The Vectorcardiogram in the Diagnosis of Inferior Wall Myocardial Infarction*

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Significant Q waves may not always be present in the electrocardiograms of patients who sustain an acute transmural inferior wall myocardial infarction. In addition, significant Q waves due to an inferior wall myocardial infarction may progressively diminish or regress completely in the follow-up period.1,2

Several studies have shown the superiority of the vectorcardiogram to the ECG in confirming the presence of an inferior wall myocardial infarction when equivocal Q waves or embryonic R waves are present in the inferior leads of the ECG.3,4 The following two cases have been selected to illustrate the value of the Frank vectorcardiogram in the diagnosis of inferior wall myocardial infarction.

The ECG and vectorcardiogram illustrated in Figure 1 were obtained from a 46-year-old man who had sustained an inferior wall myocardial infarction one year earlier. He had coronary angiographic evidence of a complete occlusion of the proximal right coronary artery and dyskinesis of the inferior wall of the left ventricle.

The ECG shown in Figure 1 illustrates Q waves of less than 0.03 sec in duration in leads 2 and aVF and a small R wave followed by a deep slurred S wave in lead 3. In addition, abnormalities of the ST-T wave are seen in the inferolateral leads.

In the frontal plane the Frank-system vectorcardiogram shows clockwise inscription of the initial deflection and of the efferent limb of the QRS loop.

The 30-msec vector is superior and to the left of the 0 point; the distance from the 0 point to the leftward x intercept is 0.60 mv; the maximal superior forces are 0.15 mv; and the ratio of maximal superior to maximal inferior deviation is 1:4.

Figure 2 illustrates the ECG and vectorcardiogram obtained from a 55-year-old man with insulin-dependent diabetes mellitus, a history of angina pectoris, and cerebrovascular disease. This patient had an episode of severe chest pain occurring at rest and lasting for 30 minutes two weeks prior to this ECG and vectorcardiogram.

The ECG shown in Figure 2 illustrates a Q wave of less than 0.03 sec in duration but exceeding 25 percent of the height of the R wave in lead 2, embryonic R waves in leads 3 and aVF, and tall R waves with an R/S ratio of less than 1.0 in leads V1 and V2.

In the frontal plane the Frank-system vectorcardiogram illustrated in Figure 2 demonstrates clockwise inscription of the initial and major portion of the QRS loop with superior or leftward orientation of the 30-msec vector. The horizontal plane QRS loop is displaced anteriorly, and its major portion is situated in the left anterior quadrant. The 40-msec vector is anterior to 16°. The initial rightward forces measure 24 msec.

In both of our patients, the ECG is suggestive, but not diagnostic, of an inferior wall myocardial infarction; however, the vectorcardiograms in both of these patients meet criteria diagnostic of inferior wall myocardial infarction. These criteria generally include clockwise inscription of the initial QRS forces around the 0 point with a superiorly oriented 25- or 30-msec vector and a maximum QRS vector above 30° in the frontal plane.5,6

In addition, the vectorcardiogram shown in Figure 2 is diagnostic of a true posterior wall myocardial infarction. The increased duration of the initial
FIGURE 1. Vectorcardiogram and ECG from 46-year-old man with old inferior wall myocardial infarction. Note clockwise inscription of initial deflection and of efferent limb of QRS loop in frontal plane (FP). SP, Sagittal plane; and HP, horizontal plane. Time lines are 2 msec. Electrocardiogram shows Q waves of less than 0.03 second in duration in leads 2 and aVF and a small R wave in lead 3.

FIGURE 2. Vectorcardiogram and ECG from 55-year-old man with history suggestive of acute myocardial infarction two weeks earlier. Note clockwise superior inscription of major portion of QRS loop in frontal plane (FP) and anterior and leftward displacement of QRS loop in horizontal plane (HP). SP, Sagittal plane. Time lines are 2 msec. Electrocardiogram illustrates Q wave of less than 0.03 second in duration but exceeding 25 percent of height of R wave in lead 2, small R waves in leads 3 and aVF, and tall R waves with R/S ratio of less than 1.0 in leads V1 and V2.
rightward forces suggest lateral extension of the infarction.

The outlined vectorcardiographic criteria for diagnosing inferior wall myocardial infarction may result in a false-positive diagnosis of infarction. Therefore, to improve specificity in our patients, additional vectorcardiographic criteria were utilized; these included distance from the 0 point to the left intercept of at least 0.30 mv and a maximum superior deviation of 0.1 mv or more with a ratio of maximum superior to maximum inferior forces of at least 1:5. With the use of these additional criteria, the incidence of a false-positive diagnosis of inferior wall myocardial infarction would be expected to be less than 3 percent.

As illustrated, the Frank system vectorcardiogram is superior to the ECG in confirming or establishing a definitive diagnosis of inferior wall myocardial infarction.

References

Announcement

National Institutes of Health, National Heart and Lung Institute
Division of Lung Diseases, Pulmonary Academic Award

The Division of Lung Diseases, National Heart and Lung Institute, invites national competition for Pulmonary Academic Awards which will have the dual purpose of improving the quality of pulmonary curricula and of fostering research and careers in the respiratory field. Each school of medicine or osteopathy in the United States or its possessions and territories is eligible for such an award which will be limited to one for each eligible school, for a project period up to five years.

The Institute hopes through this program to provide an impetus for schools that do not have an identifiable pulmonary curriculum to develop one; for schools that have a pulmonary curriculum that needs strengthening to improve it, and for schools that need someone to devote a major effort to the pulmonary curriculum, either to support a member of the staff or to recruit someone for the purpose.

Applications must be received prior to October 1, 1976. Awards will be made once a year with a beginning date prior to July 1.

Application folders with all necessary information may be obtained by writing to: Dr. Bitten Stripp, DLD, NHLI, 5333 Westbard Avenue, Washington, D.C. 20016 or (301) 496-7171.