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ELIO **CONTE**
SERGIO **CONTE**
FRANCESCO **CASCIARO**

THE VARIABILITY OF SIGNALS IN CLINICAL ELECTROPHYSIOLOGY

PRINCIPLES AND METHODS OF ANALYSIS

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CHAPTER I

INTRODUCTION

1.1. Historical notes on electrocardiography

It is known that the contraction of muscle fibers is induced by variations in electrical potential. The contraction of myocardial fibers is also caused by the same mechanism.

Electrocardiography is a disciplinary sector that deals with the detection and study of changes in electrical potential related to cardiac contraction. The electrical activity of the heart was discovered in 1887 by AD Waller, but it was the Dutch Willem Einthoven, professor of physiology at the University of Leiden, who modified a cord galvanometer by hand, thus managing to record non-current currents for the first time, amplified originating from a patient. He was therefore the first researcher who in the years 1903-1908 was able to document the electrical activity of the heart and to suggest that the electrocardiograph could represent a technique and a method for diagnosing heart disease. Thus the first electrocardiograph was created, a simple instrument in principle but of substantial importance, still today, in cardiological diagnosis. For this contribution W. Einthoven received the Nobel Prize for Medicine in 1924.

1.2. The electrocardiogram

The electrocardiogram is the recording of the electrical activity of the heart. The ECG provides important information on the electrical processes in progress, but is unable to do the same on the mechanical processes relating to muscle contraction and relaxation. The electrocardiographic trace consists of a sequence of waves that express the depolarization, i.e. the activation and repolarization, i.e. the recovery, of the different sections of the heart. The waves are called P, QRS, T, U. The P wave corresponds to atrial activation. It, after a short time, is followed by the QRS complex which expresses ventricular activation. After the QRS wave, the T wave appears which represents the repolarization of the ventricles and finally the U wave appears which still has an uncertain meaning.

We report in figure 1.1. the waves of the electrocardiogram.