

**UNCLASSIFIED**

---

---

**AD 283 790**

*Reproduced  
by the*

**ARMED SERVICES TECHNICAL INFORMATION AGENCY  
ARLINGTON HALL STATION  
ARLINGTON 12, VIRGINIA**



---

---

**UNCLASSIFIED**

NOTICE: When government or other drawings, specifications or other data are used for any purpose other than in connection with a definitely related government procurement operation, the U. S. Government thereby incurs no responsibility, nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

62-4-6

PROGRESS REPORT

PROJECT 6X60-01-001, Internal Medicine

Task 1, Value of Double Standard Two-Step  
Test in Detecting Coronary Disease

Walter Reed General Hospital  
Washington 12, D. C.

Department of Medicine  
Cardiology Service

1 July, 1961 through 30 June, 1962

D. O. Lynn, Colonel, MC  
T. W. Mattingly, Brig. Gen., MC (Ret.)\*  
G. P. Robb, M.D.\*\*  
H. H. Marks\*\*\*

Reports Control Symbol MFDDH-288

CATALOGED BY ASTIA  
AS AD No. 283 790

283 790

\*Washington Hospital Center, Formerly, Chief, Department of Medicine  
and Chief, Cardiology Service, WRGH  
\*\*Metropolitan Life Insurance Company, Formerly, Chief, Cardiology  
Service, WRGH  
\*\*\*Metropolitan Life Insurance Company

ASTIA  
RECEIVED  
SEP 17 1961  
TISIA

## ABSTRACT

PROJECT: 6X60-01-001, Internal Medicine

Task: 1, Value of Double Standard Two-Step Test in Detecting Coronary Disease

Walter Reed General Hospital, Cardiology Service

1 July, 1961 - 30 June, 1962

D. O. Lynn, Col., MC, T. W. Mattingly, Brig. Gen., MC (Ret.)

G. P. Robb, M.D., and H. H. Marks

Reports Control Symbol MEDDH-288

The value of the postexercise electrocardiogram in detecting and evaluating the changes occurring in the electrocardiogram following exercise, and its use in identifying individuals suspected of having coronary insufficiency has been the basis of a follow-up study of 1000 selected individuals in the military service having postexercise electrocardiograms at Walter Reed General Hospital between 1943 and 1950 (Electrocardiographic Stress Tests in Suspected Coronary Disease, A Long-Term Statistical Evaluation of the Types of Response to the Double Standard Two-Step Exercise Test and the Anoxemia Test: Mattingly, T. W., Robb, G.P., Marks, H.H., Walter Reed Army Institute of Research Report No. 75-57, May 1957).

The Stress Test Study was activated as a 25-year study primarily in an effort to make a diagnosis in individuals who had chest pain or discomfort, or some other finding which suggested coronary disease as the cause of pain, and to follow and study the subsequent cardiac course of each individual.

The development of fatal or nonfatal coronary artery occlusion or myocardial infarction subsequent to the test was used as criteria for identification of coronary artery disease.

At the time of the compilation of the initial data of this evaluation, in May 1954, 108 individuals studied were deceased, 20 were lost to follow-up, and 872 were living. In an initial classification of the postexercise electrocardiogram by Masters' criteria, 746 had a normal response or negative test, and 254 had an abnormal response or positive test. The instances of fatal or nonfatal occlusion were significantly higher in those having an abnormal response than in those having a normal response, but in this initial group having an abnormal response there was likewise a significant number of individuals who presented no symptoms of coronary disease as ascertained by follow-up study.

A second evaluation was made of this material, based on changes in the postexercise electrocardiogram, at which time those showing abnormal response in the electrocardiograms were further broken down by the character of the changes in the postexercise electrocardiograms. When evaluated according to individual type of response, it was found that the best correlation was obtained in those individuals

who showed ischemic ST-flattening and depression as the significant postexercise abnormality. Individuals showing only T-wave change after exercise were found to be similar to those having normal response after exercise.

Individuals showing J-junction type of depression had a higher morbidity and mortality rate from coronary disease than those with isolated T-wave change or normal response, but decidedly less than those showing ischemic or ST-depression.

#### REPORT

Since the initial report (WRAIR-75-57) and the exhibit presented at the American Medical Association Meeting in New York, June, 1957, more than 3000 copies of the initial report have been sent on request and the requests are continuing to pour in from all over the world. The findings of this report have been quoted repeatedly in other publications, reports, and lectures dealing with similar phases of this subject. While requests are still coming in for the first report, they are also now pouring in for the second report (The Postexercise Electrocardiogram, Its Value in the Diagnosis and Prognosis of Coronary Arterial Disease: Mattingly, T.W., M.D., The American Journal of Cardiology, March 1962, pp. 395-409).

The second series of tests, initiated since 1950 (Stress Test Number 2), now numbers 739 patients, and 59 of this number are known to be deceased. A pathology study in collaboration with the Armed Forces Institute of Pathology, Cardiovascular Section (Dr. Wm. C. Manion) evaluating the severity of coronary atherosclerosis in the deceased individuals in both series will continue for 25 years from the date of activation of the study.

In the past year, this material has been used extensively in writing, lecturing, and teaching. A second report has been published: (see ref. para 1 of this Report). In addition to this writing and the presentations and publications reported in prior R&D Reports, further presentations and writings in the past year are listed below.

#### Summary

In a long-term clinical follow-up evaluation and postmortem evaluation in a large series of patients, and in a smaller series of normal healthy persons who have had postexercise electrocardiograms, the postexercise electrocardiogram with an ischemic S-T configuration has been found to be the only reliable electrocardiographic manifestation of coronary insufficiency. It has both

diagnostic and prognostic value.

The presence of electrocardiographic changes in either the resting or postexercise electrocardiogram should not be considered synonymous with organic coronary arterial disease, especially obstructive coronary atherosclerosis. Such changes have been observed in patients who have normal coronary arteries but in whom metabolic and hemodynamic abnormalities are associated with either severe anemia, electrolyte disorders, drug therapy, pulmonary and systemic hypertensive vascular disease, or obstructive valvular and vascular lesions with a low and fixed cardiac output. However, since obstructive coronary atherosclerosis is by far the most common cause of coronary insufficiency, its presence should be strongly considered as the cause of coronary insufficiency until proved otherwise.

Correlation with abnormalities in the coronary arteries of deceased persons who had had postexercise ischemic electrocardiographic changes indicate that, in general, ischemic S-T-segment changes occur only when advanced and diffuse occlusive coronary disease is present. This finding is in agreement with physiologic and radiologic correlations as made by others in living patients. Usually, people who show such ischemic S-T-changes have a poor prognosis and are sensitive to complicating factors, such as thrombosis or hemorrhage into sclerotic plaques, which further compromise the coronary circulation. Sudden death or arrhythmic deaths in the early stages of an infarction are common. The interval between the initial finding of ischemic changes and death, however, was quite variable and a positive test result does not indicate a grave prognosis. After 10 years, 40 per cent of the subjects studied were still living. This finding indicates the type of coronary death which might be expected. The degree and severity of S-T depression are not important in diagnosis, but they do reflect to a significant degree the severity of the insufficiency and the prognosis of heart disease.

Other postexercise electrocardiographic changes, such as isolated changes in T-wave polarity and junctional RS-T-depression with adequate precordial tracings, presented poor correlation with subsequent clinical coronary disease or coronary disease at autopsy. These changes are not considered useful in the diagnosis and prognosis of obstructive coronary disease.

When coronary atherosclerosis was the only condition found at necropsy, neither lesser degrees of generalized occlusive disease nor complete occlusive lesions in an isolated vessel,

either with or without myocardial infarction or fibrosis, was regularly associated with ischemic changes. Therefore, the absence of abnormal changes in a postexercise electrocardiogram does not exclude organic coronary disease. Such a finding may occur with a different type and a lesser degree of coronary disease which has been observed to provide a more favorable prognosis for longevity but not for the eventual development of significant clinical coronary disease.

Since the Report to the R&D, made July 31, 1961, General Thomas W. Mattingly, the principal researcher in this Study, has used the Stress Test data in the following-listed publications and presentations:

Publications:

The Postexercise Electrocardiogram, Its Value in the Diagnosis and Prognosis of Coronary Arterial Disease: The American Journal of Cardiology, pp. 395-409, March, 1962.

Chapter for book, Diagnosis Without Special Studies, in the book entitled Congenital Heart Disease, F. A. Davis Co., Phila. 1962

Talks:

Correlation of New Diagnostic Factors in Coronary Disease: presented at the 22nd Annual Scientific Session, Maryland Trudeau Society, February 17, 1962.

Stress Test in Coronary Disease: International Conference on Diet, Serum Lipids and Atherosclerosis, sponsored by the Nutrition Foundation, Rye, New York, October 1961. (published in Federation Proceedings)

The Postexercise Electrocardiogram, Its Diagnostic and Prognostic Value: Assn. of University Cardiologists, Chicago, Ill., February 1962.

The Electrocardiogram in Angina: presented as part of the Hahnemann Conference, Philadelphia, Pa., April 1962 (to be published in Symposium Proceedings, F. A. Davis Co.)

Postexercise Electrocardiogram: presented at the 10th Annual Scientific Symposium on Heart Disease, Portland, Oregon, May 1962.