Section 5

LBBB, RBBB

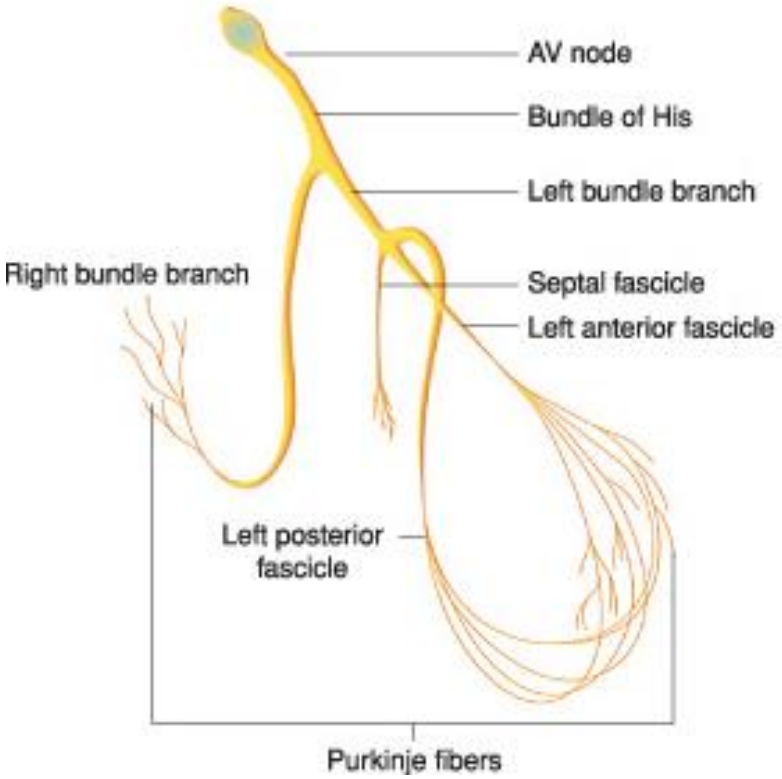
Bifascicular, Trifascicular Block

Objectives

- At the conclusion of this presentation the participant will be able to
  - Outline a systematic approach to 12 lead ECG interpretation
  - Dysrhythmias
  - Demonstrate the process for determining axis
  - List criteria for LVH, RVH, RAE, LAE LBBB, RBBB, Bifasicular and trifasicular block, acute and chronic MI changes
  - Define QTc significance and other EKG Abnormalities

Bundle Branches

- Bundle of His divides into right and left bundle branches
- Left bundle branch divides into septal, anterior and posterior fascicles



Conduction Abnormalities
BBB

- Causes of BBB
  - Arterial occlusion total
  - Arterial occlusion partial
  - Structural changes

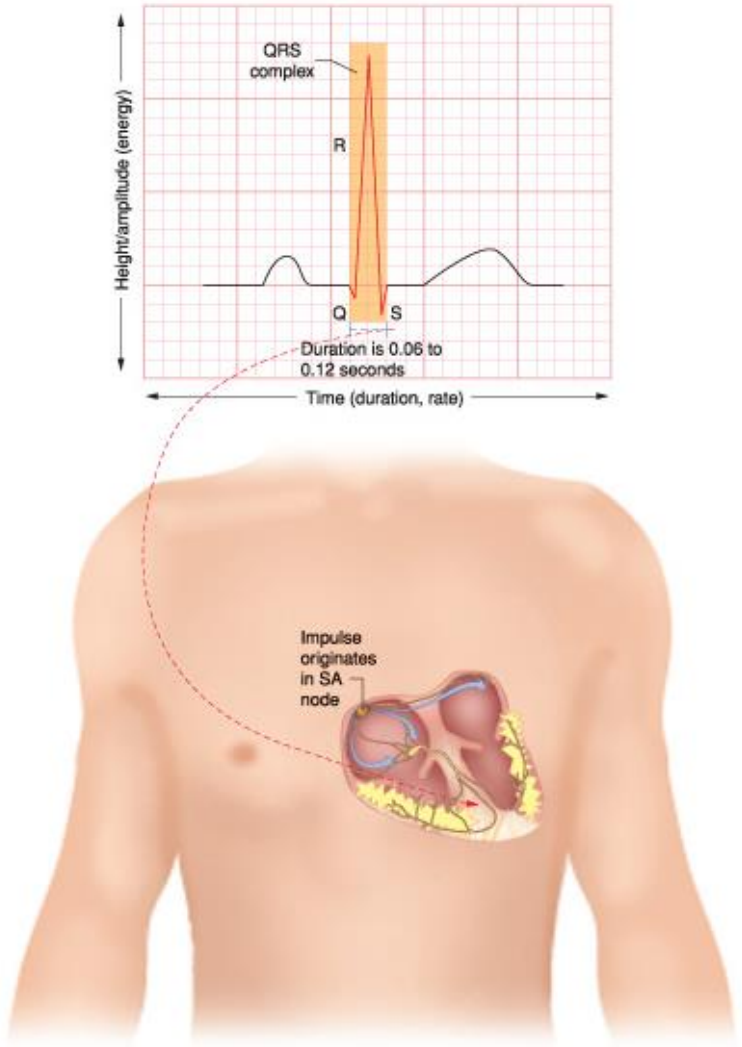
  Helpful hints r/t BBB

  ST segment and the T wave are opposite deflection of QRS

  If T waves same deflection, may mean ischemia

Normal QRS Complex

- Narrow - < 0.12 seconds in duration
- Electrical axis between 0° and +90°



QRS Interval/Bundle Branch Block

Assess QRS Duration

1. QRS duration can be measured from any of the 12 leads
2. All that matters is whether the QRS is normal or wide
3. Judge QRS prolongation from the lead where the QRS appears longest

QRS Interval/Bundle Branch Block

Assess QRS Duration cont.

4. If the QRS is:

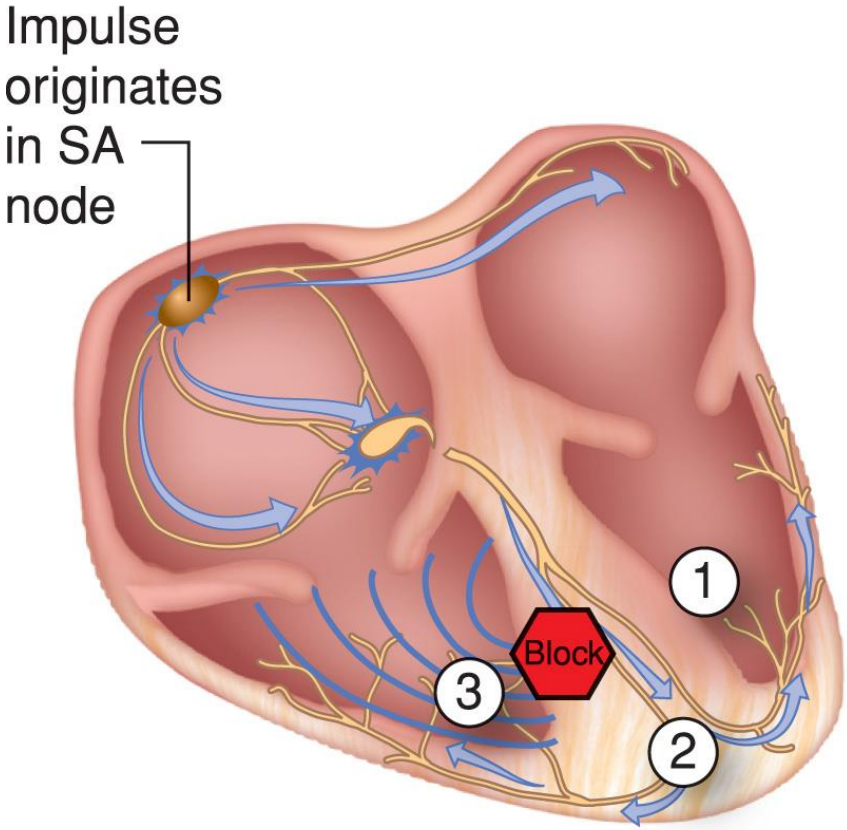
   ≤ 0.12 seconds than the QRS is normal

   > 0.12 seconds than the QRS is wide (greater than half a large box)

5. The limits given do not hold for children

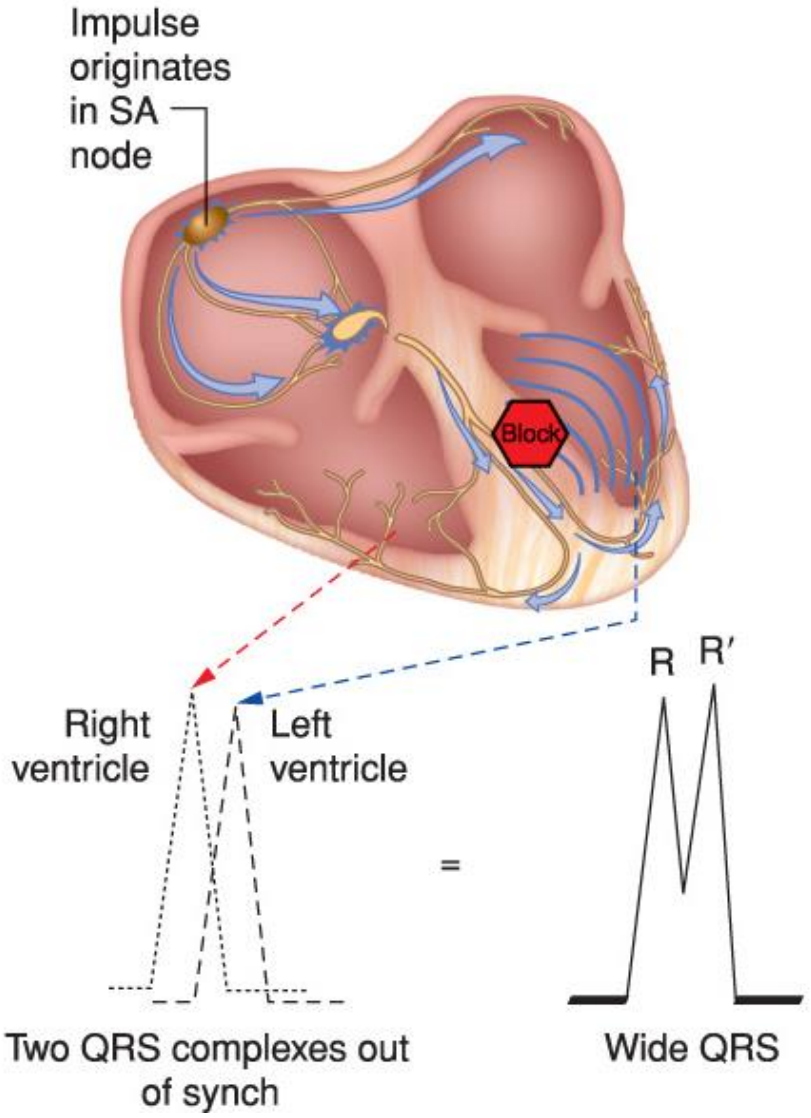
Bundle Branch Block

- Leads to one or both bundle branches failing to conduct impulses
- Produces delay in depolarization of the ventricle it supplies

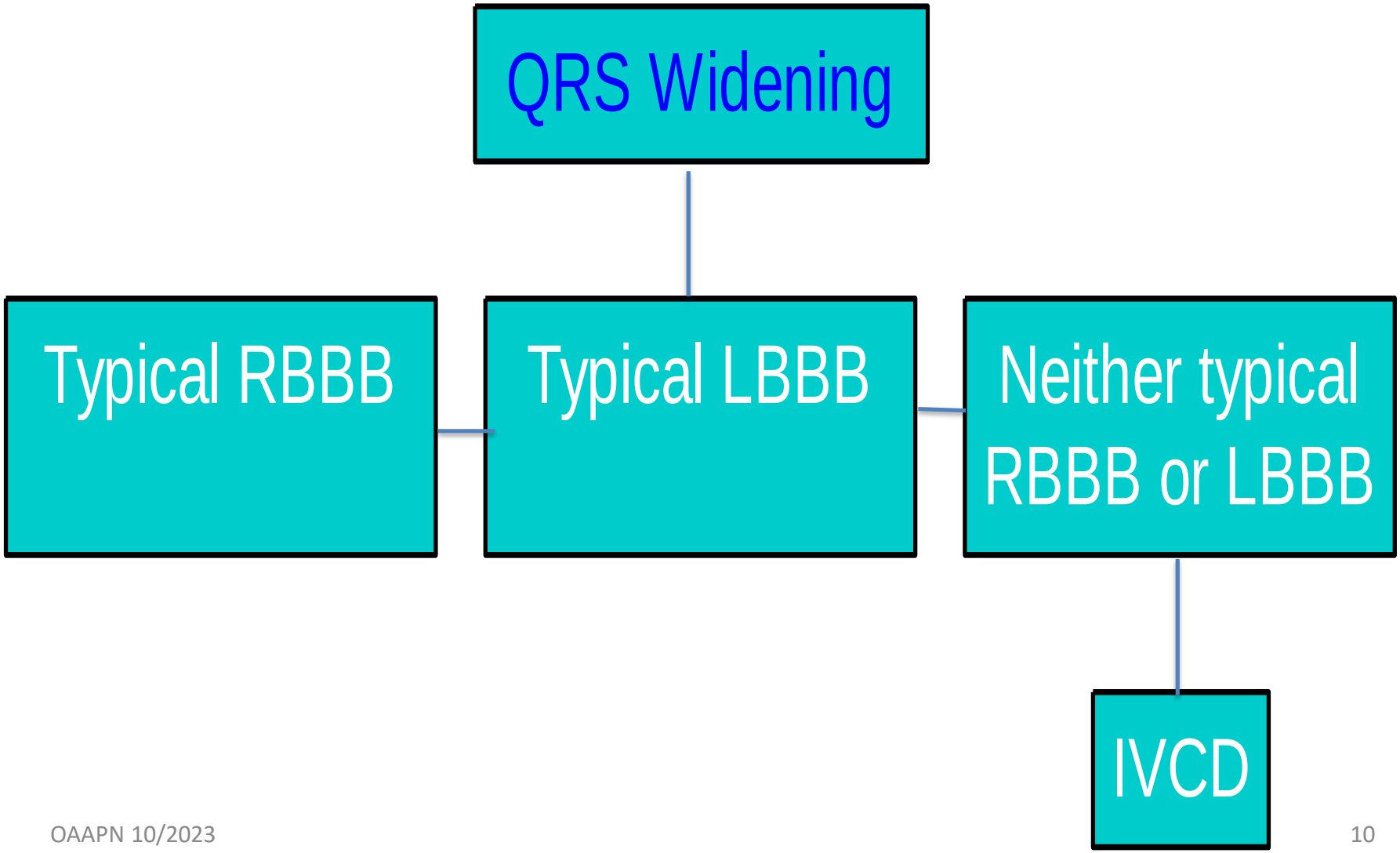


Bundle Branch Block

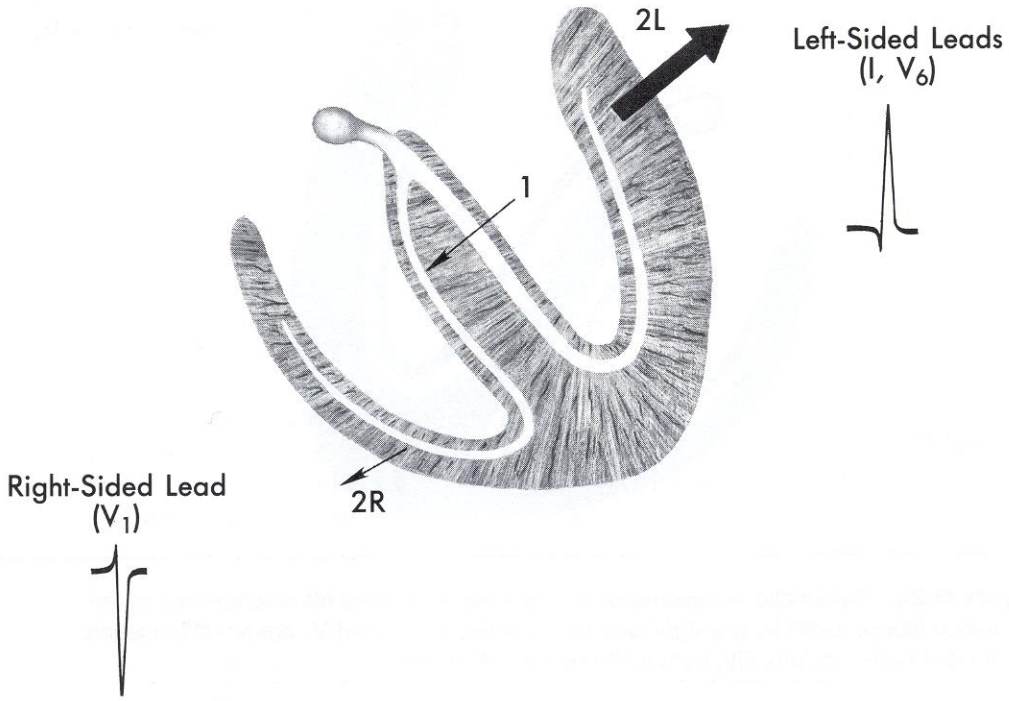
- Widened QRS complex
- RR’ configuration in chest leads



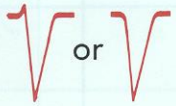
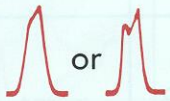
QRS Interval/Bundle Branch Block



Key Leads



ECG Findings for BBB's

	Lead V_1	Leads I and V_6	QRS duration
Typical RBBB			≥ 0.12
Typical LBBB			≥ 0.12 sec
IVCD	Neither typical RBBB nor LBBB morphology in the three key leads		≥ 0.11 sec

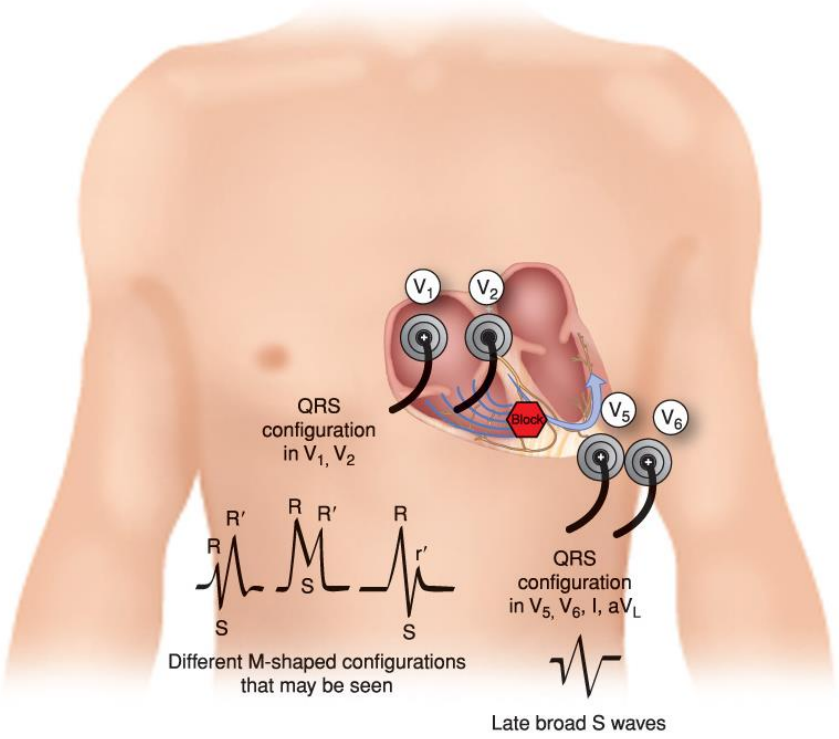
Conduction Abnormalities
RBBB

RBBB

Thin fiber, runs along intraventricular septum to the base of the papillary muscle of the right ventricle. No sub divisions. Septal perforator of LAD

Right Bundle Branch Block

- Look for RR’ in leads V_1 or V_2



Conduction Abnormalities
LBBB

LBBB

Divides two primary fascicles

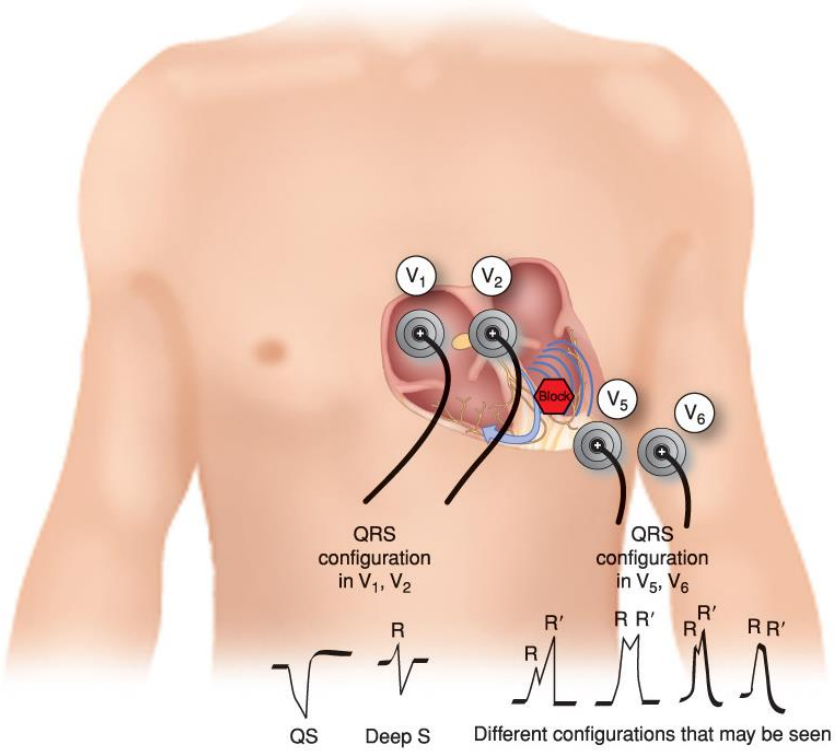
anterior and posterior branches, rare median branch

Blood supply: LAFB ; septal perforator of LAD,

LPFB ; PDA, or septal perforator

Left Bundle Branch Block

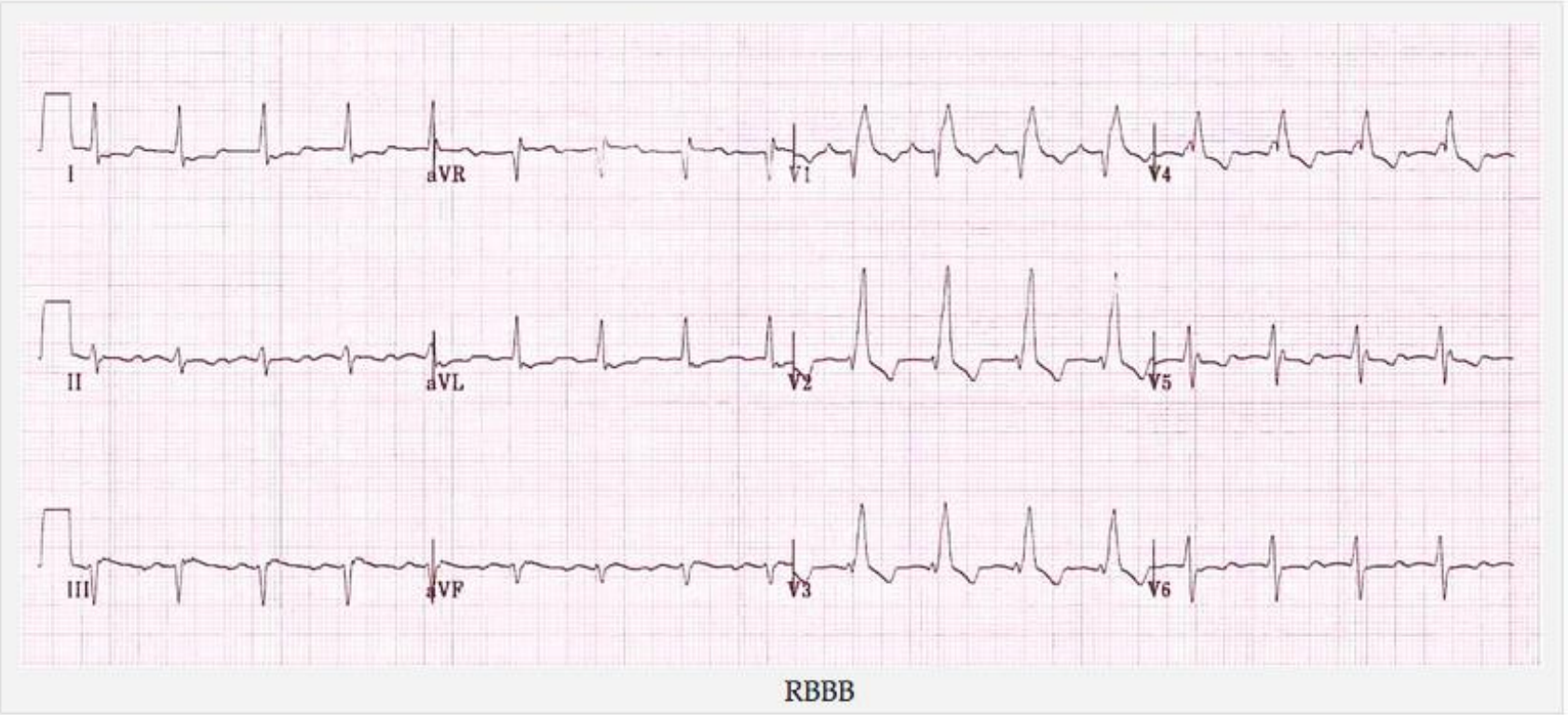
- Look for RR’ in leads V_5 or V_6



Criteria for RBBB

- ECG changes with RBBB
  - QRS > 0.12 sec
  - Rabbit ear rSR’ in V1
  - Wide S wave in V1
  - Slurred S wave in Lead I

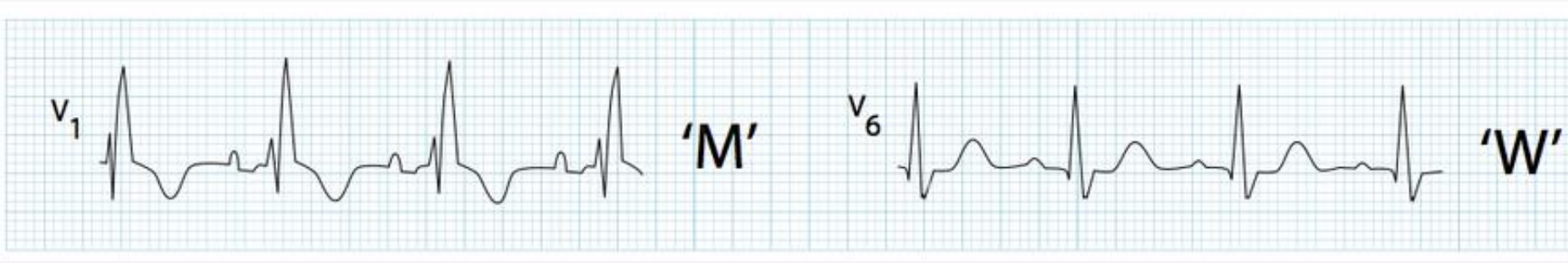
Right Bundle Branch Block



RBBB

Background

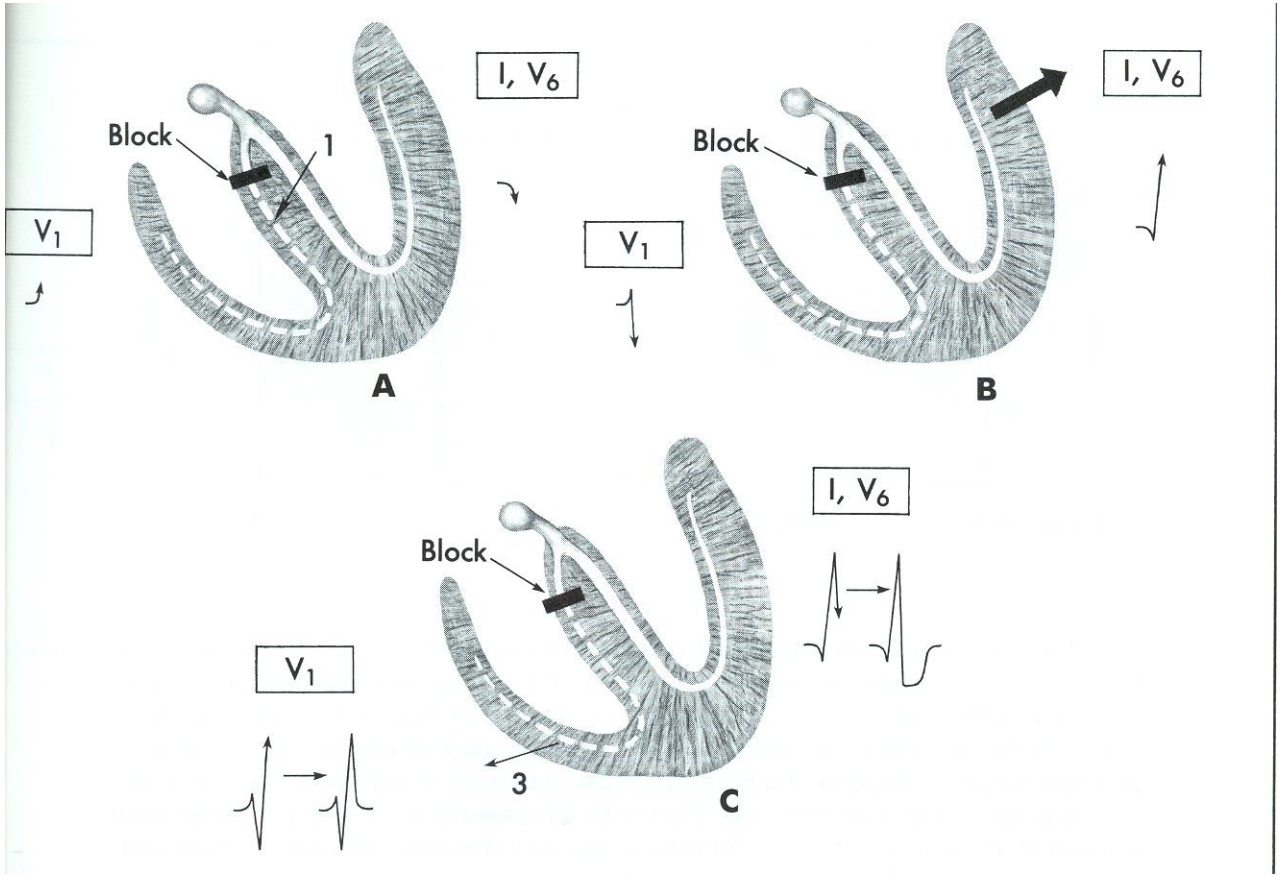
- In RBBB, activation of the right ventricle is delayed as depolarisation has to spread across the septum from the left ventricle.
- The left ventricle is activated normally, meaning that the early part of the QRS complex is unchanged.
- The delayed right ventricular activation produces a secondary R wave (R') in the right precordial leads (V1-3) and a wide, slurred S wave in the lateral leads.
- Delayed activation of the right ventricle also gives rise to secondary repolarization abnormalities, with ST depression and T wave inversion in the right precordial leads.
- In isolated RBBB the cardiac axis is unchanged, as left ventricular activation proceeds normally via the left bundle branch.



Tall R' wave in V1 ("M" pattern) with wide, slurred S wave in V6 ("W" pattern)

ECG Changes In RBBB

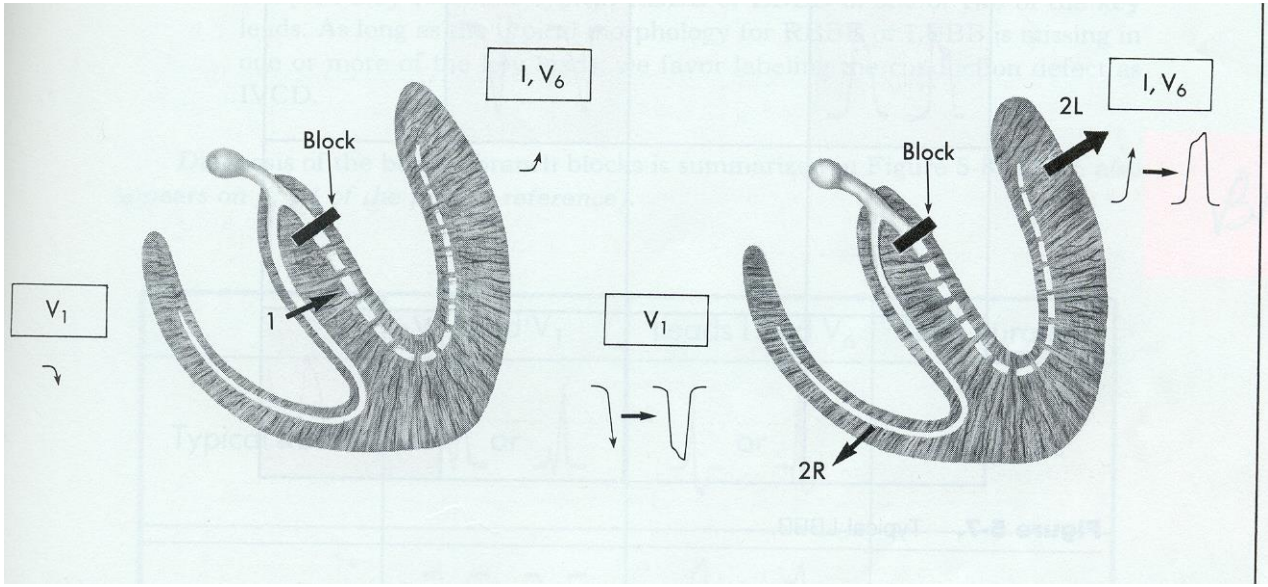
ECG Findings RBBB



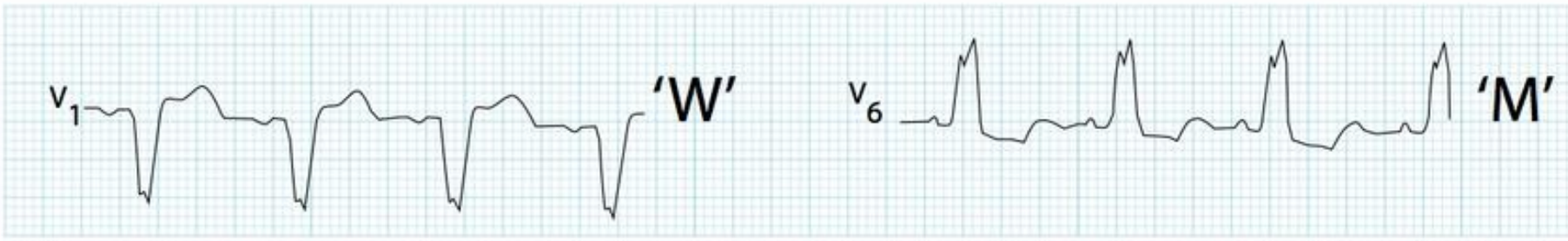
Criteria for LBBB

- ECG changes with LBBB
  - QRS > 0.12 sec
  - Absence of Q wave and presence of R wave usually notched in leads V1 & V6
  - rS or QS in V1

ECG Findings for LBBB

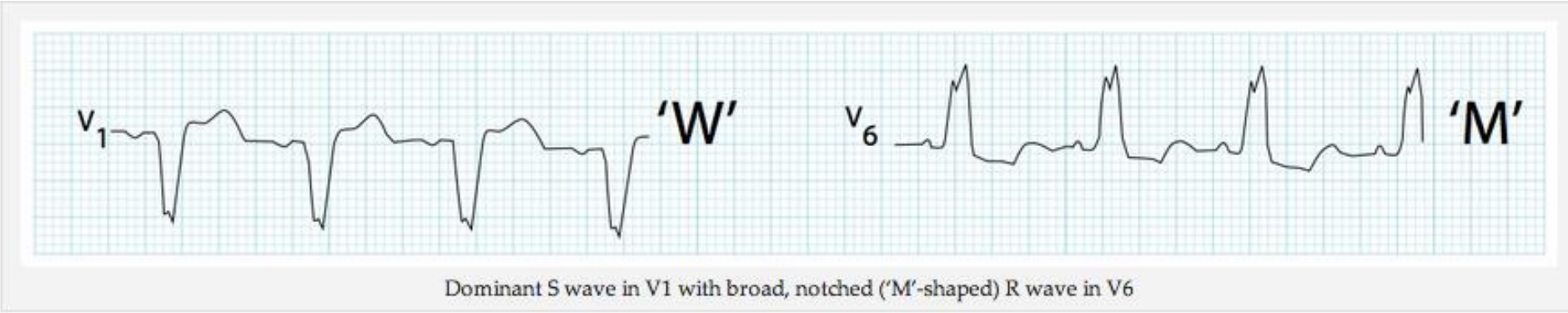


LBBB

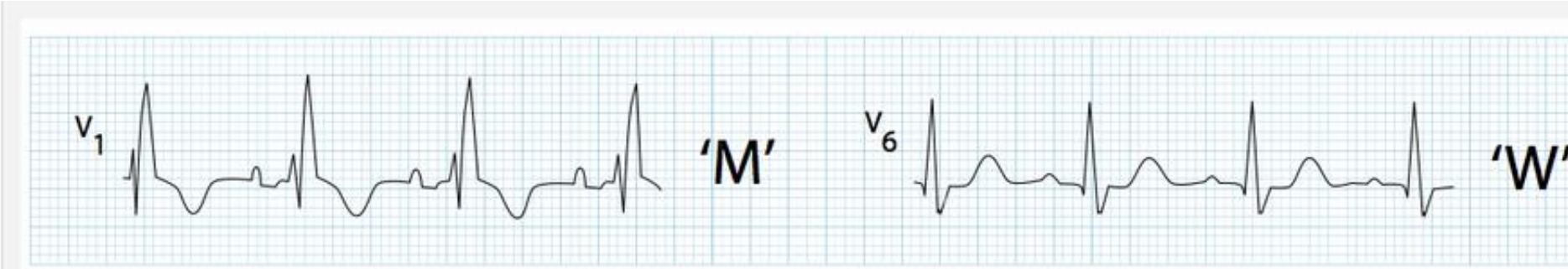


Dominant S wave in V1 with broad, notched ('M'-shaped) R wave in V6

LBBB



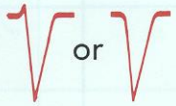
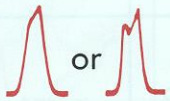
Dominant S wave in V1 with broad, notched ('M'-shaped) R wave in V6



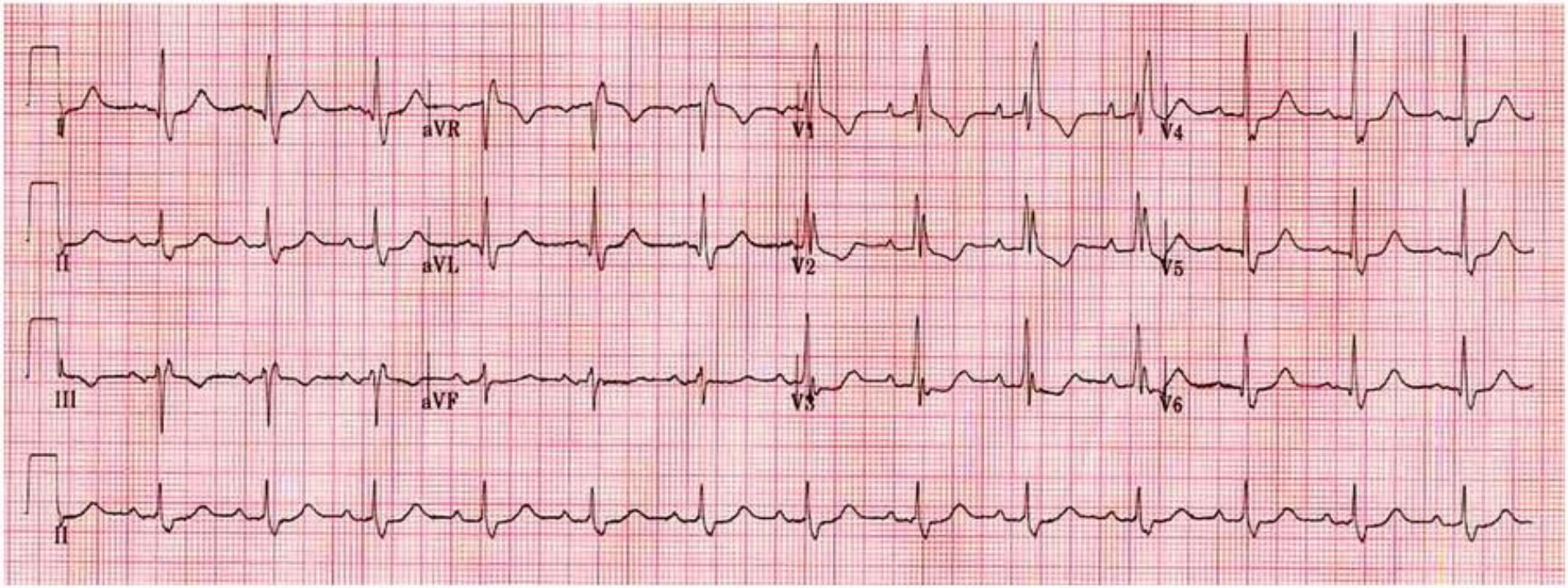
Tall R' wave in V1 ("M" pattern) with wide, slurred S wave in V6 ("W" pattern)

ECG Changes In RBBB

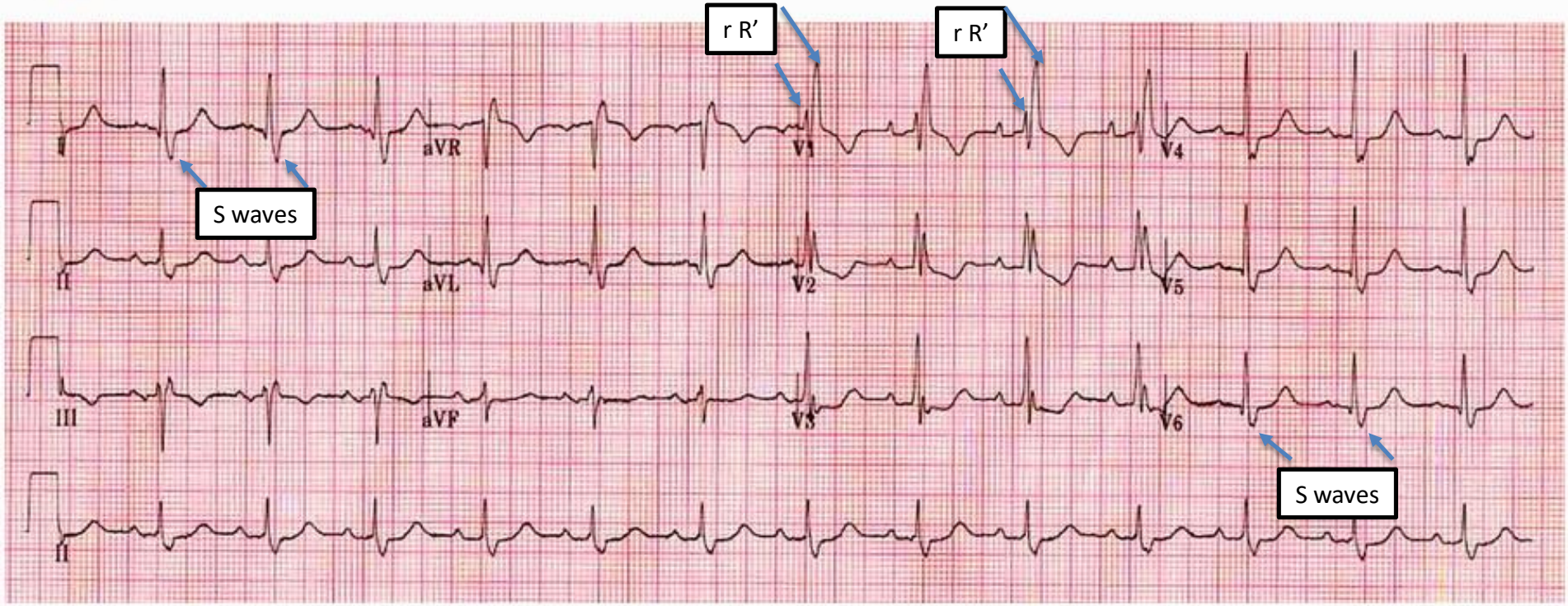
ECG Findings for BBB's

	Lead V_1	Leads I and V_6	QRS duration
Typical RBBB			≥ 0.12
Typical LBBB			≥ 0.12 sec
IVCD	Neither typical RBBB nor LBBB morphology in the three key leads		≥ 0.11 sec

Example 2



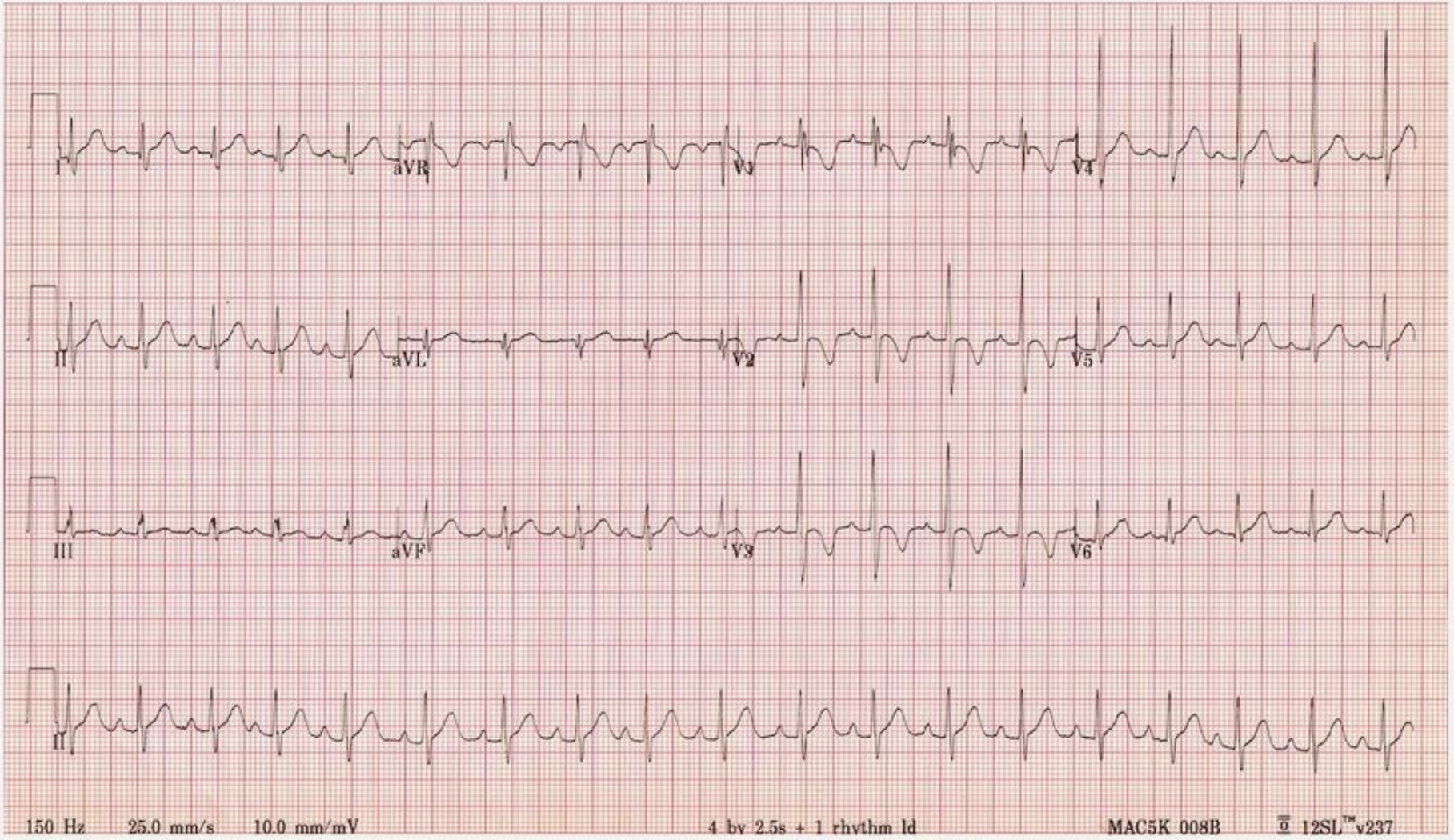
Example 2



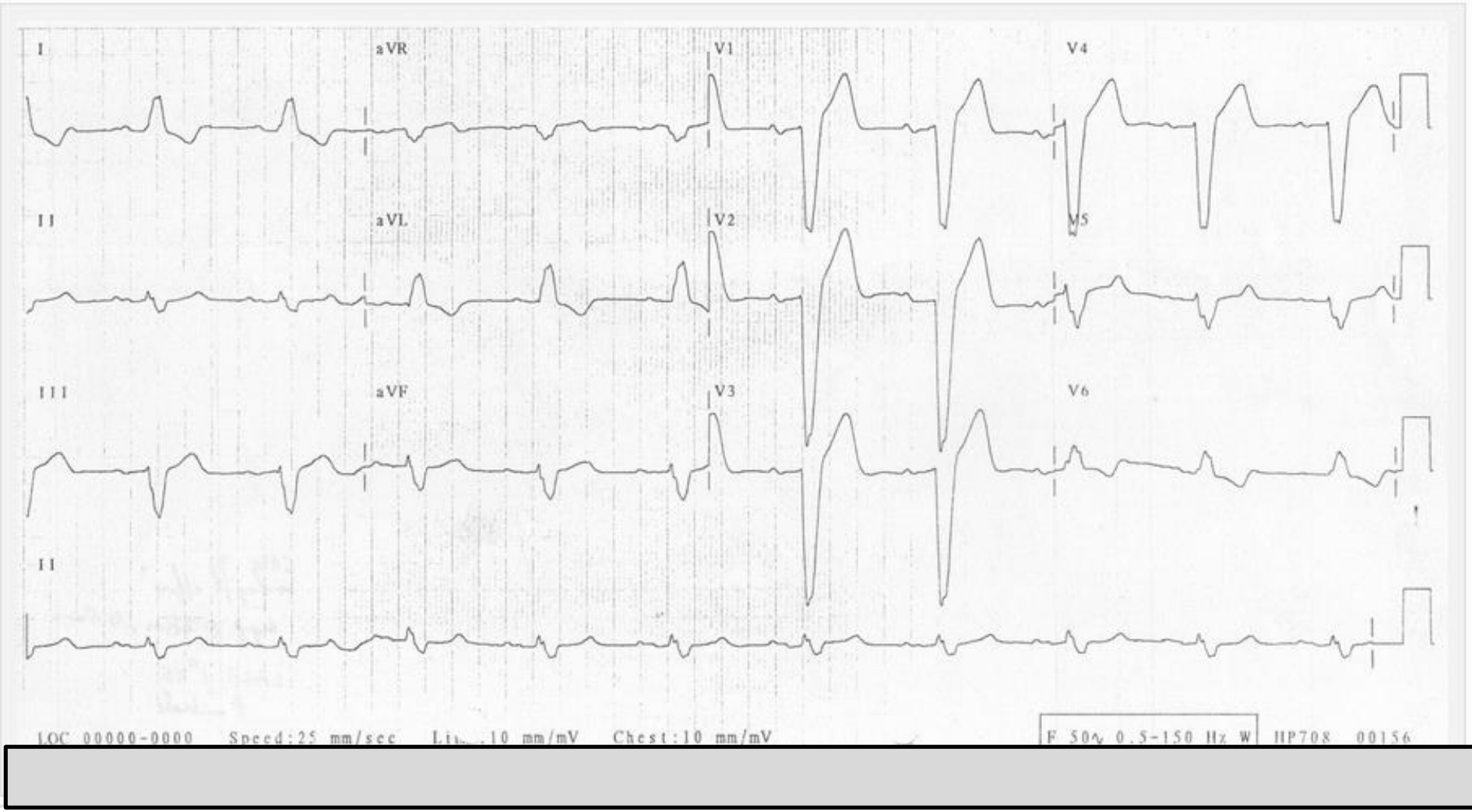
RBBB

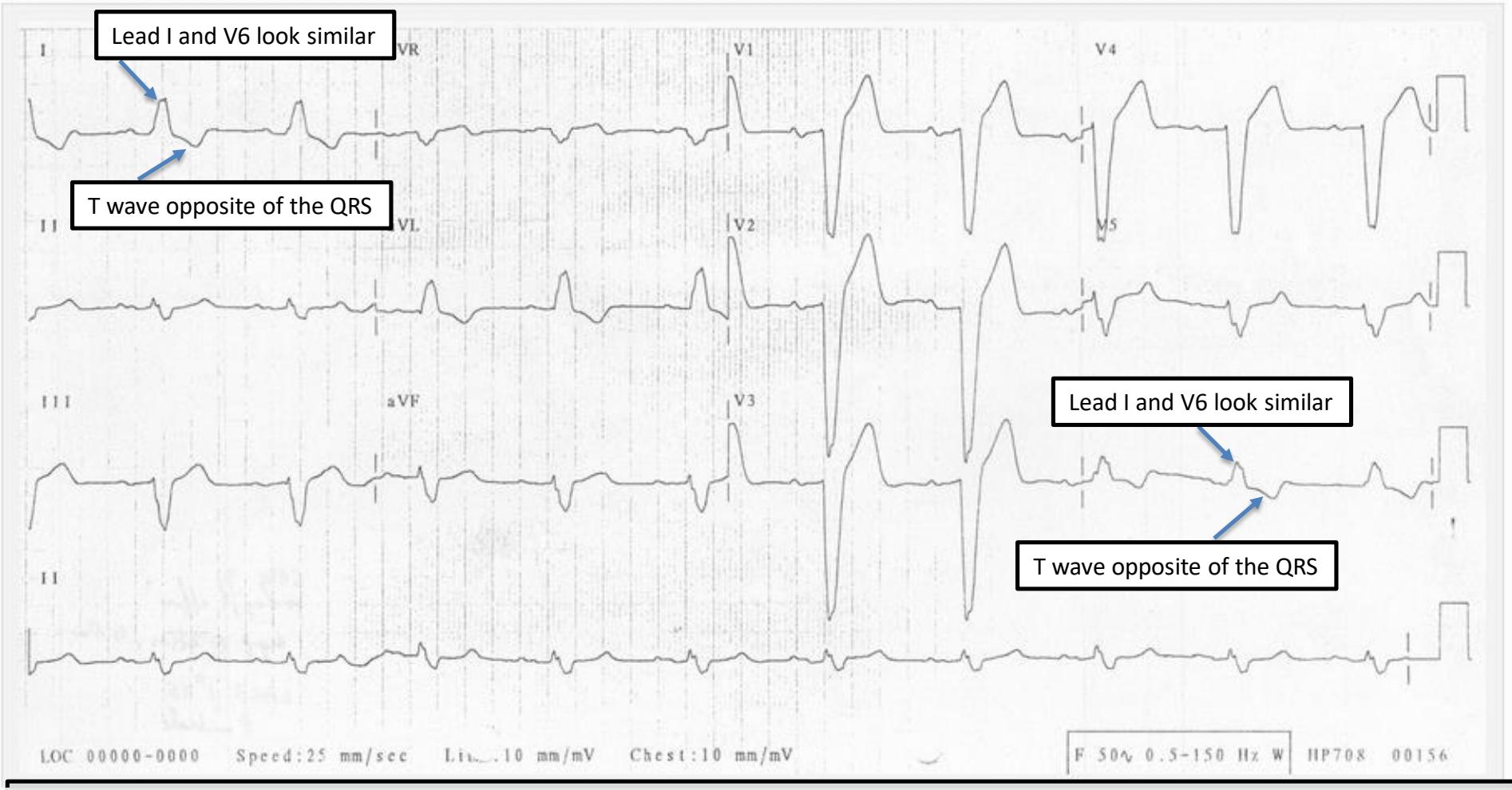
Incomplete RBBB

- Incomplete RBBB is defined as an RSR' pattern in V1-3 with QRS duration < 120ms.
- It is a normal variant, commonly seen in children (of no clinical significance).

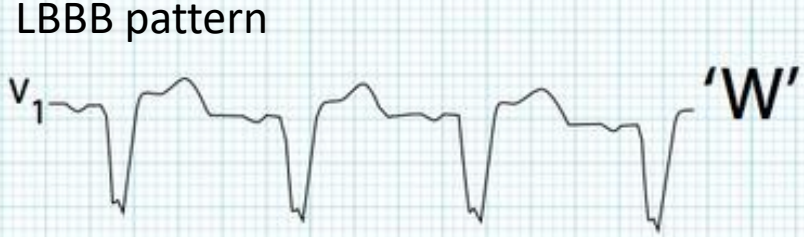


Incomplete RBBB (RSR' pattern in V1) in a 2-year old child


I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
II
LOC 00000-0000 Speed:25 mm/sec
Chest:10 mm/mV
F 50∿ 0.5-150 Hz W
HP708 00156

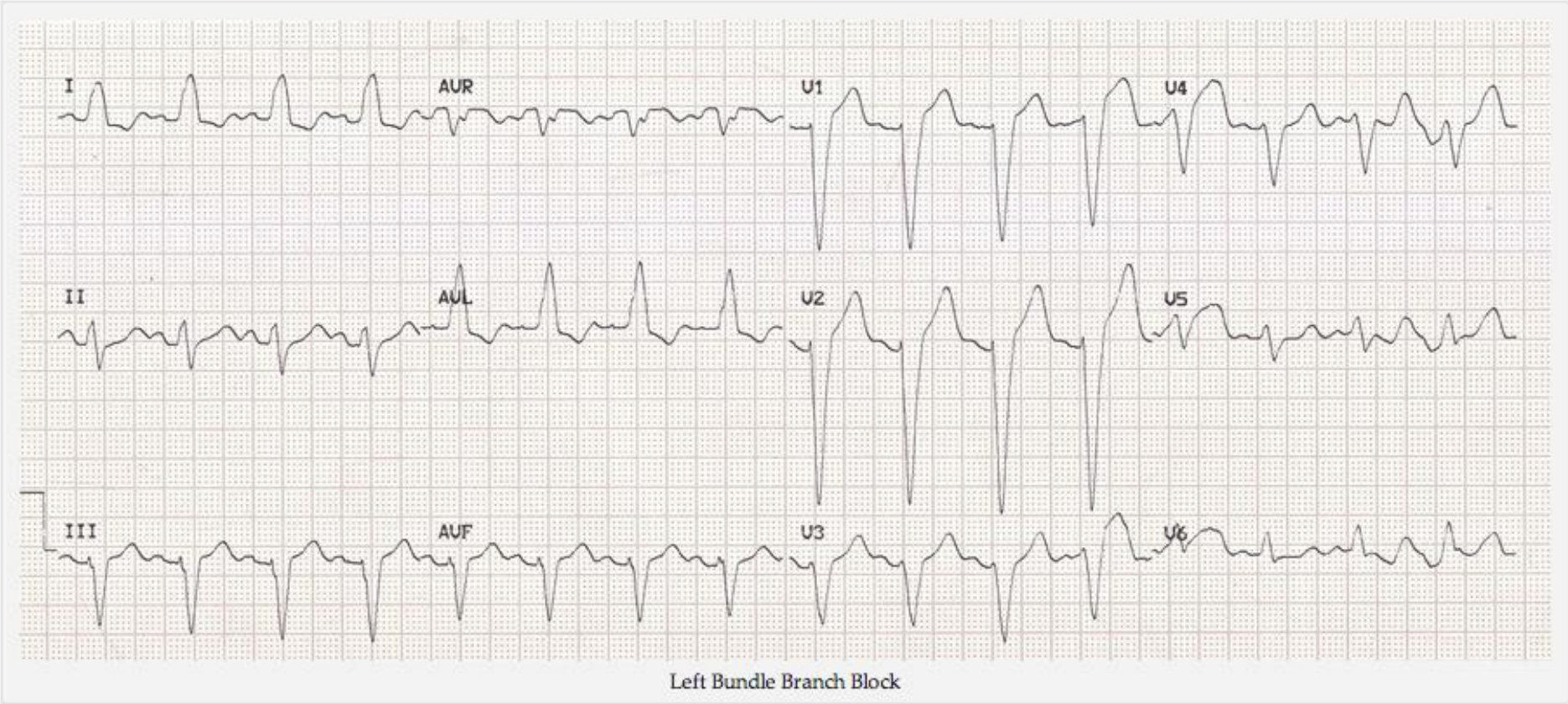


LBBB pattern



Dominant S wave in V1 with broad, notched ('M'-shaped) R wave in V6

Left Bundle Branch Block



Left Bundle Branch Block

Variations

- Sometimes rather than an RSR' pattern in V1, there may be a broad monophasic R wave or a qR complex.

Typical RSR' pattern ('M'-shaped QRS) in V1

Wide slurred S wave in lead I

Hemiblock Blocks

LAHB

LPHB

Trifascicular Block

A Word about Hemiblocks

- LAHB

More common than LPHB

If net deflection of Lead II is Negative and more than -30degrees

- LPHB

Distinctly uncommon

Rarely isolated finding

Often associated with accompanying RBBB

Dramatically deepened S wave in Lead I

More dangerous

Hemiblocks

- Occur when one of fascicles of LBB blocked
- Key to detecting is a change in the QRS axis

Identifying Hemiblocks
What to look for in what leads

Fasicular Blocks	LAFB	LPFB
Leads		
I and aVL	qR	rS
II, III, aVF	rS	qR

Hemiblock Anatomy

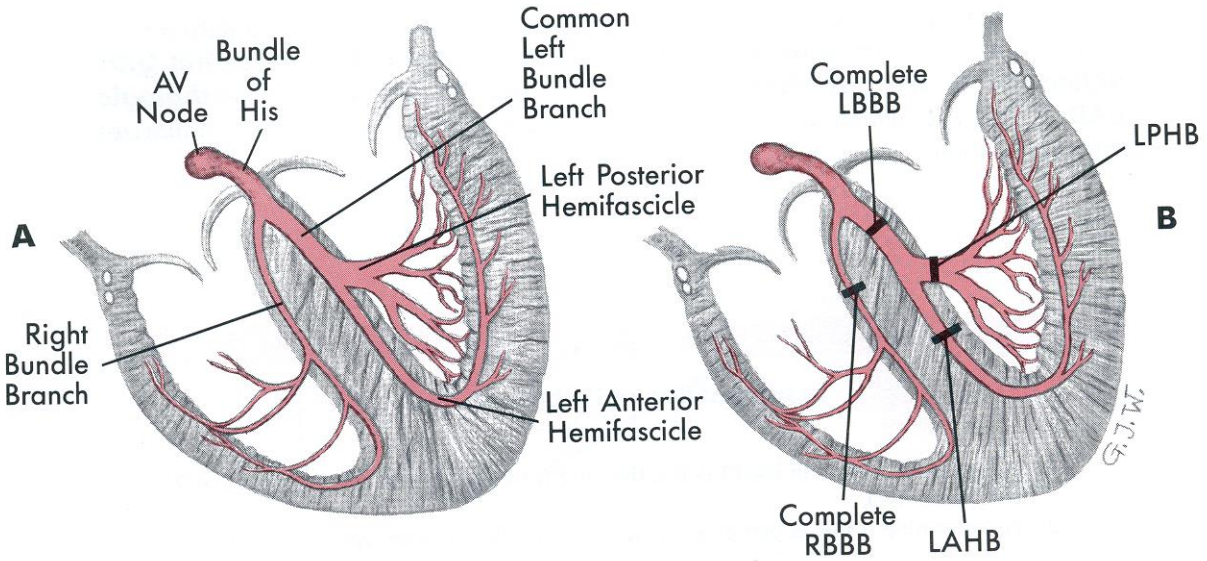
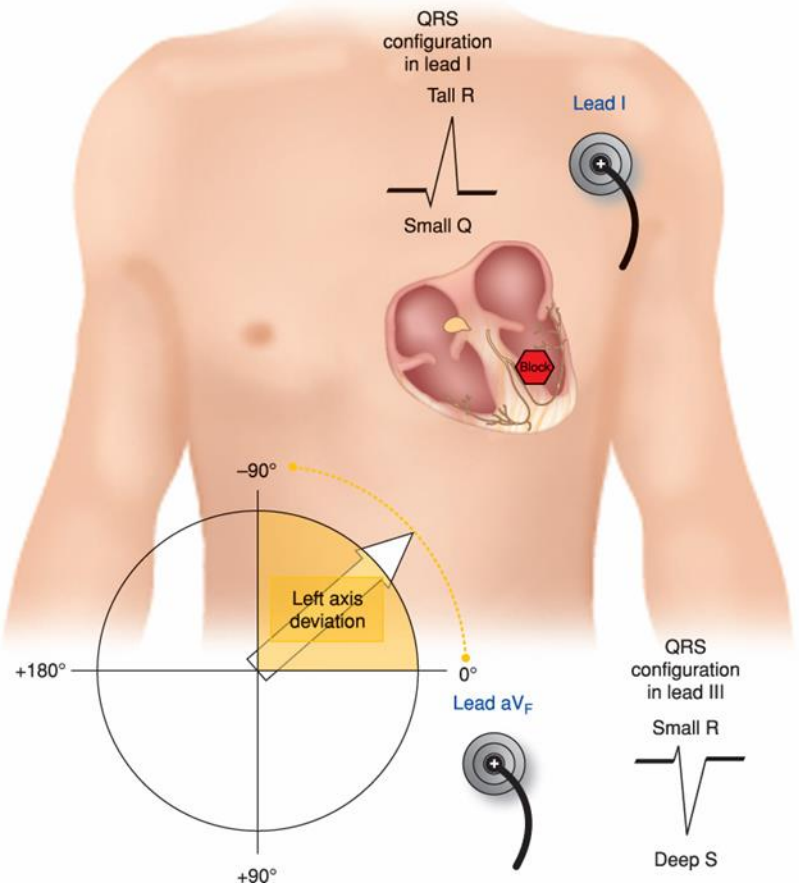
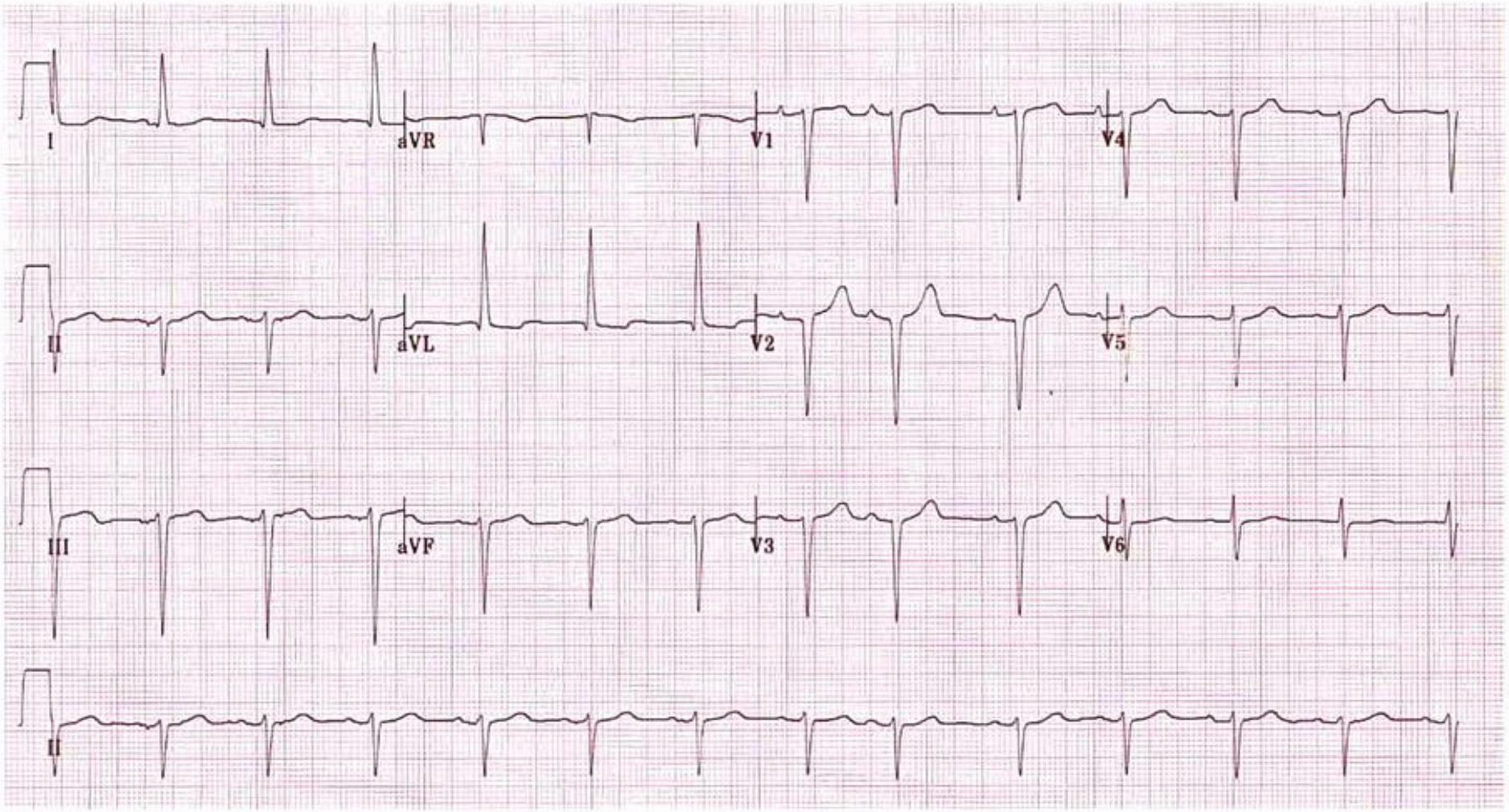


Figure 7-16. **A,** Simplified illustration showing the major divisions of the ventricular conduction system. After passing through the AV node and the bundle of His, the electrical impulse is carried to the right and common left bundle branches. The latter structure divides into the left anterior and posterior hemifascicles. **B,** Possible sites of block and the conduction defects that may be produced.

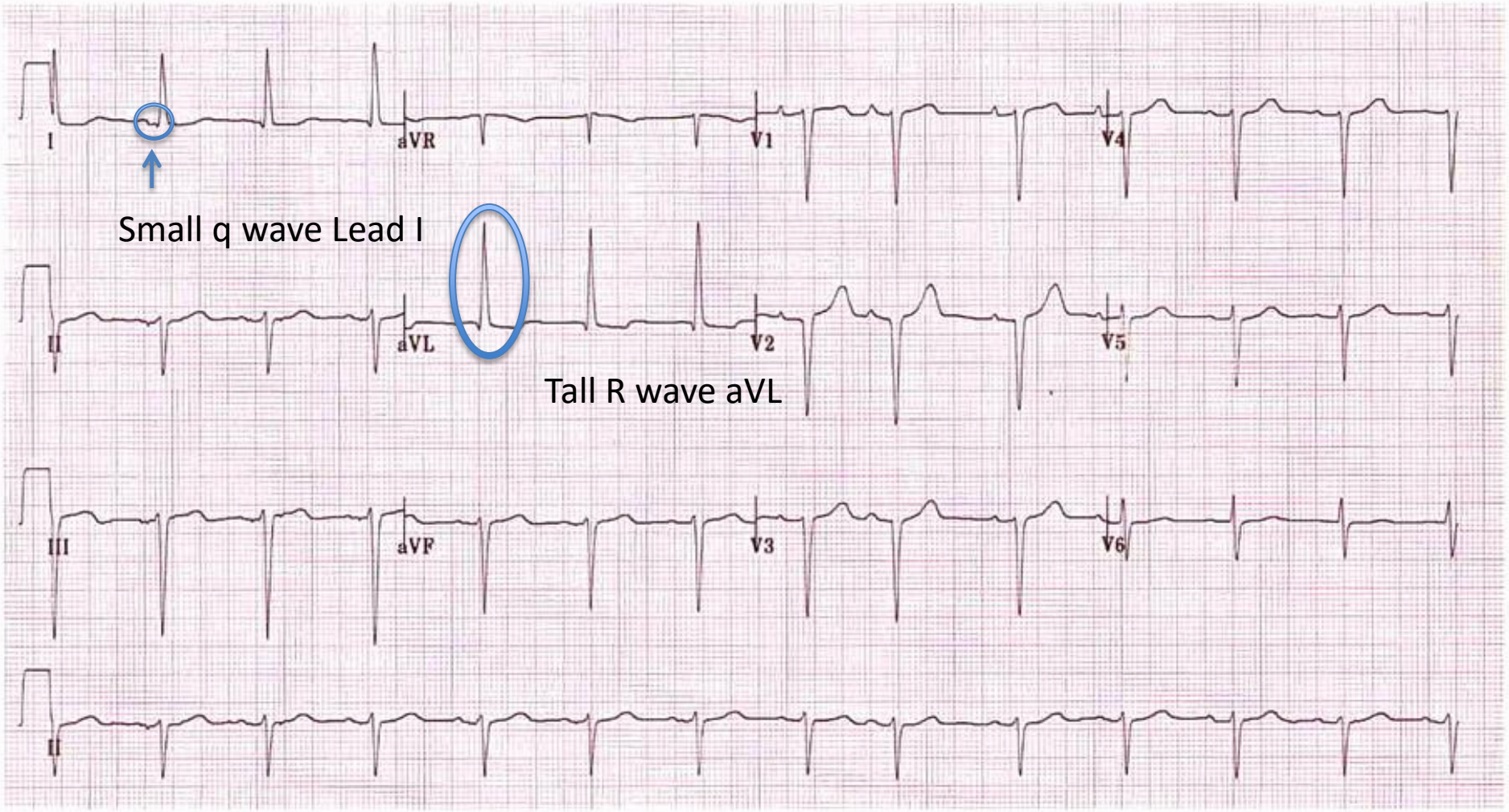
Left Anterior Hemiblock



Left Anterior Fascicular Block

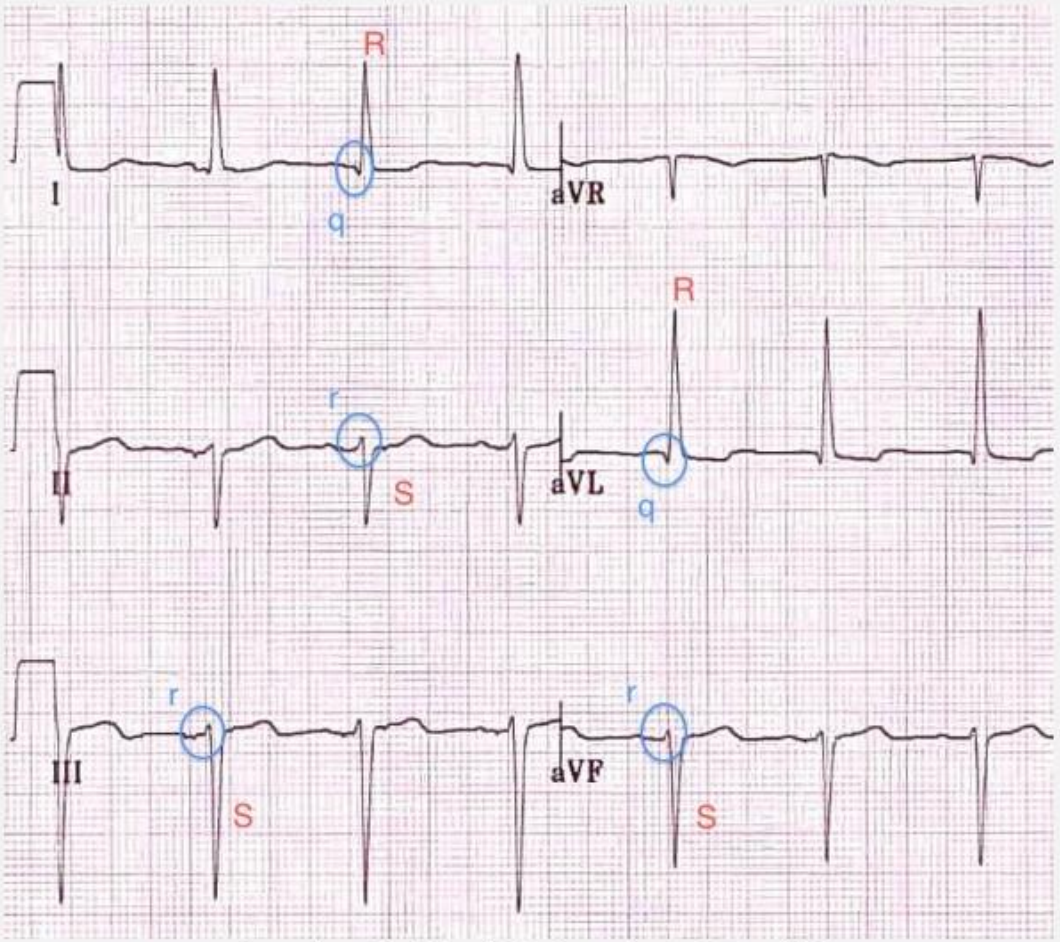


Left Anterior Fascicular Block



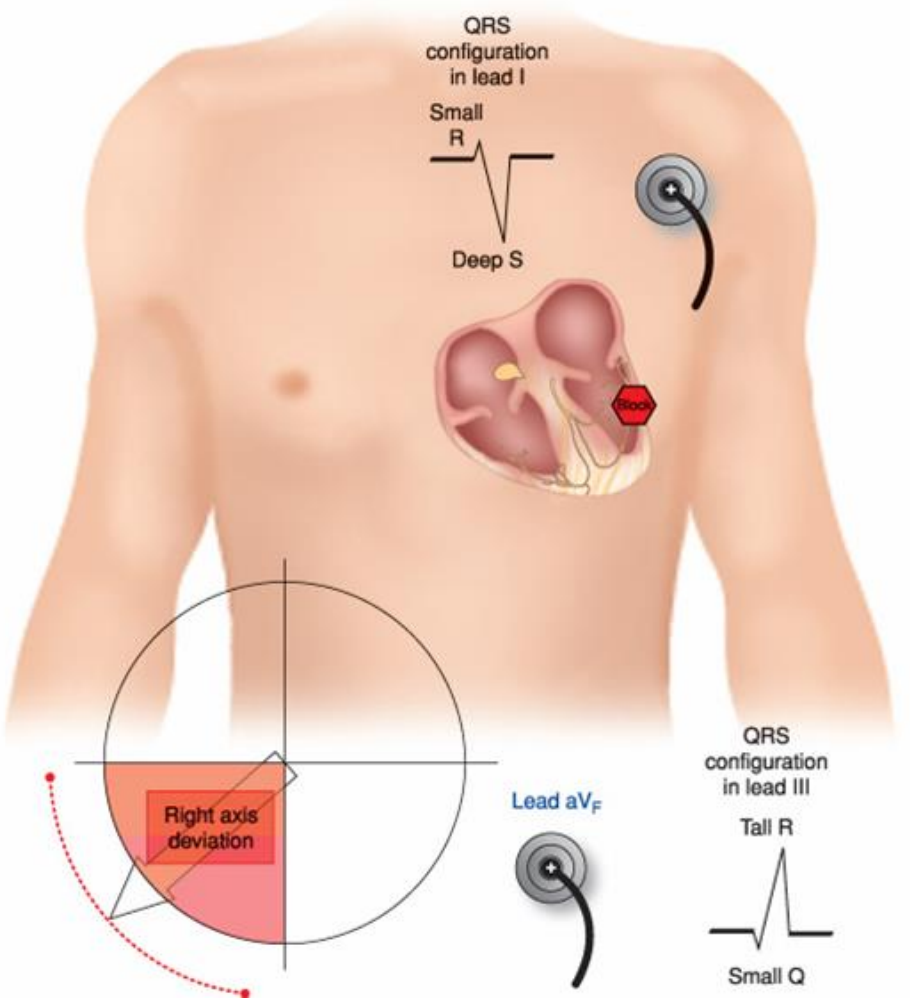
Diagnostic Criteria For LAFB

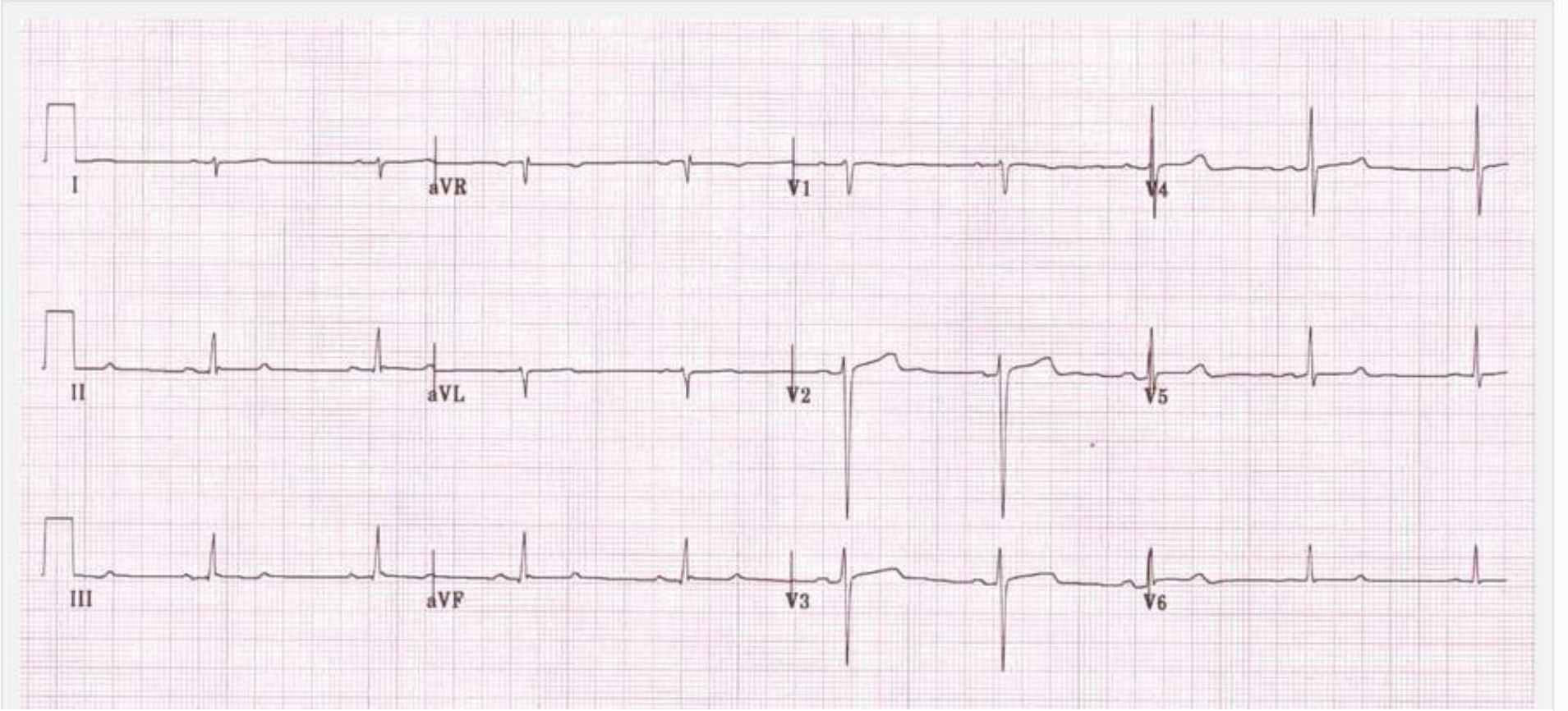
- Left axis deviation (usually between -45 and -90 degrees)
- Small Q waves with tall R waves (= 'qR complexes') in leads I and aVL
- Small R waves with deep S waves (= 'rS complexes') in leads II, III, aVF
- QRS duration normal or slightly prolonged (80-110 ms)
- Prolonged R wave peak time in aVL > 45 ms
- Increased QRS voltage in the limb leads



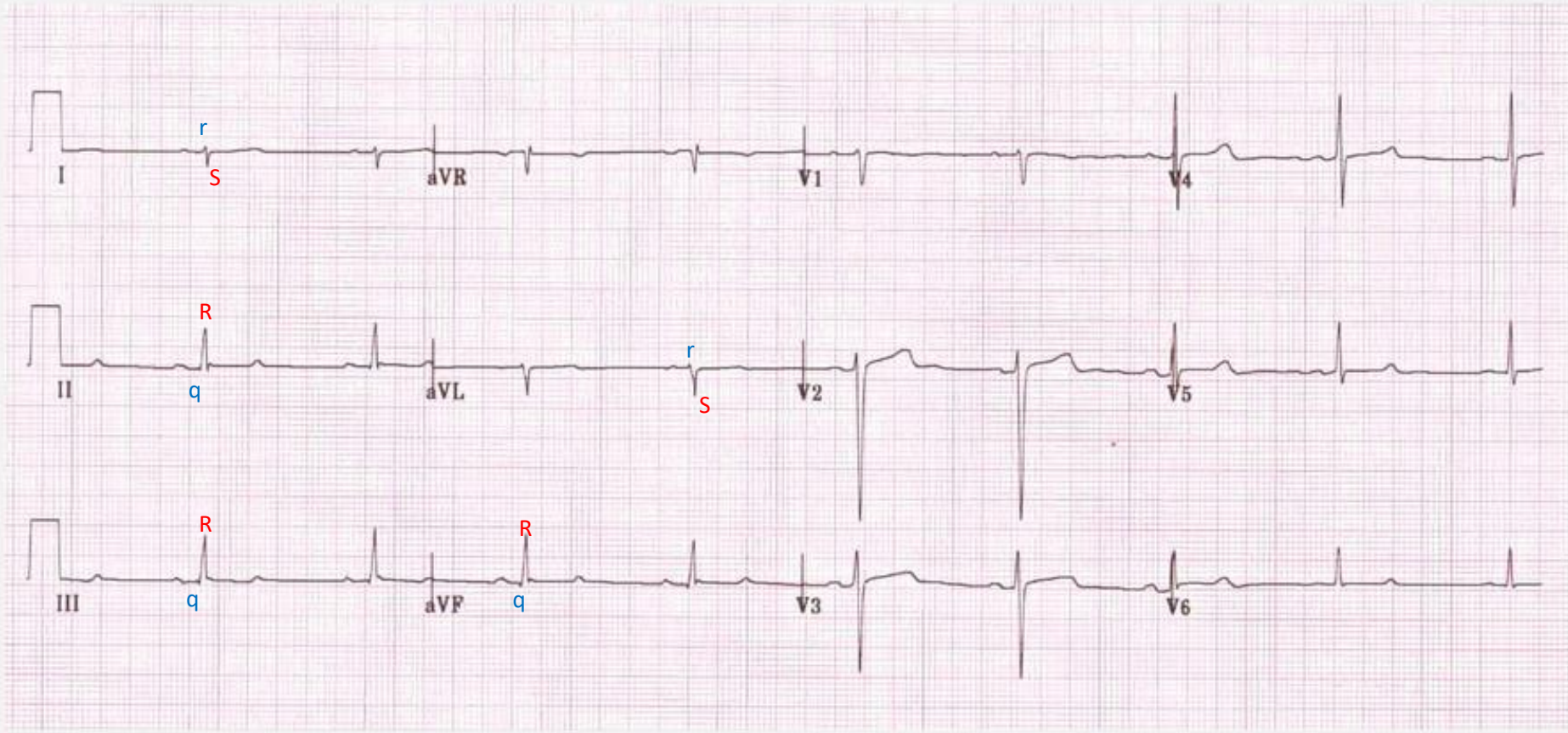
qR complexes in leads I and aVL, rS complexes in II, III and aVF

Left Posterior Hemiblock




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

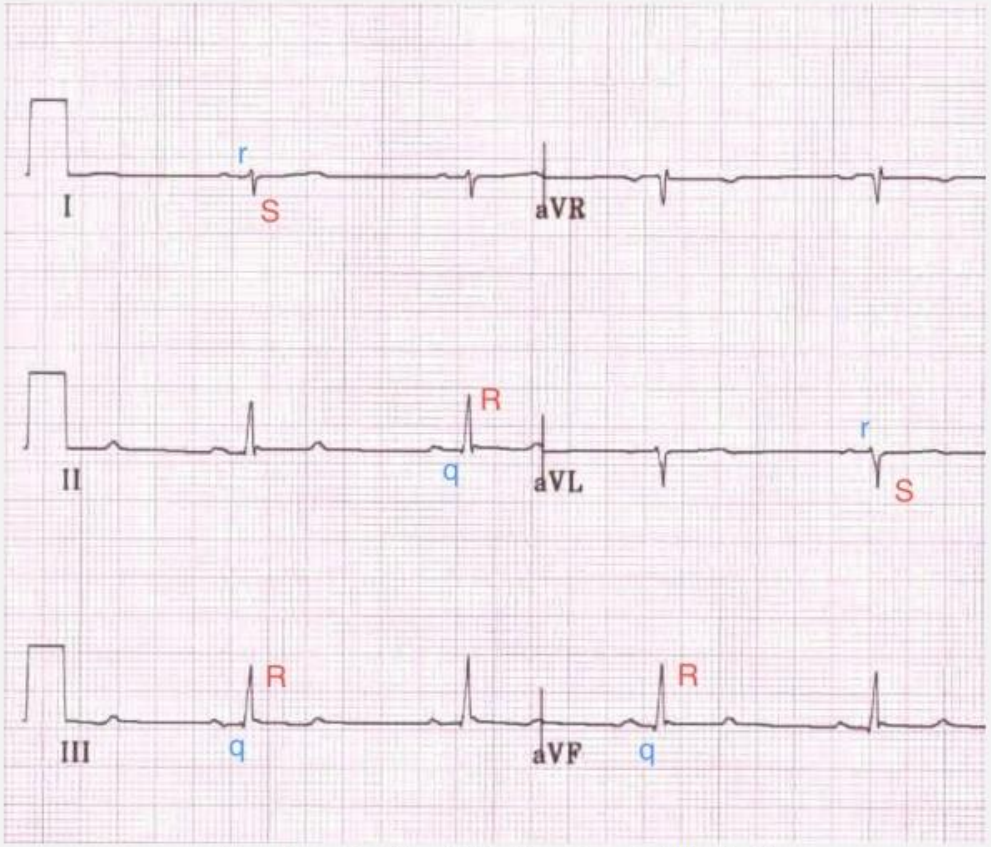
Left Posterior Fascicular Block



Left Posterior Fascicular Block

Diagnostic Criteria For LPFB

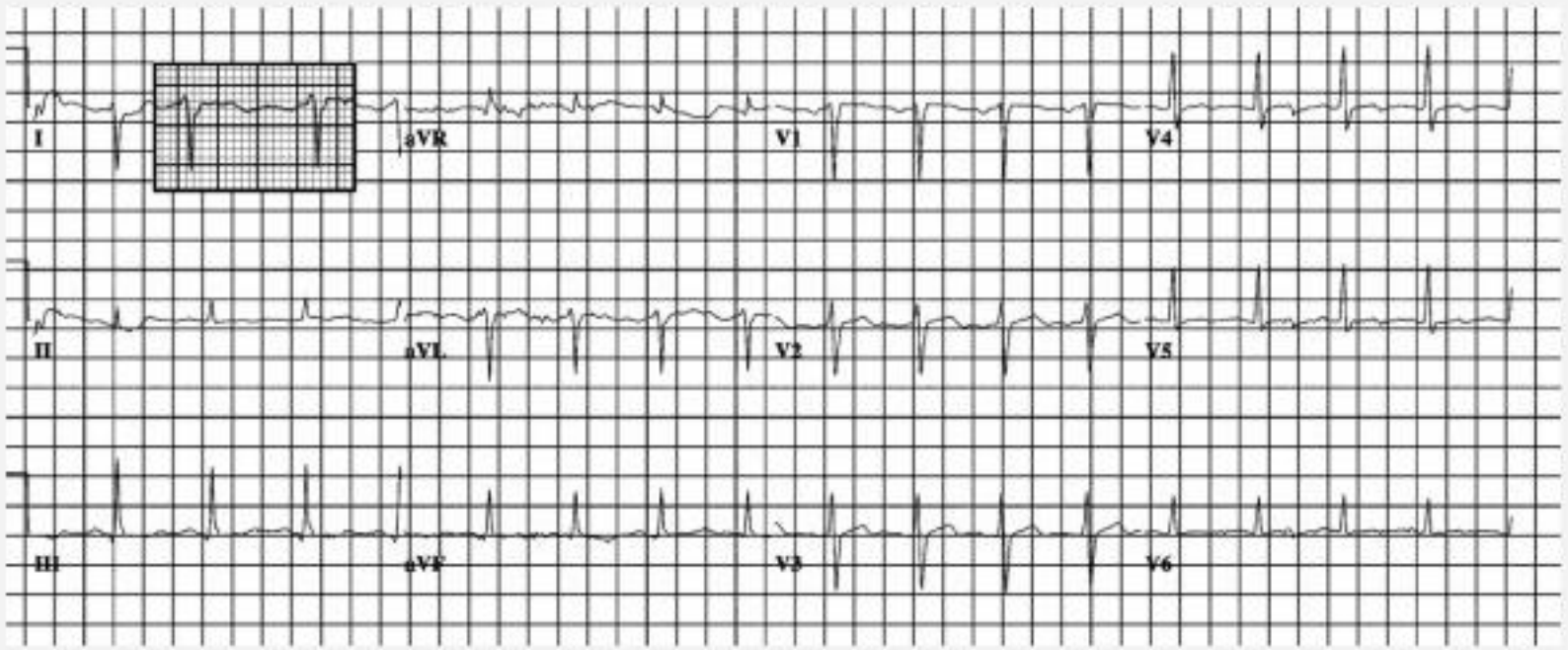
- Right axis deviation (> +90 degrees)
- Small R waves with deep S waves (= 'rS complexes') in leads I and aVL
- Small Q waves with tall R waves (= 'qR complexes') in leads II, III and aVF
- QRS duration normal or slightly prolonged (80-110ms)
- Prolonged R wave peak time in aVF
- Increased QRS voltage in the limb leads
- No evidence of right ventricular hypertrophy
- No evidence of any other cause for right axis deviation



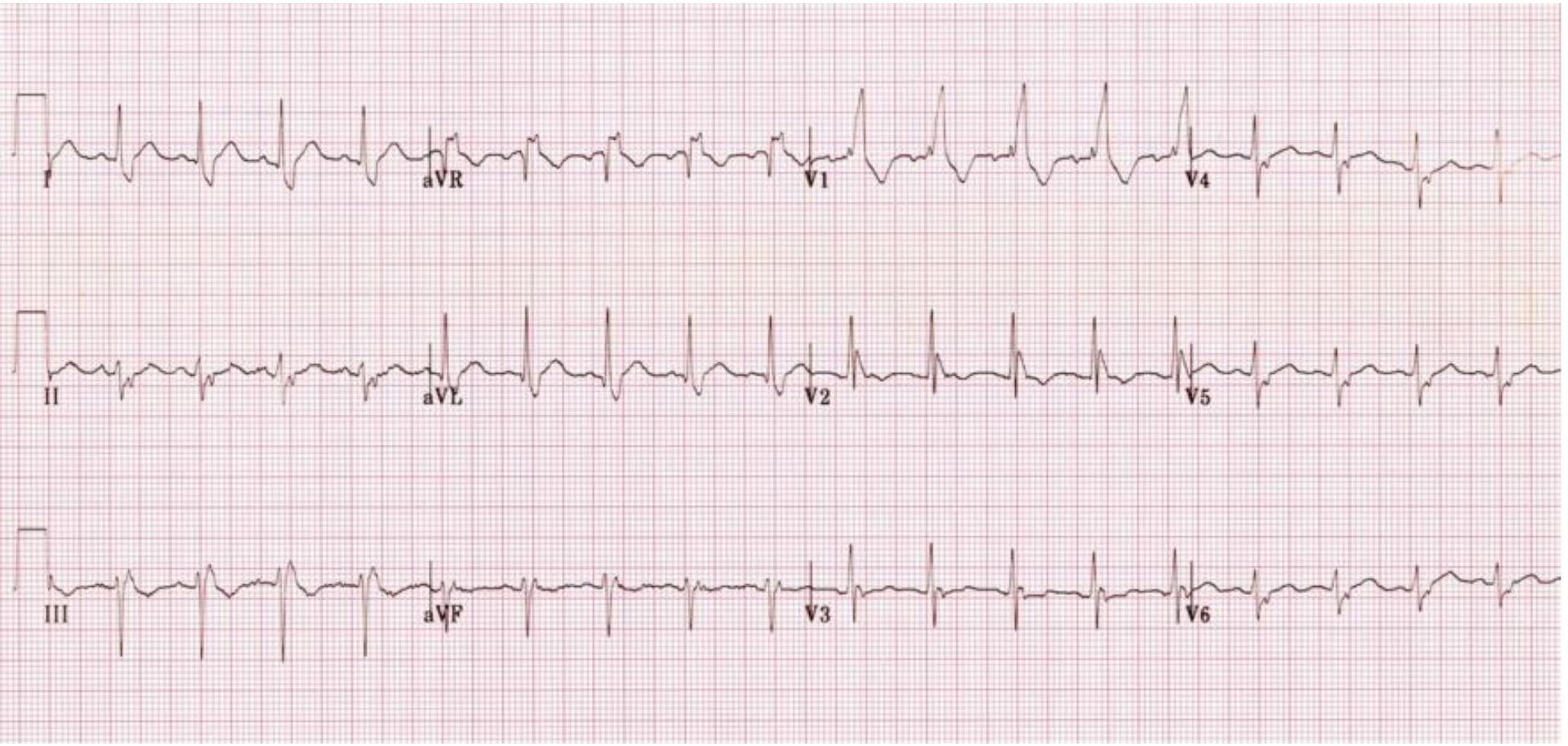
rS complexes in leads I and aVL, qR complexes in II, III and aVF

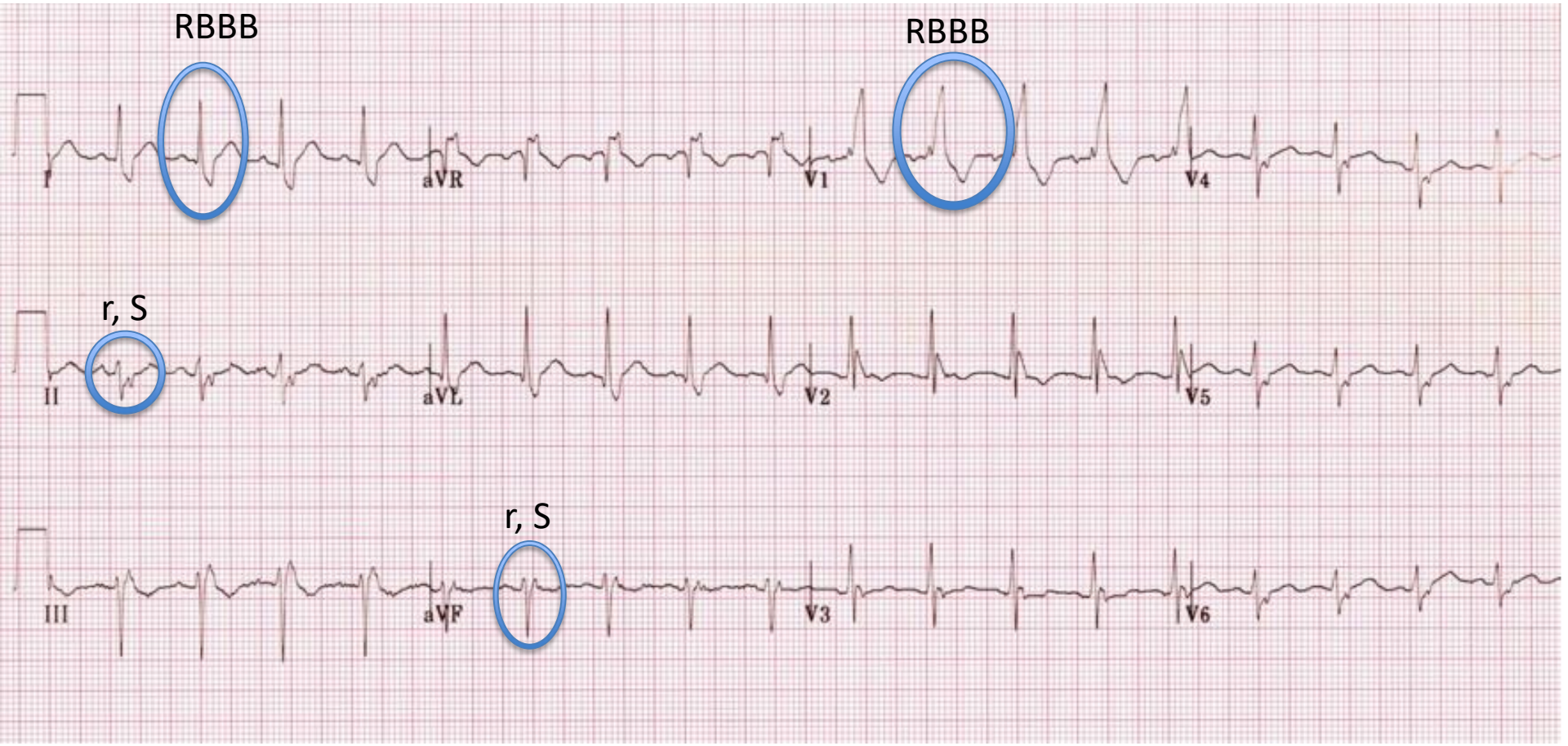
Identifying Hemiblocks
What to look for in what leads

Fasicular Blocks	LAFB	LPFB
Leads		
I and aVL	qR	rS
II, III, aVF	rS	qR



Left Posterior Fascicular Block

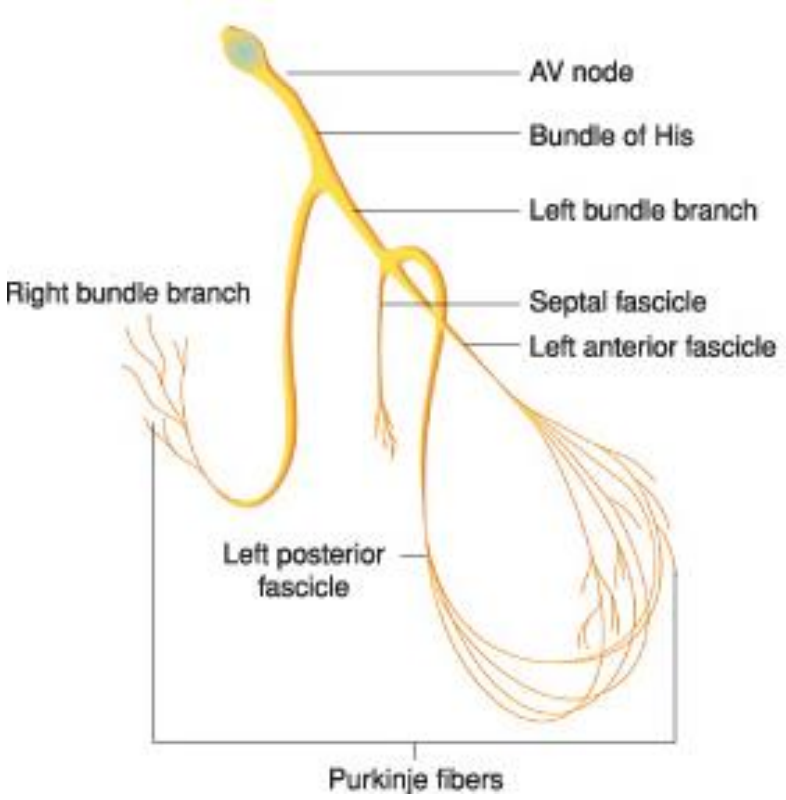

I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6



RBBB with LAFB

Trifascicular Block (TFB)

- TFB refers to presence of conduction disease in all three fascicles
  - RBB
  - LAF
  - LPF



Incomplete TFB

- Fixed block of two fascicles with evidence of delayed conduction in the remaining fascicle (1st or 2nd degree AV block)

- Fixed block of one fascicle (RBBB) with intermittent failure of the other two fascicles (alternating LAFB/LPFB)

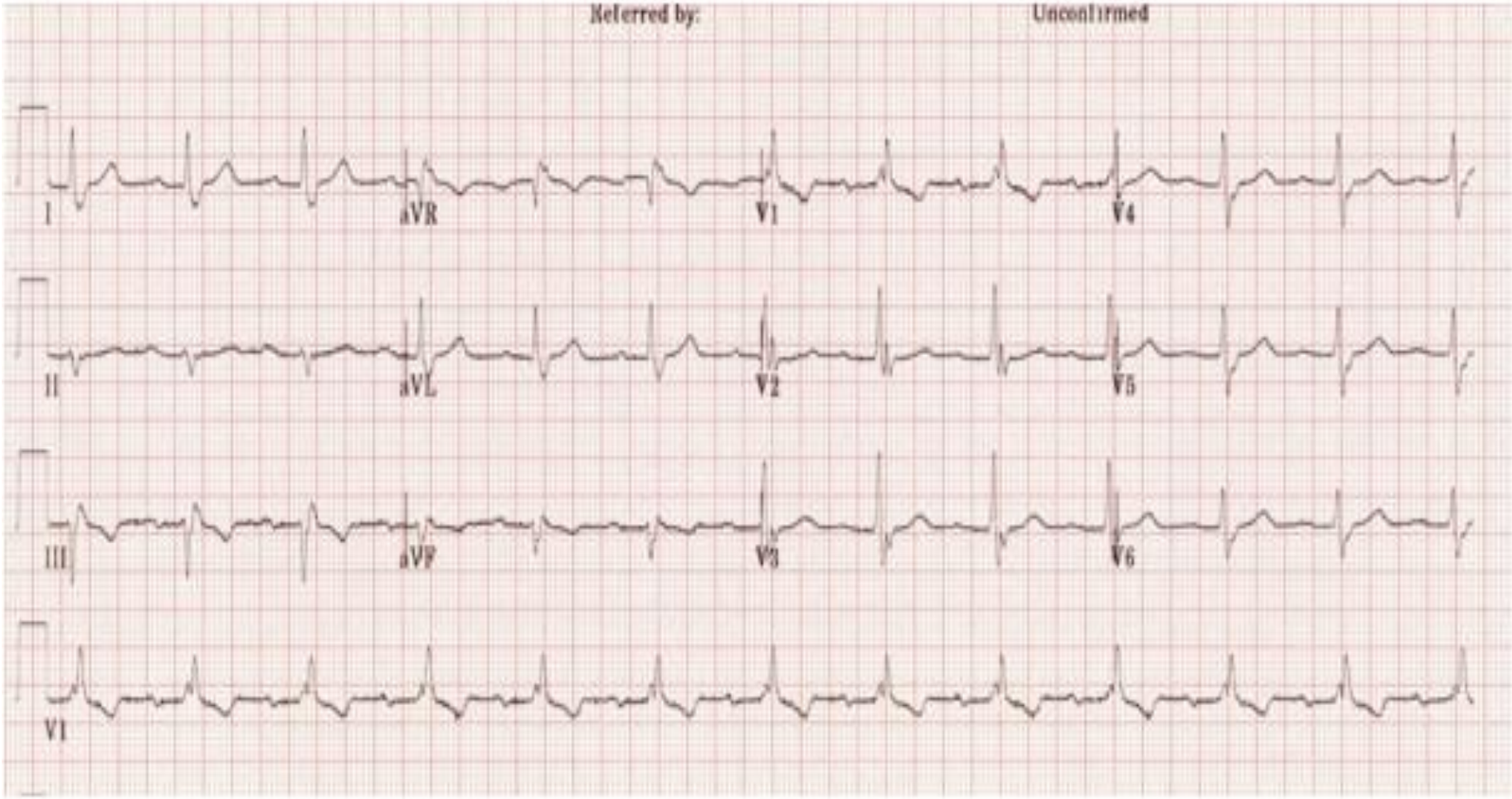
Complete TFB

- Complete TFB produces 3rd degree AV block with features of bifascicular block

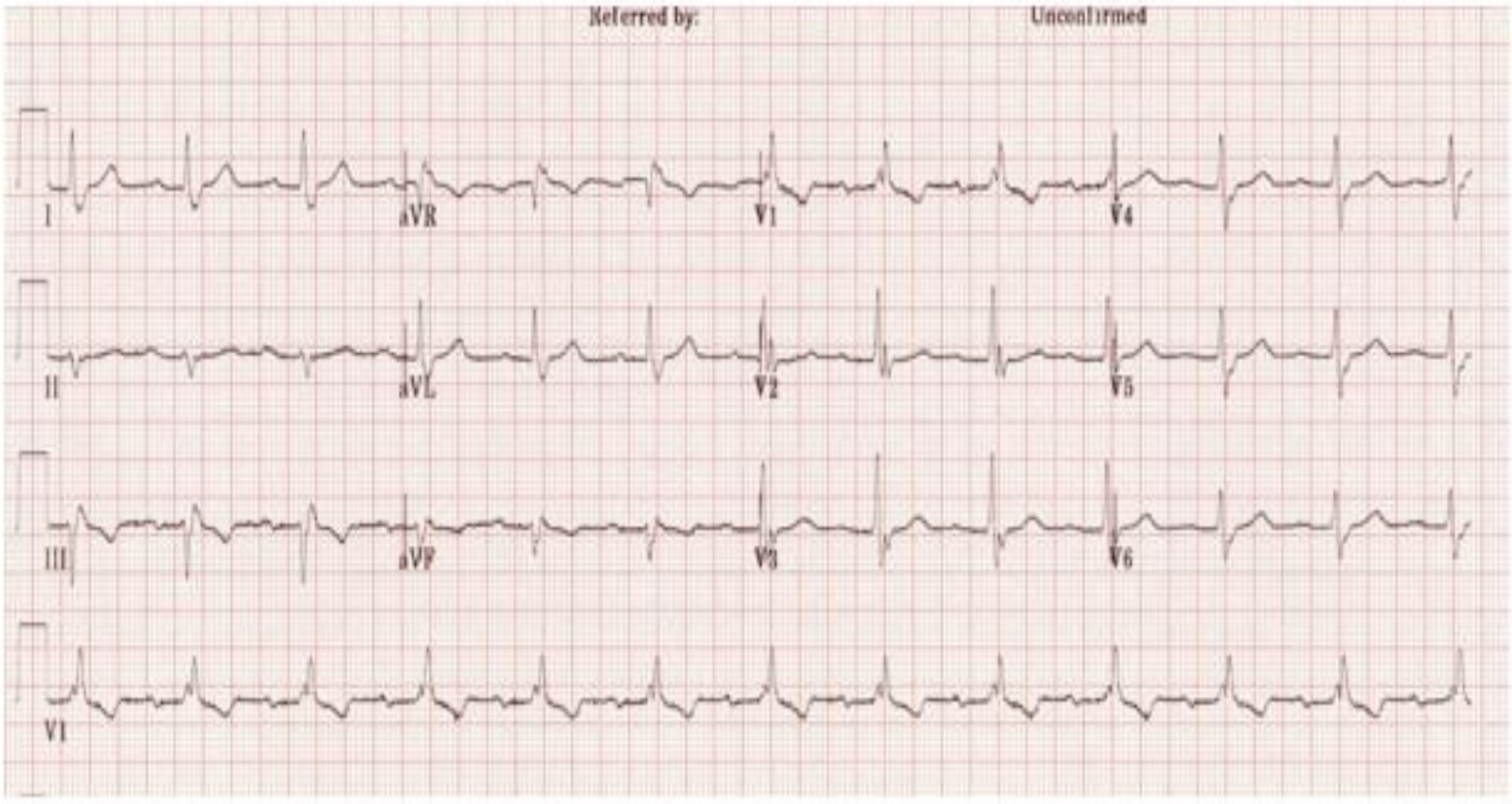
- This is due to escape rhythms that may arise from either LAF or LPF

Main Causes

- Ischemic Heart disease
- HTN
- AS
- AWMI
- Primary degenerative disease of the conducting system (Lenergre's disease)
- Congenital heart disease
- Hyperkalemia
- Digoxin Toxicity


Referred by:
Unconfirmed
I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
V1

Incomplete TFB

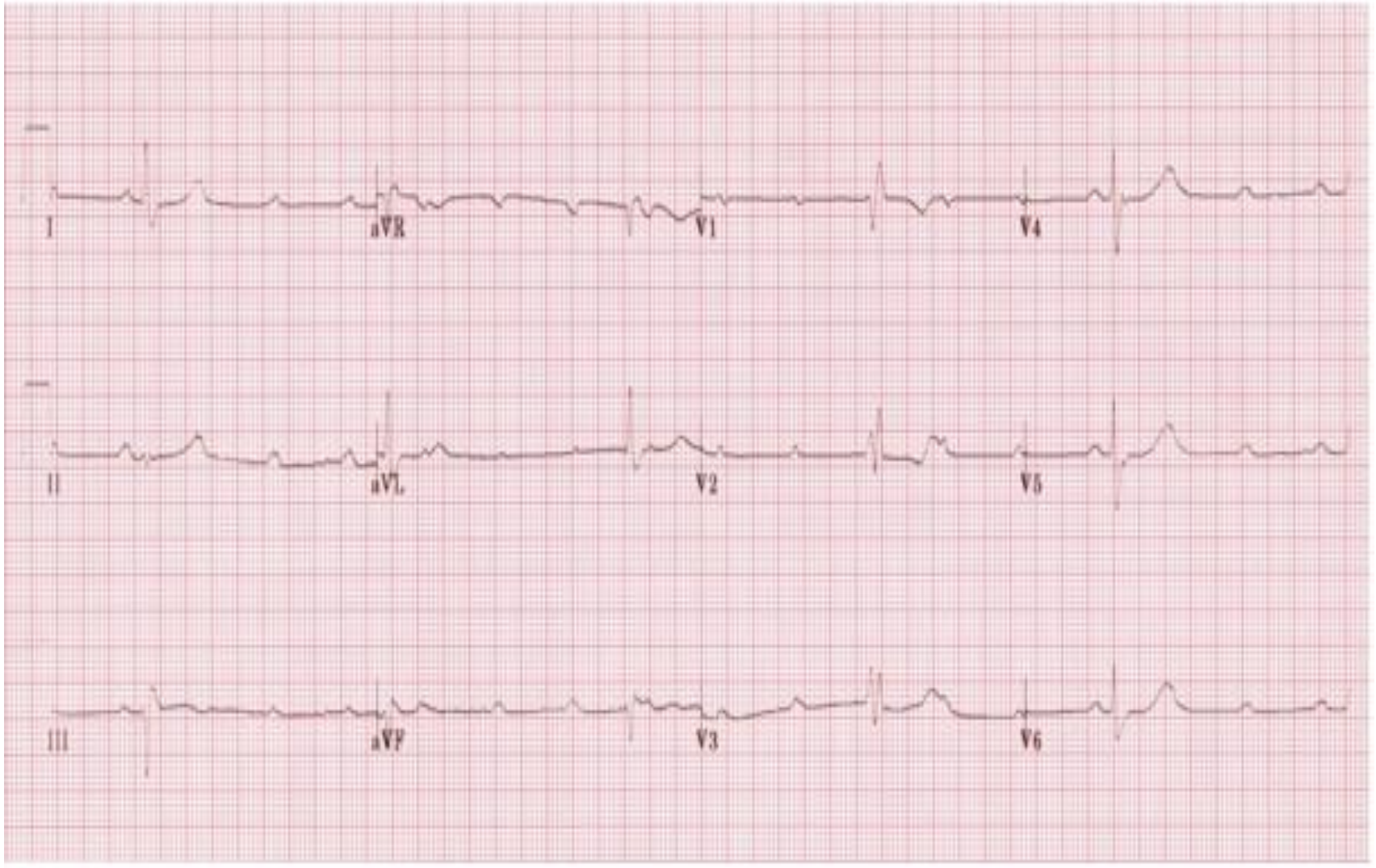


RBBB: look at lead I and V1, V6

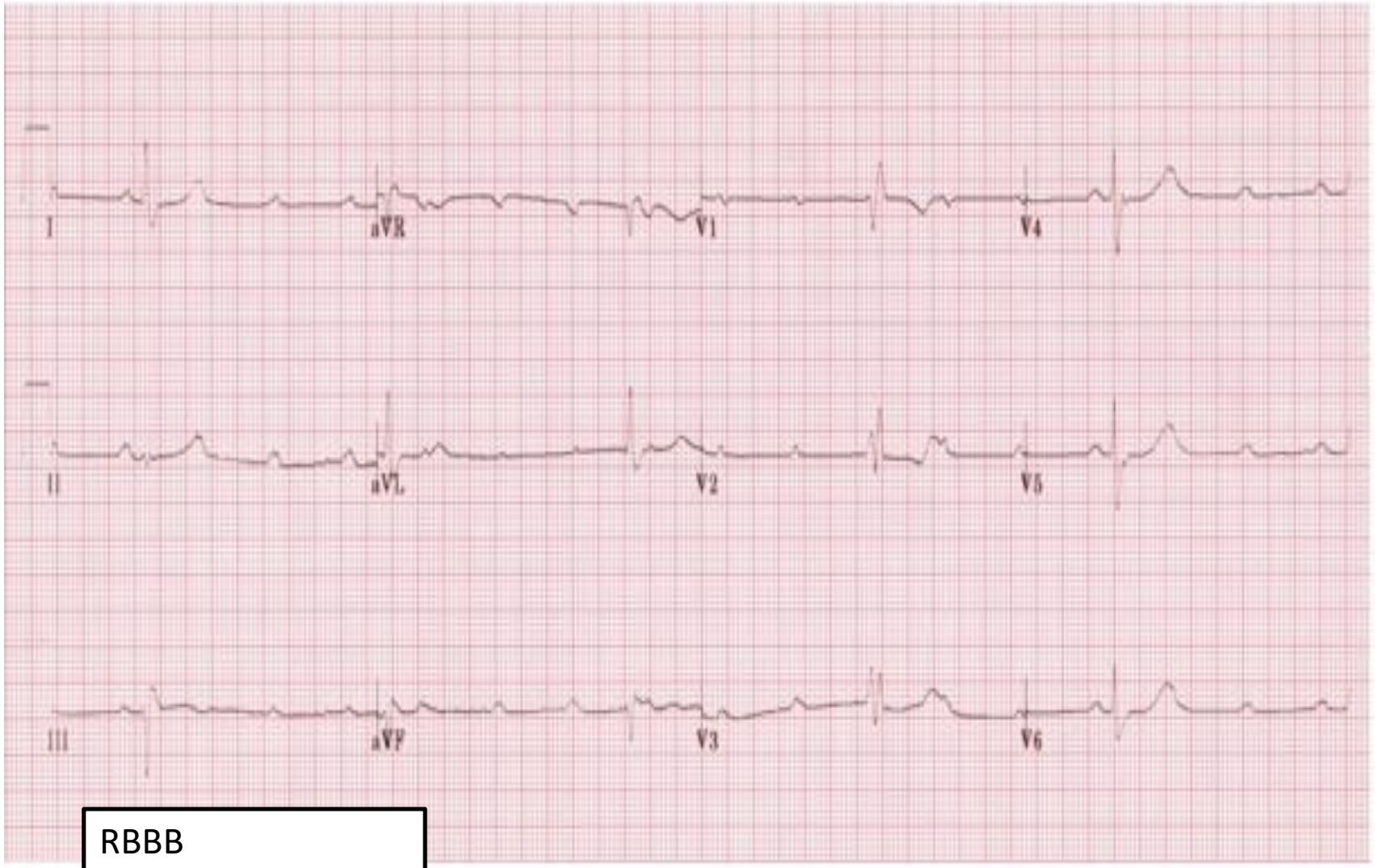
LAD: Lead I is +, Lead aVF is -

LAFB: Tall qR in I and aVL, rS in II, III, aVF

1st degree AV block: prolonged PR


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

Complete Tirfascicular Block



RBBB
LAD
LAFB
3rd degree AV block