**SHORT HISTORICAL REVIEW OF ECG METHOD**

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The discoveries by Galvani and Volta of electricity and its effects fascinated the intellectual world, but it was not until 1856 that Köllicker and Müller discovered that the heart muscle could produce electric activity.

The first device developed was known as a "galvanometer"(1794) that sensed rather than measured electricity. In 1849, DuBois-Reymond enhanced the existing device so that it would measure the current, by adding a two position switch. This device was called a "Rheotome"(flow slicer).

In 1868, a student of DuBois-Reymond, Julius Bernstein modified the rheotome, so that the interval between stimulation and sampling could be varied. This was called; "the differential rheotome" and the first EKG's ever recorded were obtained with it. Most of these were EKG's of frog hearts, with the electrodes being placed on the heart.The differential rheotome lacked sensitivity which leads to the development of the "capillary electrometer", devised by Gabriel Lippmann in 1872.

Augustus DE ‘sire' Waller was the first to discover that the electrical activity of the human heart could be recorded by the capillary electrometer without opening the chest to expose the heart. He was the first to record the electrical activity of the human heart in 1887. In his initial paper he called the record an "electrogram". One year later, he called them "cardiograms". Einthoven introduced the term we now use, "electrocardiogram".

Willem Einthoven began to develop his own galvanometer in 1900, after being dissatisfied with the capillary electrometer. This was known as the "string Galvanometer" and was introduced in 1903, although Einthoven published a preliminary report on it in 1901. Einthoven's electrocardiograph was initially manufactured in Germany by Edelman and Sons of Munich. He later went with the Cambridge Scientific Instrument Company, Ltd., of London.

In 1901, Willem Einthoven completed a series of prototypes of a string galvanometer. This device used a very thin filament of conductive wire passing between very strong electromagnets. When a current passed through the filament, the electromagnetic field would cause the string to move. A light shining on the string would cast a shadow on a moving roll of photographicpaper, thus forming a continuous curve showing the movement of the string. The original machine required water cooling for the powerful electromagnets required 5 people to operate it and weighed some 270 kilograms. This device increased the sensitivity of the standard galvanometer so that the electrical activity of the heart could be measured despite the insulation of flesh and bones.

After his development of the string galvanometer, Einthoven went on to describe the electrocardiographic features of a number of cardiovascular disorders. Later in life, Einthoven turned his attention to the study of acoustics, particularly heart sounds which he researched with Dr. P. Battaerd.

The first ECG machine introduced to the United States was an Edelman String Electrocardiograph brought by Alfred Cohn in 1909.

Einthoven assigned the letters P, Q, R, S and T to the various deflectionsand described the electrocardiographic features of a number of cardiovascular disorders. In 1924, he was awarded the Nobel Prize in Medicine for his discovery.

Though the basic principles of that era are still in use today, many advances in electrocardiography have been made over the years. The instrumentation, for example, has

The first EKG machine manufactured in the United States was designed by Professor Horatio Williams and built in 1914 by Charles Hindle. Alfred Cohn received the first Hindle EKG machine in May 1915. On May 20, 1915, the first tracing with this machine showed that the patient was having an acute anterior infarction, although it was not recognized at the time.

During the development of the string galvanometer, its size also was decreased from 600 lbs.In 1903 to 30 lbs. in 1928. Just think of the times we use to complain about the weight of the life pack 4, as we carried it in and out of the ambulances. The next improvement came with modification of the electrodes. Einthoven's original cylinders of electrolyte solutions were reduced in size and still in use as late as 1930. Alfred Cohn in 1920 introduced the strap on electrode in the United States. In 1930 the Cambridge Instrument Company of New York introduced the German silver direct-contact plate electrodes. A suction electrode was developed by Rudolph Burger in 1932 for the precordial leads. This was later modified by Welsh and is now the suction cup we currently use with our 12 lead machines.

The next stage in the development of the EKG machine lead to the use of the vacuum tubes for amplification. The first one of this type developed in the United States was by the General Electric Corporation. The cathode-ray tube was next introduced into electrocardiography. This improved the physical characteristics of the recorders.

The introduction of the amplifier-type electrocardiographs led to the development of the direct-writing instruments. As you can see the developmental stages of the EKG machine was quite amazing, as were the individuals responsible for its development.

Einthoven introduced the standard limb leads, I,II,& III or "derivations" as he called them in 1906. The labelling of the EKG complex: P, Q, R, S, T was introduced by Einthoven in 1895. In his system, the largest deflection was labelled "R" wave, regardless of whether it was positive or not.

Rune Elmqvist developed the direct-writing inkjet recorder, first demonstrated at the Congress of Cardiology in Paris, 1950. Ohnell's studies of preexcitation, to which the WPW-syndrome belongs, were important. After the initial focus on arrhythmias, ECG became more and more used in the diagnosis of myocardial ischaemia and coronary heart disease. To refine this diagnosis the hypoxaemia (breathing air with low oxygen content) test, as well as the exercise test and other stress tests were introduced. Vectorcardiography displays the spatial movements of the electrical forces generated by the heart. Long-term ECG registration with a portable tape recorder is important both for the diagnosis of arrhythmias and myocardial ischaemia. Foetal and comparative ECG have provided important clinical and scientific information.