The Practical Value of Electrocardiography

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Electrocardiography, a graphic method of investigation of the heart, had such a rapid development that periodic evaluations of its practical usefulness are necessary. Overemphasis by enthusiastic workers may stress the value of this method beyond its actual possibilities; this may cause deceptions or diagnostic errors, or simply prevent the use of other, more appropriate, methods of investigation. On the other hand, underemphasis by a few die-hard old timers, misuse by poorly trained workers, or disappointment in its findings, occasionally cause unwarranted criticisms. It is appropriate to say that, in the presence of wide enthusiasm, criticisms are usually limited to personal comments and seldom find their way into medical literature.

Electrocardiographic technique is now established on a generally standardized basis. This consists of the use of 12 leads (three standard limb leads, three augmented V-leads of the limbs, and six precordial V-leads). Additional chest, esophageal, or epigastric leads, as well as functional tests, are sometimes necessary.

An electrocardiographic report can be of different types: (1) purely descriptive; (2) including analysis of certain peculiarities like axis deviation, premature beats, etc.; (3) including a diagnosis such as “atrial flutter,” and “myocardial infarction” or “digitalis heart”.

Complete electrocardiographic evaluation can be done only by a cardiologist who has examined the patient. The study of multiple precordial leads emphasizes the need of close supervision of the technician.

It is impossible to draw a sharp line between normal and abnormal tracings. In reaching a decision, the observer must consider the possible occurrence of a certain variation in the ecg of a normal person. Personal experience and additional clinical and laboratory data determine whether an abnormality should be considered pathologic.

The electrocardiogram can be used for “timing” certain accidents or waves recorded by means of mechanical, sound, or roentgenological methods. Thus, a venous tracing, a phonocardiogram, or an electrokymogram, can be recorded together with an electrocardiogram.

An electrocardiogram gives accurate information about the pacemaker of the heart and permits evaluation of the atrial and ventricular rates. Thus, the ectopic rhythms are easily studied.

Rhythms by usurpation are those where an ectopic focus with high excitability becomes the pacemaker (atrial and nodal tachycardia, atrial flutter, ventricular tachycardia, atrial fibrillation, premature contractions, and also ventricular flutter and fibrillation). Rhythms by default are those where lack of a normal sinus impulse or interruption in its transmission

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require control of the heart by a new, lower pacemaker (nodal rhythm and idioventricular rhythm due to sinus arrest, paralysis, or depression; to block; or to a-v block).

The study of the electric axis of the heart has attracted considerable attention since Einthoven. Even though there cannot be exact identification of the electrical with the anatomical position of the heart, displacements and rotations of this organ caused by either mechanical phenomena (traction, compression) or sectional enlargement (dilatation or hypertrophy of one ventricle), are accompanied by remarkable modifications of the electric axis. Thus, study of this axis can supply indirect data in valvular defects, congenital malformation, hypertensive heart disease, and cor pulmonale. The most striking changes are those caused by dextrocardia.

The study of the V-leads, developed as a consequence of Wilson's and Goldberger's investigations, has increased the accuracy of determination of the position of the heart.

Small changes in the duration of QRS, modifications of its shape, secondary changes of the T wave, concurrent modifications of the axis, and comparison of V1-V2 with V5-V6, permit identification of the following lesions of either ventricle: ventricular hypertrophy and "strain"; bundle branch block; intraventricular block.

A delay of a-v conduction (determination of P-R); changes in the duration of electrical systole (determination of Q-T); and evidence of increased excitability (premature contractions, paroxysmal tachycardia), reveal diffuse myocardial disturbance. This is typical of acute myocarditis, as well as of coronary occlusion.

Changes of the metabolism, electrolyte imbalance, and effect of digitalis or quinidine on the myocardium, are also revealed by electrocardiography.

Changes of the coronary circulation are not directly revealed by the electrocardiogram. However, the repercussion of decrease in the supply of blood (and oxygen) to the myocardium is such that the electric tracing is very revealing. Three different stages may occur in the evolution of a transmural myocardial lesion due to coronary disturbance. They are revealed by three patterns: (a) pattern of ischemia (inverted T wave) due to predominant delay of repolarization of the subepicardial layers; (b) pattern of injury (raised S-T) due to predominant suffering of subepicardial layers; (c) pattern of necrosis (QS or QR complex followed by inverted T) due to electrical inertia of the tissue. It should be emphasized that the type and course of evolution of the tracings is even more important than the changes themselves. Therefore, repeated tracings should be recorded.

Alterations of the electrocardiogram in pericarditis consist of three main patterns: (a) pattern of ischemia (inversion of the T wave); (b) pattern of injury (raised S-T); (c) pattern of effusion (low voltage). The two first patterns are due to an inflammatory process of the subepicardial layers; their interpretation is similar to that of similar patterns in coronary heart disease. The last pattern occurs only in large effusions and is due to short circuiting of electric potentials by the fluid.
Certain informative data are valuable in the interpretation of a tracing and in the writing of a report. They are: age and sex, blood pressure, valvular defects, drugs received, and clinical diagnosis.

In several diseases, the information supplied by the electrocardiogram is inadequate and may even be misleading. Knowledge of this may be useful and point out the need for different methods of study.

**SUMMARY**

The electrocardiogram has a unique place and can supply data even when symptoms and signs of heart disease are minor or absent. On the other hand, the connection between electric and mechanical phenomena of the heart is only indirect. Therefore, the data supplied by the electrocardiograph in valvular lesion, malformations of the heart, hypertension, and aortic or pulmonic lesions, are of limited importance. Excessive stress on minor modifications of the electric tracing in cases where sound or pulse tracings, roentgenology, or catheterization, give essential data, would only result in incomplete or incorrect diagnosis. A French proverb says: “La plus belle femme du monde ne peut donner que ce qu'elle a.” Which means: “do not ask for a ready made diagnosis, supplied by the electrocardiogram.”

**RESUME**

El electrocardiograma tiene un lugar singular y puede dar datos aún cuando los síntomas y signos de afeción cardíaca son menores o faltan. Por otra parte, la conexión entre los fenómenos eléctricos y los mecánicos es sólo indirecta. Por tanto, los datos proporcionados por el electro en la lesión valvular, las malformaciones del corazón, y las lesiones de la pulmonar y aórticas son de importancia limitada. La excesiva importancia dada a modificaciones menores del trazo eléctrico en casos en que la auscultación o los trazos esfigmométricos, la roentgenología y la caterización dan datos esenciales, conduciría sólo a un diagnóstico incorrecto o incompleto. Un proverbio francés dice: “La mujer más bella del mundo no puede dar sino lo que ella tiene,” lo que significa: “No se pida un diagnóstico ya hecho al electrocardiograma.”

**RESUME**

L'électrocardiogramme à une place essentielle, et peut donner des résultats déterminants, même quand les symptômes et les signes de l'affection cardiaque sont discrets ou absents. Mais à l'opposé, les rapports qui unissent les phénomènes cardiaques électriques et mécaniques ne sont qu'indirects. Il en résulte que les informations apportées par l'électrocardiographie dans les lésions valvulaires, dans les malformations cardiaques, dans l'hyper-tension, dans les atteintes de l'aorte ou de l'artère pulmonaire, sont de valeur limitée. Il faut se garder de se baser d'une façon excessive sur des modifications discrètes du tracé électrique alors que les tracés du pouls ou des bruits cardiaques, la radiologie ou le cathétérisme donnent des conclusions formelles. Méconnaître ce principe entraînerait des diagnostics incomplets ou incorrects. Un proverbe français dit que “la plus belle femme du monde ne peut donner que ce qu'elle a.” Ceci signifie qu'il ne faut pas demander à l'électrocardiogramme un diagnostic tout fait.