Evolution of the Major Discoveries in Electrocardiology

Dr. Frank Marcus & Dr. Andrés R. Pérez Riera

What is the goal and significance of the study of history in electrocardiology and science in general? Knowledge of history allows us to analyze the past concepts to understand the present and anticipate the future. No discovery or scientific advancement could be analyzed far from the historical-social context in which it arises. Understanding and learning what were the main currents of our predecessors, as well as determining the meaning of each concept is fundamental to continue advancing: "without theories, there is no advancement of knowledge." On the other hand, it is essential to be clear that there are no finished topics, but men who ran out of topics, and there is no more profitable investment than knowledge (1).

How did the electrocardiogram develop?

In the 19th C, Kölliker and Müller (1856) showed that the heart produced bioelectrical activity corresponding to the heart beat. The first to perform a cardiac electrical recording was Augustus Waller by his capillary electrometer (St. Mary's Hospital, Paddington, London). Clinical implementation became possible when the brilliant Willem Einthoven (Leiden, Holland), developed the string galvanometer (1902), much more accurate than the capillary electrometer of Waller, and the foundation of the current electrocardiogram (ECG). Einthoven designated the different ECG deflections with the letters P, Q, R, S and T, and described the electrocardiographic characteristics of a large number of heart diseases. Because of his extraordinary discovery, he was awarded with the Nobel Prize in Physiology and Medicine in 1924. Later, the Cambridge Scientific Instruments company, with its headquarters in London, manufactured Einthoven's device and arranged a joint-venture with a New York company to create the Cambridge Instruments Company, Inc. Soon the method proved its huge value in medical diagnosis, and it remains in the 21st C., as one of the essential pillars of cardiological diagnosis associated. In recent years, the ECG proved to be essential to indicate cardiac resynchronization therapy, when making

decisions about management in acute coronary syndromes (gold standard), in the diagnosis and prognosis of channelopathies (long and short QT syndromes, Brugada syndrome, early repolarization syndromes and catecholaminergic polymorphic ventricular tachycardia), and it is the main method for the diagnosis of all arrhythmias.

The ECG is a great help and supplement to the diagnosis of cardiomyopathies, especially hypertrophic cardiomyopathy and arrhythmogenic right ventricular cardiomyopathy/ dysplasia. In Latin America it is essential for the tracking of chronic chagasic myocarditis, a social scourge in these areas of the world. It is important in the detection of electrolytic alterations, hypothermia, the effect and toxicity of drugs. It is still of great value in the initial diagnosis of cardiac chamber enlargement, congenital heart diseases, chronic obstructive pulmonary disease, emphysema, acute pulmonary embolism, pericardiopathies, and valvulopathies. Finally, it is important to detect artifacts in the ECG; i.e. alterations in the recording not related to the electrical activity of the heart, responsible for distortions that may lead to performing unnecessary tests or therapeutic interventions.

We have described the main discoveries in this field that have taken place over more than a century. We expect to awaken in our readers interest in the ECG which is an essential supplementary method for cardiological diagnosis.

Reference:

1. Ortega y Gasset J. *The Dehumanization of art and Ideas about the Novel, 1925*.

Andrés Ricardo Pérez-Riera M.D. Ph.D.

In charge of the Electro-vectorcardiogram sector – Cardiology discipline – ABC Faculty of Medicine - ABC Foudation – Santo André Sao Paulo – Brazil

riera@uol.com.br

Frank I. Marcus, MD

Emeritus Professor of Medicine, Section of Cardiology, Department of Medicine University of Arizona Health Sciences Center – Tucson, Arizona -USA

fmarcus@u.arizona.edu