



**Department of Anesthesia
Techniques**
Electrocardiogram

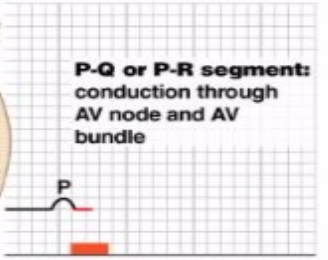
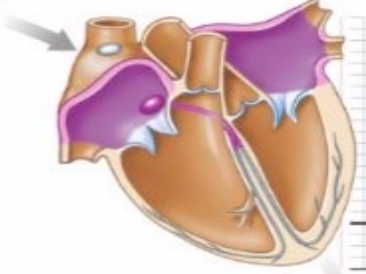
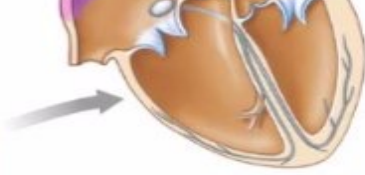
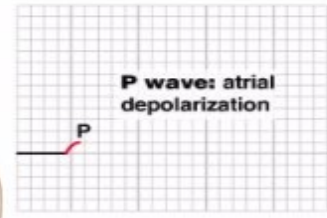
III



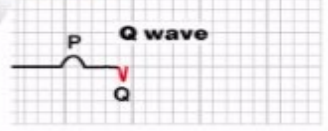
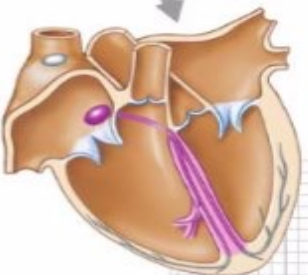
Dr. Mohammed Sami
Mohammed.sami.hasan@uomus.edu.iq

ELECTRICAL EVENTS OF THE CARDIAC CYCLE

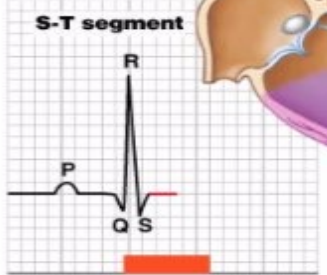
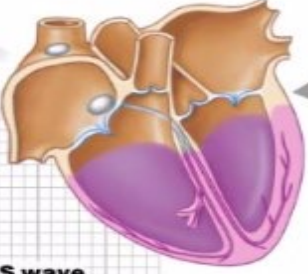
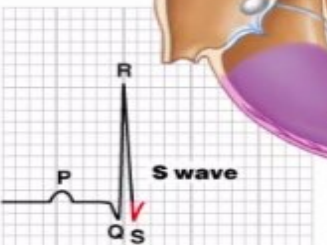
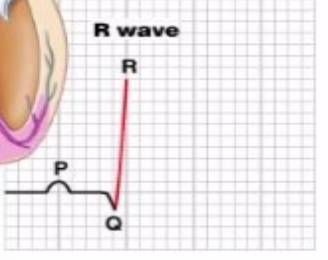
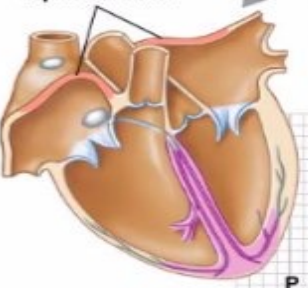
START



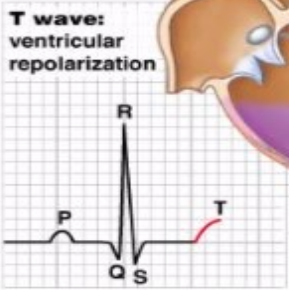
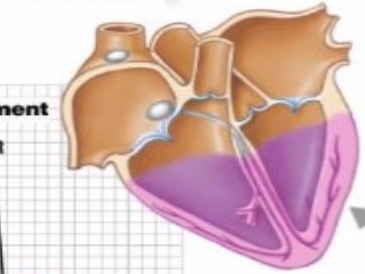
Atria contract



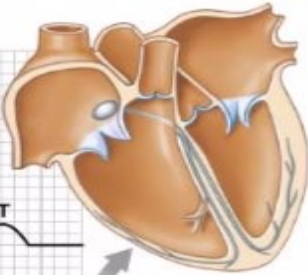
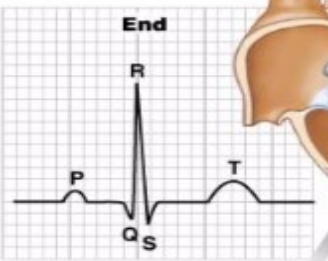
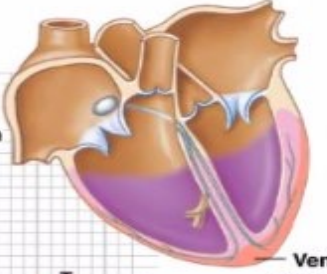
Atrial repolarization



Ventricles contract



Ventricular repolarization



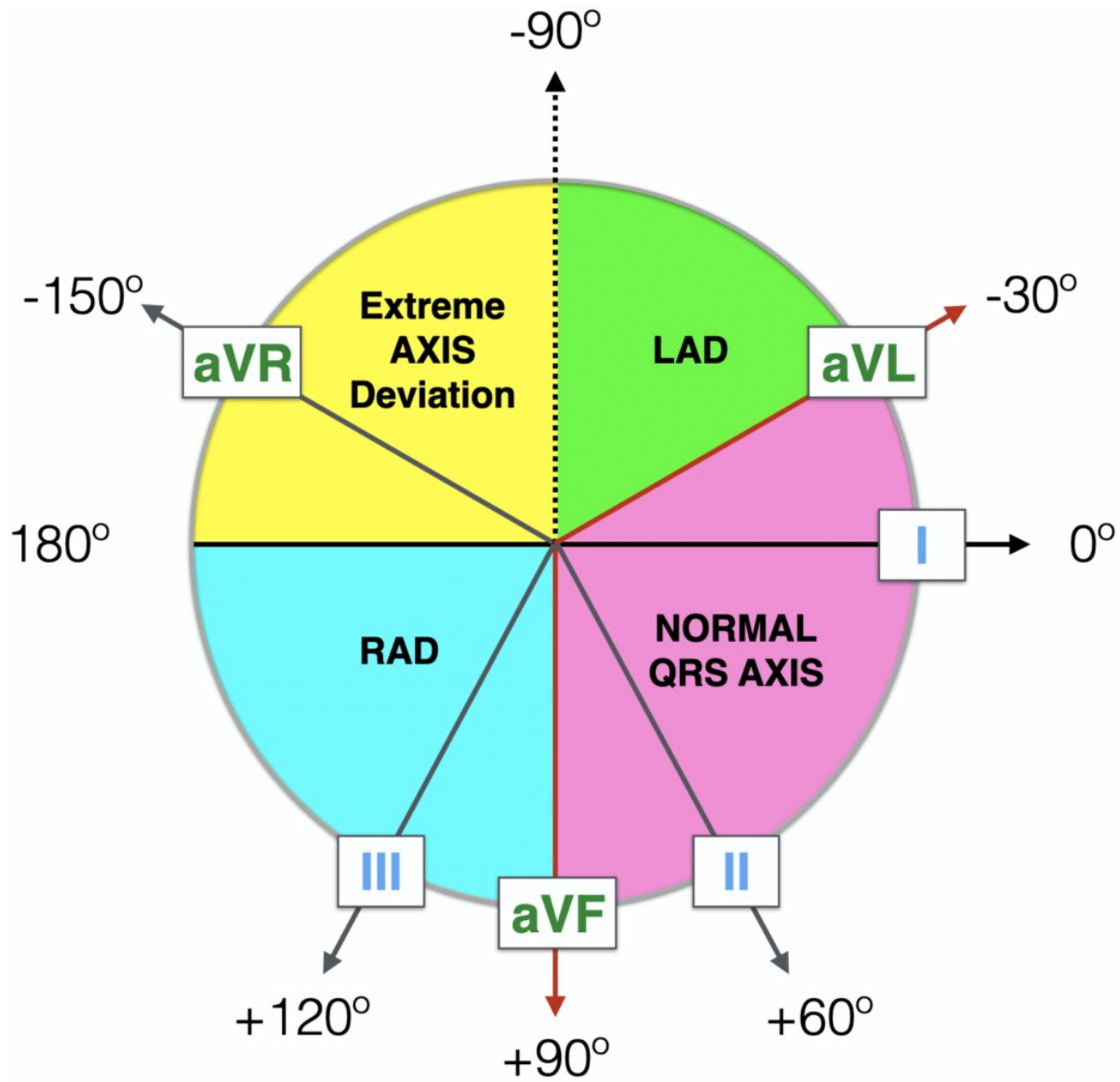
Anatomic Orientation (Summary)

I Lateral	aVR None	V ₁ Septal	V ₄ Anterior
II Inferior	aVL Lateral	V ₂ Septal	V ₅ Lateral
III Inferior	aVF Inferior	V ₃ Anterior	V ₆ Lateral

Axis

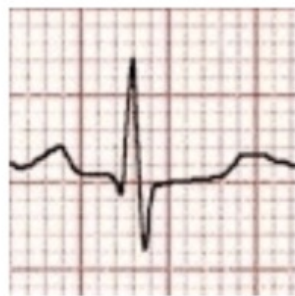
- **QRS complex axis:** is the general direction of the ventricular depolarization
- three types:
 - normal
 - left deviated
 - right deviated.

Population data shows that normal QRS axis is from -30° to 105° with 0° being along lead I and positive being inferior and negative being superior



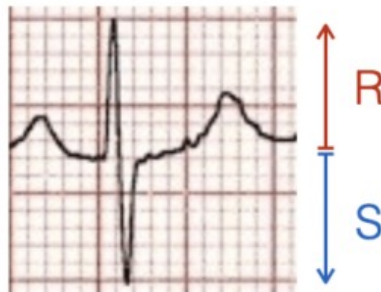
Axis estimation

- look at **LEAD I** and **LEAD aVF**.
- Examine the QRS complex in each lead and determine if it is Positive, Isoelectric or Negative:



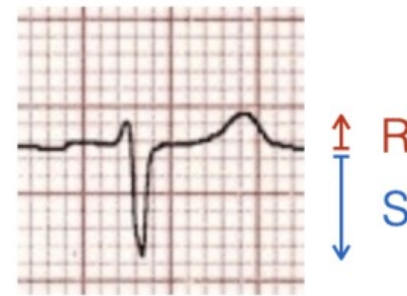
POSITIVE

$$[R > S]$$



EQUIPHASIC

$$[R = S]$$

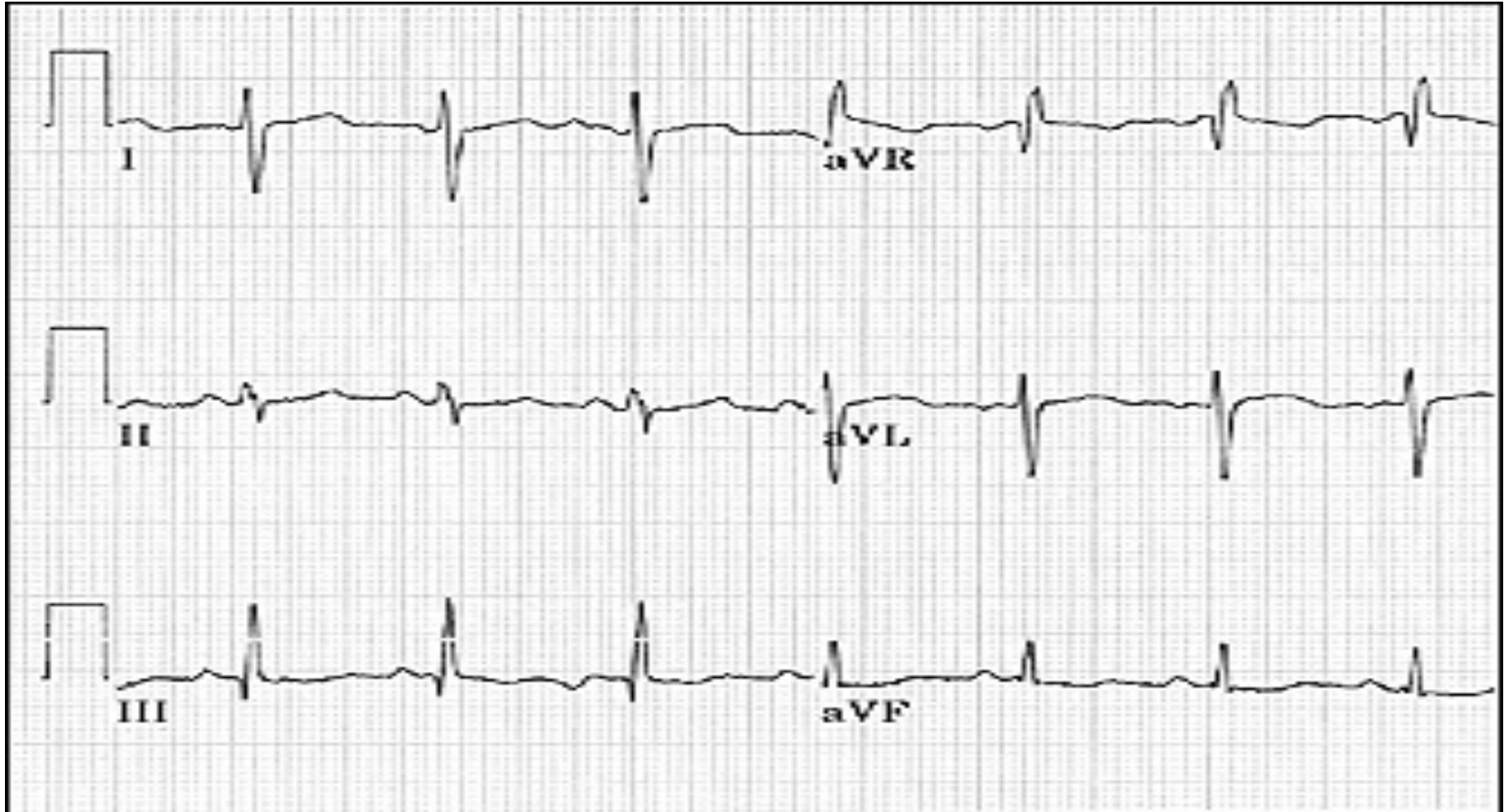


NEGATIVE

$$[R < S]$$

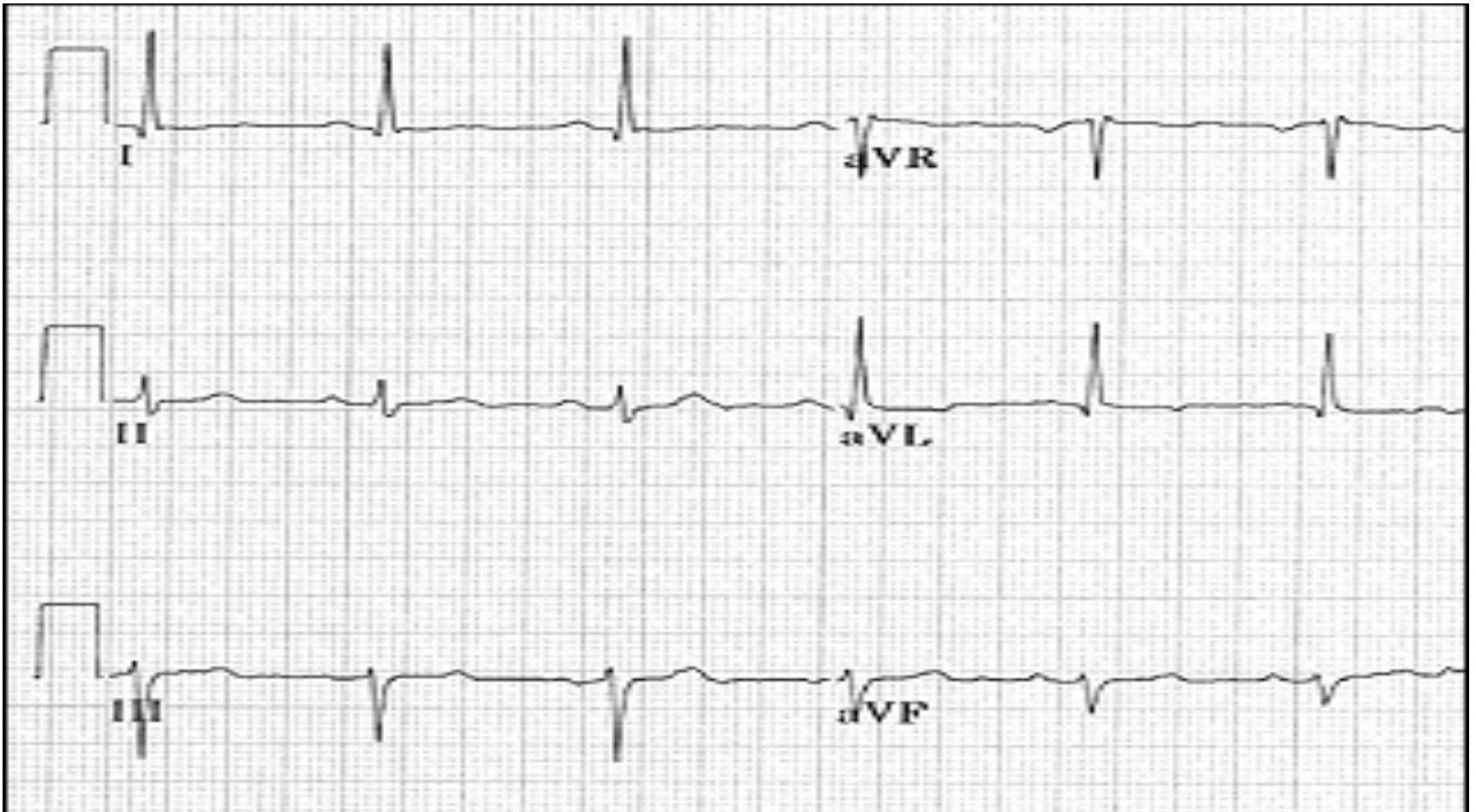
Lead 1	Lead aVF	Quadrant	Axis
POSITIVE	POSITIVE		Normal Axis (0 to +90°)
POSITIVE	NEGATIVE		**Possible LAD (0 to -90°)
NEGATIVE	POSITIVE		RAD (+90° to 180°)
NEGATIVE	NEGATIVE		Extreme Axis (-90° to 180°)

Example 1



Negative in I, positive in aVF → RAD

Example 2



Positive in I, negative in aVF → LAD

WHAT YOU NEED TO LOOK FOR in ECG?

- Are the limb leads set up correctly?
- Are the chest leads set up correctly?
- Is the ECG free of artifact.

IS the ECG SET UP CORRECTLY?

LIMB LEADS

- aVR – always negative
- Lead I – always positive

CHEST LEADS

- R wave progression
- Small to Tall



PROBLEMS WITH THE ECG

- Artifact
- Electrical interference
- Muscle tremor
- Wandering baseline

artifacts

- ECG alterations, not related to cardiac electrical activity.
- the components of the (ECG) such as the baseline and waves can be distorted.
- Motion artifacts are due to movement.

FIND THE ARTEFACT

07/10/2002 10:33:56
65 years Female

89 kgs 152 cms

MDS Metro, Ingram

Rx:
Dx:

Oper: RH

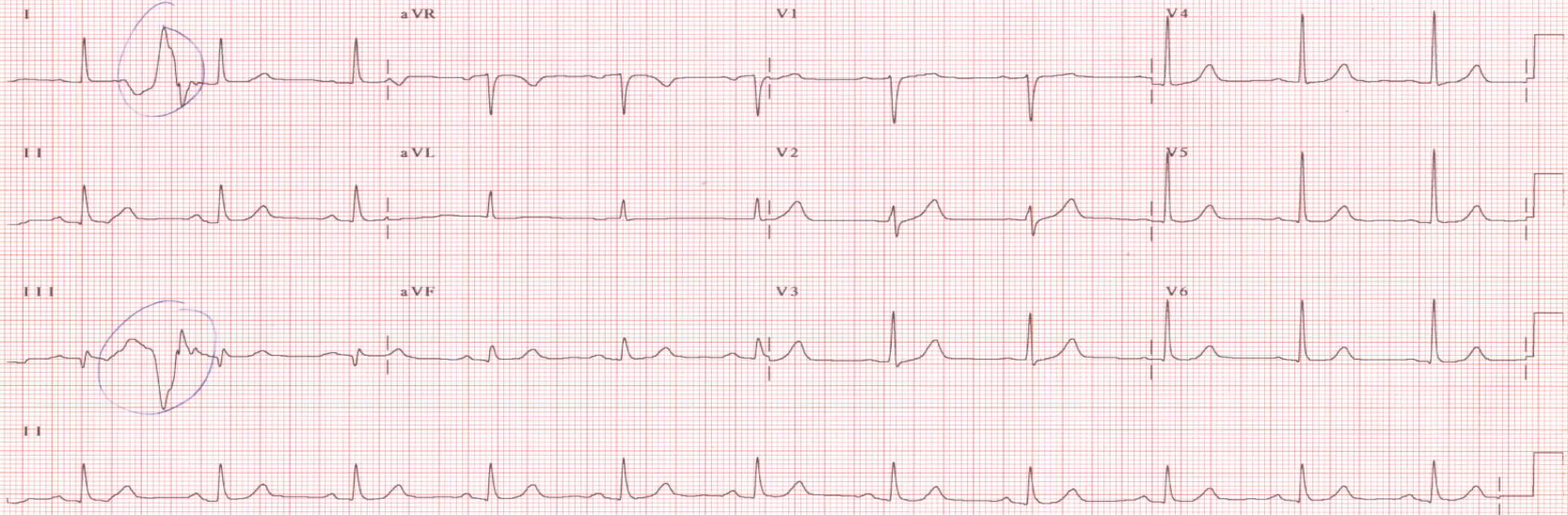
Rate 78 No interpretive report, criteria version
PR 186
QRSD 79
QT 380
QTc 433

D of B
01/JUL/37
COMMENTS

Requested by:

--AXIS--
P 83
QRS 32
T 57

PRELIMINARY-MD MUST REVIEW



LOC 14-0000 Speed: 25 mm/sec Limb: 10 mm/mV Ches 0 mm/mV

F 60v 0.5-40 Hz W HP7 11391

Agilent

REORDER # M1707A

MUSCLE TREMOR

40 years

Female 59 kg 165 cm

STANLEY GREENBERG, R.N.

Rate 71
PR 165
QRSD 92
QT 398
QTc 432

3
3
RE---

QC

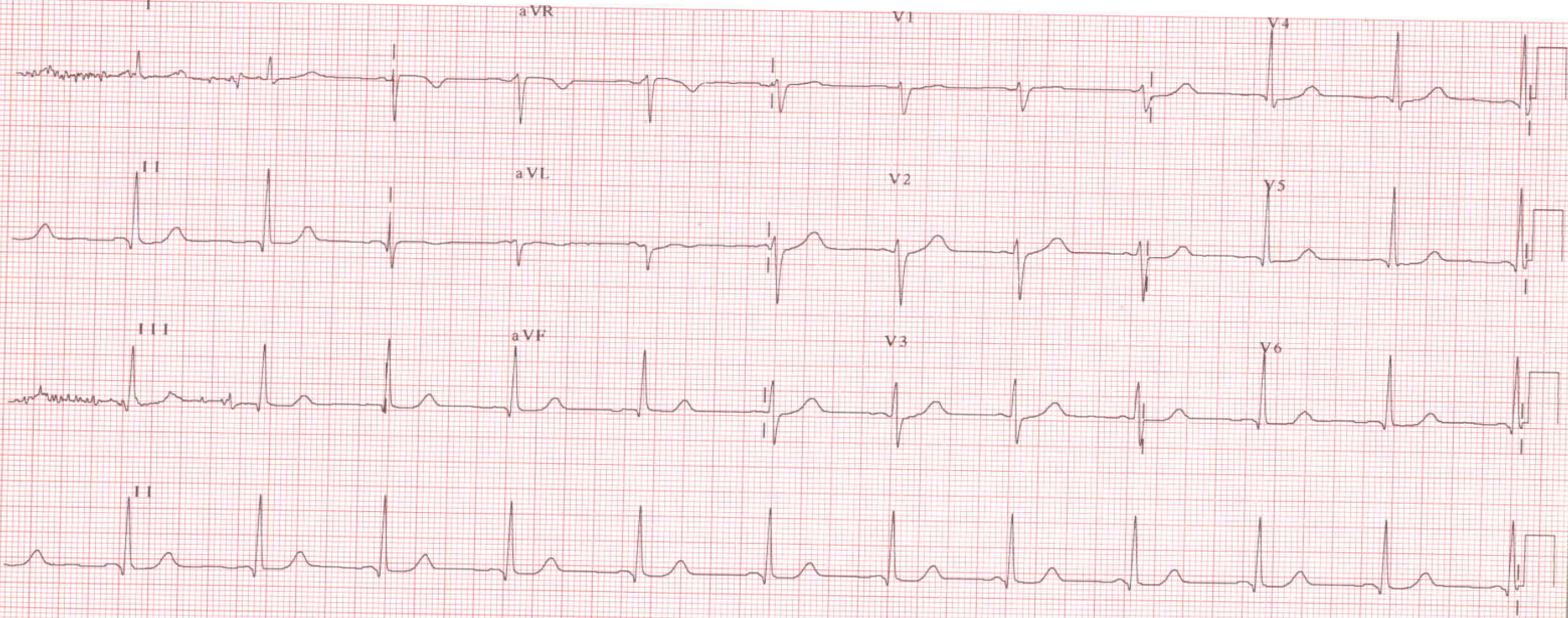
artifact

Operator: AR

MEDICATION
NO RX

Requested by:

--Axis--
P Ind.
QRS 88
T 74

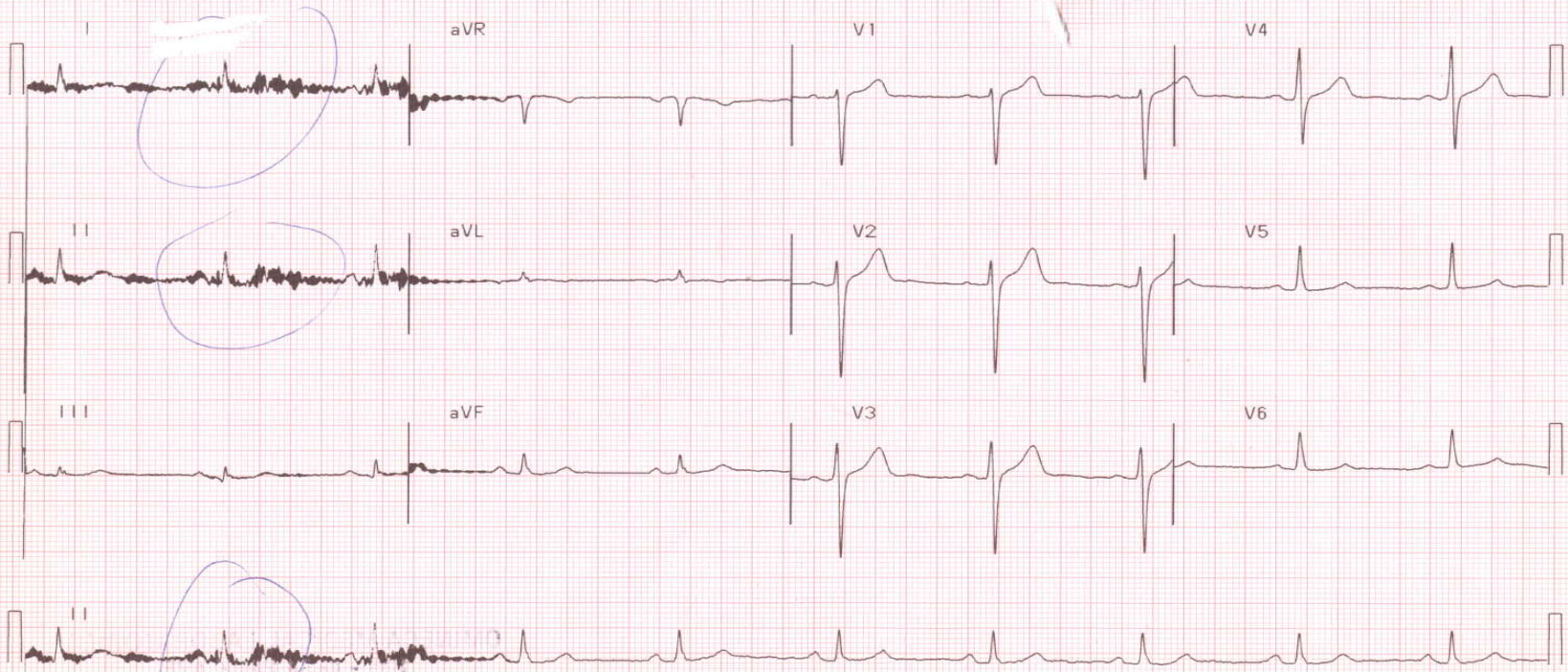


ELECTRICAL INTERFERENCE

Name: [REDACTED]
ID: [REDACTED]
Date: 09/24/02 Time: 11:22
Age: 51 Sex: MALE
Hgt: 72 IN Wgt: 215 LBS
Med1:
Med2:
Ccl1:
Ccl2:
Cmnt:

Vent rate: 59	SINUS BRADYCARDIA
	DEMAND VENTRICULAR PACING
	ST-T changes in inferior leads
	MAY BE RELATED TO THE ELECTRONIC PACEMAKER ACTIVITY
	SUMMARY: ABNORMAL ** UNCONFIRMED ANALYSIS **

-- Durations --	
P : 108	
QRS: 114	
-- Intervals --	
PR : 164	
QT : 422	
QTc : 421	
-- Axes --	
P : 65	
QRS: 45	
T : 54	



Speed: 25 mm/s Freq: 60~ .05 - 30Hz
Gain: Limb 10 Chest 10 mm/mv

E350i Rev.1.15 GP1 10.1

Ectopic beat

- "Ectopic" means something that is in an odd place or position
- **Types of Ectopic Beats**
- **Premature atrial contractions (PACs)**
- **Premature ventricular contractions**

ECTOPIC BEATS

Multifocal PVC's: more than one shape



P Wave

- **Represents**

 - Atrial Depolarization**

 - Should be upright in all leads except aVR**

 - Best studied in Standard lead II**

- **Duration - .08 to .10 sec (2 small sq)**

- **Right atrial enlargement**

 - peaked p waves
 - best seen in leads II, III, and aVF

- **Left atrial enlargement**

 - double hump or “m” shaped P



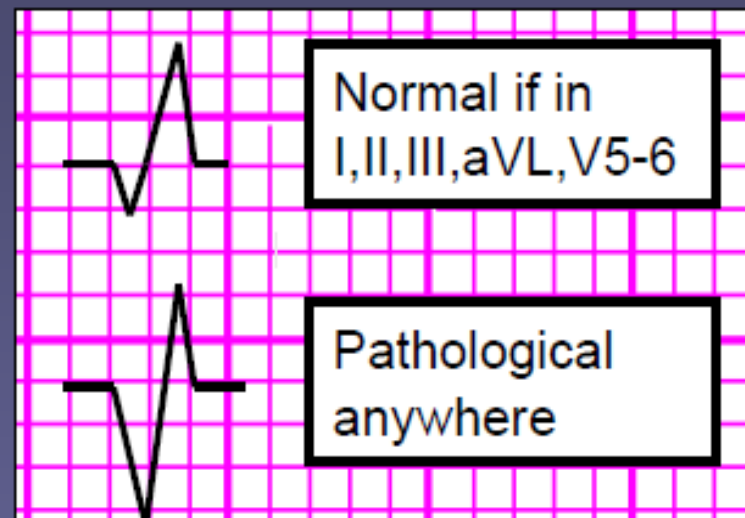
The PR interval

- The PR interval is measured between the start of the P wave to the start of the QRS complex
- (therefore if there is a Q wave before the R wave the PR interval is measured from the start of the P wave to the start of the Q wave, not the start of the R wave)

The Q wave

Are there any pathological Q waves?

- A Q wave can be pathological if it is:
 - Deeper than 2 small squares (0.2mV)and/or
 - Wider than 1 small square (0.04s)



The QRS height

- If the complexes in the chest leads look very tall, consider left ventricular hypertrophy (LVH)
- If the depth of the S wave in V_1 added to the height of the R wave in V_6 comes to more than 35mm, LVH is present

QRS width

- The width of the QRS complex should be less than 0.12 seconds (3 small squares)
- Some texts say less than 0.10 seconds (2.5 small squares)
- If the QRS is wider than this, it suggests a ventricular conduction problem – usually right or left bundle branch block (RBBB or LBBB)