Department of Anesthesia Techniques
Title of the lec1: ECG
Assist. Prof. Dr. Aqeel H. Al-Jothery
Dr. Sajad A. Al-ghazali

Electrocardiogram (ECG)

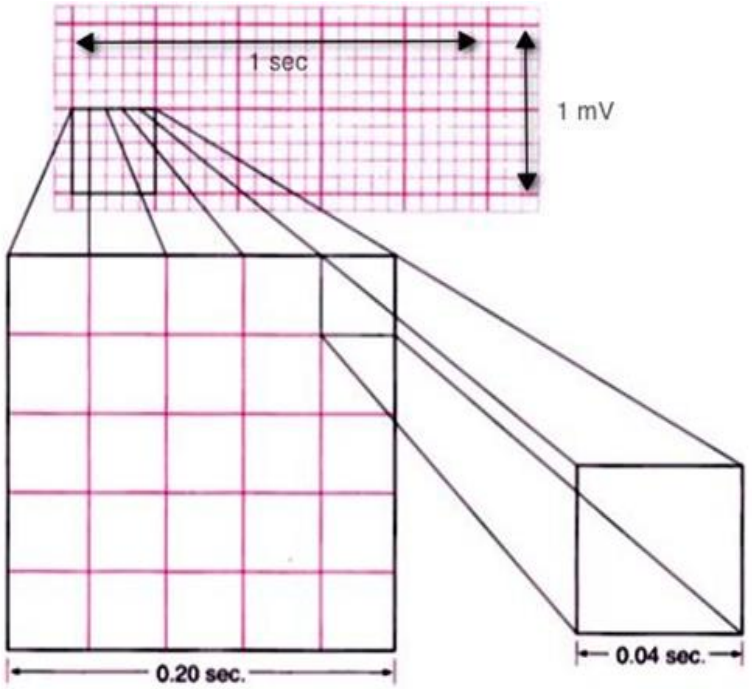
Practical Applied physiology

Introduction

- Electrocardiography is a process of recording electrical activities of heart muscle at skin surface.
- Electrocardiograph the name of the machine
- Electrocardiogram the record from this procedure

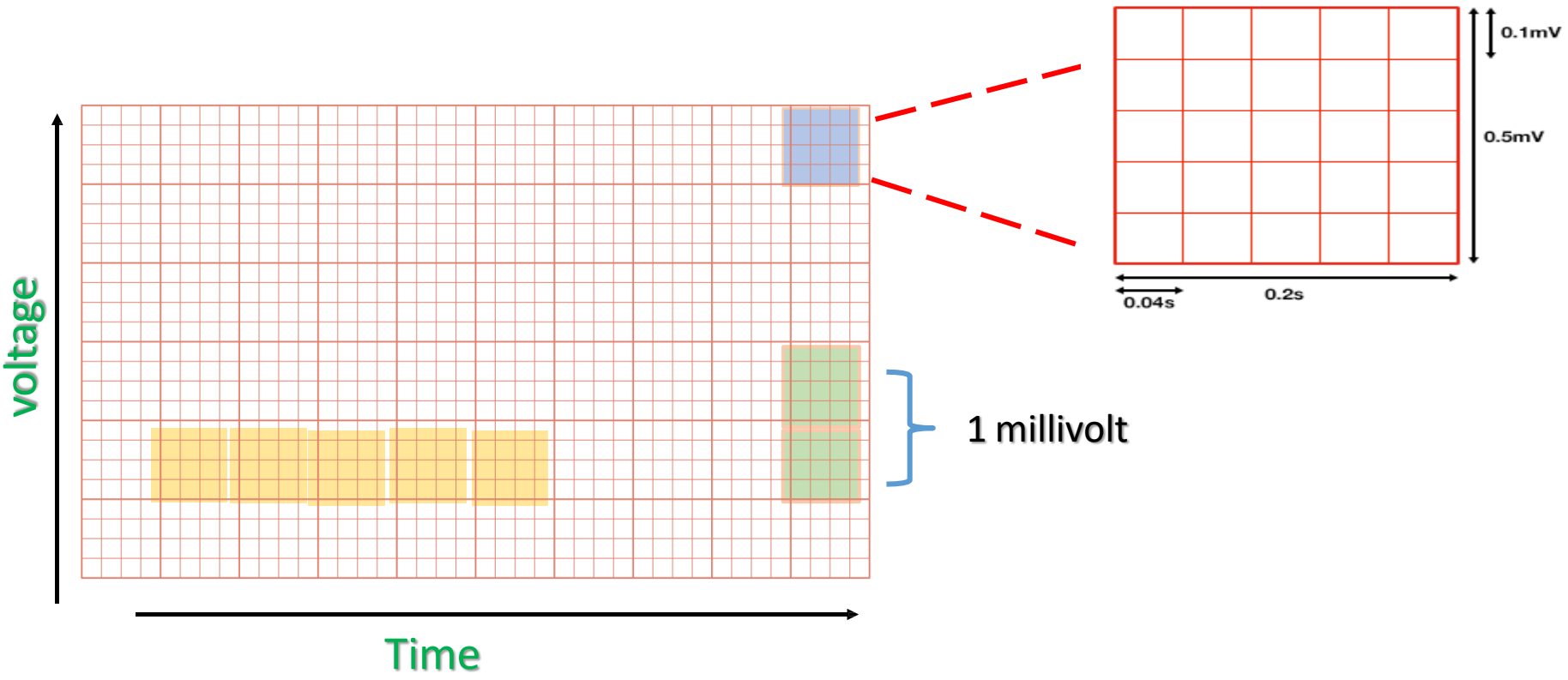
Introduction

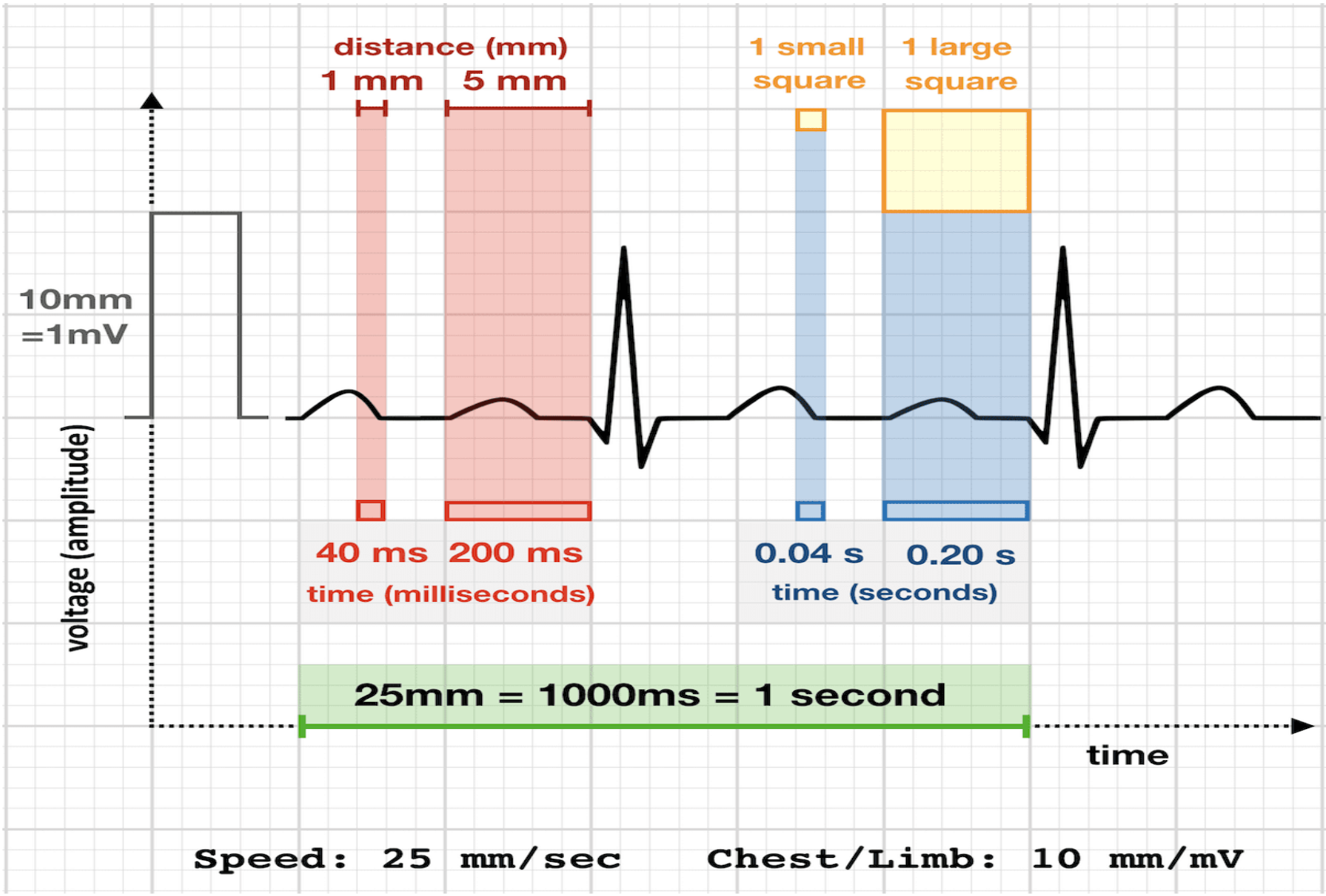
- The horizontal axis of the ECG paper records time,
- 1 large square = 5 small squares
- 1 small square = 1 millimeter
- 5 large squares = 25 millimeters = 1 second
- 5 millimeters (5 small squares) = 0.20 second
- 1 small square= 0.04 second.

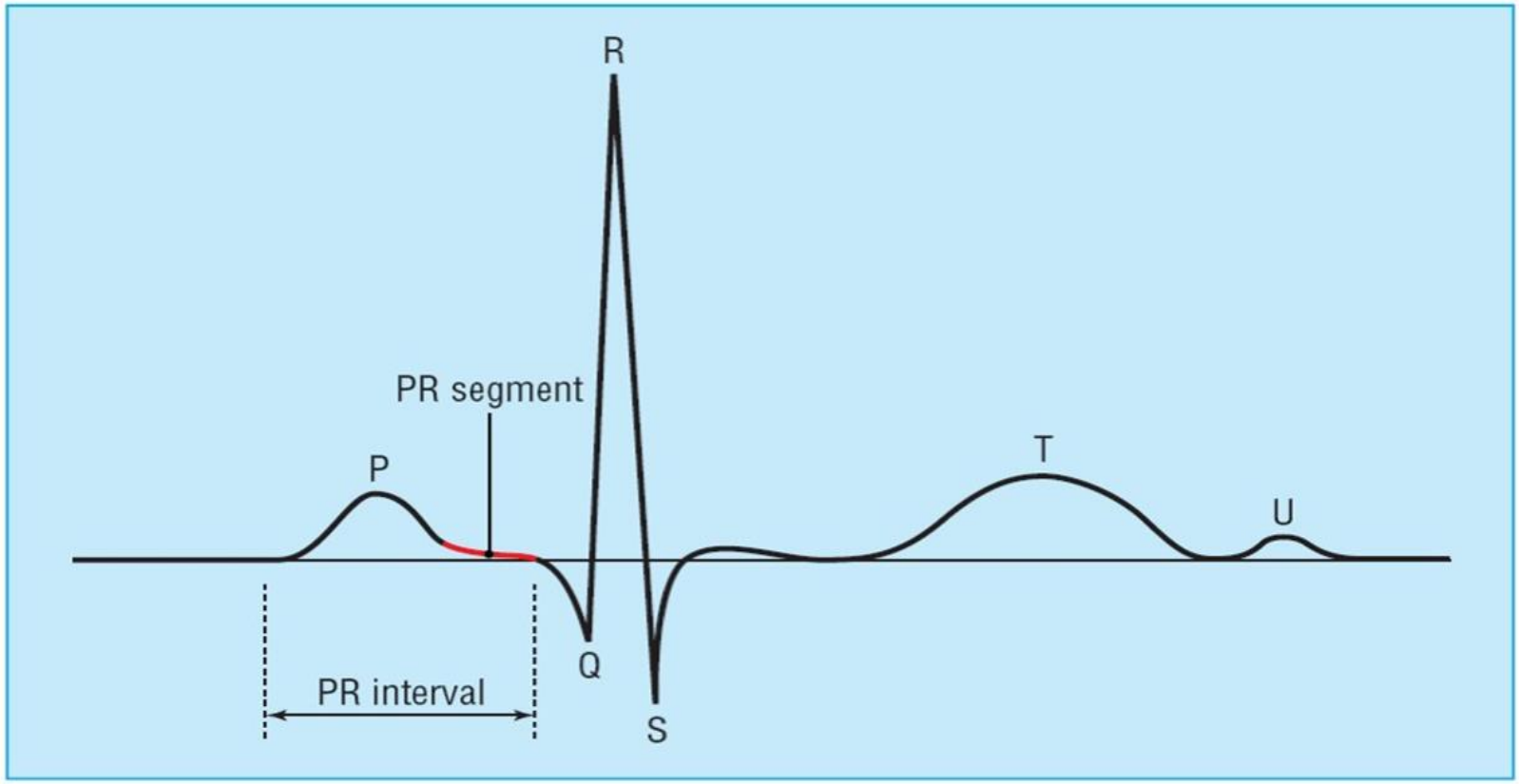


- The vertical axis records ECG amplitude (voltage).
- 1 large square = 0.5 mV
- 2 large square (10 small squares) = 1 mV

ECG paper

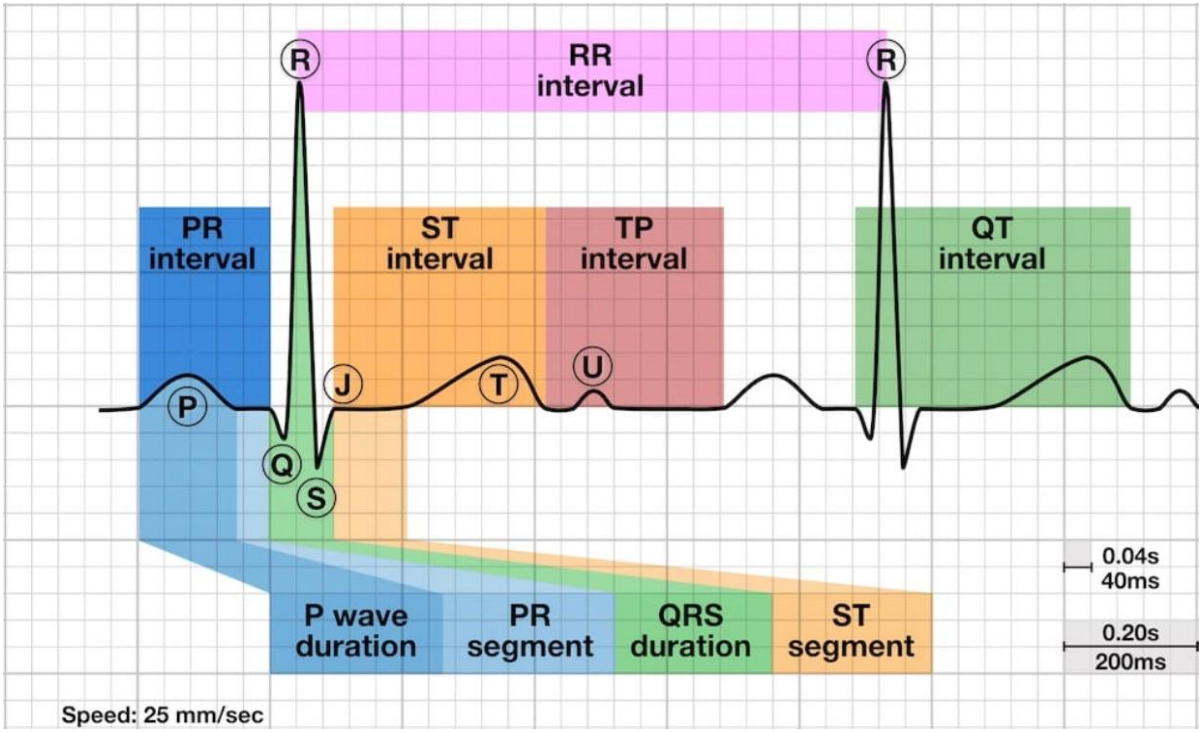



distance (mm)
1 mm
5 mm
1 small square
1 large square
10mm =1mV
voltage (amplitude)
40 ms
200 ms
time (milliseconds)
0.04 s
0.20 s
time (seconds)
25mm = 1000ms = 1 second
time
Speed: 25 mm/sec
Chest/Limb: 10 mm/mV

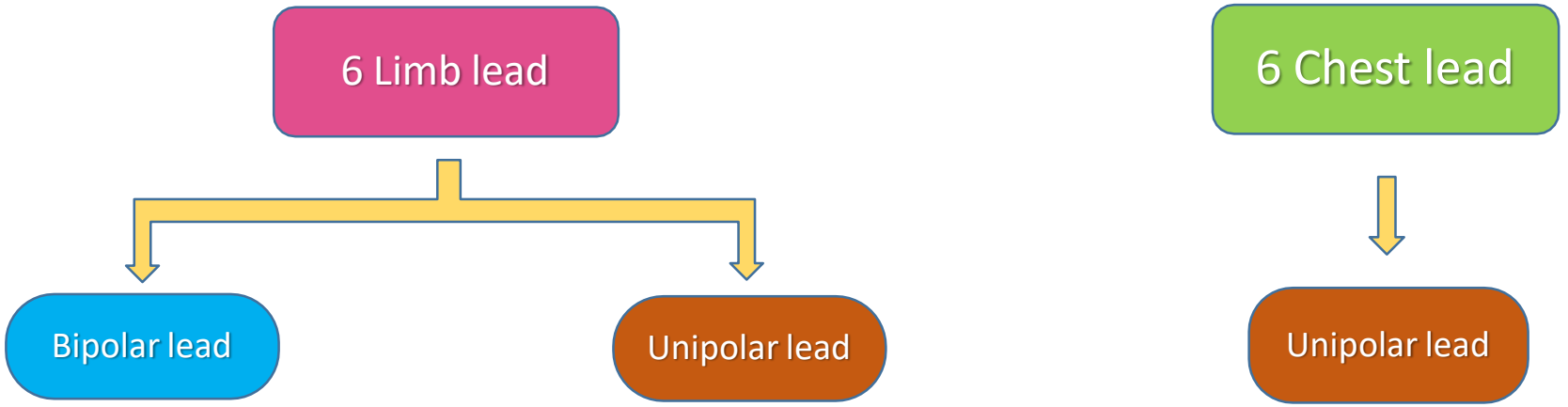


Normal duration of PR interval is 0.12-0.20 s (three to five small squares)

The normal electrocardiogram of one cardiac cycle is composed of:



The standard ECG is composed of six limb leads and six chest leads



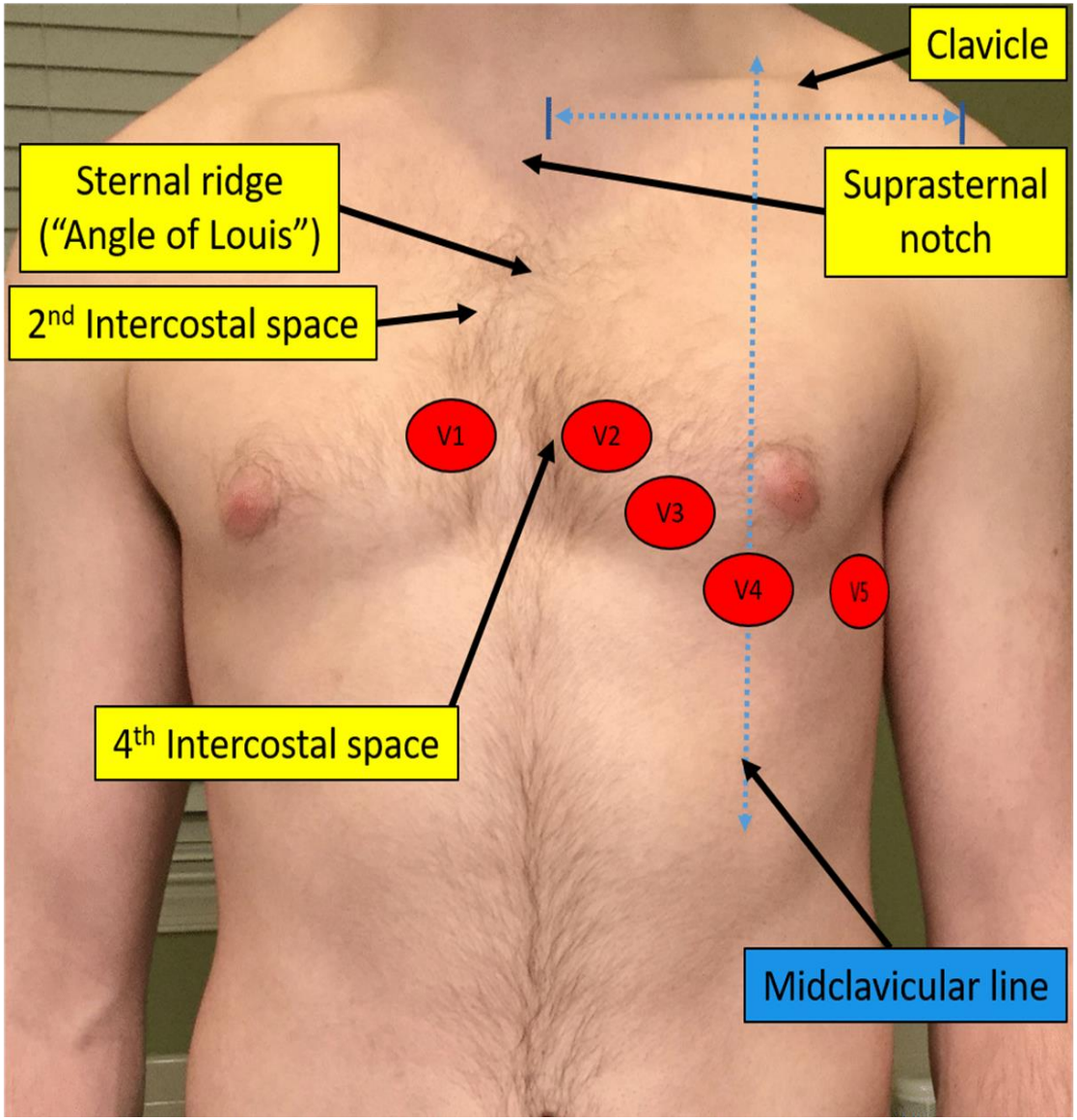
Lead I
Lead II
Lead III

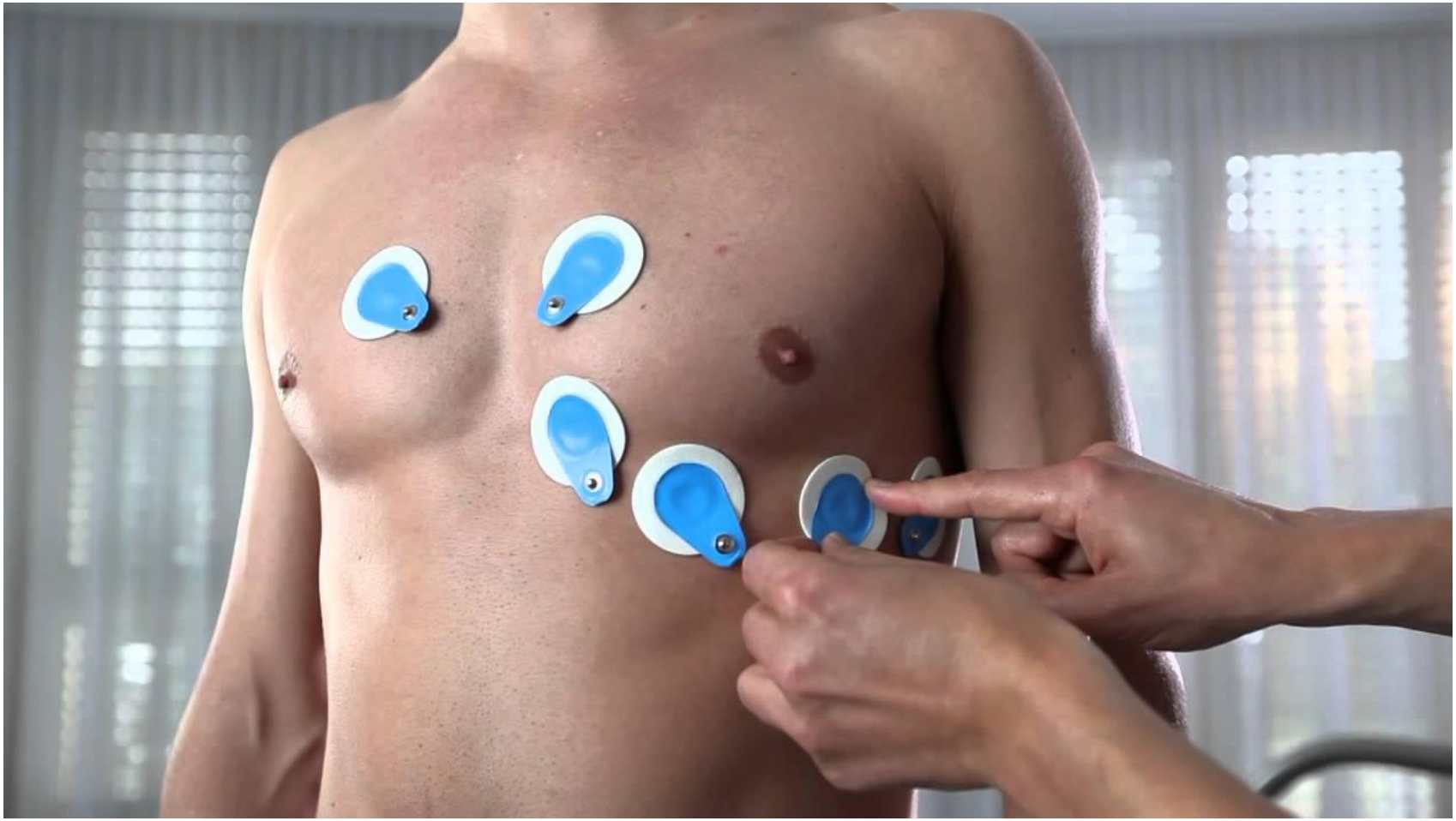
Augmented voltage right arm(AVR)
Augmented voltage left arm(AVL)
Augmented voltage left foot (AVF)

V1.V2
V3.V4
V5.V6

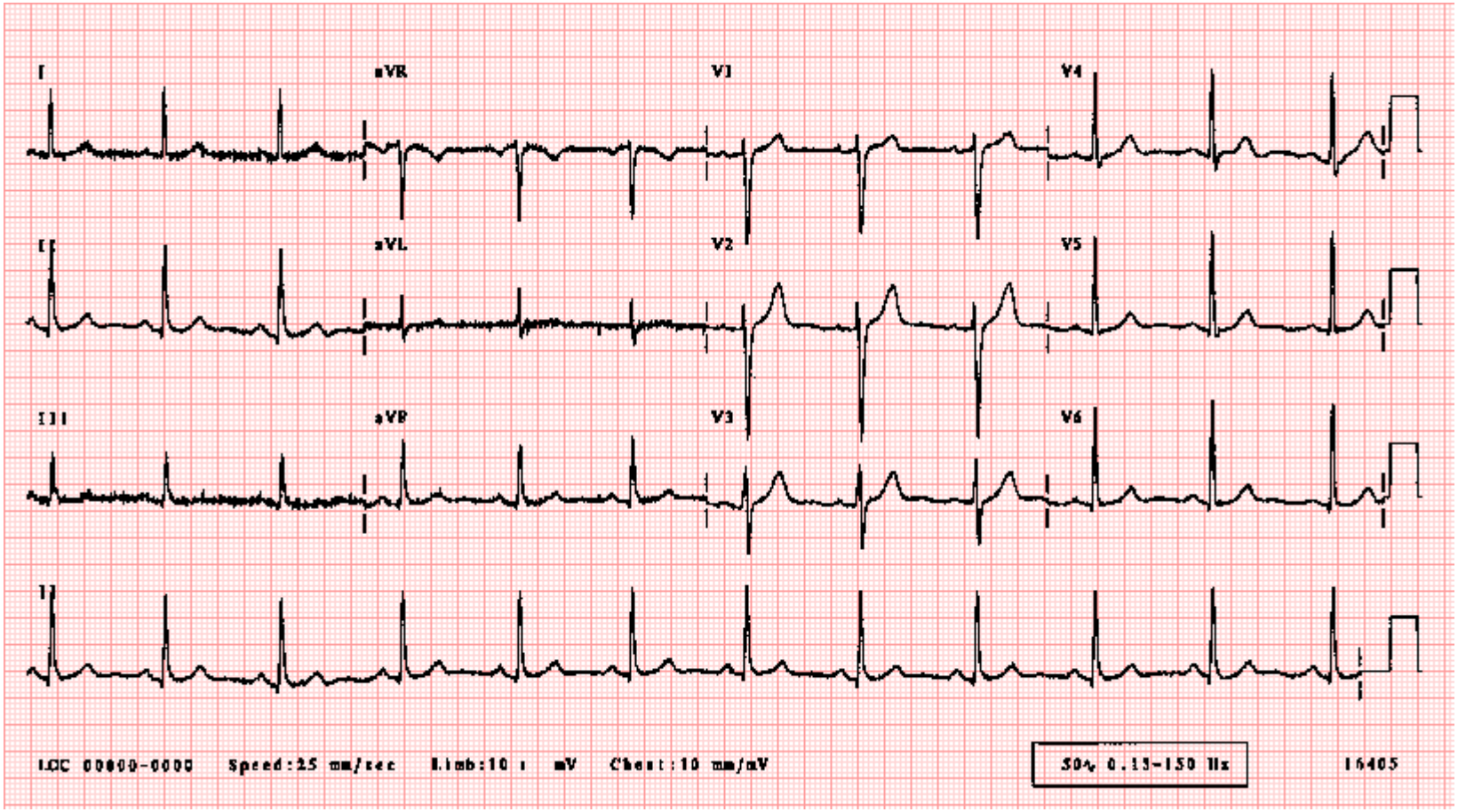
To determine sites of chest leads:

- From the **angle of Louis**, move your fingers to the right and you will feel a gap between the ribs. This gap is the 2nd Intercostal space. From this position, run your fingers downward till you reach 4th intercostal space which is the position for V1.


Clavicle
Sternal ridge ("Angle of Louis")
Suprasternal notch
2nd Intercostal space
V1
V2
V3
V4
V5
4th Intercostal space
Midclavicular line



Normal electrocardiogram of 12 leads:-



ECG process

- **Material and instruments:-**

1- Subject.

2- Electrocardiograph machine.

- **Method:**

1-The subject must be lie down and relax (prevent muscle contraction).

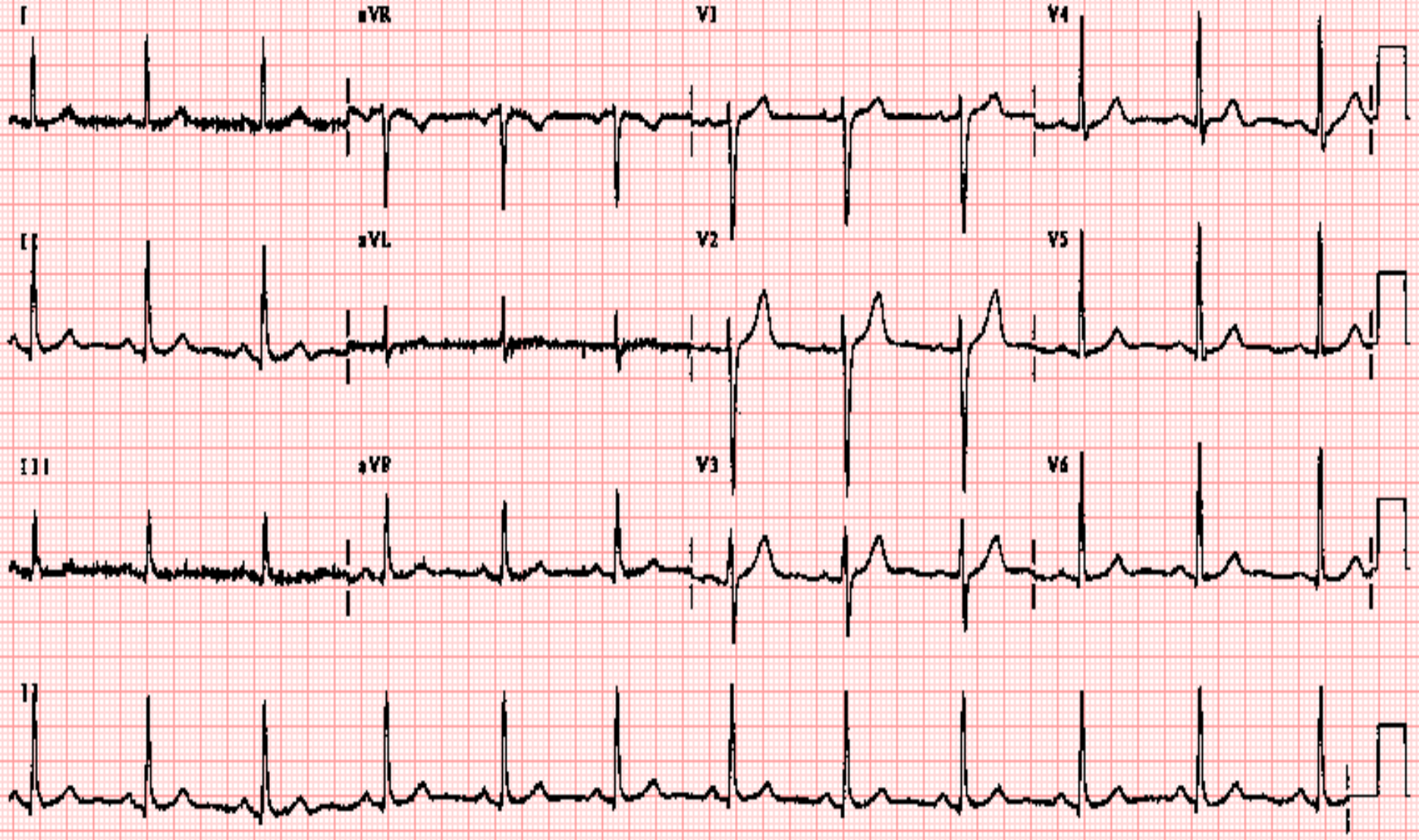
2- Connect the four limb leads, and six unipolar chest leads to correct sites.

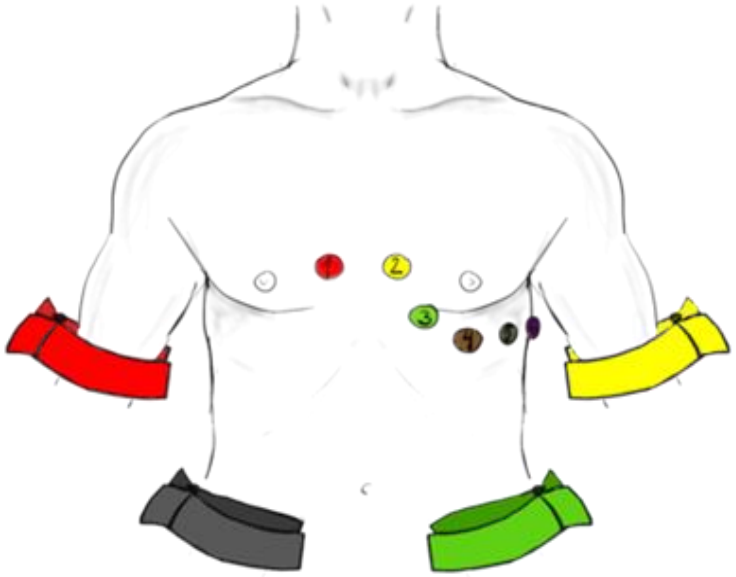
3- Calibrate the voltage with the 1mv, vertically 1cm (2 large squares).

4- Calibrate the rate 25 mm/second.

5- Record the all 12 leads.

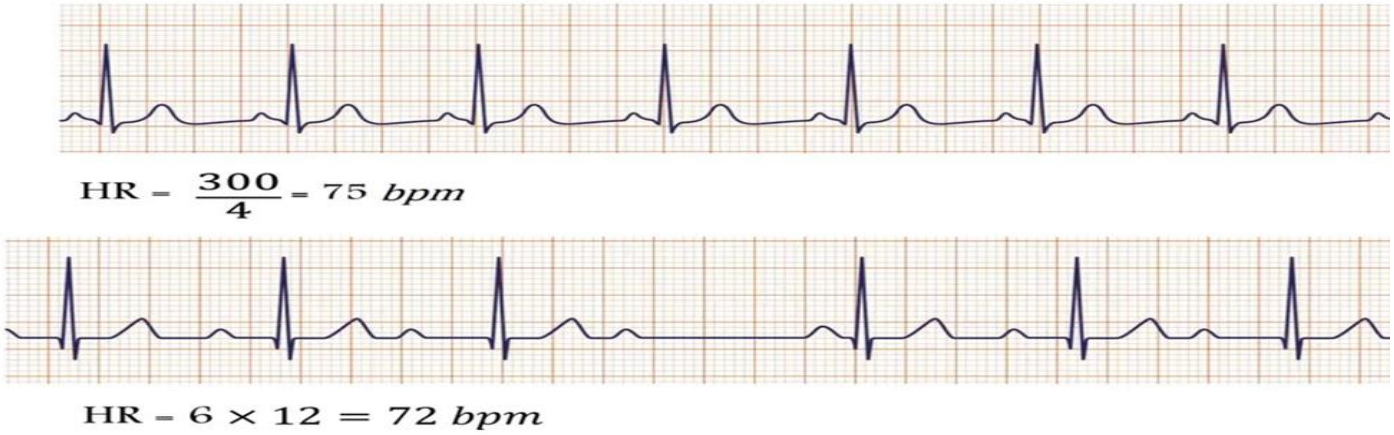
6- Record for each lead three or four complex waves.


I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
II
LOC 00000-0000
Speed:25 mm/sec
Limb:10 mm/mV
Chest:10 mm/mV
50Hz 0.15-150 Hz
16405



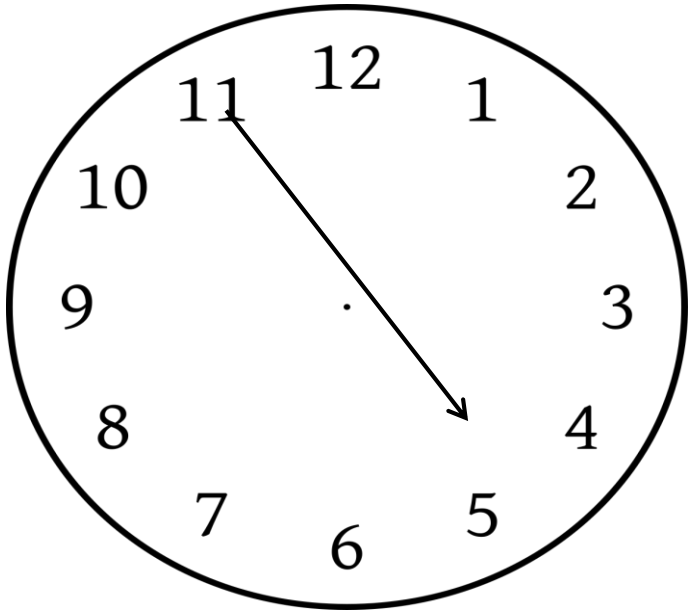
Analysis of the ECG

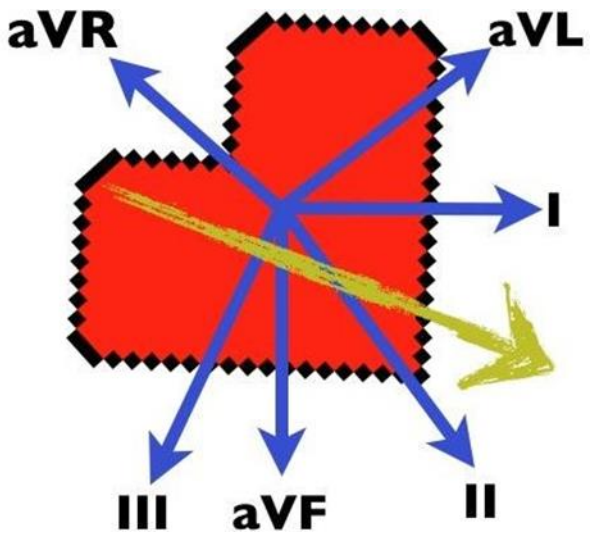
- 1- Rhythm : Heart rhythm can be either regular or irregular .This can be determined by looking at the R-R wave interval (عدد المربعات الكبيرة بين الموجات).
- 2- Heart rate: The heart rate is a number of heart cycles per minutes.
- **Regular:** by counting the number of large squares between two consecutive R waves and dividing this into 300.
- **Irregular:** numbers of QRS complex are counted in 5 second in the strip multiplied by 12 to get the HR/minute.
-



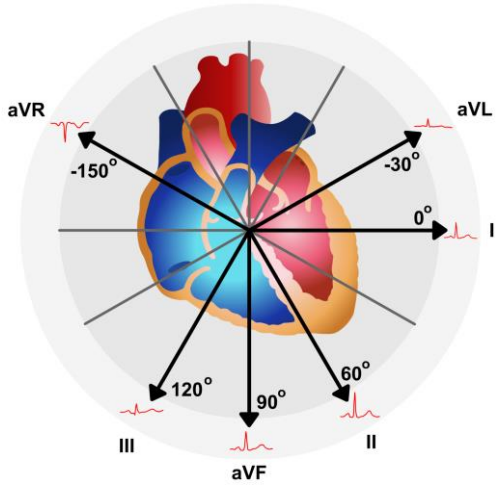
Analysis of the ECG

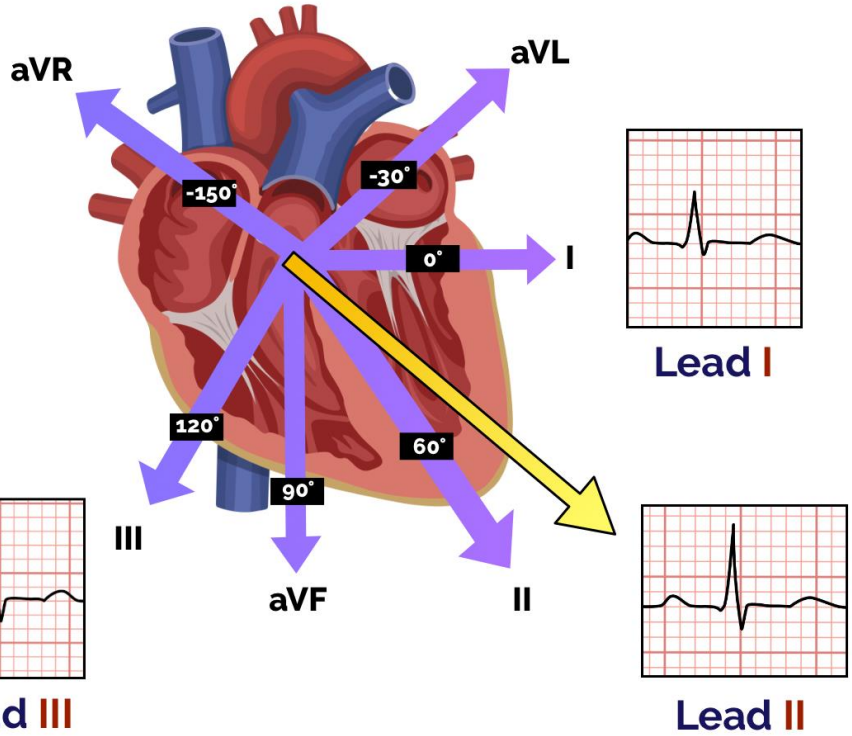
- **3- Electrical axis:** Cardiac axis describes the overall direction of electrical spread within the heart . In a healthy individual the axis should spread from **11 o'clock to 5 o'clock**. The direction of the axis can be derived more easily from QRS complex in lead I, lead II, and lead III.





Normal Cardiac Axis





Lead I

Lead III

Lead II

GEEKY MEDICS

Abnormal cases

Ischemia occurs when part of the heart muscle, the myocardium, is deprived of oxygen and nutrients.

Common causes of ischemia are:

1. Narrowing or obstruction of a coronary artery.

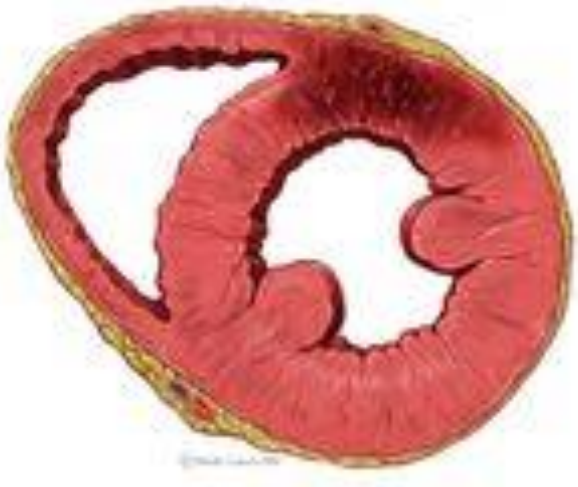
2. A rapid arrhythmia, like atrial or ventricular fibrilation causing an imbalance in supply and demand.

A short period of ischemia causes *reversible* effects: The heart cells will be able to recover.

When the episode of ischemia lasts for a longer period of time, heart muscle cells die. This is called a **heart attack** or **myocardial infarction**. That is why it is critical to recognize ischemia on the ECG in an early stage.

Ischemic changes

Necrosis



Fibrosis

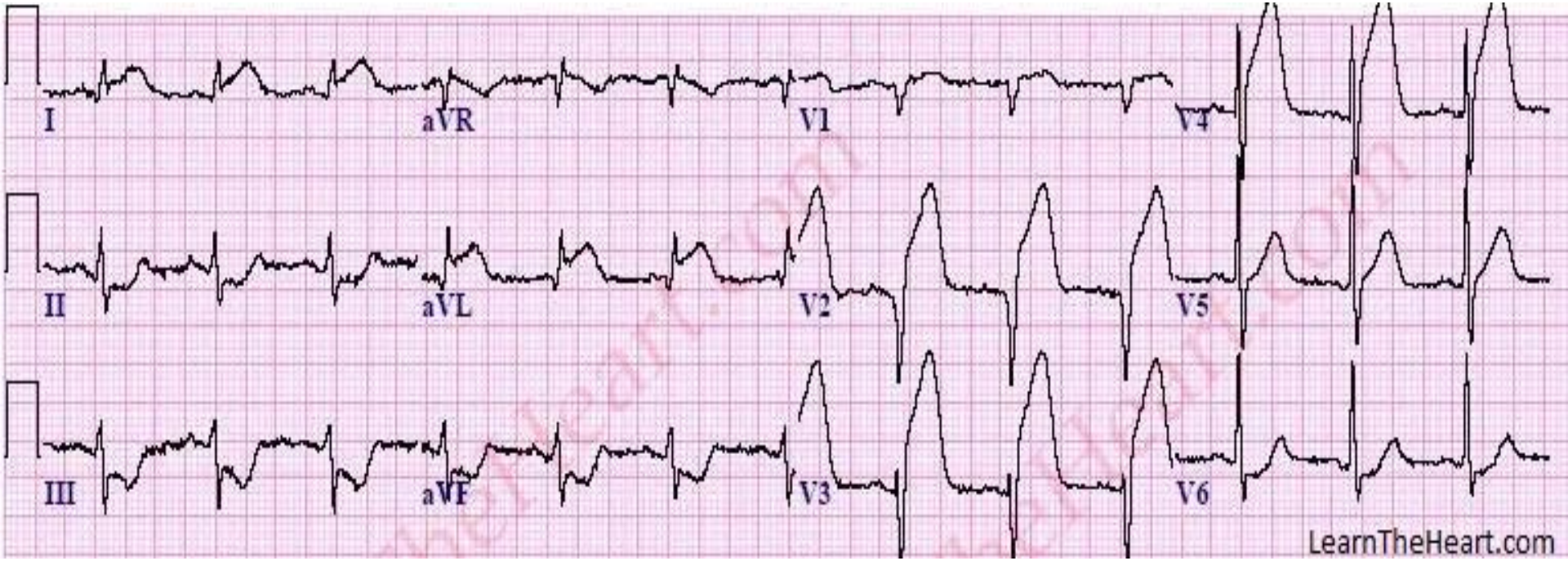
Case study:

A 70-year-old male presents to the Emergency complaining of chest pain. He was watching a football game when his pain started. He describes the pain as pressure over the left chest that started 45 minutes prior to arrival. The pain radiates to the left shoulder and is associated with some nausea but no vomiting.

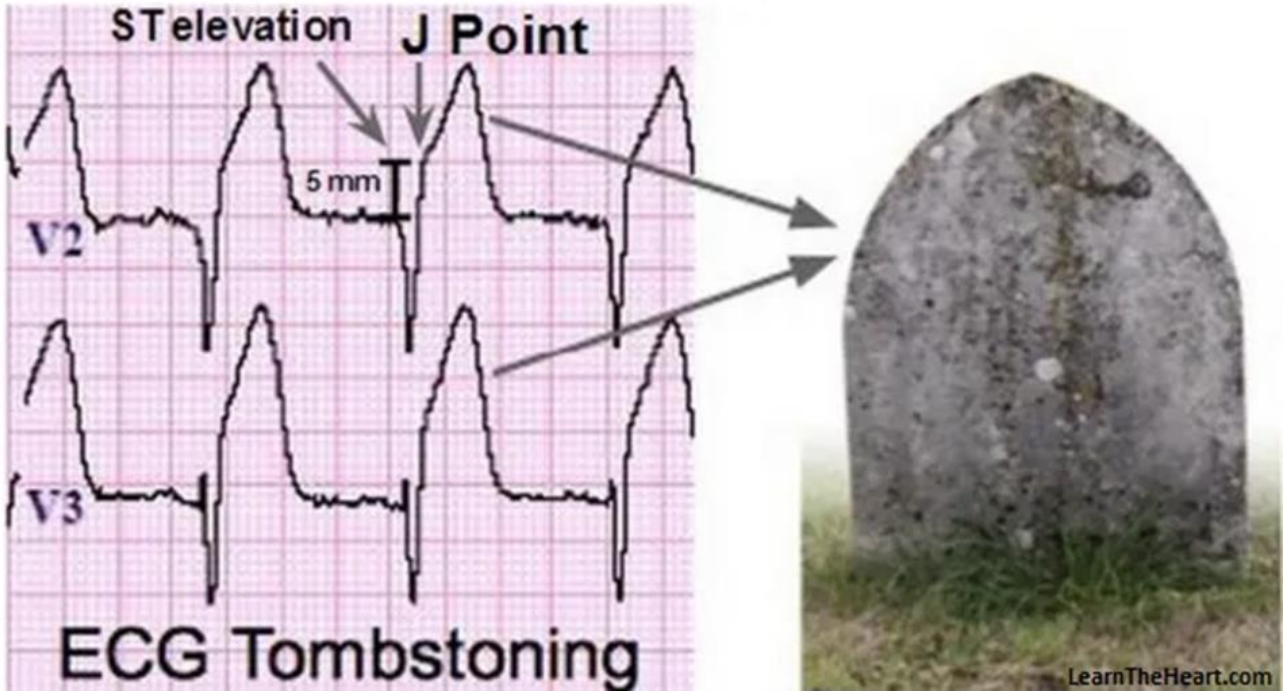
Myocardial infarction (MI)

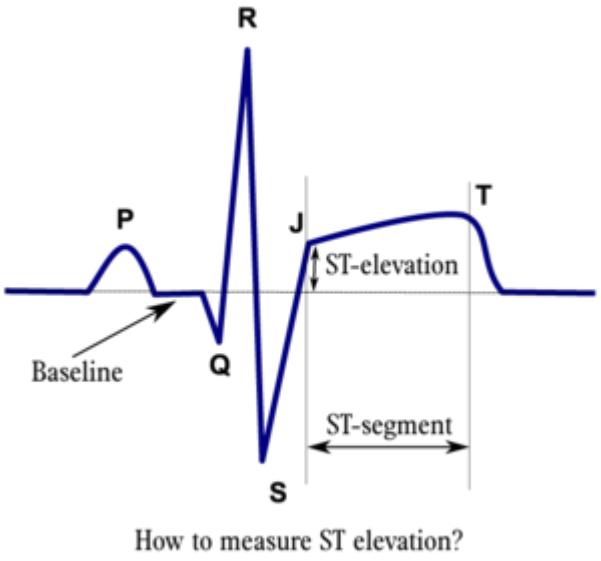
The ECG findings of an acute anterior **myocardial infarction (MI)** wall include:

* ST segment elevation in the anterior leads (V3 and V4)
* Reciprocal ST segment depression in the inferior leads (II, III and aVF).



MI


ST elevation
J Point
5 mm
V2
V3
ECG Tombstoning
LearnTheHeart.com

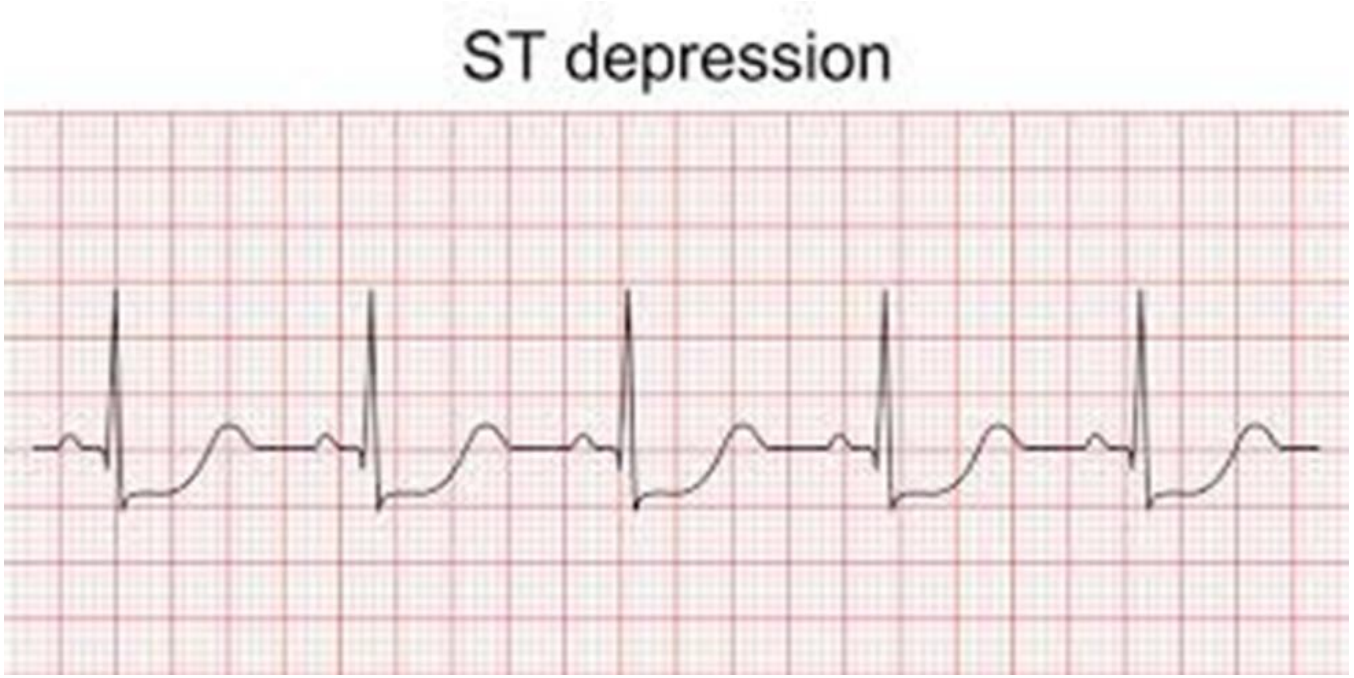

R
P
J
T
ST-elevation
Baseline
Q
ST-segment
S
How to measure ST elevation?

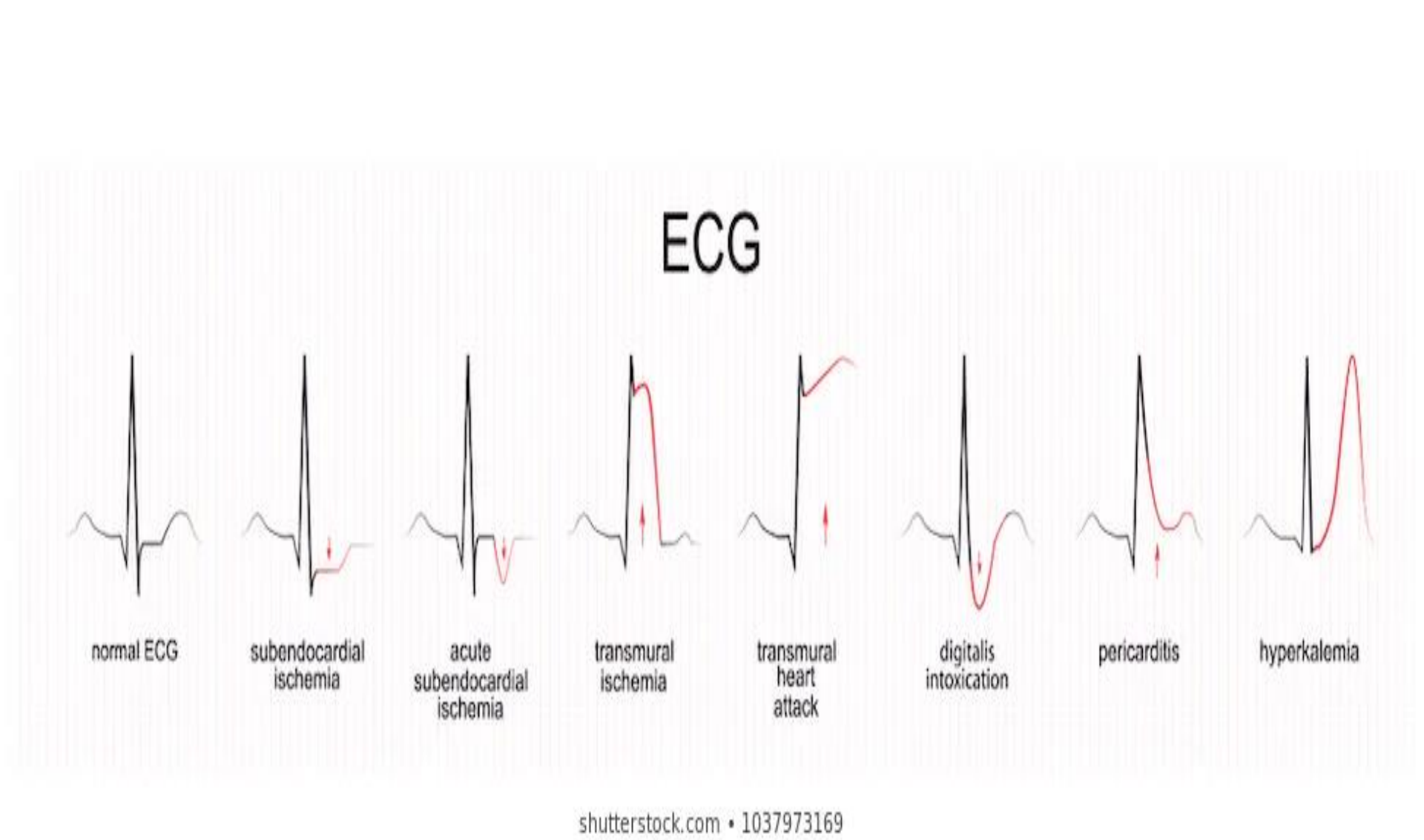
Unstable angina

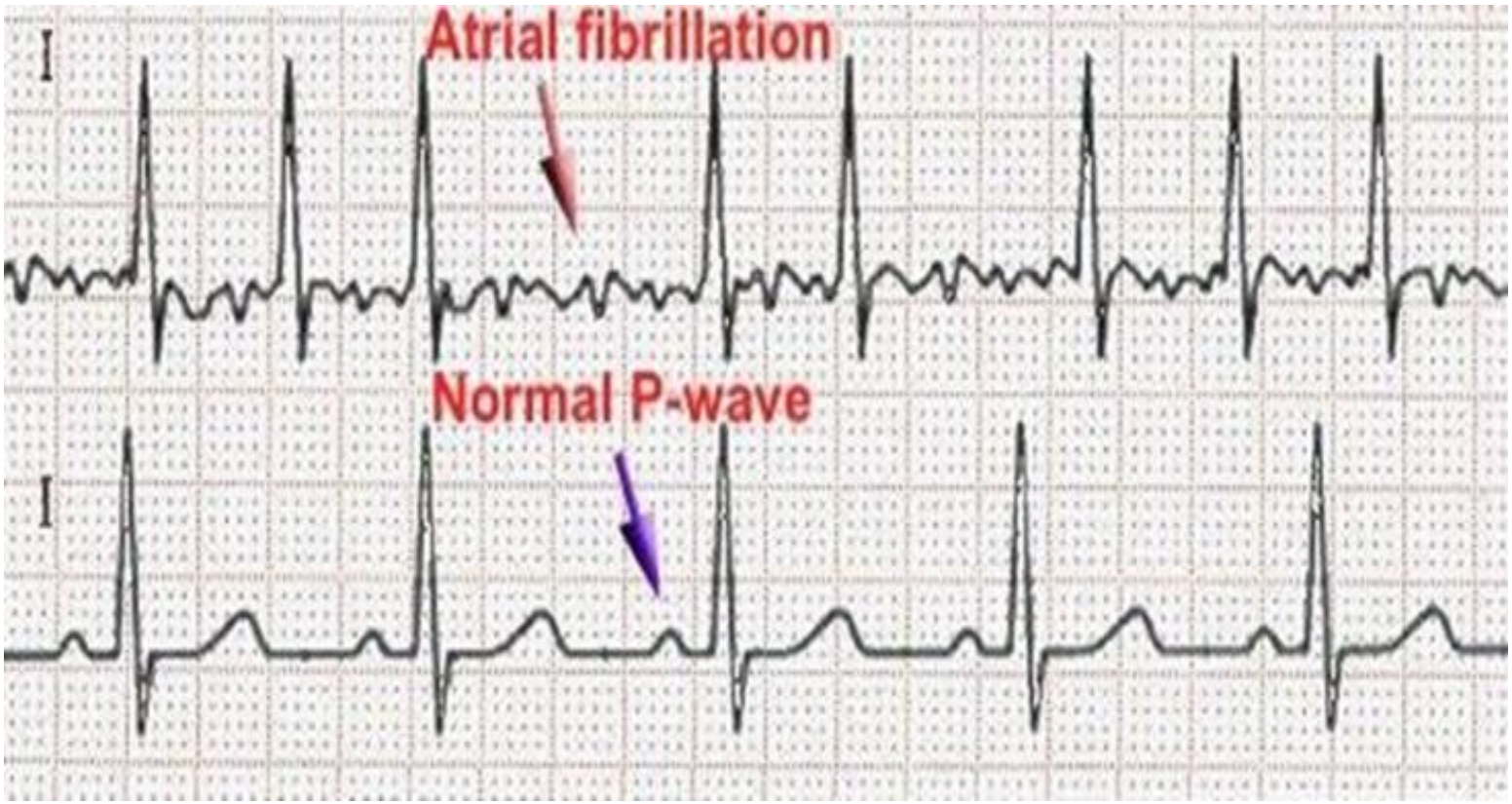
***Angina** results from acute obstruction of a coronary artery without myocardial infarction.

* Symptoms include chest discomfort with or without dyspnea, nausea.

* On ECG ST-segment depression. transient






I
Atrial fibrillation
Normal P-wave
I

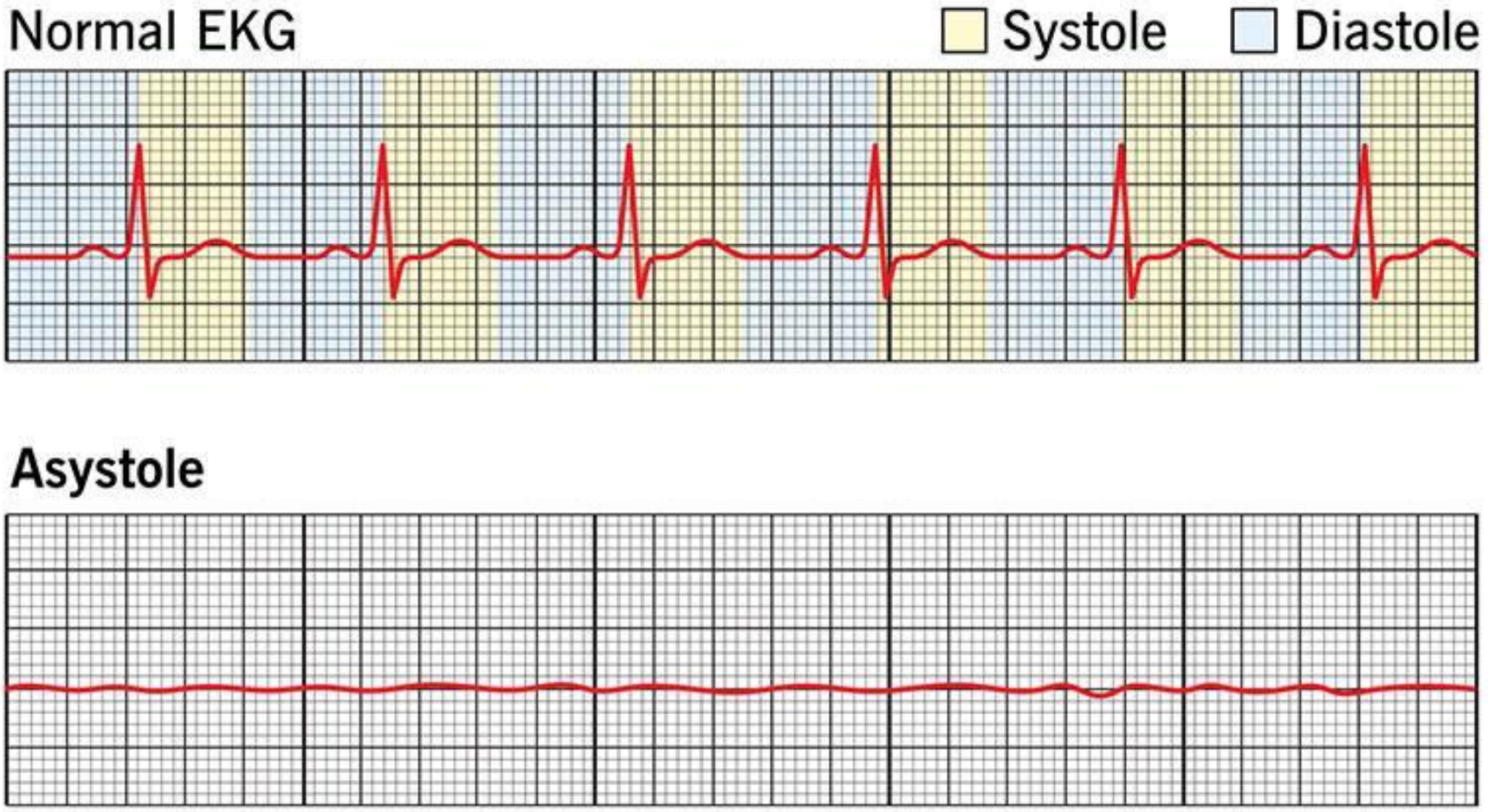
Asystole

* Is when the heart's electrical system fails, causing the heart to stop pumping.

* This is also known as "flat-line" or "flat-lining" on ECG

* Without immediate CPR or medical care, this condition is deadly within minutes.

Asystole



ECG MONITORING IN THEATRE

Cardiac arrhythmias during anaesthesia and surgery occur In many cases.

Many are of clinical significance

and therefore their detection is of considerable importance.

Examining an ECG strip:

1. What is the ventricular rate? Brady or tachy cardia
2. Is the QRS complex of normal duration or widened?
3. Is the QRS regular or irregular?
4. Are P waves present and are they normally shaped?
5. How is atrial activity related to ventricular activity?


IntelliVue MX800
69
0
68
97
43
121/82 (91)
83
29
0
36.0
10:01
+01:34
PHILIPS


Thank You