

Electrocardiography (ECG)

Biomedical Engineering - URJC

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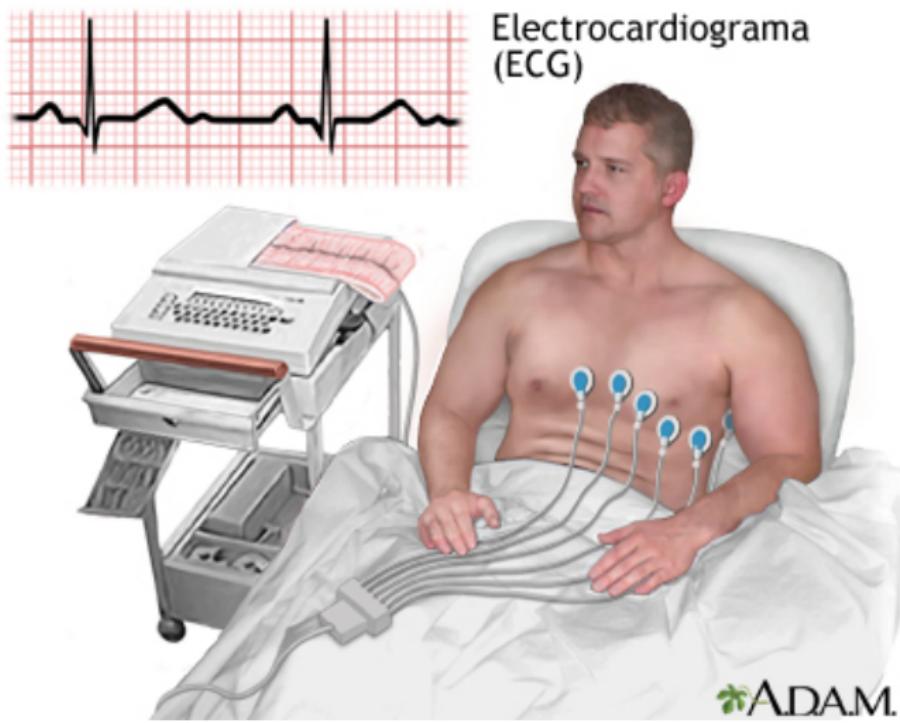
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Introduction

Electrocardiography is the process of producing an **electrocardiogram** (ECG or EKG), recording the **heart's electrical activity**. It is a graph of **voltage versus time** using electrodes on the skin.

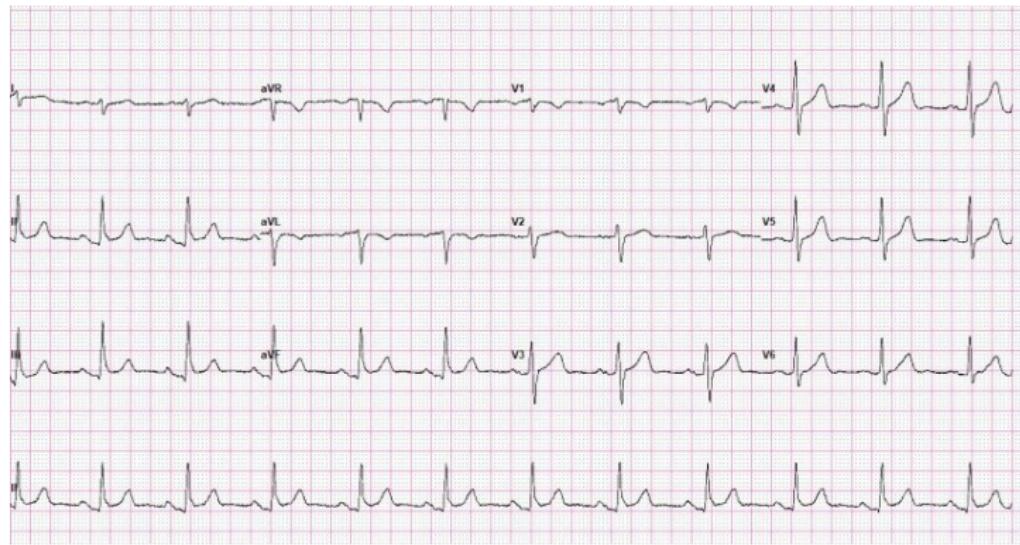
- Small electrical changes detected during cardiac cycles.
- Changes in ECG pattern indicate cardiac abnormalities.

Device and set-up



ADAM.

A typical ECG

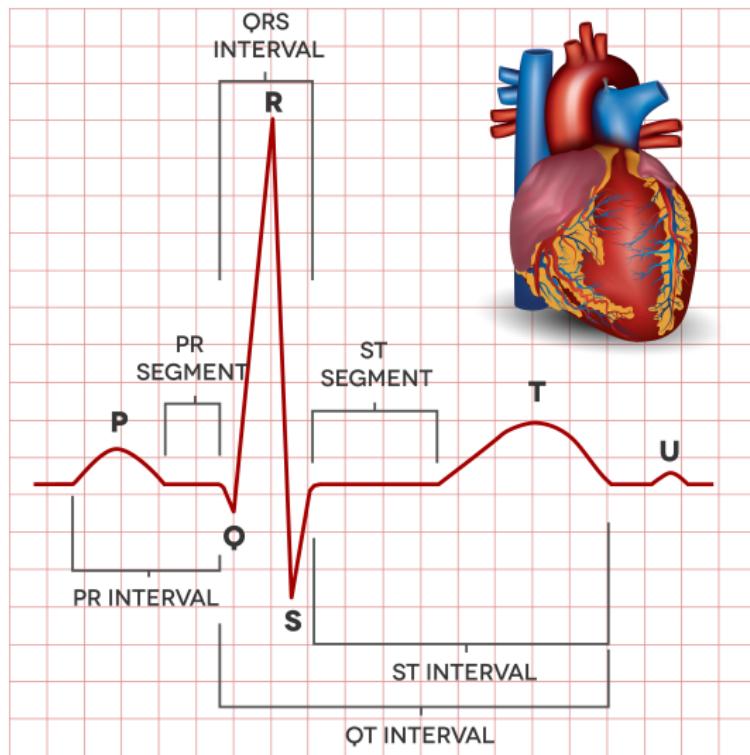


Components

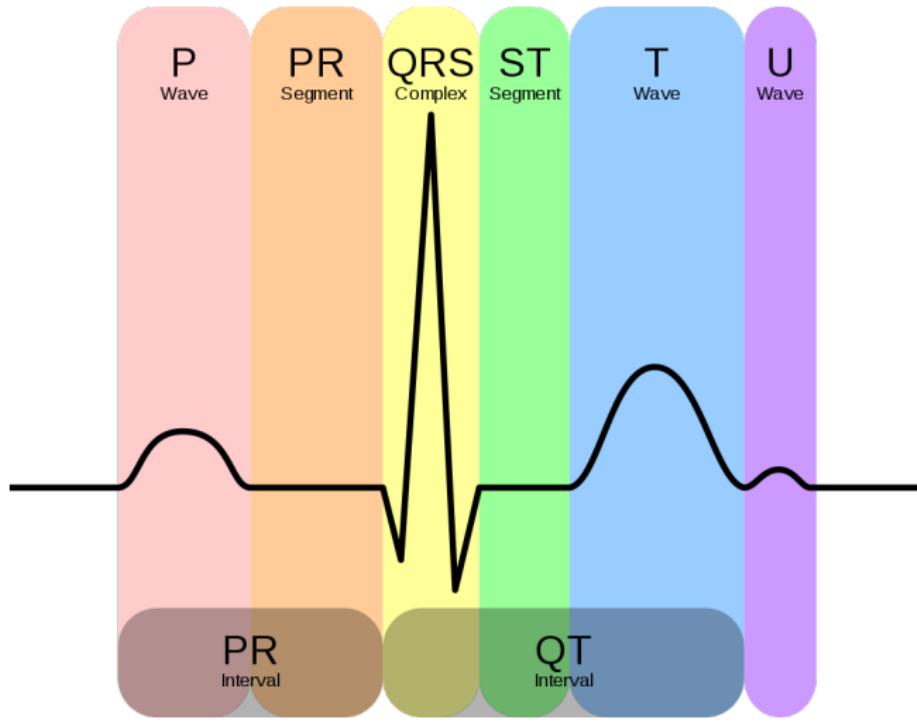
There are three main components to an ECG or a normal rhythm (four, if U wave is taken into account):

- 1 The P wave represents atrial depolarization, i.e., depolarization of the atria (plural of “atrium”).
- 2 The QRS complex represents ventricular depolarization, i.e., depolarization of the ventricles.
- 3 The T wave represents ventricular repolarization.
- 4 The U wave represents papillary muscle repolarization.

A typical ECG



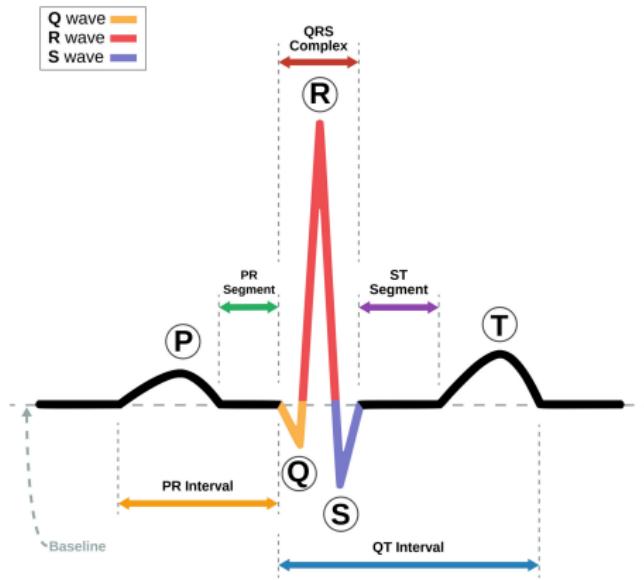
A typical ECG



A typical ECG



Parts of the ECG



Abnormalities

Changes in the normal ECG pattern occur in numerous cardiac abnormalities, including:

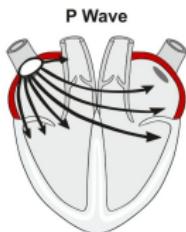
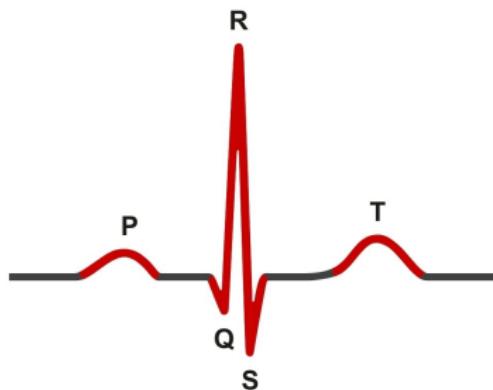
- 1 Cardiac rhythm disturbances (arrhythmias)
- 2 Ischemic coronary disease (infarction, angina)
- 3 Electrolyte disturbances (potassium, calcium), such as hypokalemia and hyperkalemia

Healthy Heart Depolarization

Why do physicians use ECG?:

- Assess the progression during each heartbeat.
- Assess the characteristic ECG tracing.
- Provides information about heart structure and electrical conduction.

A typical cycle



Activation of the Atria

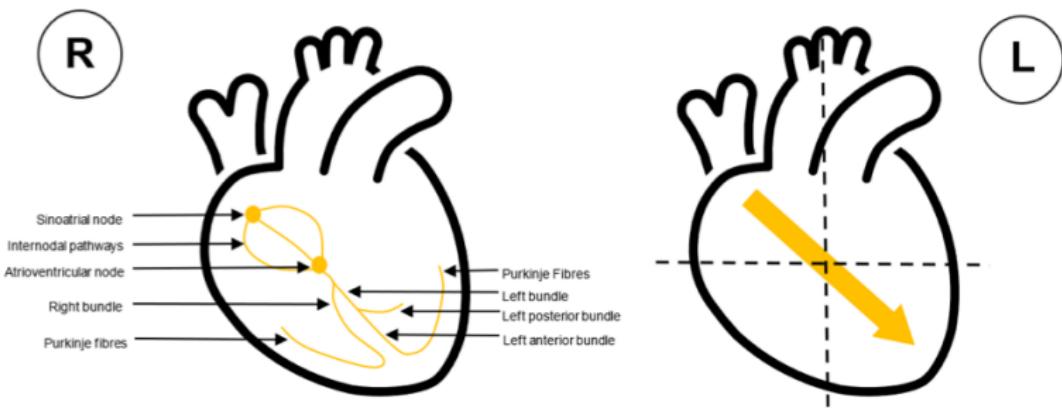


Activation of the Ventricles



Recovery Wave

A typical cycle



Interpretation

What are the purposes of an ECG?

- Understanding the electrical conduction system.
- ECG patterns: normal variation or pathological.
- ECG does not equate with mechanical pumping activity.
- Pattern recognition and relationships between P waves (atrial depolarization), QRS complexes (ventricular depolarization), and T waves (ventricular repolarization).

Electrodes and Leads

- Electrodes on the body surface form leads.
- Leads: limb and precordial (chest).
- 10 electrodes form 12 ECG leads, measuring specific potential differences.

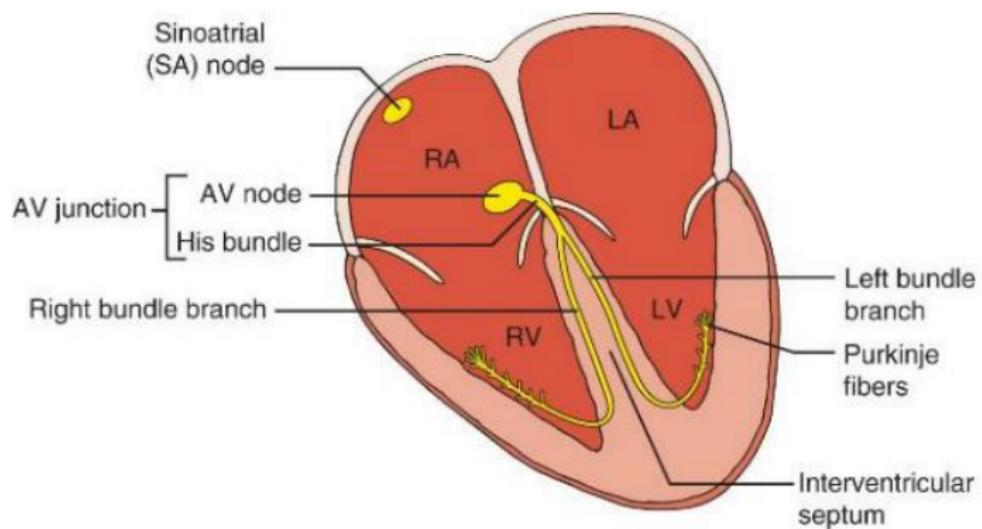
Traditional 12-Lead ECG

- Ten electrodes on limbs and chest.
- Measures heart's electrical potential from twelve angles.
- Captures depolarization throughout the cardiac cycle.

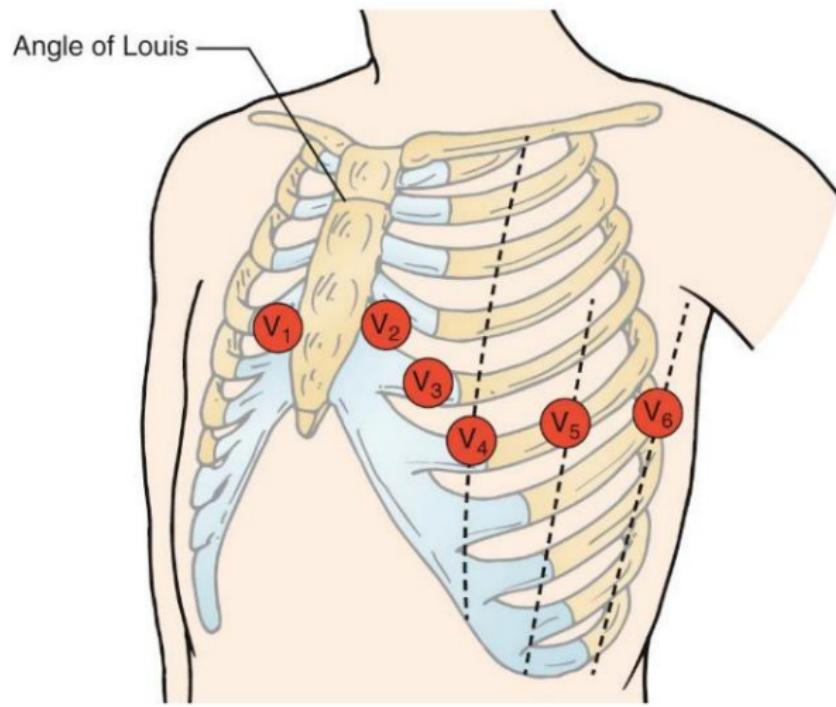
Conclusion

- ECG provides valuable information about the heart's electrical activity.
- Interpretation involves pattern recognition and understanding the theory behind ECGs.

Questions



Questions



Questions

