

# Conduction Disturbances

The background is a solid teal color. In the bottom right corner, there is a dark teal silhouette of a mountain range with jagged peaks.

# Overview of the Presentation

- ◆ Sino Atrial Block
- ◆ AV Blocks
- ◆ Bundle Branch Block
- ◆ Fascicular Block

# Sino Atrial Block

- Implies that there is delay or failure of a normally generated sinus impulse to exit the nodal region.
- First degree SA block
- Second degree SA block
  - 1.Type 1 (Mobitz 1)
  - 2.Type 2 (Mobitz 2)
- Third degree SA block

# First Degree Sino Atrial Exit Block

- ◆ Implies that the conduction time where each impulse leaving the node is prolonged
- ◆ This problem cannot be observed on surface EKG
- ◆ Electro physiology study needed to measure the sino atrial conduction time



# Second Degree Sino Atrial Exit Block

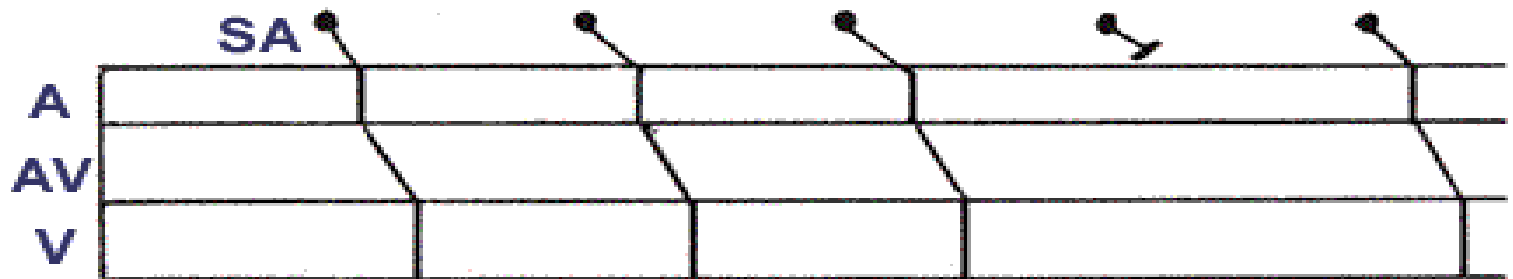
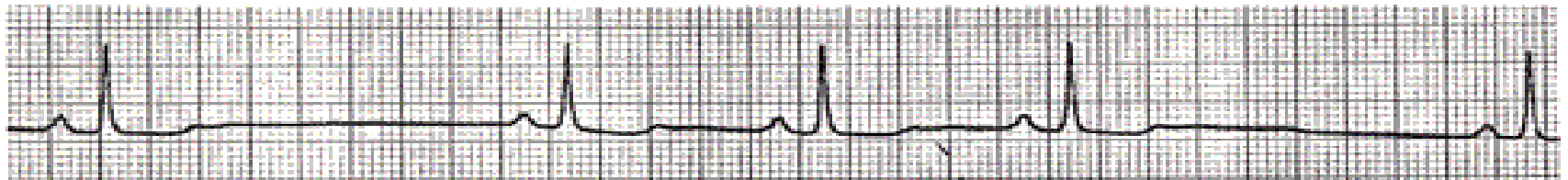
- ◆ Type I (SA Wenckebach)

1. PP intervals gradually shorten until a pause occurs (i.e., the blocked sinus impulse fails to reach the atria)

2. The pause duration is *less than* the two preceding PP intervals

3. The PP interval following the pause is *greater than* the PP interval just before the pause

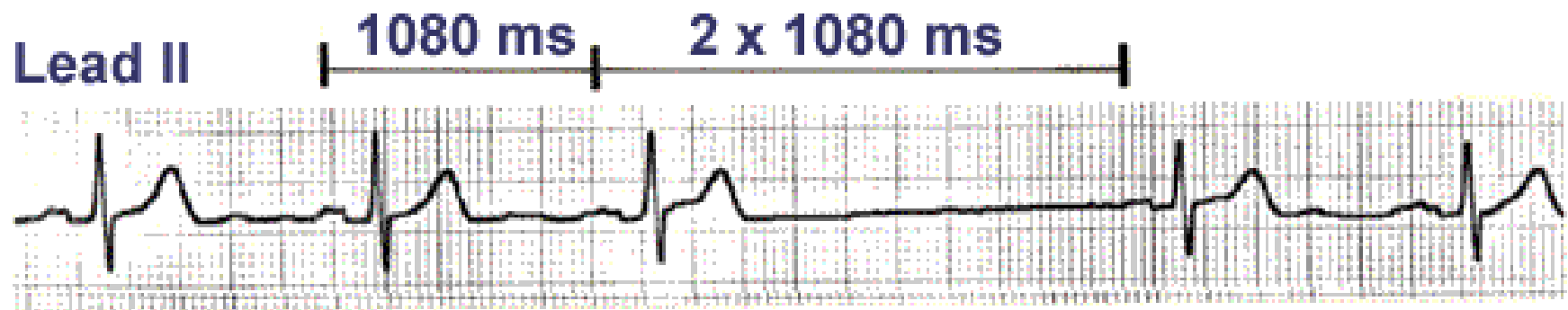
## Lead II



**Sino-Atrial Exit Block (type I)**

# Second Degree Type II SA Block

- ◆ PP intervals fairly constant (unless sinus arrhythmia present) until conduction failure occurs.
- ◆ The pause is approximately *twice* the basic PP interval



**Sino-Atrial Exit Block (Type II)**

Feodorova

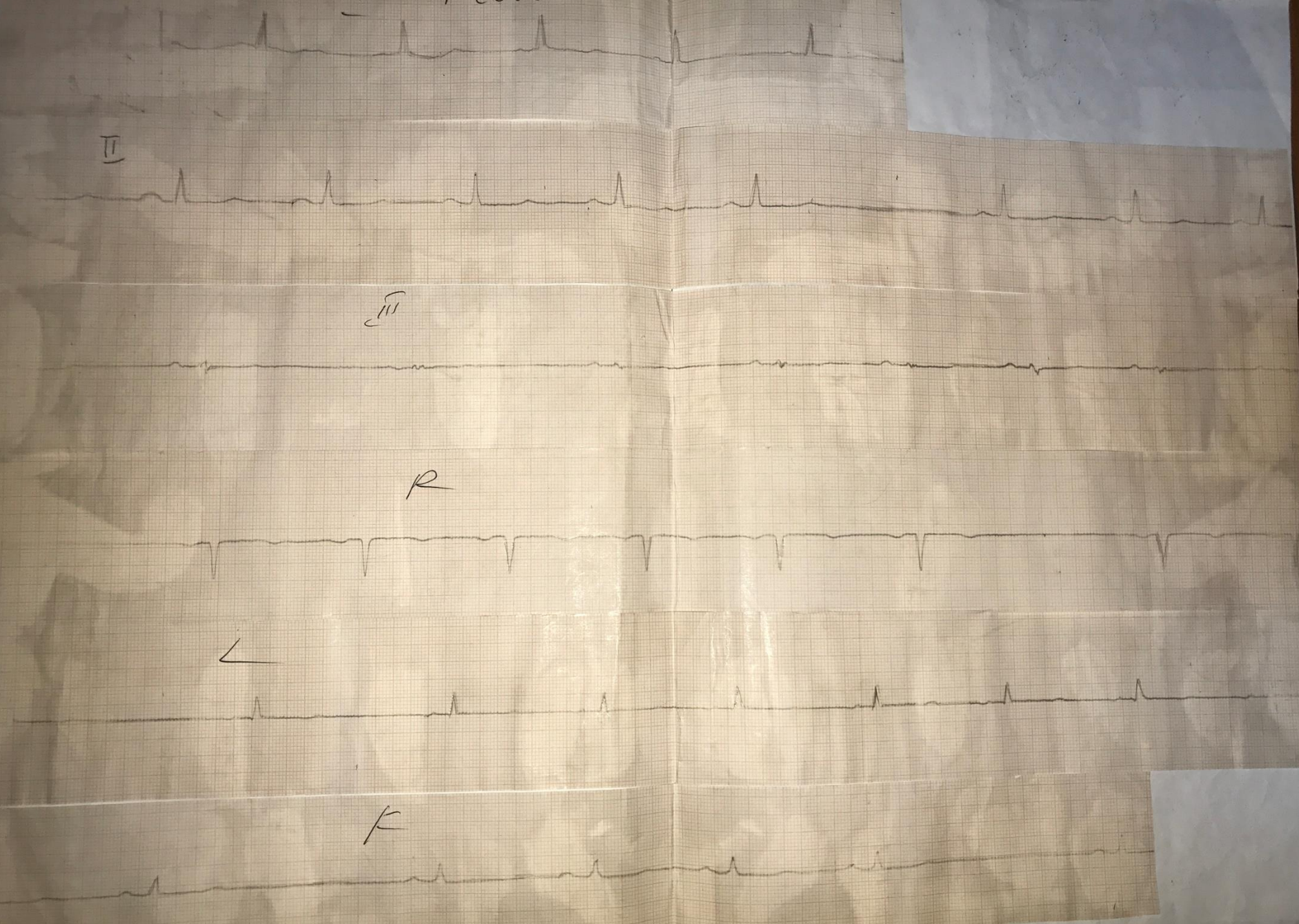
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# Third Degree Or Complete Sino Atrial Exit Block

- ◆ Cannot be distinguished from a prolonged sinus pause or arrest
- ◆ Can be identified from direct recording of sinus node pacemaker activity during an EP study



# AV Blocks:

Divided in to incomplete and complete block

- ◆ Incomplete AV block includes
  - a. first-degree AV block
  - b. second degree AV block
  - c. advanced AV block
- ◆ Complete AV block, also known as third degree AV block

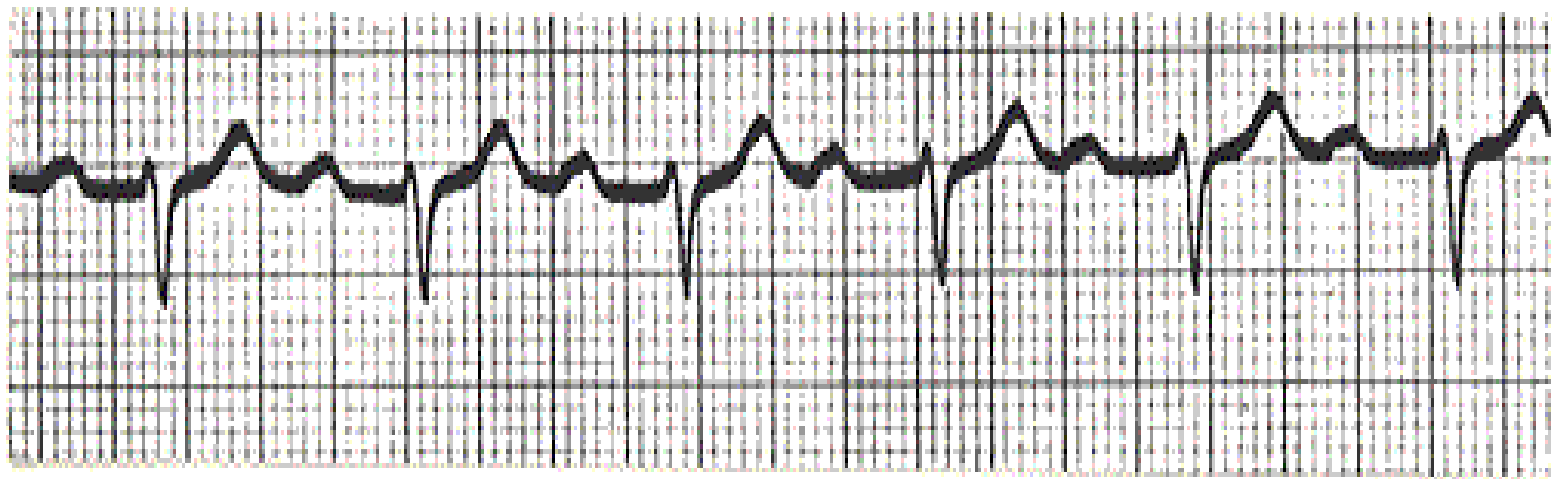
# Location of the Block

- ◆ Proximal to, in, or distal to the His bundle in the atrium or AV node
- ◆ All degrees of AV block may be intermittent or persistent

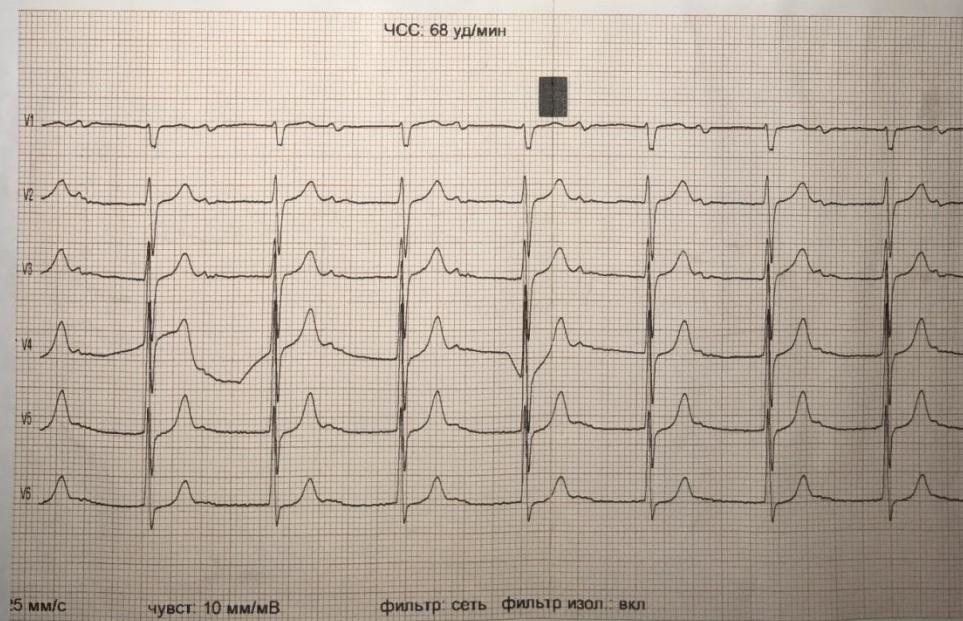
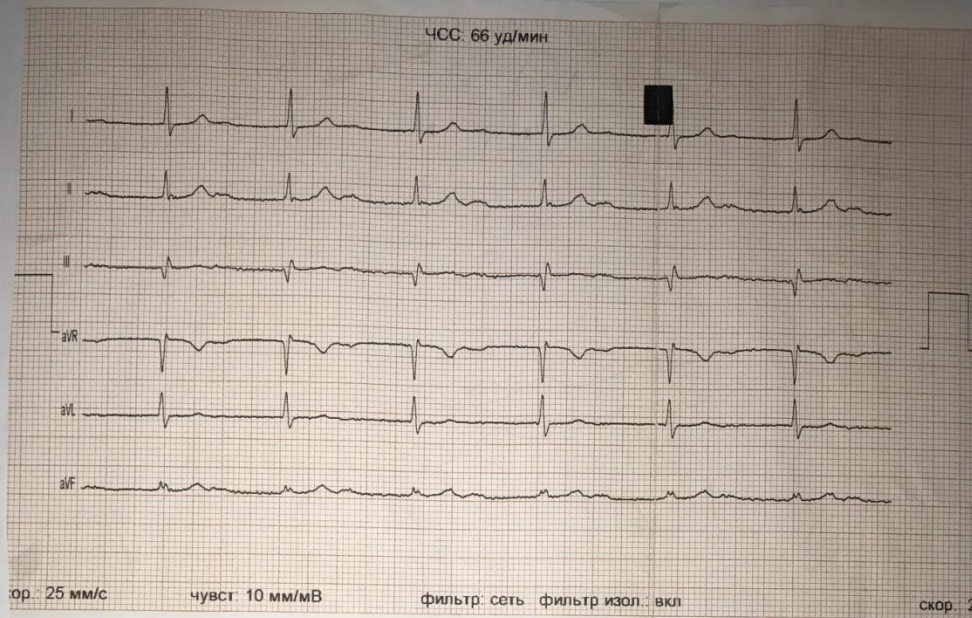


# First Degree AV Block

- ◆ PR interval is prolonged 0.21-0.40 seconds, but no R-R interval change



**1st degree AV block (PR = 280 ms)**



# Second-Degree AV Block

- ◆ There is intermittent failure of the supraventricular impulse to be conducted to the ventricles
- ◆ Some of the P waves are not followed by a QRS complex. The conduction ratio (P/QRS ratio) may be set at 2:1, 3:1, 3:2, 4:3, and so forth

# Types Of Second-Degree AV Block:I and II

- ◆ Type I also is called Wenckebach phenomenon or Mobitz type I and represents the more common type
- ◆ Type II is also called Mobitz type II

# Type I Second-Degree AV Block: Wenckebach Phenomenon

- ◆ ECG findings

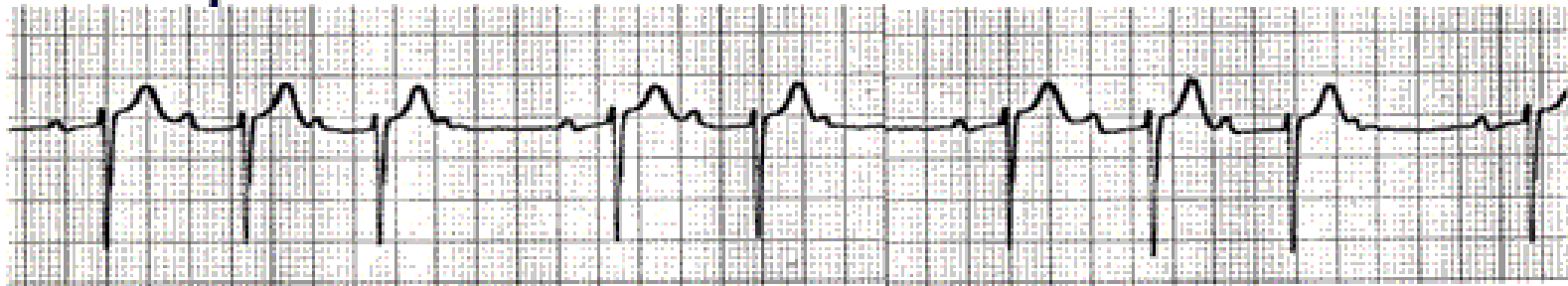
1. Progressive lengthening of the PR interval until a P wave is blocked

2. Progressive shortening of the RR interval until a P wave is blocked

3. RR interval containing the blocked P wave is shorter than the sum of two PP intervals

Lead V<sub>1</sub>

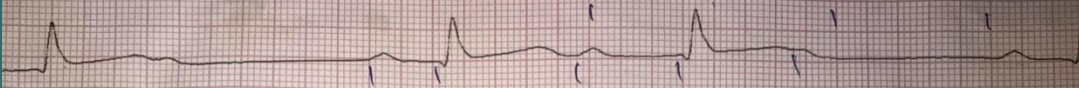
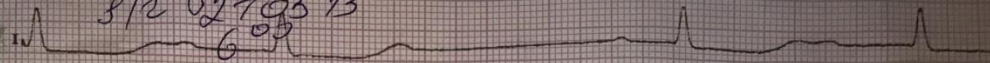
"Classic Wenckebach"



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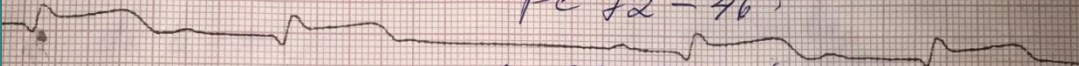


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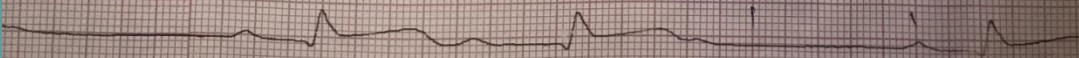
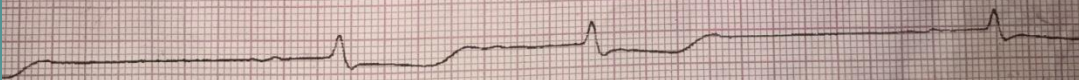
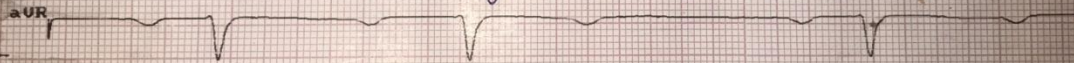


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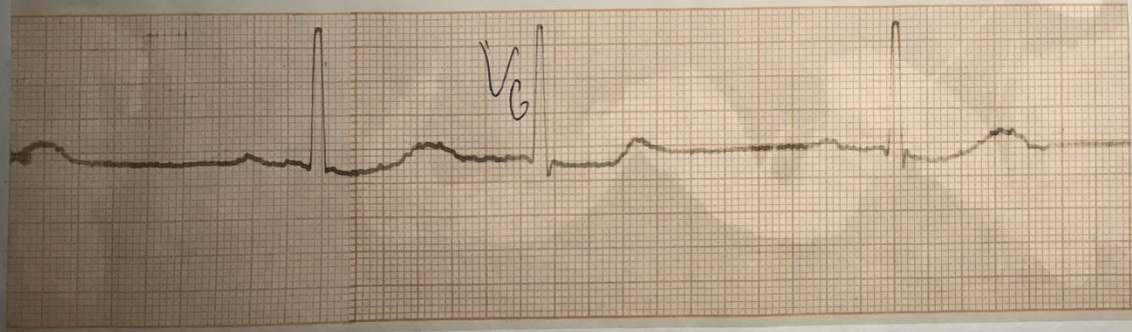
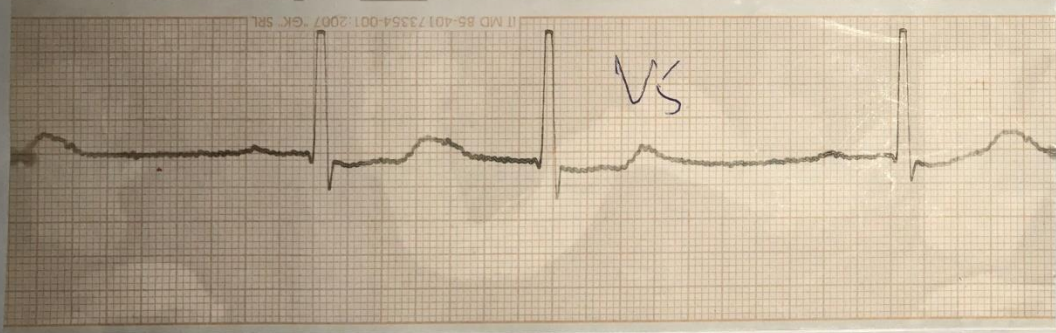
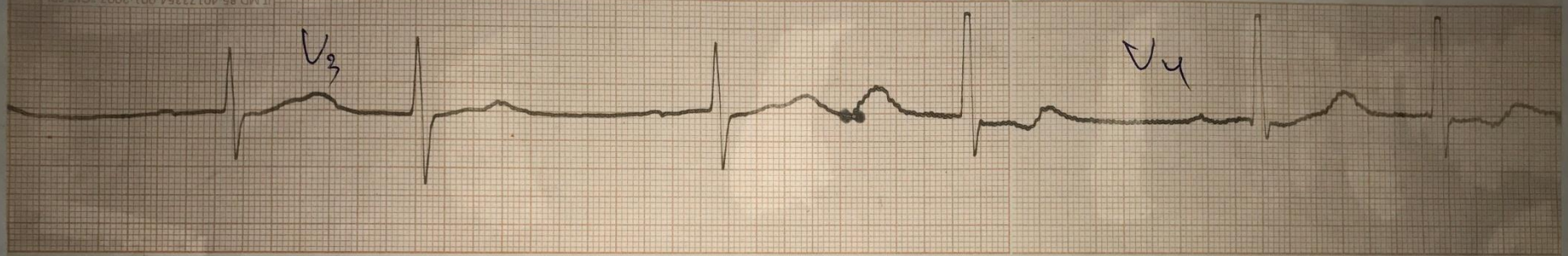
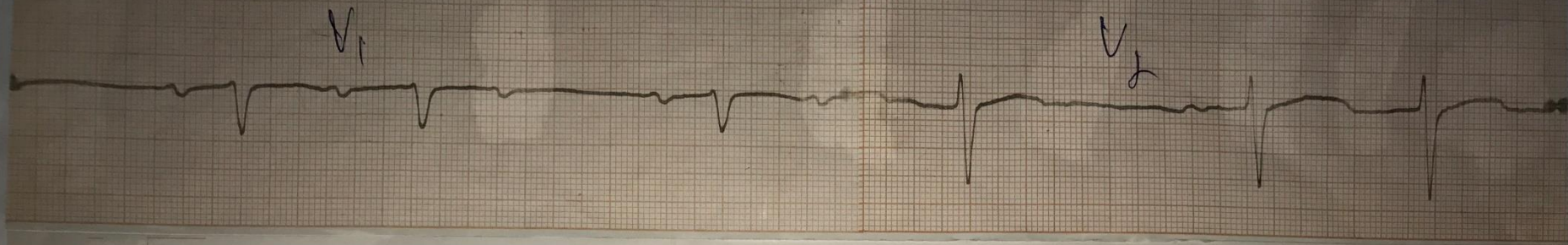
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AV bloc II (IIU).  
Inferior axis acute post-op.



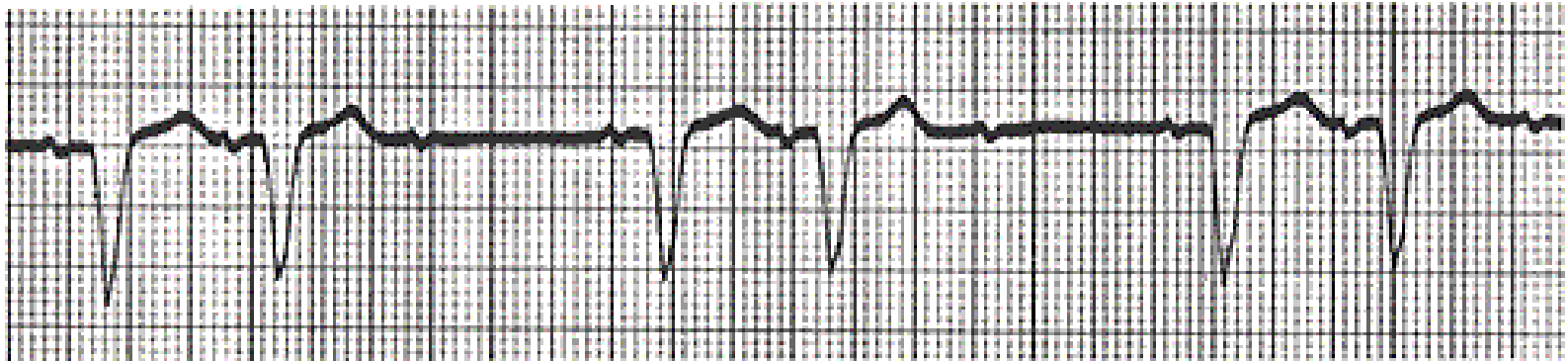




# Type II Second-Degree AV Block: Mobitz Type II

- ◆ ECG findings
  1. Intermittent blocked P waves
  2. PR intervals may be normal or prolonged, but they remain constant
  3. When the AV conduction ratio is 2:1, it is often impossible to determine whether the second-degree AV block is type I or II
  4. A long rhythm strip may help

**Lead V<sub>1</sub>**



**2nd degree AV block (type II) with LBBB**





# High-Grade or Advanced AV Block

- ◆ When the AV conduction ratio is 3:1 or higher, the rhythm is called advanced AV blocked
- ◆ A comparison of the PR intervals of the occasional captured complexes may provide a clue
- ◆ If the PR interval varies and its duration is inversely related to the interval between the P wave and its preceding R wave (RP), type I block is likely
- ◆ A constant PR interval in all captured complexes suggests type II block

# Complete (Third-Degree) AV Block

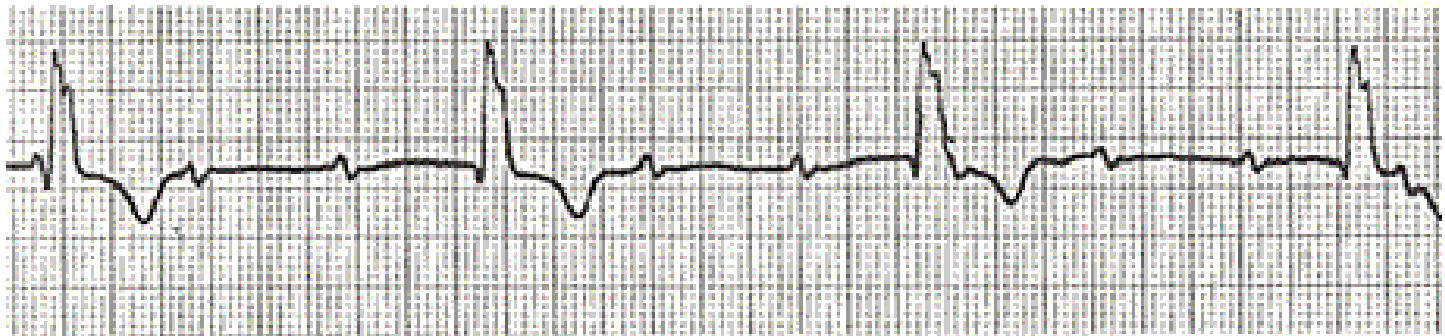
- ◆ There is complete failure of the supraventricular impulses to reach the ventricles
- ◆ The atrial and ventricular activities are independent of each other

# ECG Findings

- ◆ In patients with sinus rhythm and complete AV block, the PP and RR intervals are regular, but the P waves bear no constant relation to the QRS complexes

## Lead V<sub>1</sub>

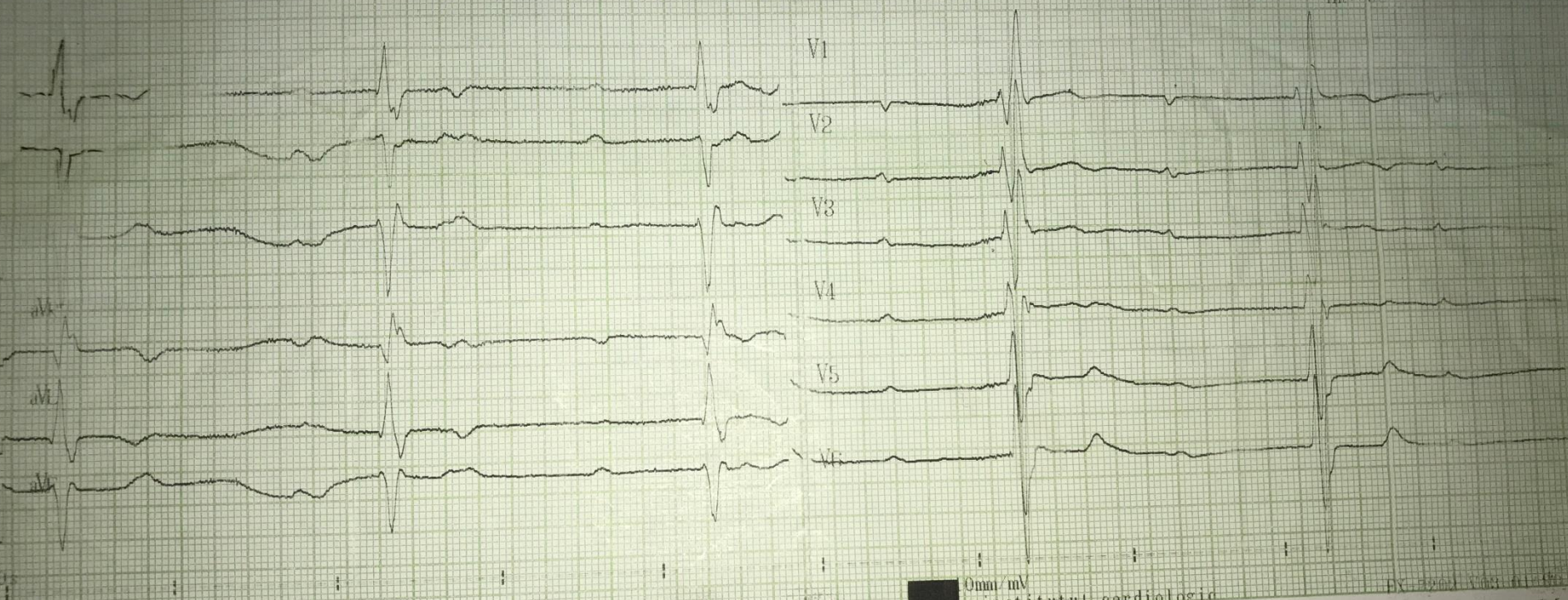
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**B**







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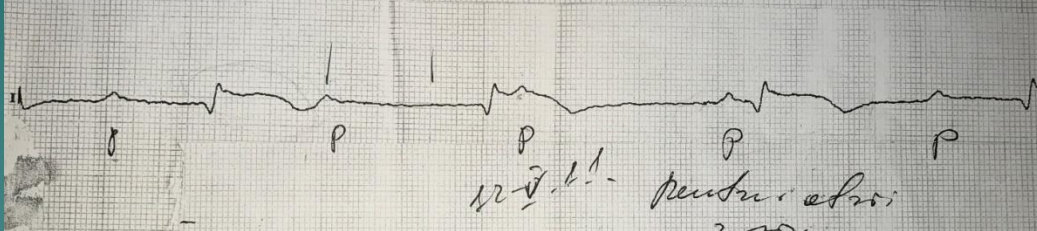


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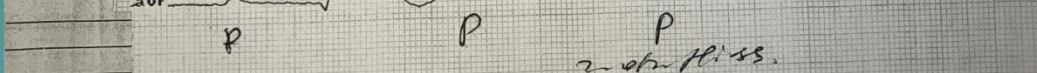
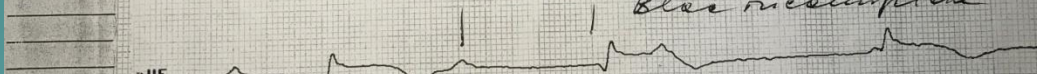
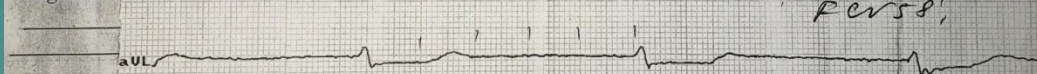
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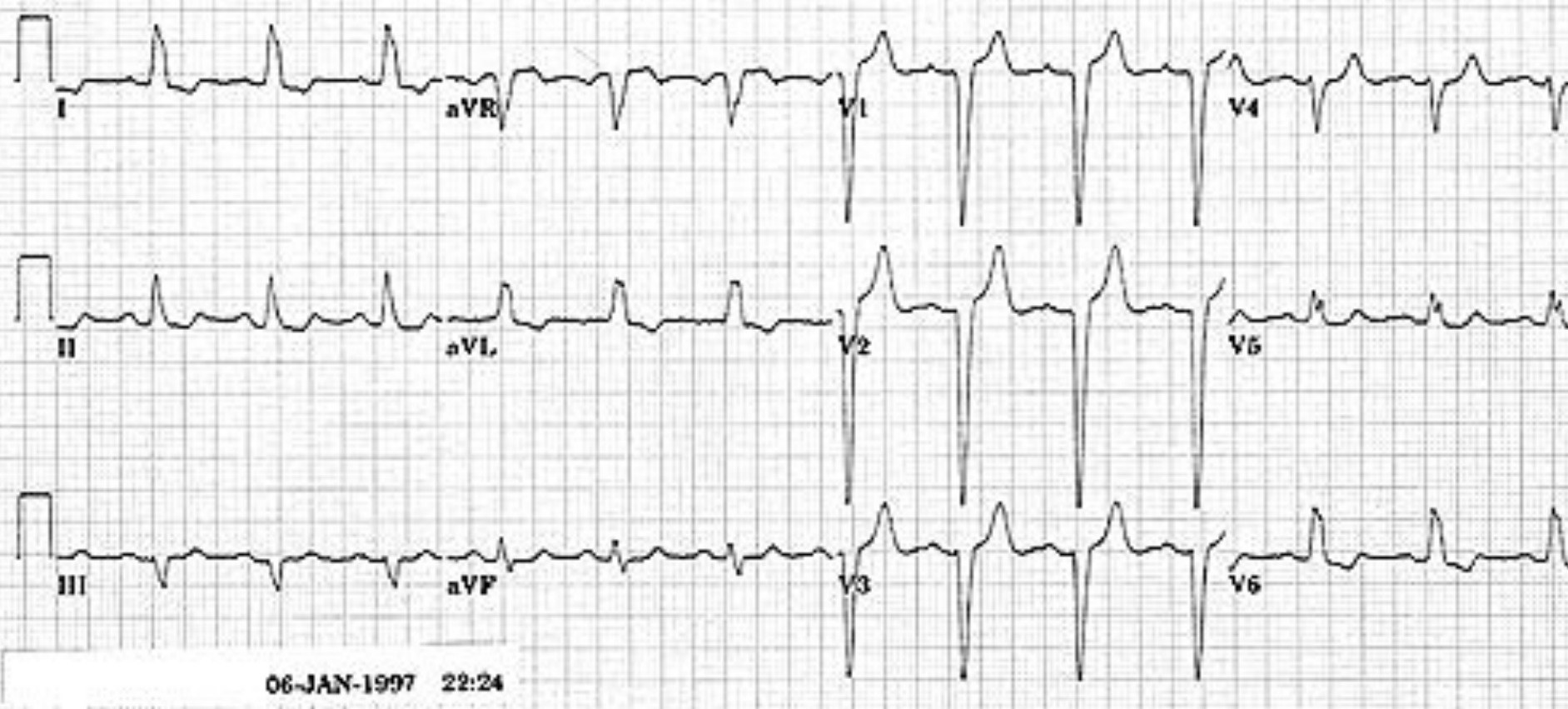
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# Bundle Branch Block

- Left Bundle Branch Block
  1. Complete LBBB
  2. Incomplete LBBB
  
- Right Bundle Branch Block
  1. Complete RBBB
  2. Incomplete RBBB

# Left Bundle Branch Block Electrocardiographic Criteria

1. The QRS duration is  $>/- 120$  ms
2. Leads V5, V6 and AVL show broad and notched or slurred R waves
3. With the possible exception of lead AVL, the Q wave is absent in left-sided leads
4. Reciprocal changes in V1 and V2
5. Left axis deviation may be present

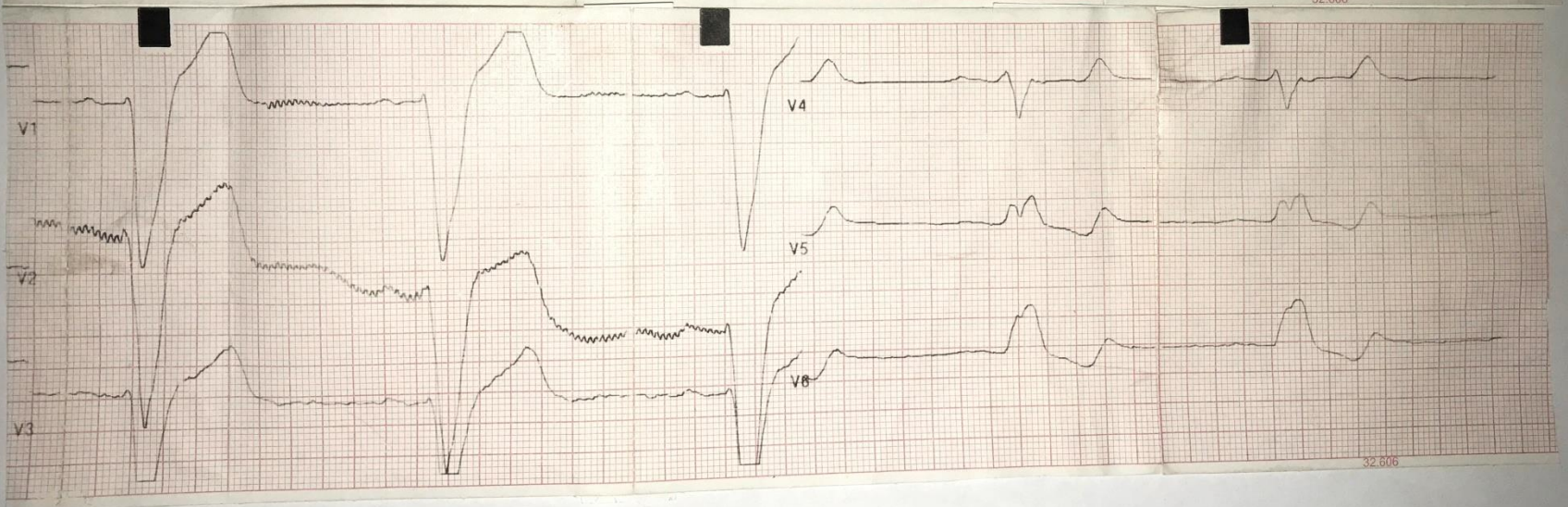
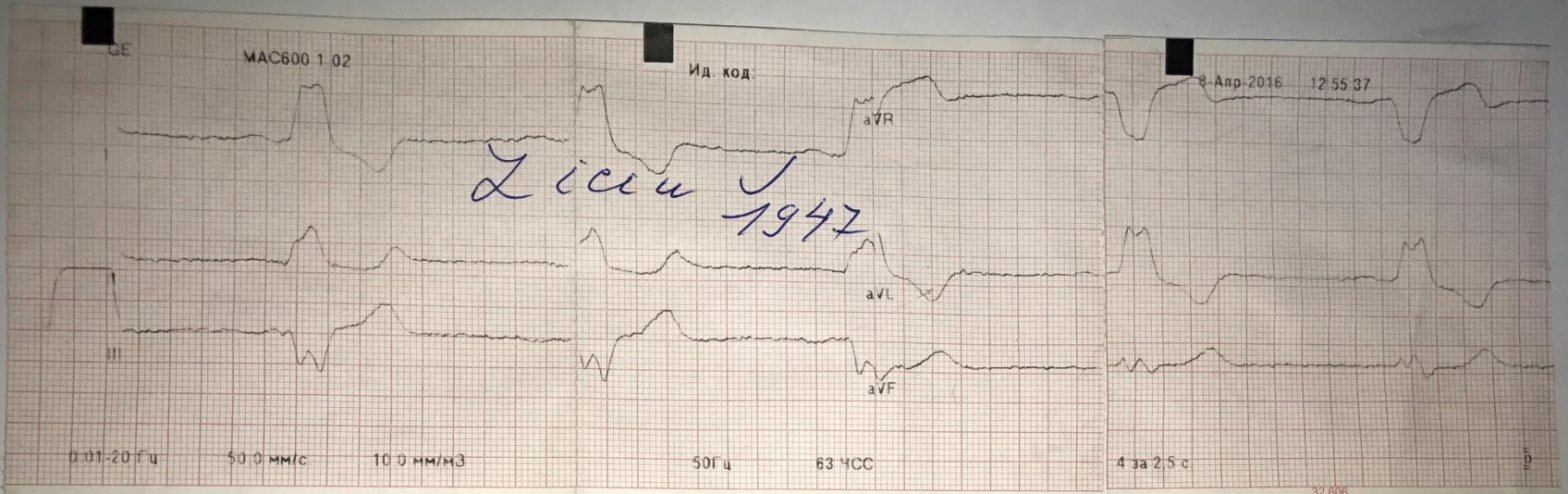


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# Causes Of LBBB

- ◆ Hypertrophy, dilatation or fibrosis of the left ventricular myocardium
- ◆ Ischemic heart disease
- ◆ Cardiomyopathies
- ◆ Advanced valvular heart disease
  - Toxic, inflammatory changes
  - Hyperkalemia
  - Digitalis toxicity
  - Degenerative disease of the conducting system

# Prevalence Of LBBB

At age 50 is 0.4%, and at age 80 it is 6.7%

In most subjects with LBBB, regional wall motion abnormalities (akinetic or dyskinetic segments in the septum, anterior wall or at the apex) are present even in the absence of cardiomyopathy



# Incomplete Left Bundle Branch Block

◆ Criteria for incomplete LBBB include

1. QRS duration  $> 100$  ms but  $< 120$  ms

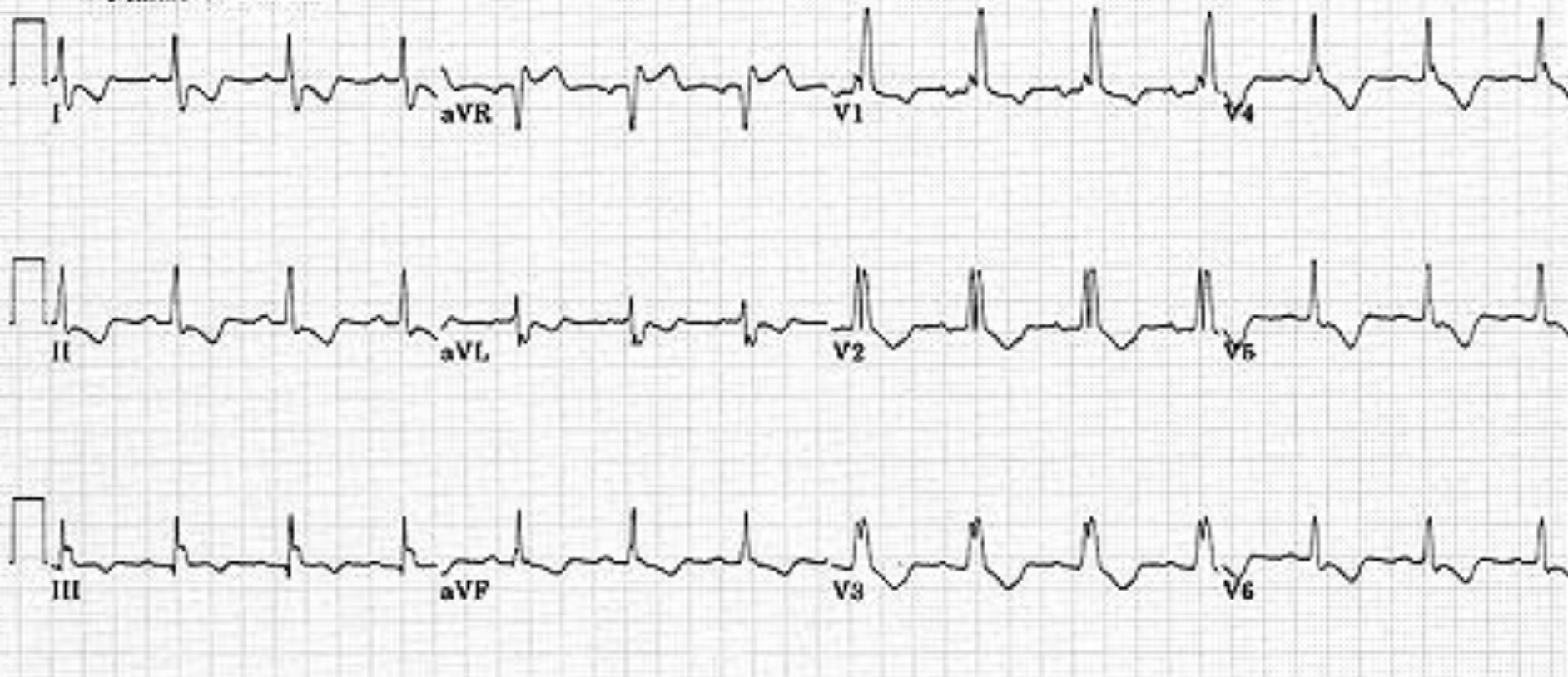
2. Absence of a Q wave in leads V5, V6 and I

# Right Bundle Branch Block

◆ The diagnostic criteria include

1. QRS duration is  $> 120$  ms
2. An  $rsr'$ ,  $rsR'$  or  $rSR'$  pattern in lead V1 or V2 and occasionally a wide and notched R wave.
3. Reciprocal changes in V5, V6, I and AVL

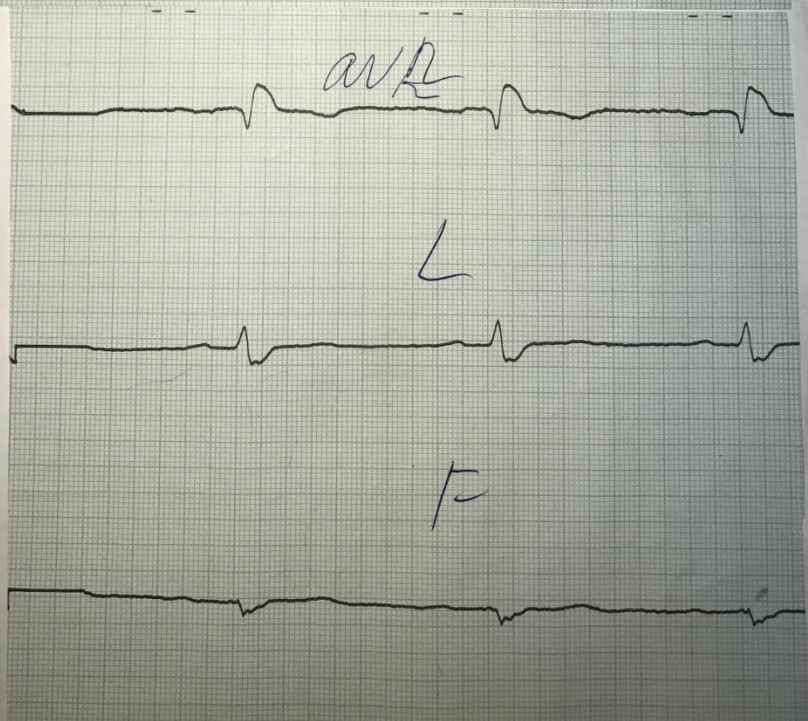
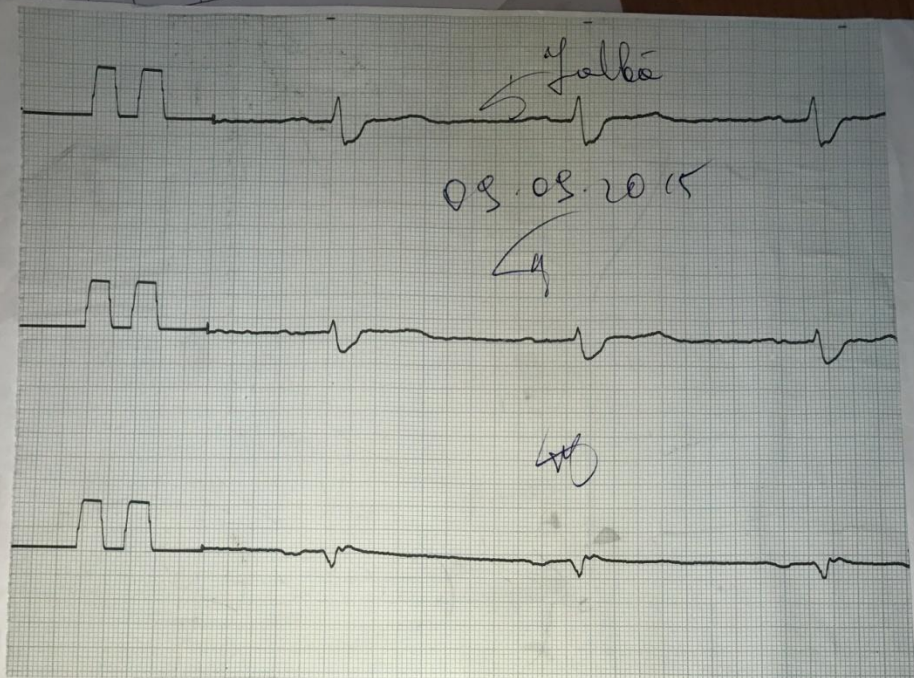
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Female Caucasian



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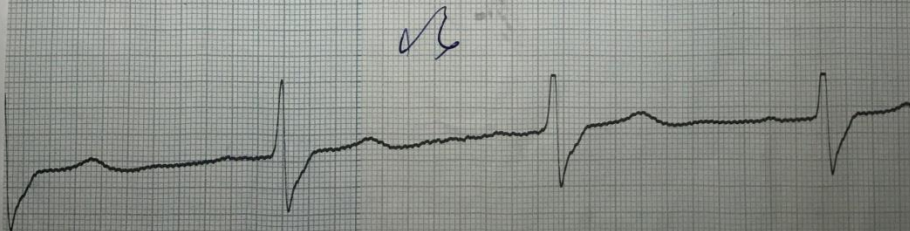
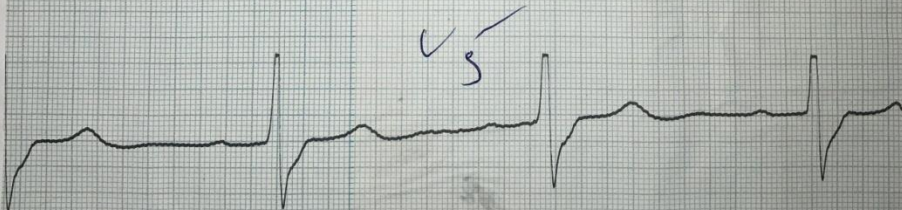
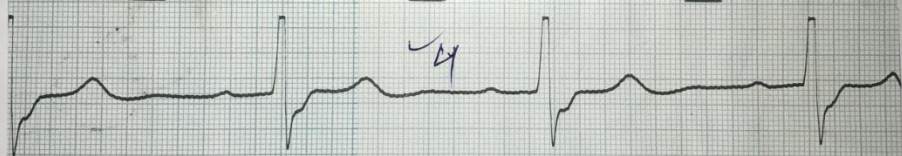
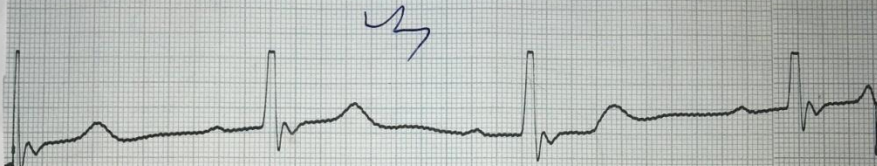
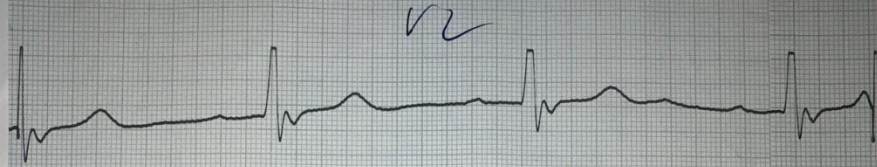
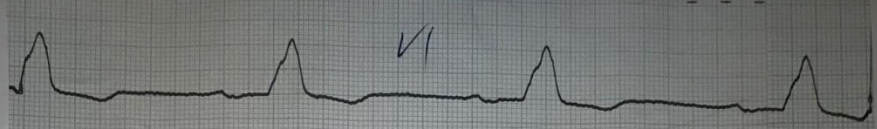


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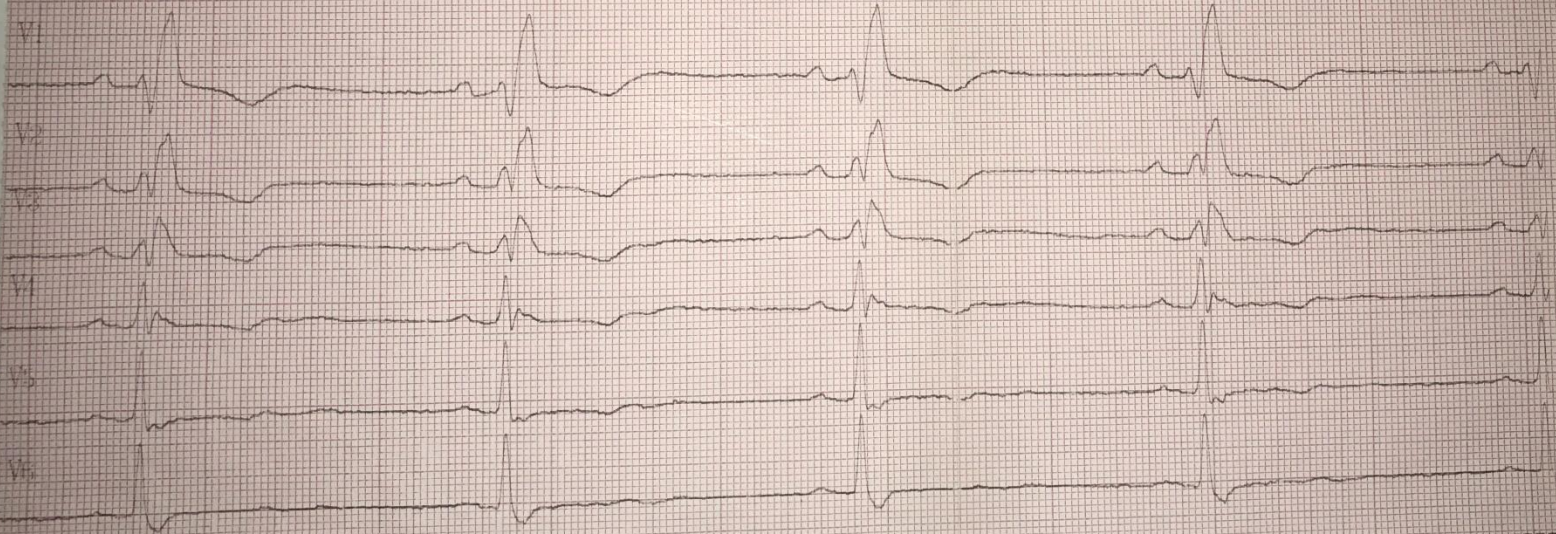
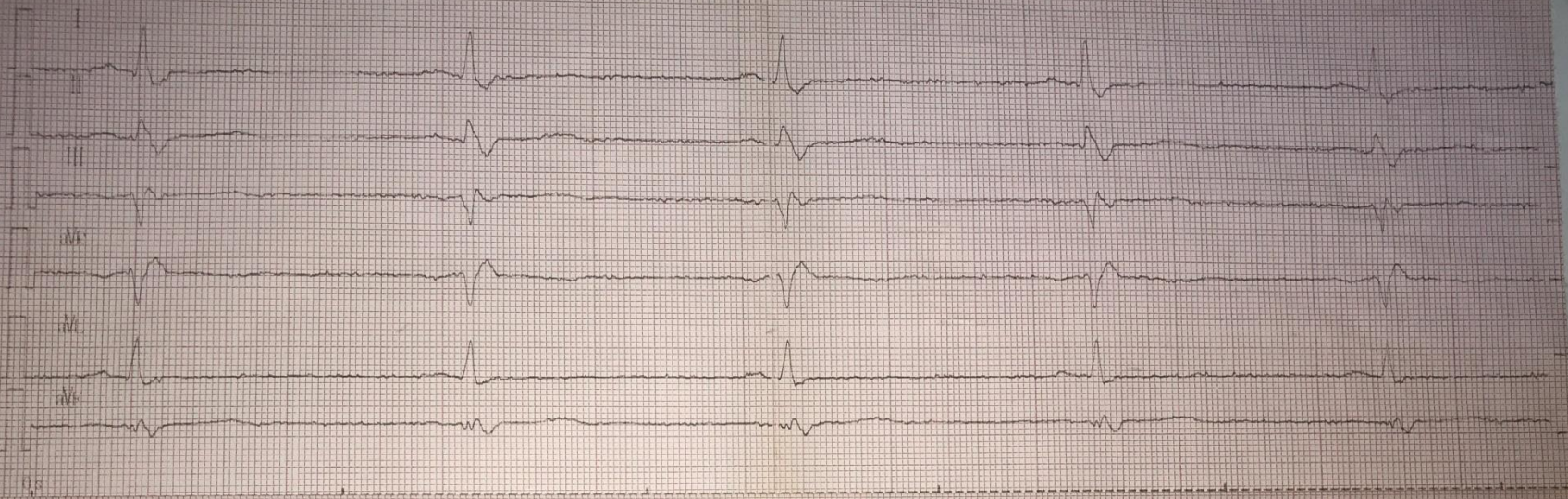


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Female 57 years

23 Jan 2014 12:22:08

Name: [REDACTED]




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Vm/mV

# Causes of RBBB

3. Right ventricular hypertrophy
  4. Increase incidence of RBBB among population at high altitude
  5. Ebstein's anomaly
  6. Brugada Syndrome
- 
- A stylized silhouette of a mountain range in shades of teal, located in the bottom right corner of the slide.



# RBBB in the General Population

- ◆ The incidence increased with age
  1. Below age 30 the incidence is 1.3 per 1000
  2. Between 30 and 44 it ranges from 2.0 to 2.9 per 1000

# Incomplete RBBB

- ◆ Criteria for incomplete RBBB are the same as for complete RBBB except that the QRS duration is  $< 120$  ms



# Causes of Incomplete RBBB

1. Atrial septal defect (RAD in secundum or sinus venosus type, LAD with ostium primum type)
2. Ebstein's anomaly
3. Right ventricular dysplasia
4. Congenital absence or atrophy of the bundle branch
5. After transplanted hearts
6. Brugada Syndrome

# Fascicular Blocks

- ◆ The left bundle branch divides into two fascicles
  1. Superior and anterior
  2. Inferior and posterior

# Types Of Fascicular Block

- ◆ Left anterior fascicular block
- ◆ Left posterior fascicular block
- ◆ Bifascicular Block
- ◆ Trifascicular Block

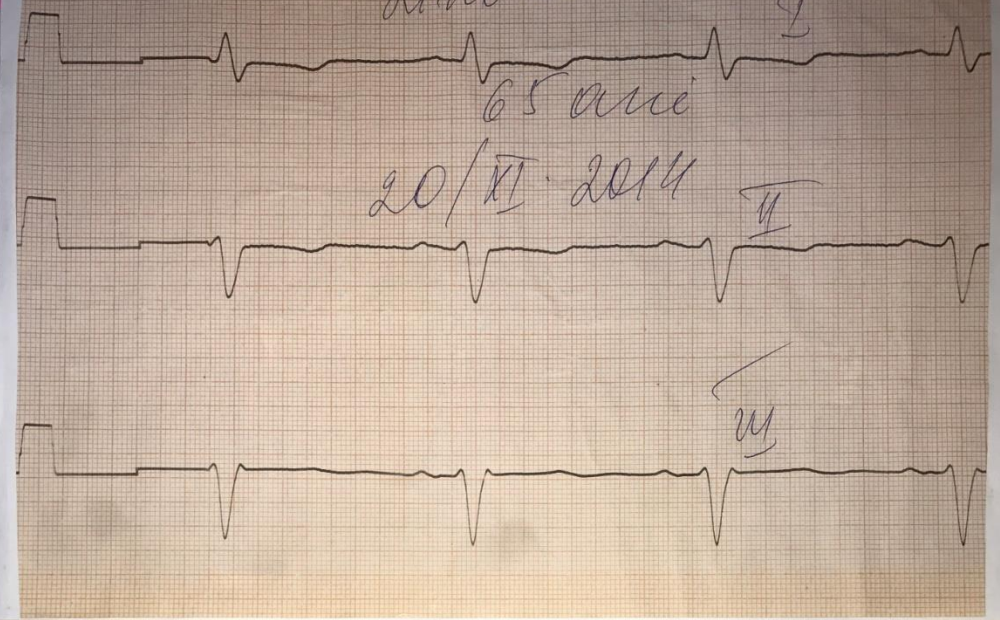
# Left Anterior Fascicular Block

- ◆ Left axis deviation
- ◆ QRS duration usually  $<0.12s$  unless coexisting RBBB
- ◆ Poor R wave progression in leads V1-V3 and deeper S waves in leads V5 and V6
- ◆ There is RS pattern with R wave in lead II  $>$  lead III
- ◆ S wave in lead III  $>$  lead II
- ◆ QR pattern in lead I and AVL, with small Q wave

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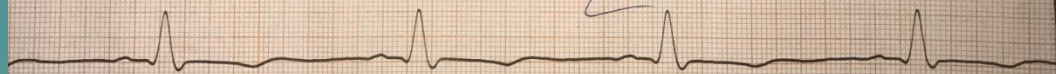
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# Causes of Left Anterior Fascicular Block

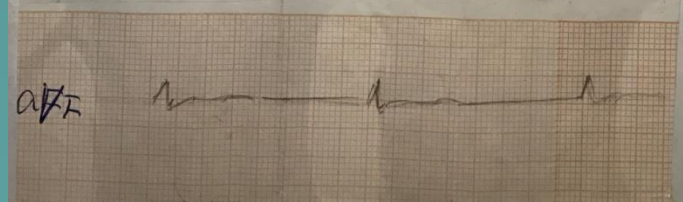
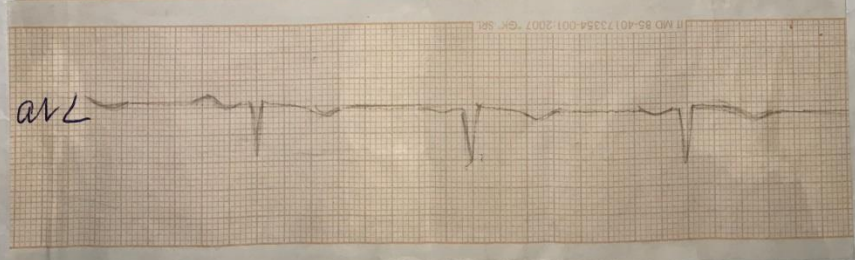
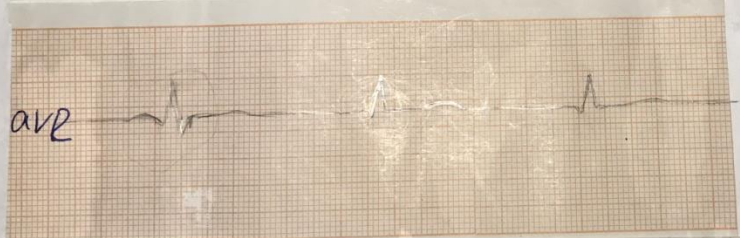
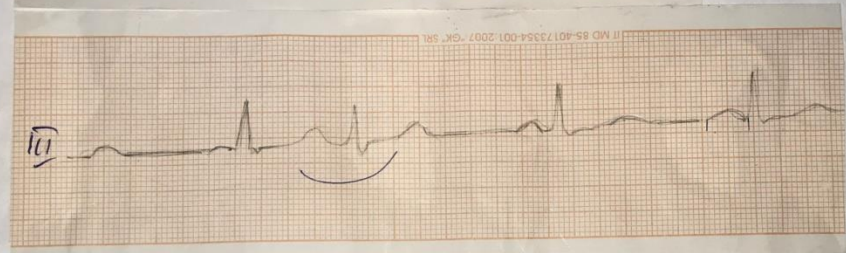
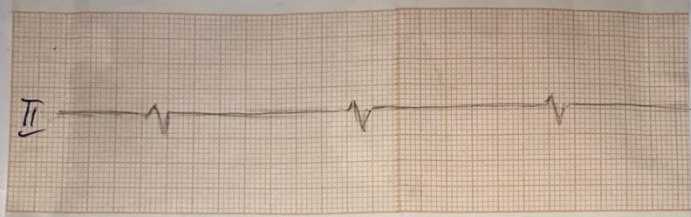
1. Acute Myocardial Infarction
2. Hypertensive heart disease
3. Degenerative disease of the conducting system
4. Myocardial fibrosis

# Left Posterior Fascicular Block

- ◆ Diagnostic Criteria include
  1. QRS duration 100- <120 ms
  2. No ST segment or T wave changes
  3. Right axis deviation
  4. QR pattern in inferior leads (II, III, AVF)  
small q wave
  5. RS pattern in lead lead I and AVL (small R with deep S)

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# Bifascicular Bundle Branch Block

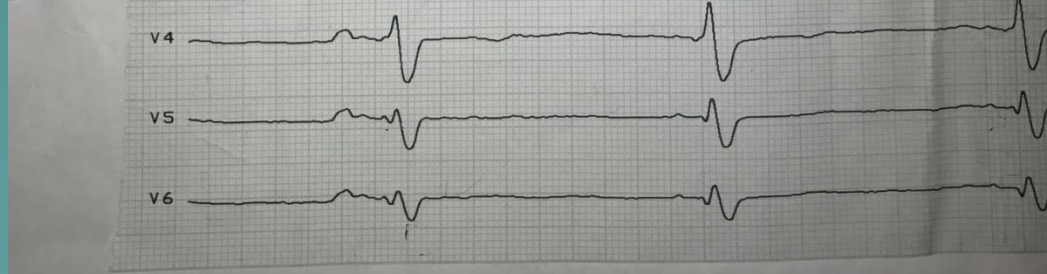
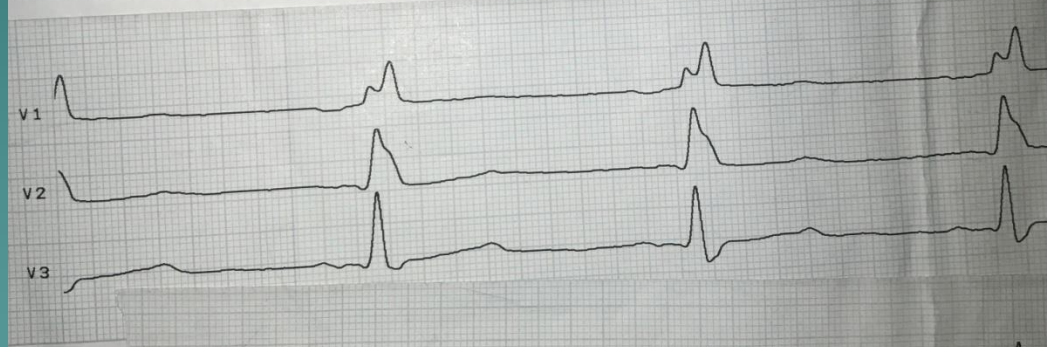
RBBB with either left anterior or left posterior fascicular block

## ◆ Diagnostic criteria

1. Prolongation of the QRS duration to 0.12 second or longer
2. RSR' pattern in lead V1, with the R' being broad and slurred
3. Wide, slurred S wave in leads I, V5 and V6
4. Left axis or right axis deviation



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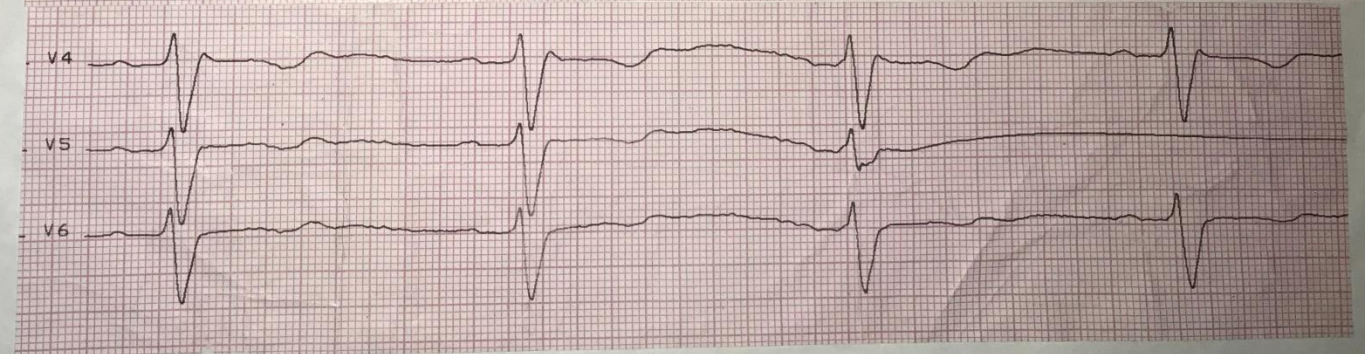
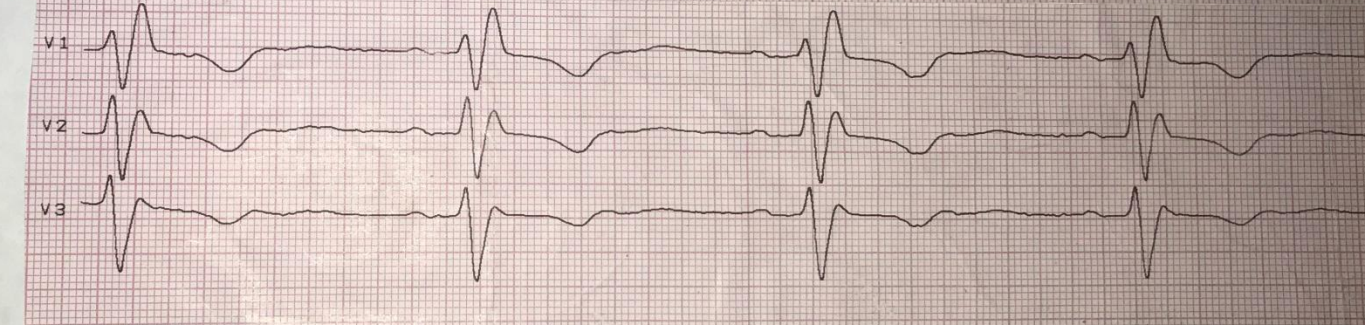
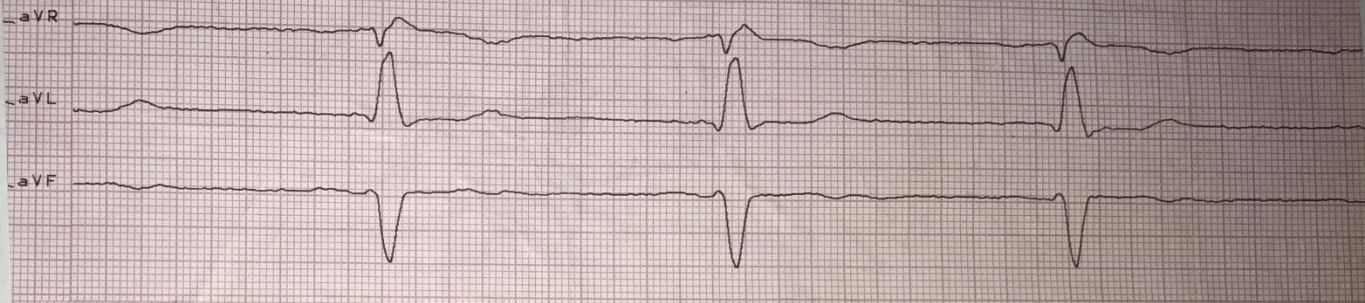


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# Causes of Bifascicular Block

1. Coronary artery disease
2. Degenerative disease of the conducting system
3. Aortic stenosis
4. Hypertensive heart disease
5. Myocardial fibrosis
6. Tetralogy of Fallot
7. After cardiac transplantation

# Trifascicular Block

- ◆ *The combination of RBBB, LAFB and long PR interval*
- ◆ *Implies that conduction is delayed in the third fascicle*



# Indications For Implantation of Permanent Pacing in Acquired AV Block

## ◆ Class I

1. Third-degree AV block associated with
  - a. Bradycardia with symptoms (C)
  - b. Arrhythmias and other medical conditions that require drugs that result in symptomatic bradycardia (C)
  
2. Second-degree AV block with symptomatic bradycardia

- ◆ Asymptomatic third-degree AV block with average awake ventricular rates of 40 bpm or faster (B,C)
- ◆ Asymptomatic type II second-degree AV block (B)
- ◆ First-degree AV block with symptoms suggestive of pacemaker syndrome and documented alleviation of symptoms with temporary AV pacing (B)

# Indications for Permanent Pacing in Chronic Bifascicular and Trifascicular Block

## 1. Class I

- ◆ Intermittent third-degree AV block. (B)
- ◆ Type II second-degree AV block. (B)

## 2. Class IIa

- ◆ Syncope not proved to be due to AV block when other likely causes have been excluded, specifically ventricular tachycardia (VT). (B)

## 3. Class III

- ◆ Fascicular block without AV block or symptoms. (B)
- ◆ Fascicular block with first-degree AV block without symptoms. (B)

# Indications for Permanent Pacing After The Acute Phase Of Myocardial Infarction

- ◆ Persistent second-degree AV block with bilateral bundle branch block or third-degree AV block w
- ◆ Persistent and symptomatic second- or third-degree AV block. (C)



# Arrhythmias

