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Received October 29, 1959. P.S.E.B.M., 1960, v103.

Interpretation of the Master "2-Step" Exercise Electrocardiogram by Quantitative Analysis of RS-T Segment. (25503)

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This study was undertaken to formulate additional criteria for interpretation of the Master "2-Step" exercise test. While the significance of a negative test has been established (1), "false positive" responses occur not infrequently in healthy individuals. Our experiment was based on the electrophysiologic principle that *duration* of RS-T depression in a given cycle is more important than *extent* of its depression. Thus, RS-T segment depression due to current of injury produced by sub-endocardial ischemia should persist for a greater portion of ventricular systole than the depression associated with simple tachycardia, or benign changes in ventricular gradient (2).

Material and method. 234 consecutive "2-Step" tests in which there was RS-T segment depression after exercise, were analyzed. In each case, the resting 12 lead tracing was entirely normal. There were 163 men and 71 women, all followed for 2 to 8 years, average 4 years. On the basis of comprehensive clinical evaluation and follow-up, these were divided in 2 groups: (a) 100 patients with definite organic ischemic heart disease (77 males and 23 females) and (b) 134 without organic heart disease (86 men and 48 women). Standard lead II and leads V_2 through V_6 were recorded in all patients immediately after exercise, as well as in 2 minutes and 6 minutes. Duration of RS-T segment depression in elec-

trical systole, independent of heart rate, was measured according to the technic of Lepeschkin and Surawicz (3). In Fig. 1 the RS-T segment is deviated below the baseline. X is the point of return of depressed segment to isoelectricity. The time from beginning of ventricular activation to point X (QX interval) is expressed as percentile of QT (electrical systole) interval for that complex. (QX/QT ratio). The QX/QT ratio was recorded in every lead and in each time interval, wherever RS-T segment depression, however minimal, was present. Intervals were measured by calipers. In each case, the greatest QX/QT ratio was recorded, independent of the extent of RS-T depression in mm.

Results. The mean QX/QT ratio among 100 organic patients, both male and female, was 57.4%, exceeding 50% in all but one case.

The mean ratio among individuals without heart disease, was 43.9%, all but 12% failing to attain values of 50% or greater. These findings are illustrated in cumulative frequency distribution curves (Figs. 2a, 2b). Analysis by sex indicates that only 4 of 86 functional males had ratios of QX/QT greater than 50% (4.7%), whereas 12 of 48 women in the "no heart disease" category exceeded this value.

The overall diagnostic accuracy of QX/QT ratio when applied to evaluation of any RS-T depression after the "2-Step" test is 92.8%. The technic, however, is 97% accurate in males.

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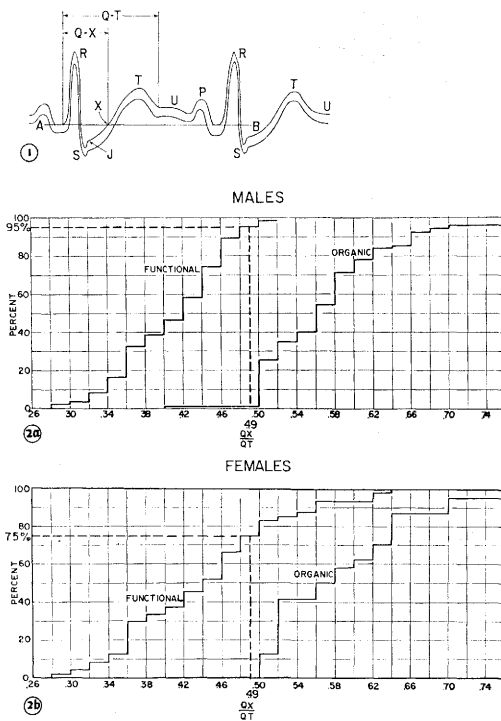


FIG. 1. Modified from Lepeschkin, E. and Surawicz, B., *New England J. Med.*, 258, 1958. RS-T segment is depressed. J is junction between end of QRS complex and beginning of RS-T segment. X is point of return of the depressed RS-T segment to isoelectricity. QX is time measured from beginning of ventricular activation to point X. QT interval (electrical systole) is measured from earliest deflection of QRS complex to end of T-wave. AB, the baseline or line of isoelectricity, is drawn through 2 successive QRS complexes.

FIG. 2a. Bar type cumulative frequency distribution curve in males indicates that 96% of individuals without heart disease have QX/QT ratios below 50%. With exception of one patient, all organic cases have values of 50% or more.

FIG. 2b. Cumulative frequency distribution bar graph of QX/QT ratio in women. All patients with organic heart disease have QX/QT ratios exceeding 50%. Among functional cases, 75% do not attain a 50% ratio.

There was no apparent relationship between QX/QT ratio and extent of RS-T depression in either organic or functional cases.

Conclusions. 1) There is a statistically valid difference in the nature of depressed RS-T segment after the "2-Step" test, among functional cases *vs.* those with ischemic heart disease. In presence of coronary heart disease, the depression persists for greater portion of ventricular complex than in functional cases. The QX/QT ratio is a simple and convenient expression of this characteristic of the RS-T segment and corrects for changes in heart rate. 2) A QX/QT ratio of 50% appears the optimal point at which to separate organic from functional cases. In 100 patients with known coronary heart disease, 99% demonstrate QX/QT ratios of 50% or more. Using this criterion, total incidence of false positive responses is 12% but with only 4.7% false reactors occurring among men. The overall accuracy of the criterion in both organic and functional cases with RS-T depression is 92.8% in our series. 3) It is suggested that criteria of an abnormal "2-Step" test should henceforth include a QX/QT ratio of 50% or more.

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Received November 5, 1959. P.S.E.B.M., 1960, v103.

Pantothenic Acid, Thiamine and Folic Acid Levels at Parturition.* (25504)

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Evidence showing fetal malformations and death from deficiencies of pantothenic acid (1), Vit. B₁₂(2), folic acid (PGA)(3), ribo-

flavin(4), Vits. A, E, and K(5,6,7) have been

* This study was supported by U. S. Public Health Service Grants.