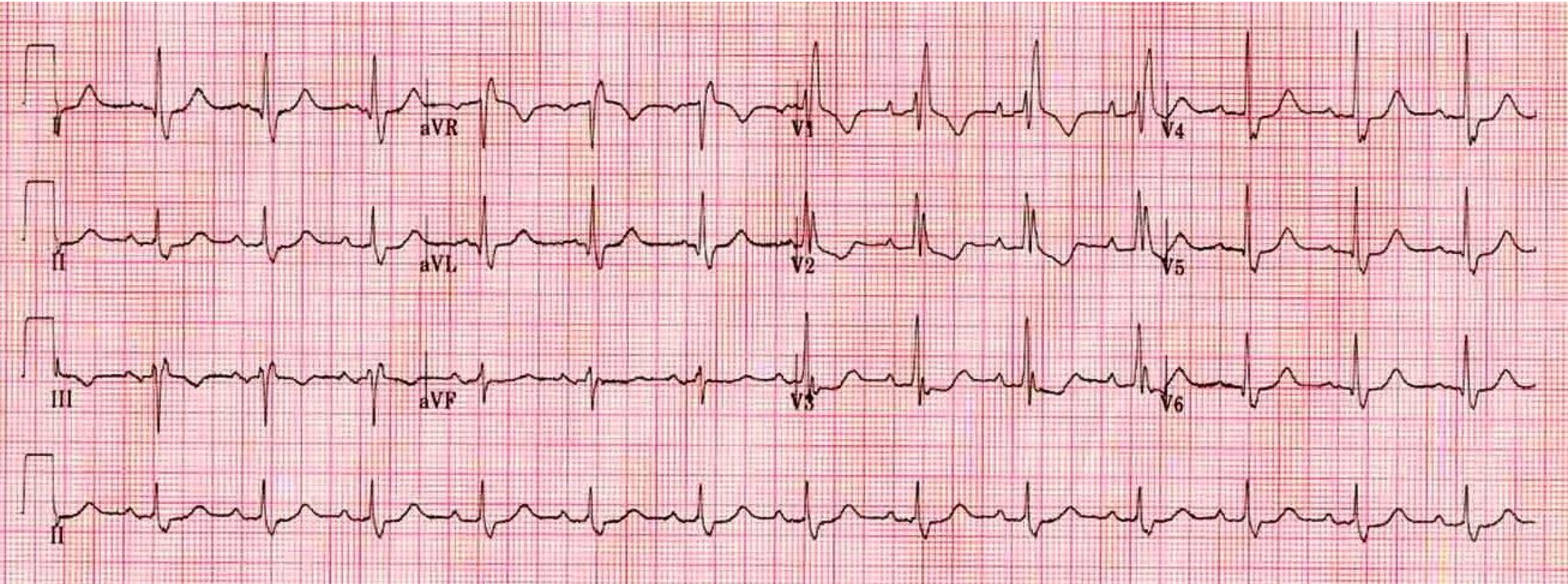
In Summary

- If QRS is wide: > 0.12 msec
- Look for rabbit ears
 - V1-2 = RBBB
 - V4-6 = LBBB
- LBBB tracing looks much more bizarre than RBBB
- Refer

LBBB

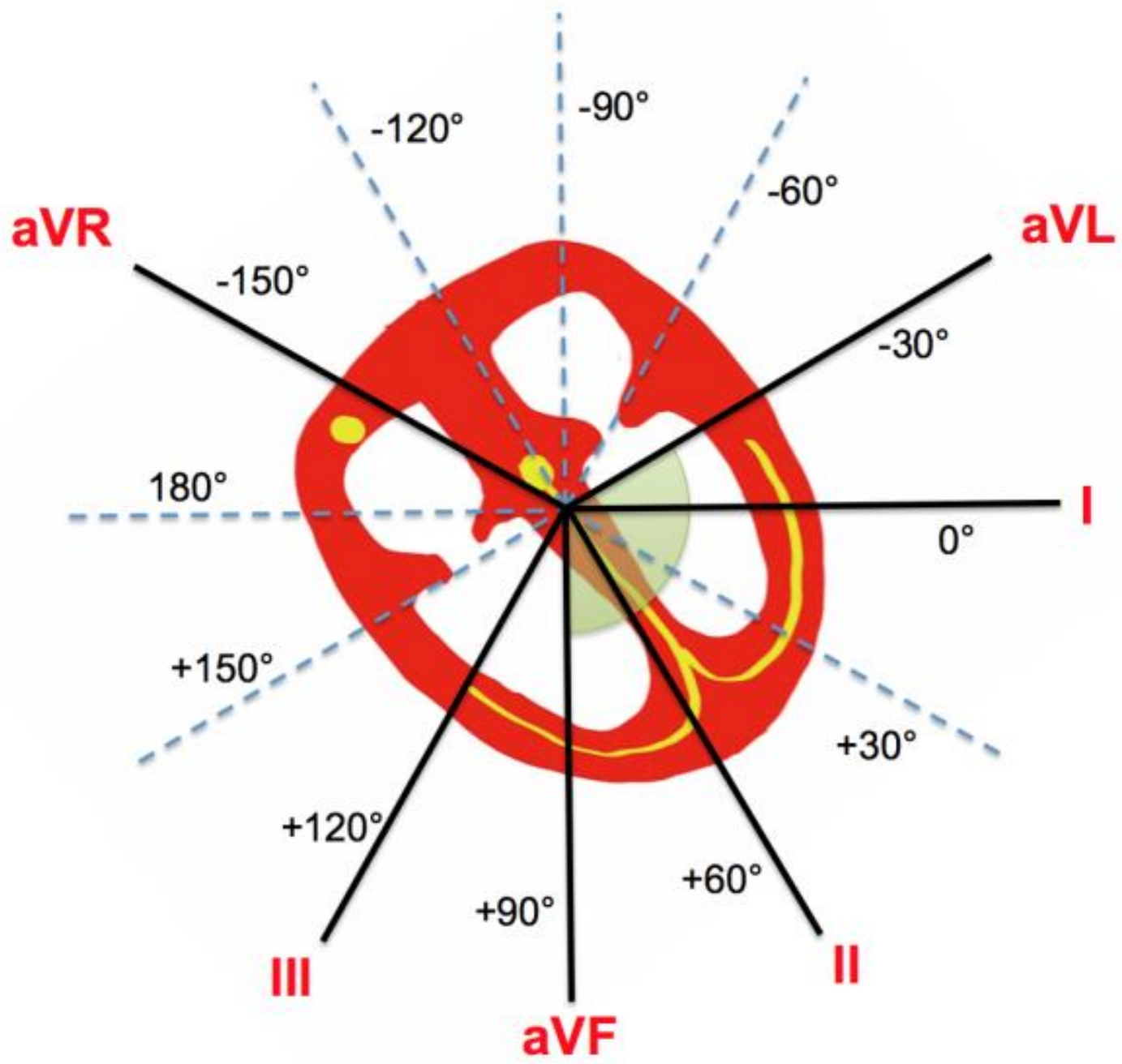


RBBB



Axis

- Axis is the direction of depolarization
- If the direction is +, the EKG needle deflects upward
- If the direction is -, the needle deflects downward
- The mean QRS axis is down and left
 - If more left “horizontal heart”
 - If more down “vertical heart”
 - May see these terms in EKG reports or APS



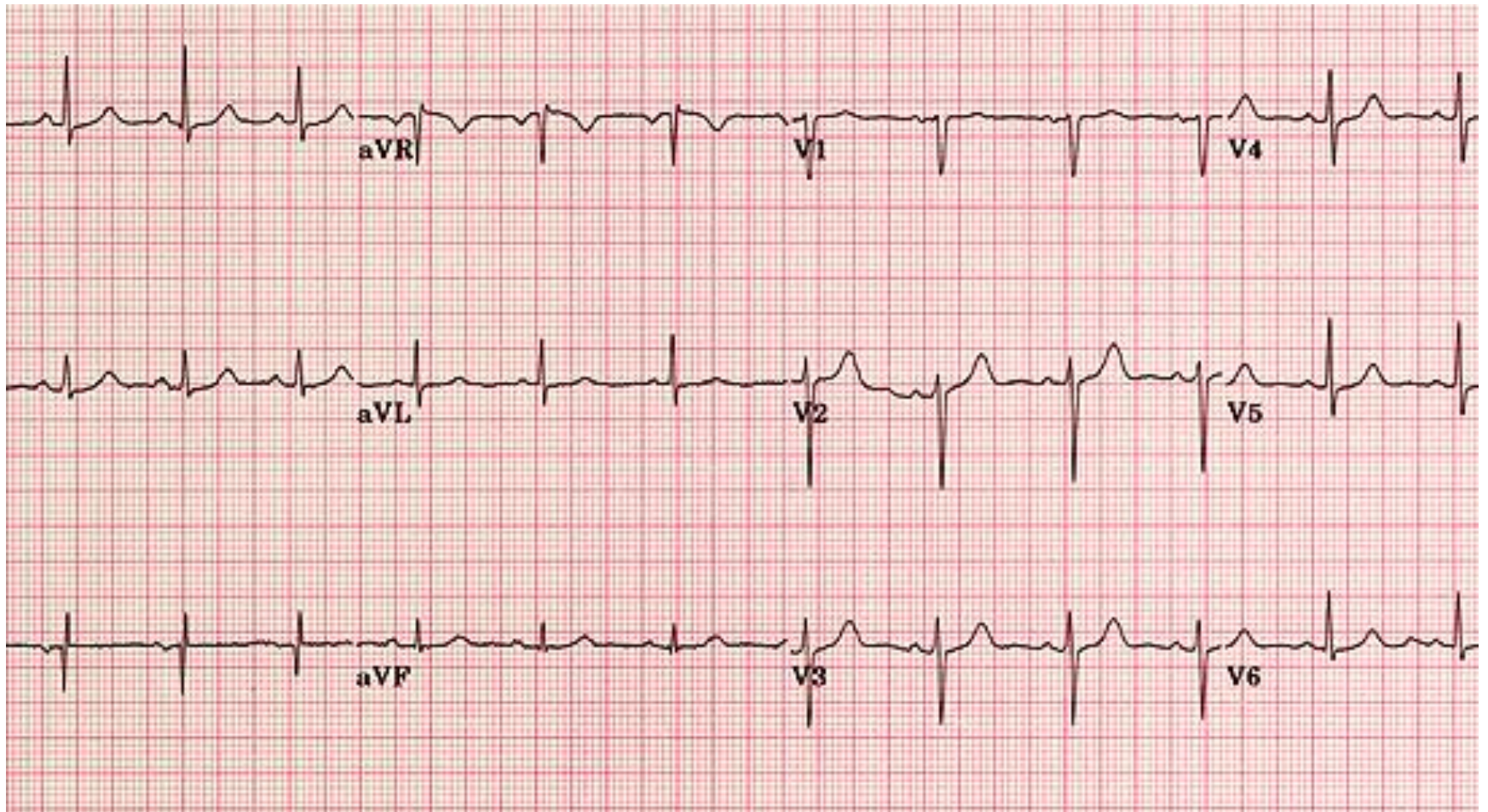
Axis

- Normal axis
- Right axis-RAD
- Left axis-LAD
- Indeterminate axis or extreme RAD

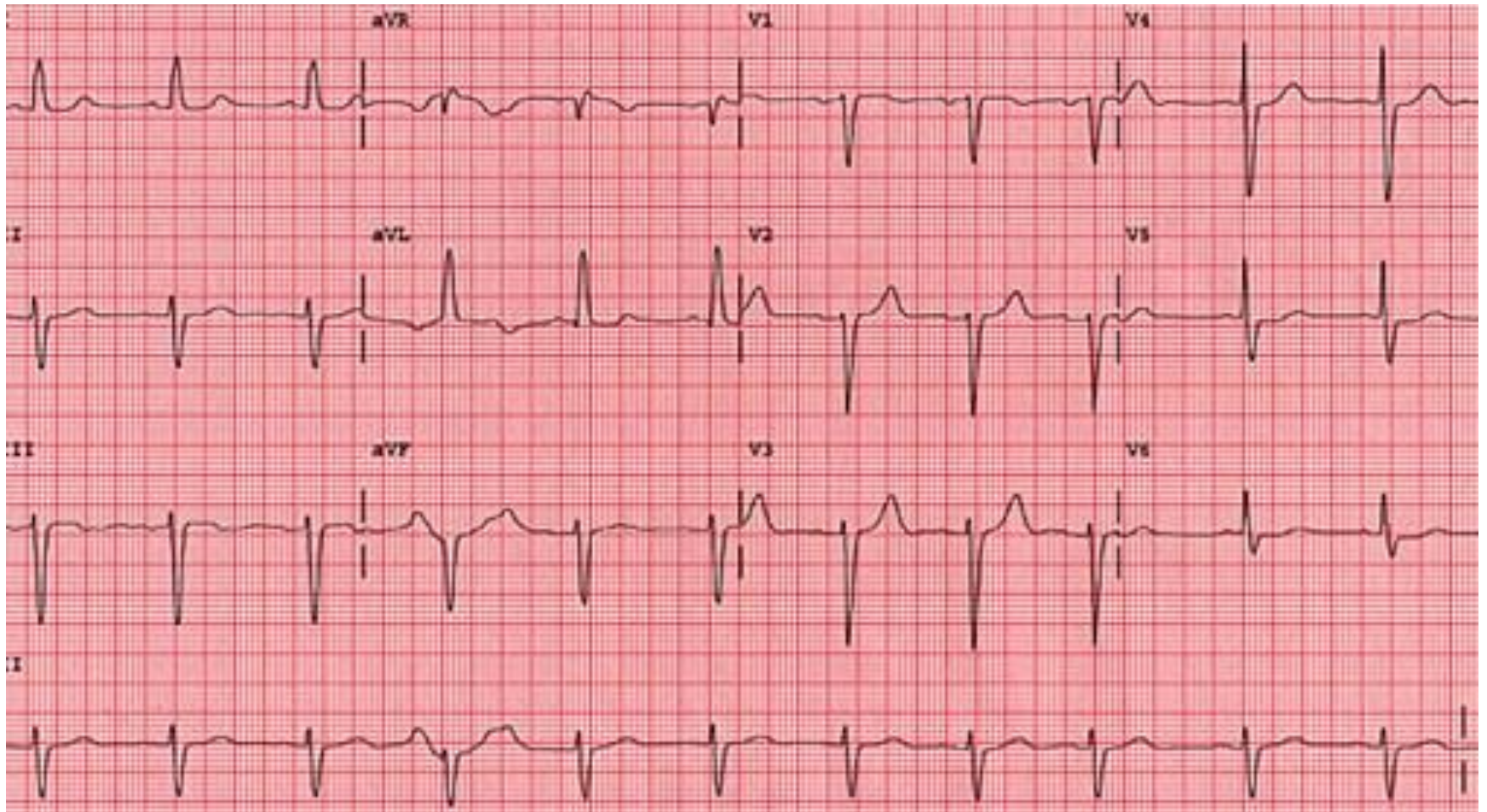
Axis

- look at leads 1 and 2
- If leads 1 and 2 are positive: normal axis
- If lead 1 is pos and 2 is neg: LAD
- If lead 1 is neg and 2 is pos: RAD
- If lead 1 and 2 are neg: indeterminate axis
- LAD much more common than RAD

Normal Axis



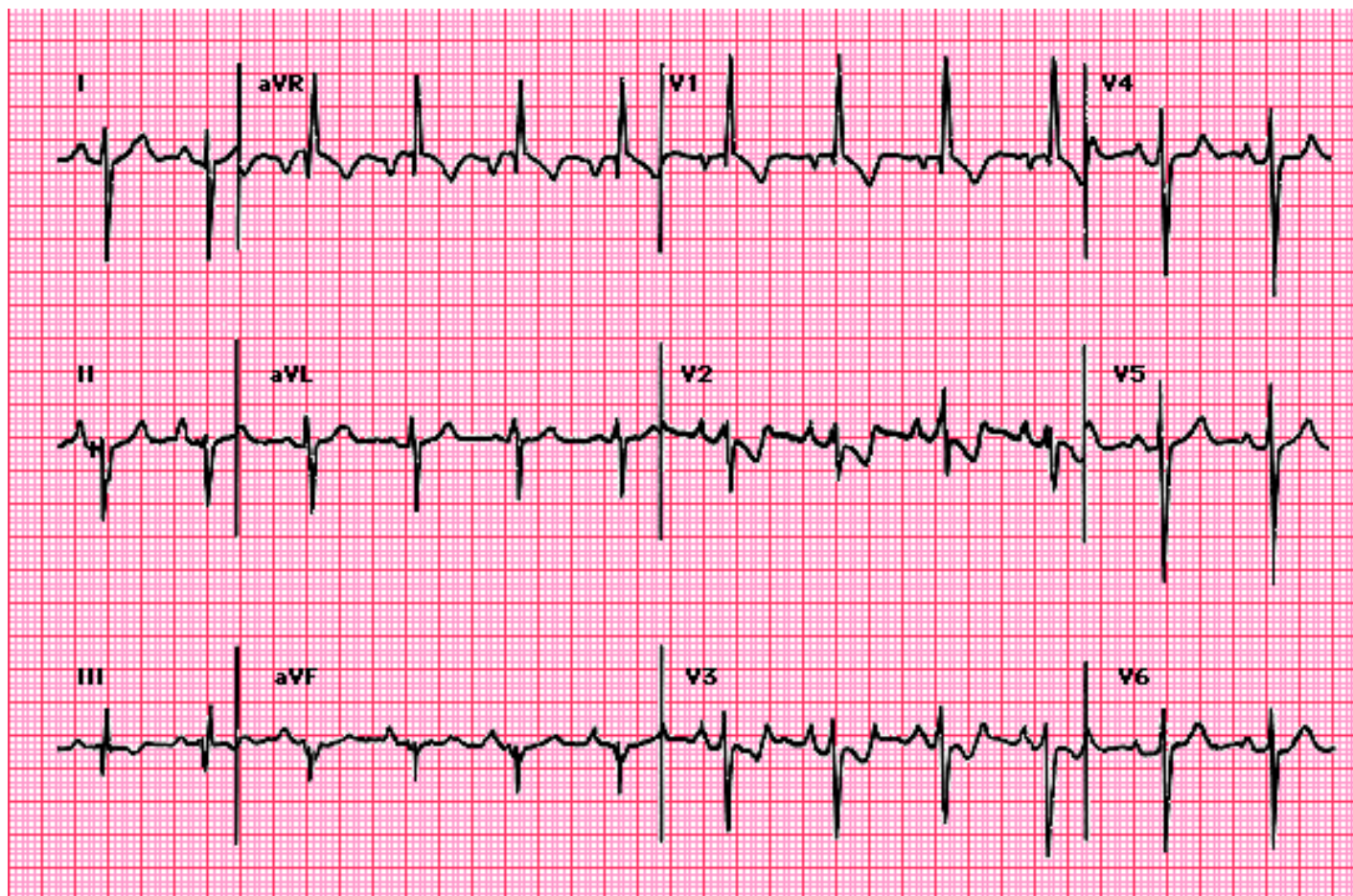
LAD



RAD



Indeterminate or Extreme RAD

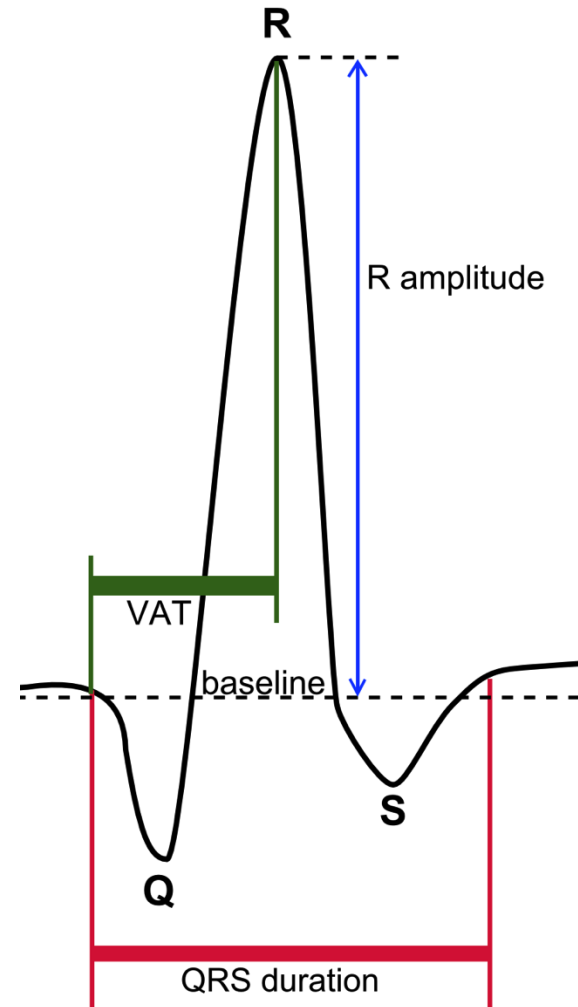


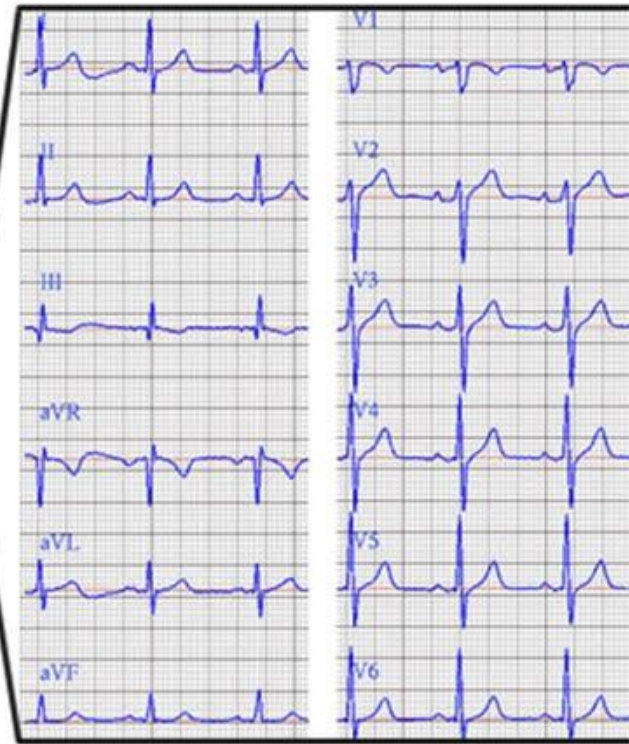
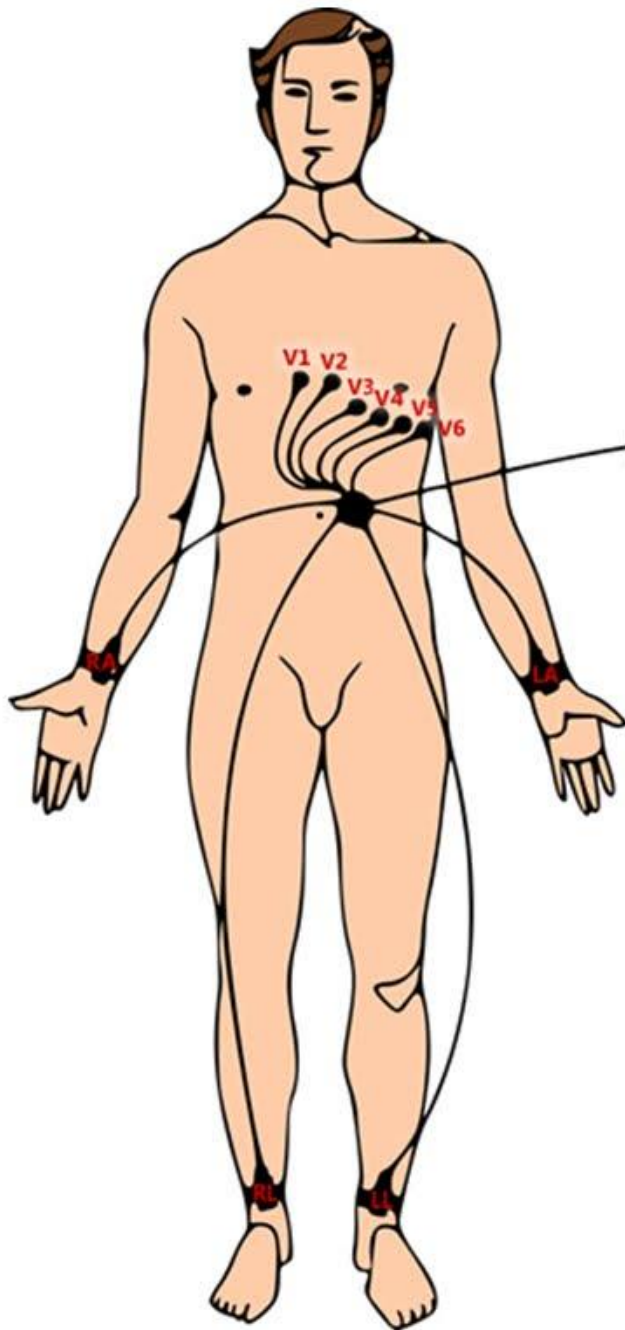
Right ventricular hypertrophy Right ventricular hypertrophy due, in this case, to primary pulmonary hypertension. The characteristic features include marked right axis deviation ($+210^\circ$ which is equal to -150°), tall R wave in V1 (as part of a qR complex), delayed precordial transition zone with prominent S waves in leads V5 and V6, inverted T waves and ST depression in V1 to V3 consistent with right ventricular "strain", and peaked P waves in lead II consistent with concomitant right atrial enlargement.
Courtesy of Ary Goldberger, MD.

Chest Lead Transition

Chest Lead Transition

- V1-2: small R large S
- V3-4: equal R and S
- V5-6: large R small S
- Transition area is V3-4





V1 - 4th intercostal space
R sternal border

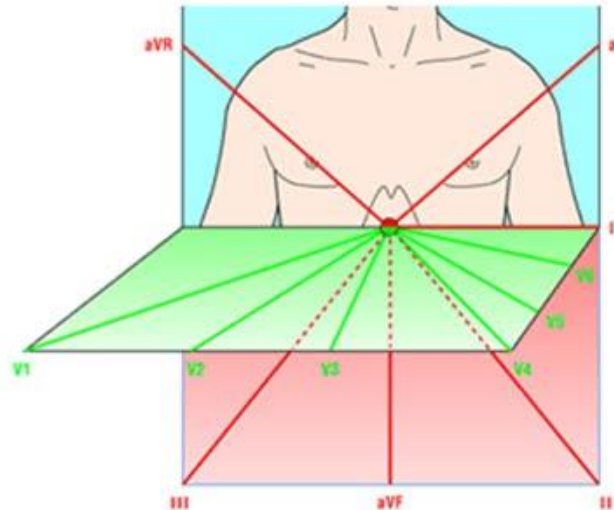
V2 - 4th intercostal space
L sternal border

V3 - Between leads V2 and V4.

V4 - 5th L intercostal space in
midclavicular line

V5 - Horizontally even with V4,
but in the anterior axillary line.

V6 - Horizontally even with V4
and V5 in the midaxillary line.
(The midaxillary line is the
imaginary line that extends
down from the middle of the
patient's armpit.)



Hypertrophy

- Atrial: look at P waves
- Ventricular: look at QRS
- Don't worry as much about atrial hypertrophy
- Ventricular hypertrophy of more concern
- LVH and RVH

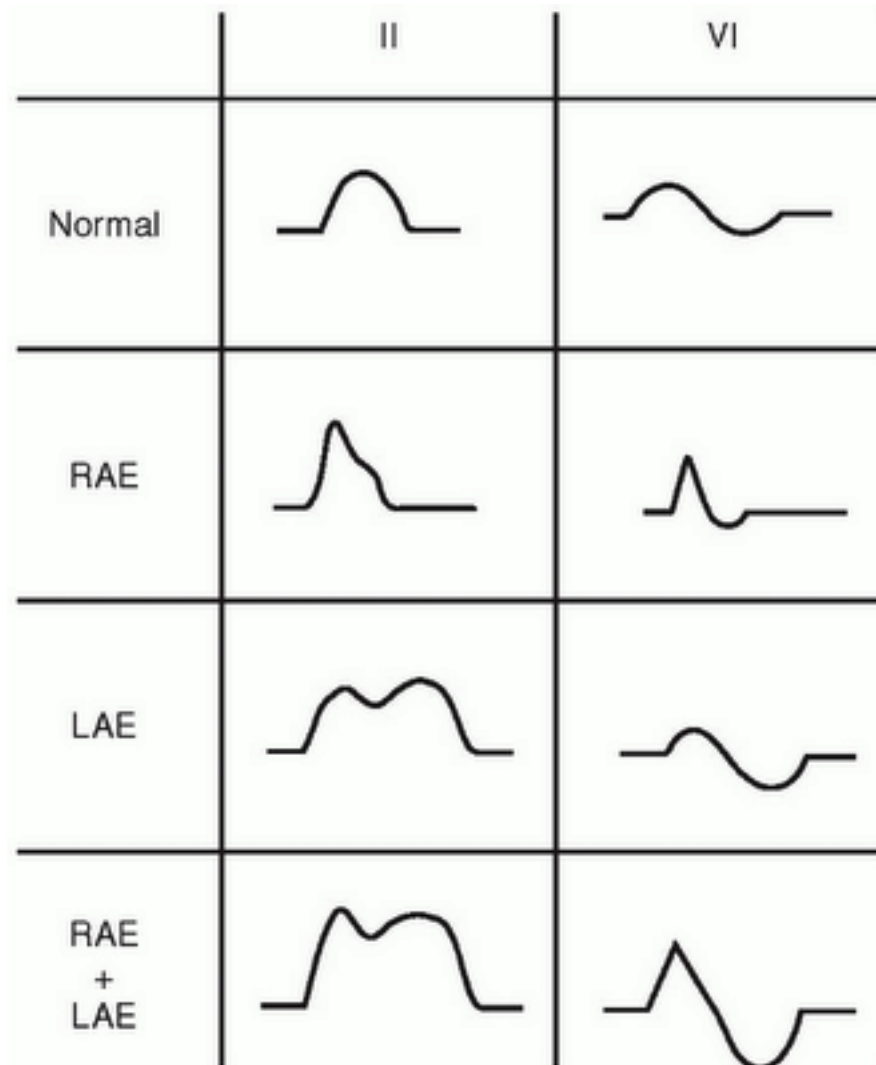
Atrial Hypertrophy or Enlargement

- Atrial contraction represented by the P wave
- Lead V1 and lead 2 is best place to look at P waves
 - Lead placement is critical
- RAE and LAE

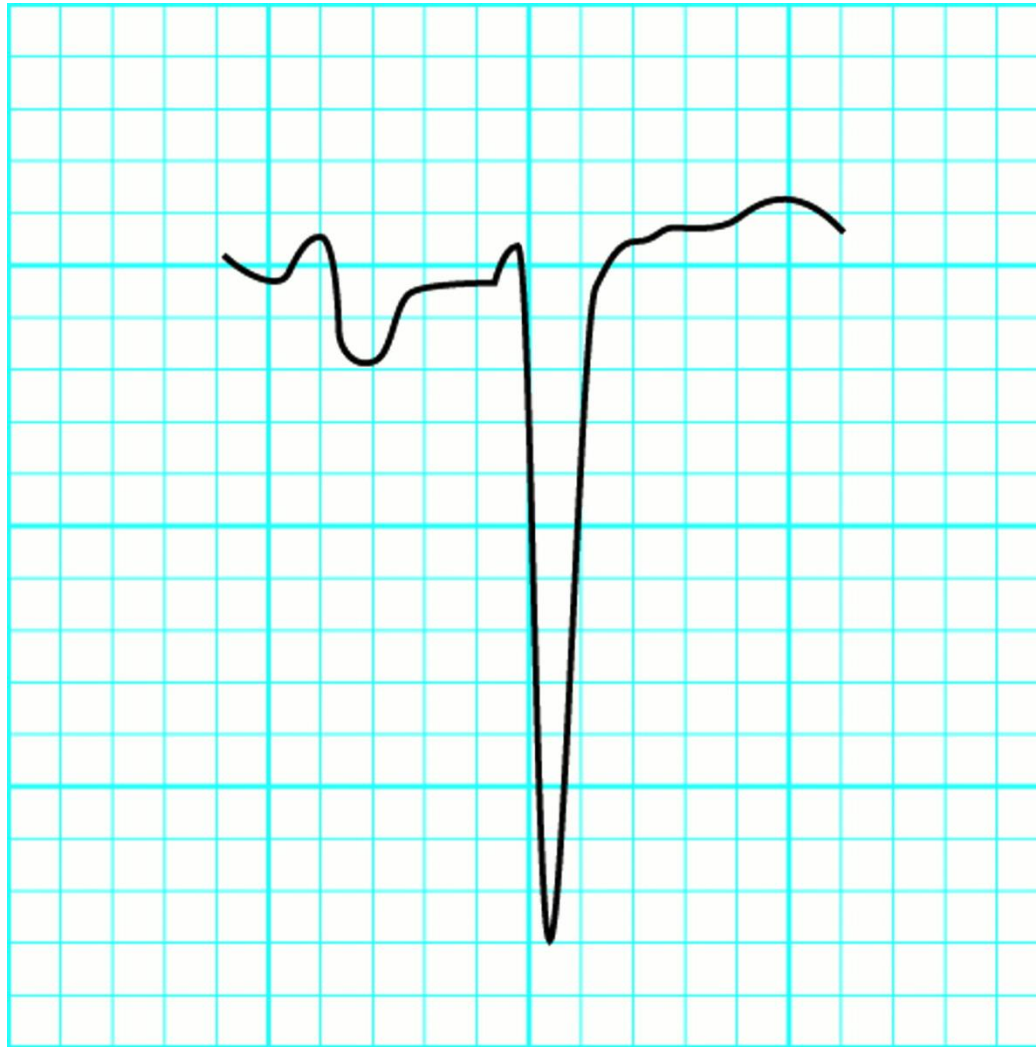
RAE and LAE

- RAE
 - Peaked and/or notched tall P waves in 2, 3, and F
 - Chronic lung disease
 - Tricuspid stenosis
 - Pulmonary hypertension, OSA
- LAE
 - Diphasic P wave V1
 - Mitral stenosis, HTN, CHF

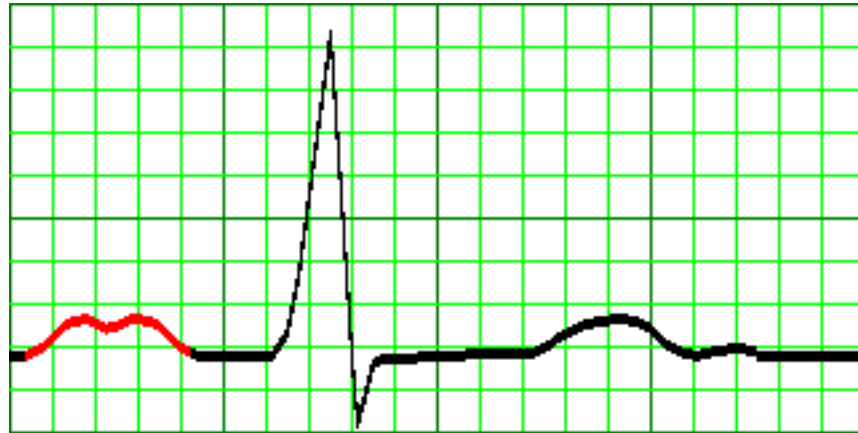
RAE/LAE



Diphasic P wave



Notched P wave

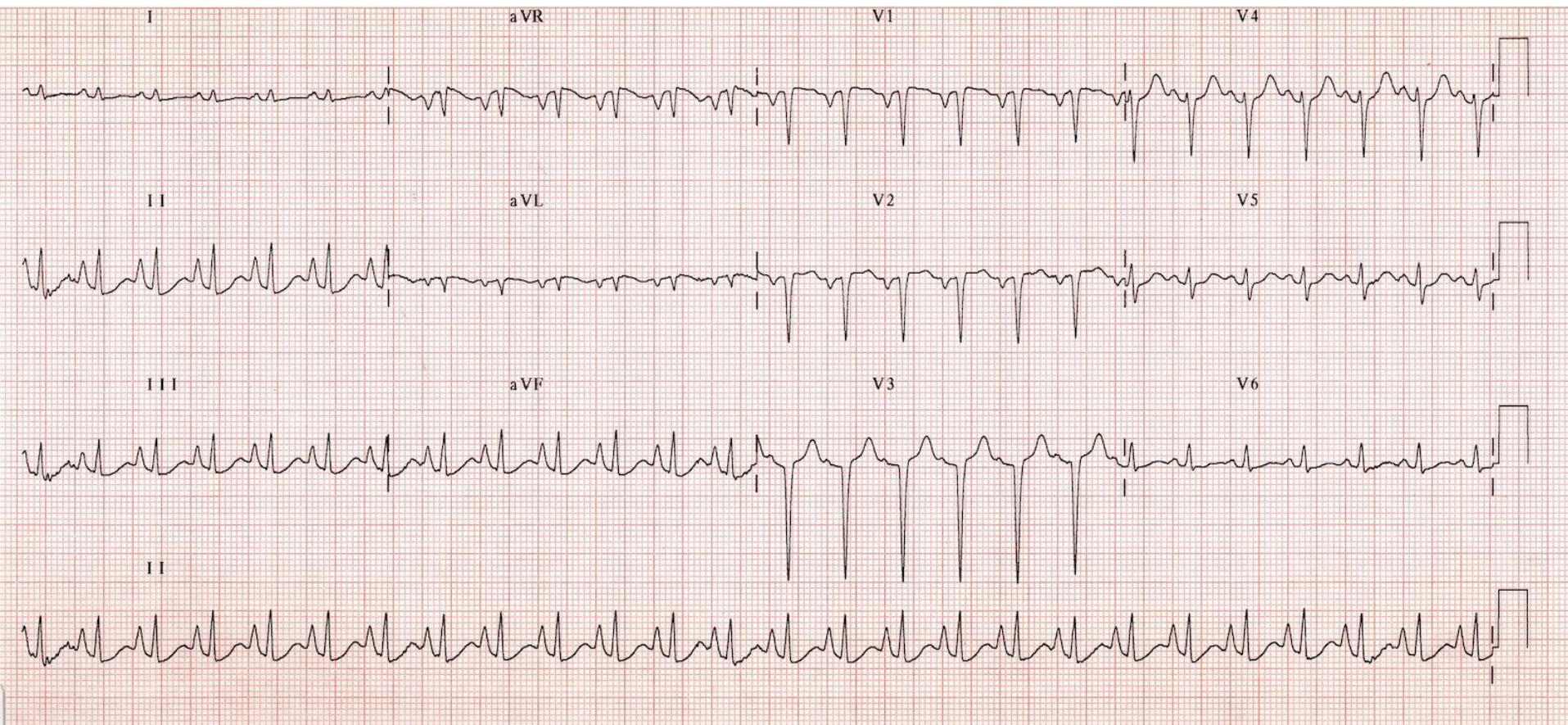


Peaked P waves



Lead 2

Peaked P waves



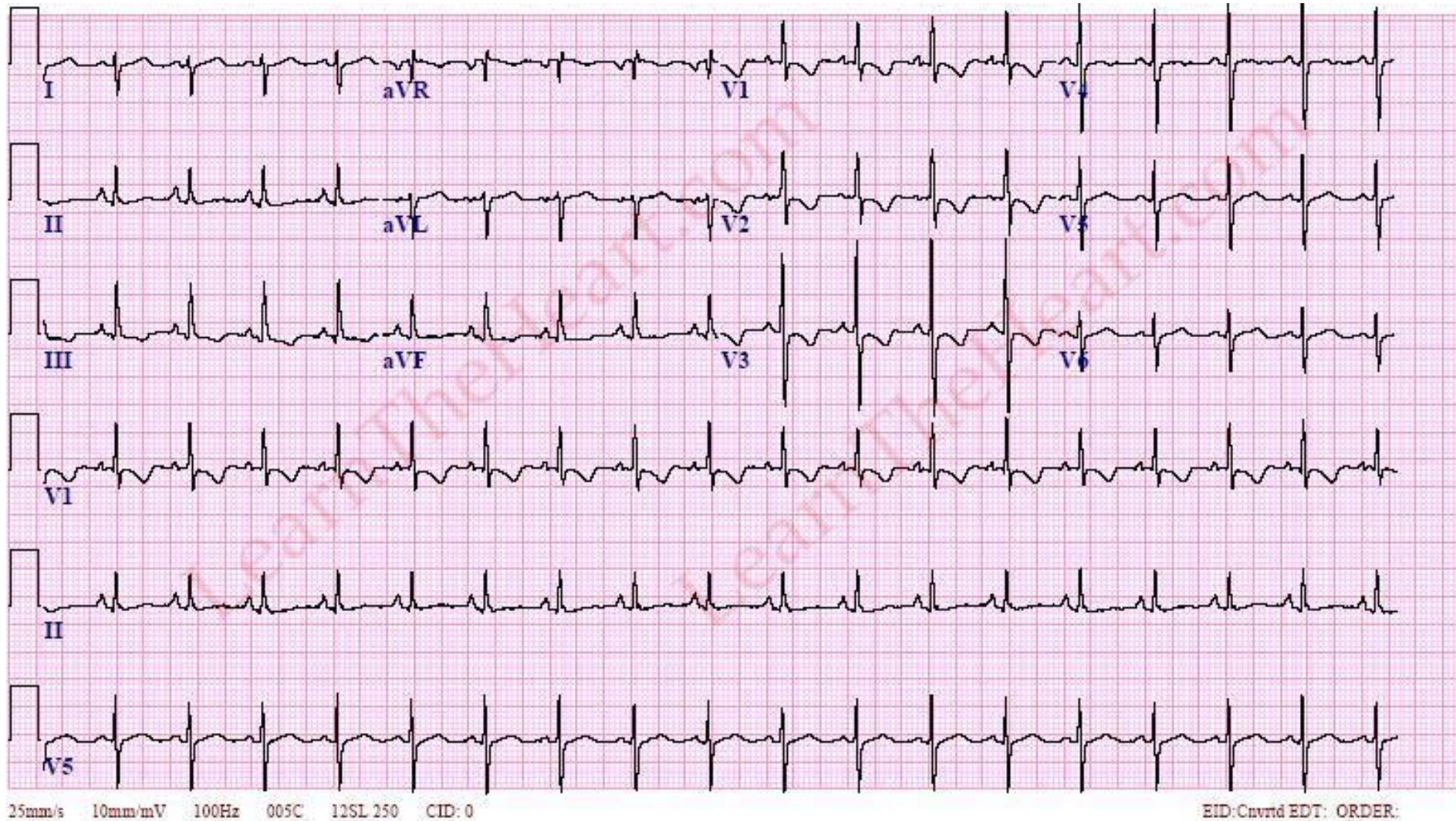
Left Atrial Enlargement



Right Ventricular Hypertrophy

- Look at V1 and 2
- Normally the R wave is small in V1-2
- With RVH the $R > S$ in V1
- Often see RAD
- Lead placement critical
 - A real issue with insurance EKG's

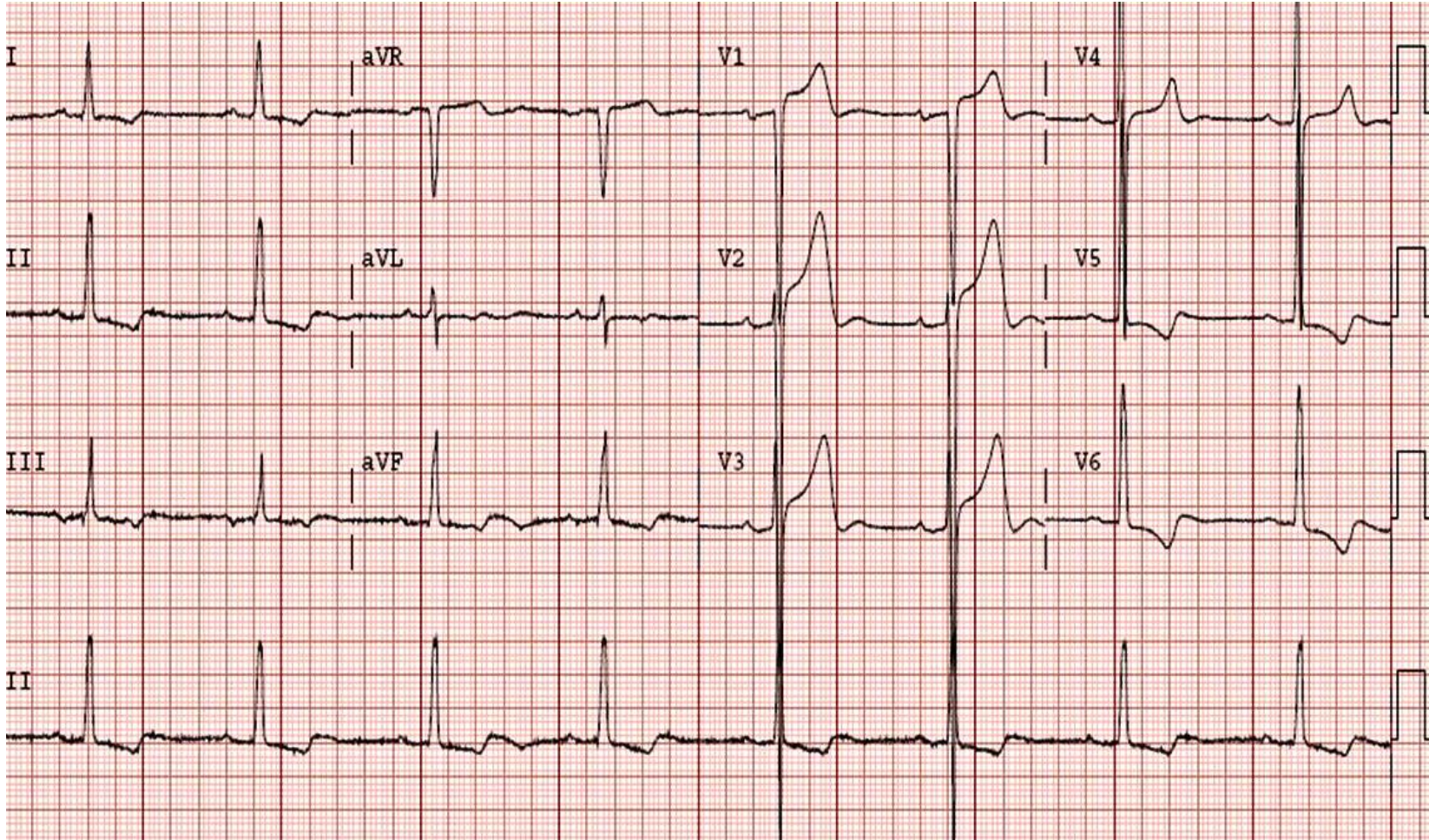
RVH

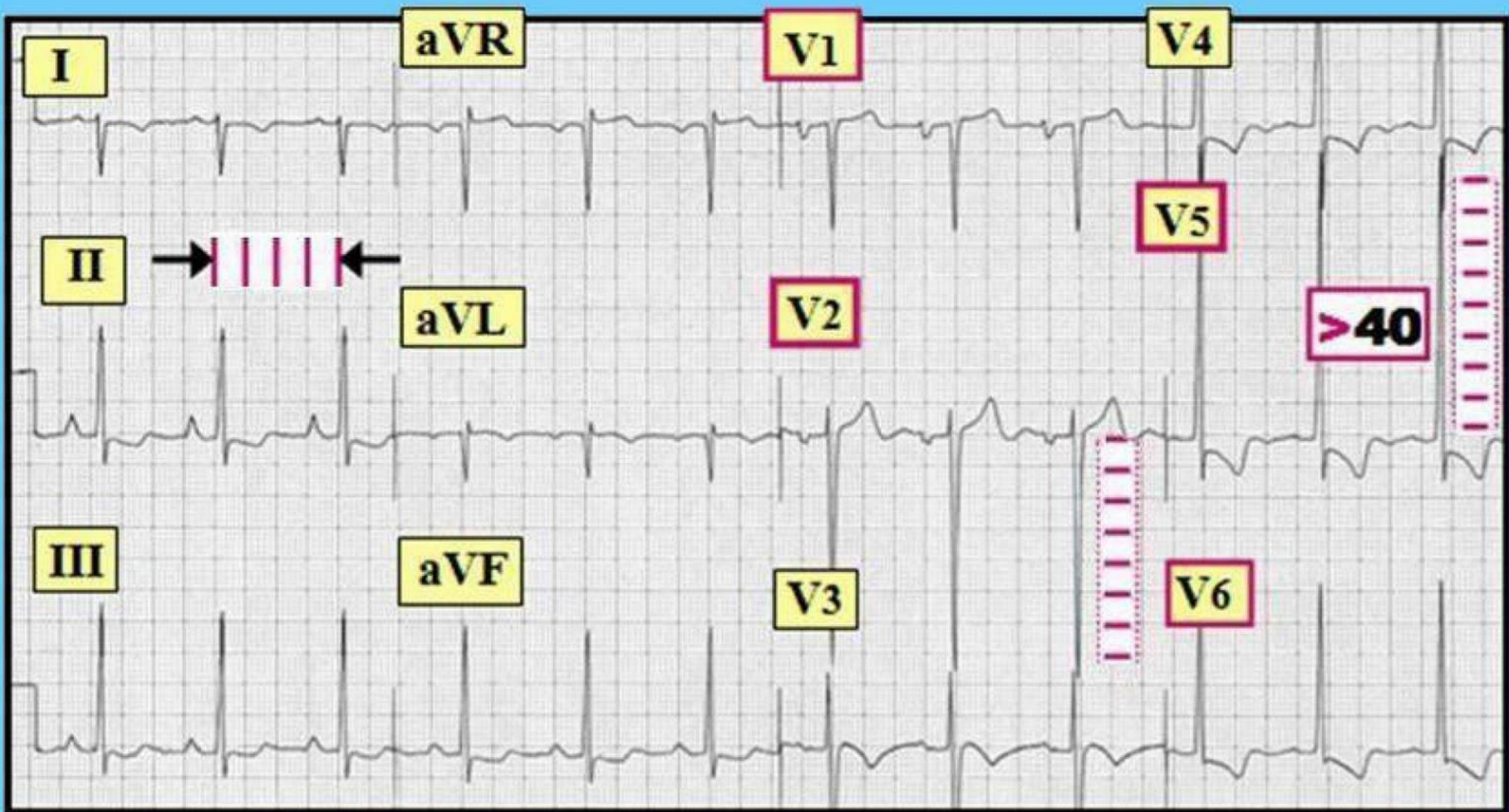


Left Ventricular Hypertrophy

- Large S wave in V2
- Large R wave V5
- S in V2 + R in V5 $>$ 35mm (some say 40)
 - Use calipers to measure
- R wave in lead AVL $>$ 11mm

LVH





LVH with Strain

- Meets all criteria for LVH plus marked inverted T waves in the V leads
- More serious
- Typically associated with severe uncontrolled HTN
- Manual highly rate

LVH with Strain



