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THE VALUE OF VECTORCARDIOGRAPHY IN THE DIAGNOSIS OF  
CORONARY INSUFFICIENCY WITH DISTURBED INTRAVENTRICULAR  
CONDUCTIVITY

- USSR -

by V. S. Gasilin and Yu. P. Mironova

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THE VALUE OF VECTORCARDIOGRAPHY IN THE DIAGNOSIS OF  
CORONARY INSUFFICIENCY WITH DISTURBED INTRAVENTRICULAR  
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Following is a translation of an article by  
V. S. Gasilin and Yu. P. Mironova in *Terapev-  
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From the Chair of Propaedeutics of Internal  
Diseases (Head -- Prof. S. V. Shestakov) of  
Kuybyshev Medical Institute

Infarct of the myocardium is a serious disease, and its favorable outcome depends to a great extent on a correct and timely diagnosis. With this in view, a number of methods of examining patients is employed and much success has been achieved already. But even at the present time, a few decades after the clinical picture of the myocardial infarct had been described by V. P. Obratsov and N. D. Strazhesko, its correct diagnosis is at times difficult. Particularly often errors are made in the atypical course of the infarct. The electrocardiogram is not always a sufficiently reliable criterion for its recognition; in eight to ten percent of cases the ECG shows no changes (O. I. Glasova, S. V. Shestakov), but much more frequently at the basis of error in the electrocardiographic diagnosis of a myocardial infarct lie disturbances of conductivity and fibrillating arrhythmia which disguise the infarct changes on the electrocardiogram (L. I. Fogelson, V. Ye. Nezhlin, S. V. Shestakov, V. G. Popov, G. Ya. Dekhtyar', Rodriguez, Anselmi and Sodi-Pallares).

In searching for means of a more correct diagnosis of this disease, the scientists strive to perfect the methods of electrophysiological study of the cardiovascular system. One of these methods is vectorcardiography.

Vectorcardiogram disturbances in myocardial infarcts were studied by M. N. Tumanovskiy, I. T. Akulinichev, E. A. Kyandzhuntseva and V. I. Makolkin, S. L. Mailyan, Sh. I. Shurgaya, and I. I. Bykov; only in the works of I. I. Bykov did we find indications on vectorcardiogram changes in myocardial infarcts complicated by blockades.

In order to study the possibilities of vectorcardiography in the diagnosis of coronary insufficiency with the disturbance of conductivity, we carried out a vectorcardiographic investigation of 50 patients suffering from atherosclerosis of the coronary arteries and atherosclerotic cardiosclerosis with phenomena of chronic coronary insufficiency, and 50 patients with atherosclerosis of coronary arteries and a myocardial infarct (of one month to one-and-a-half-year duration from start of illness).

In recording a vectorcardiogram we employed the five-plane pyramidal Akulinichev system with apparatus sensitivity of one mm = 20mm. Simultaneously, we analyzed the data of electrocardiographic, clinical and X-ray examinations. The ECG was taken according to three standards, the third on inspiration, a unipolar from the left leg and six thoracic according to Wilson, and dipolar leads.

Of the 50 patients of the second group, in 30 there was an infarct of the anterior wall of the left ventricle, in 10 -- the anterior and left lateral walls, and in 10 -- the posterior wall of the left ventricle. In nearly half of the patients the infarct extended to the interventricular septum.

A disturbance of conductivity within the ventricles was observed in 30 patients, in eight of whom there was a left branch block of Hiss bundle.

The common signs of a myocardial infarct on the vectorcardiogram were marked deformation of the QRS loop, its twisting, additional loop formation, and the position of the loop on both sides of the axis coordinates with formation of several large vectors. At this, the spatial orientation of the loop was disturbed and its apex was bent toward the side, opposite to the focus of the myocardial necrosis. Along the course of the QRS loop depressions were observed attesting to the loss of electrical activity by certain areas of the myocardium. Also a considerable diminution of QRS and T loops was noted. The maximal vector of the QRS loop in the first three planes equalled on the average 10 to 25 mm as against 40 to 50 mm under normal conditions. The diminution of the size of the loop is caused by reduction of the actively stimulated muscular mass due to its necrotization and scar substitution.

The vectorcardiogram changes were generally more pronounced in extensive myocardial infarcts affecting two walls of the left ventricle and the interventricular septum, and they developed in conjunction with the electrocardiogram irregularities. In cases where the myocardial infarct was complicated with a Hiss bundle, left-branch block, the electrocardiographic picture was not infrequently masked by the

picture of a block. The vectorcardiogram, on the other hand, continues to undergo changes characteristic of a myocardial infarct and did not differ from a vectorcardiogram of patients suffering from a myocardial infarct uncomplicated with a branch block of the Hiss bundle.

Such vectorcardiogram changes developed in myocardial infarct patients with disturbed intraventricular conductivity and widening of the QRS complex up to 0.10 -- 0.11 sec.

In the Hiss bundle branch block of different etiology (atherosclerotic cardiosclerosis, rheumatism) there was observed an increase and widening of the QRS loop without noticeable deformation, depressions along its course, and additional loop-formation.

We shall cite as an example the vectorcardiogram of a woman patient Ye., 55 years of age, with a history of an infarct of the anterior wall of the left ventricle and the interventricular septum. The patient was troubled with pinching pains in the cardiac region and severe dyspnea changing into an asthmatic attack upon physical exertion. Her general condition was of medium gravity. The cardiac limits were: on the right side -- two centimeters from the right border of the sternum, upper -- in the third intercostal region, left -- two centimeters externally from the left median clavicular line. Heart sounds were dull, a systolic murmur was heard at the apex. Over the lungs there was a box-like sound on percussion, a vesicular breathing and moist, non-sonorous, fine vesicular bronchi on auscultation of the lower lobes. The liver was palpable four centimeters from the edge of the costal arc.

In the electrocardiogram shown in Fig. 1 one observes a notched QRS complex in the standard leads and its bifurcation in the form of letter M in the IV, V and VI thoracic leads. The displacement of the S -- T interval above the isoelectric line in the first three thoracic leads, and below it -- in the I standard and two last thoracic leads; there is evidence of a Hiss bundle left branch block; the duration of the QRS complex is 0.15 sec.

A vectorcardiogram is shown in Fig. 2. One observes a marked deformation of the QRS loop in all planes, its twisting, additional loop-formation, localization of the loop on both sides of the horizontal coordinate (it is very difficult to determine the direction of the maximal vector to the loop). The maximal vector is reduced and equals 10 to 18 mm in various planes. The QRS loop is bent backward in plane I, in II -- backward and to the right, in III -- backward and to the left, i. e. toward the focus of the myocardial lesion localized in the anterior wall.

Thus, our data, as well as the observations of

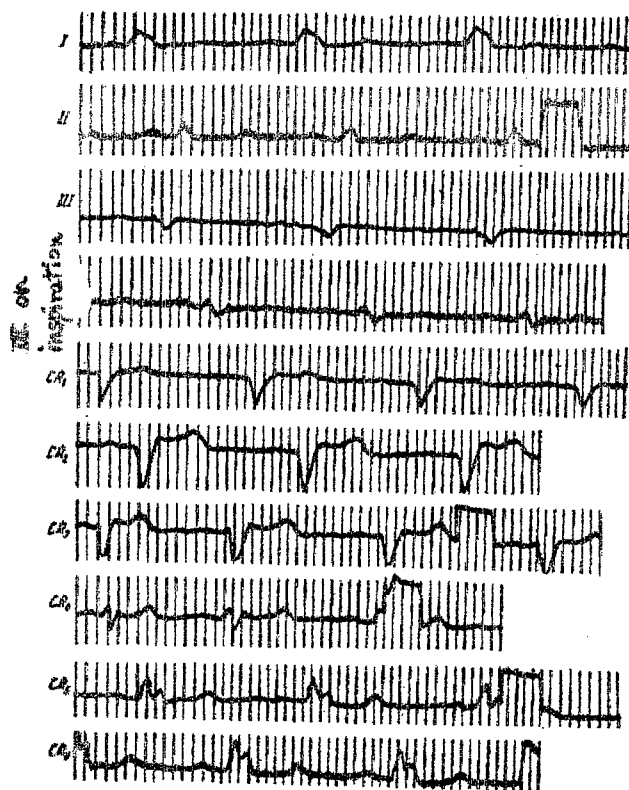


Fig. 1. Electrocardiogram of Patient Ye.

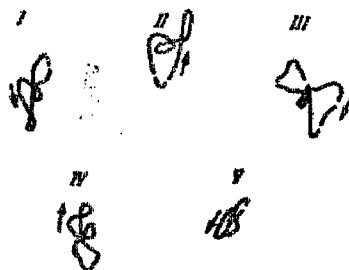


Fig. 2. Vectorcardiogram of Patient Ye.

The numbers indicate planes; arrow -- the direction of unfolding of the QRS loop.

I. I. Bykov attest to the value of the vectorcardiographic method in the complex examination of patients suffering from cardiovascular diseases. In the disturbances of coronary circulation with a myocardial infarct formation the vectorcardiogram undergoes considerable changes. These changes develop also in a myocardial infarct complicated by a branch block of the bundle of Hiss, where the electrocardiographic changes may not be typical of an infarct. In these cases a vectorcardiographic examination makes possible a more correct diagnosis.

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