

The Reliability of SPECT thallium-201 Scintigraphy in Hypertensive African-Americans

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A. Introduction

Patients with hypertension may present with symptoms of angina with or without coronary artery disease (CAD). The pretest likelihood for coronary artery disease increases with concomitant diabetes mellitus, hypercholesterolemia, and other risk factors. Standard noninvasive evaluation in patients with a high likelihood of CAD includes stress (exercise or persantine) electrocardiography and SPECT thallium-201 testing. One large review of 22 studies found that the sensitivity and specificity for exercise electrocardiography to be 58% and 82% respectively while that for thallium-201 scintigraphy was 83% and 90% respectively (1) in patients routinely referred for diagnosis. The positive and negative predictive values for thallium-201 testing were found to be from 88-93% and 43-72% respectively in several studies (2-6). These studies, however, were done on a primarily Caucasian population; there are few studies evaluating the use of SPECT thallium-201 testing in African-Americans.

In hypertensive patients, the use of exercise ECG is problematic in the diagnosis of obstructive epicardial coronary artery disease. Resting ST-T wave changes may occur with left ventricular hypertrophy which may obscure ECG changes in ischemia (7,8). It has been documented, in the absence of demonstrated arteriographic coronary disease, that significant segmental myocardial perfusion defects occur with exercise testing in patients with valvular heart disease, conduction abnormalities, and cardiomyopathic heart disease (9-15) especially in those with hypertrophic cardiomyopathy (16-20). In this condition, perfusion defects are seen in the septal and lateral regions (21) with the suspicion being an abnormality in the coronary microcirculation in these regions with an impairment of rapid filling. Extravascular compression on the microcirculation restricts flow through the vascular bed resulting in myocardial ischemia in the affected and adjacent areas (22). Legrand et al (23) found that patients with abnormal exercise thallium-201 scans were found to have abnormal coronary flow reserve; he noted that five of seven of the patients with abnormal results (total=8) had a history of hypertension. Similarly, Houghton et al (24) also demonstrated that in hypertensive patients without CAD, thallium perfusion defects are associated with depressed coronary vasodilator reserve; he noted that there were eleven hypertensive patients with abnormal stress thallium results among a total of forty three patients (false positive rate of 24%).

Although there have been studies documenting abnormal coronary blood flow in hypertensive patients without CAD (25-27), there are few studies that comment on a possible relationship between patients with hypertension and abnormal thallium-201 perfusion scans. These previous studies demonstrate that in patients with arterial hypertension and angina pectoris who have normal coronary arteries, there is a reduction of dipyridamole induced coronary vasodilation (25-27).

One study demonstrated (28) that in normotensive and hypertensive somotor responses to normal coronary arteries, endothelial dysfunction resulted in heterogeneous vasomotor responses to acetylcholine with a greater degree of abnormal responses among hypertensive patients. In addition, the abnormal responses in the microvasculature was greater with increasing severity of hypertension. The idea that a greater degree of inherited endothelial dysfunction may be responsible for the higher case fatality rates among African-Americans from coronary heart disease despite having lesser amounts of CAD compared with Caucasians has also been investigated (24,29).

The prevalence of hypertension is greater in blacks, appears at an earlier age, and results in higher morbidity and mortality as compared to whites (30, 31). Nearly 45% of adult blacks were found to have hypertension (systolic blood pressure \geq 140 or diastolic blood pressure \geq or patients taking medications for hypertension) in one low income urban center with the results fairly matching recent US national

health surveys (30). A recent study (32) found that nearly a third of all adults in Harlem, New York were hypotensive.

Because hypertension in African-Americans may be more destructive on the microvasculature rather than the coronary arteries as compared to whites thallium 201 testing May not be a reliable noninvasive diagnostic test to diagnose CAD as there may be much higher false positive rates in African-Americans.

The main purpose of this study is to determine the positive in predictive value SPECT –thallium 201 testing in hypertensive African-Americans.

B. Methods

All patients at Harlem Hospital starting from 1/97 to the present with abnormal thallium (stress or persantine) results who subsequently underwent cardiac catheterization will be evaluated. Catheterization will have been performed one day to four months after thallium testing has been done. Interpretation of both thallium scanning and angiography shall be performed by tow independent readers in the respective fields. Coronary arteries that are less than fifty percent obstructed shall be classified as disease free coronary arteries.

Exclusion criteria

- Ethanol related cardiomyopathy
- Cocaine use
- Valvualr heart disease
- Known coronary artery disease
- Left Bundle Branch Block
- Hypertrophic cardiomyopathy

Patients are defined as having hypertension with SBP \geq 140 and DBP \geq 90 or if the patient is currently on antihypertensive medications. Patients will be defined as having diabetes by current standard definitions. Patients will be classified as obese with a BMI $>$ 27.

Positive predictive value for patients with hypertenson alone risk factors against those without hypertension, and it will be determined for patients with hypertension and other risk factors against those with other risk factors without hypertension. Standard chi square testing will be done. The accepted positive predicted value is approximately 90%, with rough estimates of this value being 60% in the African-American population, this would require 40 patients in each group.

C. Study Procedures

none

D. Study drugs

none

E. Medical devices

none

F. Study questionnaires

none

G. Recruitment of subjects

as described above

H. Confidentiality of study data

all data coded w potential

I. Conflict of interest

none

J. Location of Study

Harlem Hospital

K. Potential Risks

none

L. Potential Benefits

N/A

M. Alternative Therapies

none

N. Compensation to Subjects

none

O. Costs to subjects

none

P. Minors as research subject

N/A

Q. Radiation or Radioactive Substances

none

R. References:

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