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METHOD IN THE DIAGNOSIS OF ACQUIRED  
HEART DEFECTS

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

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THE PROBLEM OF THE USE OF THE VECTORCARDIOGRAPHIC METHOD  
IN THE DIAGNOSIS OF ACQUIRED HEART DEFECTS

[Following is the translation of an article by V. S. Gasilin and Yu. P. Mironova entitled K Voprosy o Primenenii Vektorkardiographicheskogo Metoda v Diagnostike Priobretennykh Porokov Serdtsa, (English version above), in Klinicheskaya Meditsina (Clinical Medicine), Vol. XLI, No. 6, Moscow, 1960, pages 50-53.]

The Department of Propaedeutics of Internal Diseases (Director - Prof. S.V. Shestakov) of the Kuybyshev Medical Institute (Director - D.A. Voronov)

It is known that, in aortic insufficiency, an Austin-Flint murmur may be heard at the apex of the heart, in the presystolic period, together with a systolic murmur of relative mitral insufficiency (G.F. Lang). This auscultative picture simulates combined mitral valvular disease of the heart. The ECG, in the presence of mitral and aortic valvular disease, usually shows right axis deviation, reflecting only stenosis of the left atrio-ventricular orifice. All of this may lead to diagnostic errors. At the same time, a perfectly clear-cut topical diagnosis of valvular heart disease is necessary in connection with the swiftly-growing field of surgical treatment of heart lesions. All of this has led

us to undertake a study of the diagnosis of acquired heart disease with the use of the vectorcardiographic method.

In the Soviet literature we have found a few works on the vectorcardiographic diagnosis of rheumatism.

I.T.Akulinichev and S.L.Mailyan took vectorcardiograms in three planes using leads from the extremities, which is not a widely-used method; hence, it is difficult to compare their findings with the observations of other authors. M.I.Kechker, studying with the vectorcardiographic method the diagnosis of ventricular hypertrophy of the heart, noticed characteristic changes in it: displacement of the orientation of the vector loop; changes in the direction of rotation of the QRS loop while being traced out; failure of closure of the loop; increase in the area of the loop; orientation of the T loop to the side opposite that of the QRS loop. With myocardial dilatation, such changes in the vectorcardiogram are not encountered. In their report, Z.Z.Dorofeyeva and I.F.Ignat'yeva attempted to describe the vectorcardiographic changes of the active process but did not present the findings corresponding to the establishment of lesions of one or another valve.

We carried out complex studies of patients, taking into account clinical, X-ray, ECG, and vectorcardiographic findings. ECG's were taken from ten leads; vectorcardiograms were taken using the five-plane pyramid system of precordial leads of I.T. Akulinichev with a sensitivity of the vectorcardioscope of one

mv = 20 mm. In some cases, with considerable enlargement of the loop, the sensitivity of the apparatus was reduced to one mv = ten mm.

Altogether we studied 104 patients with combined mitral lesions of rheumatic etiology, 20 with insufficiency of the mitral valve, 17 with combined mitral and aortic lesions, and one with aortic insufficiency of syphilitic origin.

In the present report we did not undertake to analyze in detail the changes in the vectorcardiogram in different groups of patients, for this had been done by us earlier. We have merely attempted to determine the changes which would permit a correct diagnosis of mitral and aortic valvular lesions.

In the group of patients with combined mitral lesions, there was reduction in the QRS loop, compression or widening of it, <sup>and</sup> increase in the angle between the QRS and T loops to 90 degrees and more. In some cases, there were changes in the spatial orientation of the loops (displacement to the negative quadrants in projections I, II, and III, and to the positive quadrants in the two latter projections) and in the direction of evolution of the loops.

These changes in the vectorcardiogram were most marked in patients with active processes, recurrences of endomyocarditis, combined mitral valvular lesions, i.e. in patients with considerable changes in the myocardium; they were evident to a lesser degree in patients with inactive processes.

Starting with these findings, we suggest that obvious disturbances in the vectorcardiographic picture may bear indirect witness to activity of the rheumatic process.

In all patients with stenosis of the left atrio-ventricular orifice, there was an increase in the P loop to ten to 15 mm.

In not a single case, including patients with mitral insufficiency, did we observe a marked increase in the maximum QRS vector.

In the group of patients with combined mitral and aortic lesions, the QRS loop was considerably enlarged. The maximum vector of this loop reached 90 to 120 mm. In some cases there was also widening of the QRS loop. The angular disposition of the QRS and T loops and the direction of evolution of their traces were within normal limits. The angle between the QRS and T loops rarely exceeded 40 to 50 degrees. There was no deformation of the QRS and T loops.

In the instance of isolated aortic insufficiency of syphilitic etiology, the increase in the QRS loop was especially marked, and the maximum vector was 120 mm.

In the majority of patients of this group, the ECG showed right axis deviation, reflecting only the mitral lesion.

Let us give an example.

Patient P., 22 years old, with a diagnosis of rheumatism in the inactive phase, combined mitral lesions, and aortic insufficiency. The findings of clinical studies indicated the pres-

ence of the above-mentioned lesions.

The ECG (Fig.1), taken with the three standard leads, and with I and V of the thoracic leads, showed increase in the P<sub>II,III</sub> wave with elevation of the S-T segment above the isoelectric line in the chest leads, and right axis deviation. These changes testify only to the presence of combined lesions of the mitral valve.

On the vectorcardiogram (Fig.2) there was increase in the P, QRS, and T loops, widening of the QRS loop (in projections II and III, which were oriented to the hypertrophic left and right ventricles), and distribution of it to both sides of the horizontal coordinate. The vectorcardiogram indicated the presence of combined mitral lesions (increase in the P loop) and insufficiency of the aortic valve (increase and widening of the QRS loops).

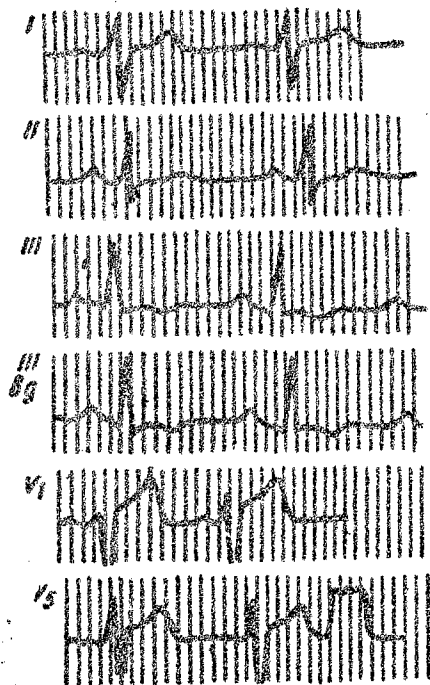


Fig.1 - ECG of patient P.

The increase in the QRS loop corresponds to the increased electrical activity of the myocardium. As is known, the magnitude of the electromotive force is proportional to the mass of cardiac muscle (L.I. Fogel'son). With increase in the muscle there are changes in the electromotive force. With damage to the aortic valve leaflets, there is hypertrophy of the left ventricle, which leads to increase in the electromotive force of the myocardium and, accordingly, to a numerical increase in the maximum vector of the QRS loop. Increase in the maximum vector of the QRS loop of the vectorcardiogram reflects only relatively the increase in the electromotive force of the hypertrophied ventricle and does not testify to an absolute increase in this force. All the same, vectorcardiography affords extensive possibilities in the solution of this problem as compared with electrocardiography.

We have already remarked that the form of the QRS and T loops, their orientation with respect to the horizontal coordinate, and the direction of evolution of the ray, are changed in patients with combined mitral and aortic valve lesions to a lesser degree than in patients with mitral lesions alone. The cause of this is not yet clear to us. It is possible that this is explained by the better blood supply to the myocardium in patients with aortic lesions, due to the greater systolic volume of the heart.

Hence, the vectorcardiogram may aid in the differential diagnosis of lesions of the mitral and aortic valves. Lesions of the latter are indicated by the considerable increase and widening of the QRS loop of the vectorcardiogram due to hypertrophy

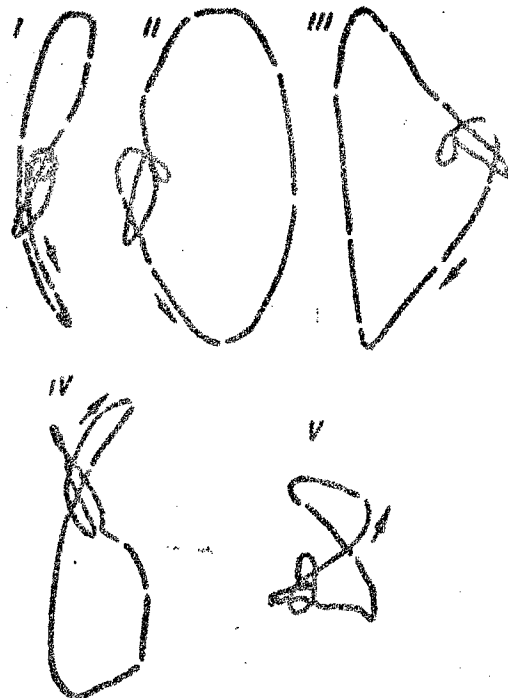


Fig.2 - Vectorcardiogram of patient P. The figures (I to V) designate the projections; arrows show the direction of rotation of the QRS loop.

of the left ventricle, in the presence of negligible changes in the form of the loops and their spatial disposition. Such evidences of hypertrophy of the ventricles as failure of closure and of the QRS loop' direction of the QRS and T loops to opposite sides (M.I. Keckler), according to our findings, are not of great value in diagnosis, since they were encountered in only two of our patients.



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