

Exercise Tolerance Test as screening tool for suspected Myocardial Ischemia

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Objective: To identify the common indications for Exercise tolerance Test (ETT) and to determine the frequency of IHD among subjects who presented with chest pain.

Methodology: It was a cross-sectional study; the data was taken from ETT Unit at Department of Cardiology Rehman Medical Institute, Peshawar, Pakistan using Bruce protocol.

Result: Out of 200 patients, there were 116 (58%) males and 84 (42%) females who presented in the cardiology department for ETT. Common indications for ETT were chest pain 124 (62%) and shortness of breath 24(12%), while 24(12%) and 28(14%) of subject were referred for general checkup and nonspecific symptoms, respectively. Exercise ECG showed no ST changes in 100

(50%) patients. The most common risk factors were smoking, hypertension, obesity and diabetes. Majority of subjects 148 (74%) were test negative for ischemic heart disease and angina, 36 (18%) had test positive for ischemia and angina and only 16 (8%) ETT were negative for ischemic heart disease and positive for arrhythmias.

Conclusions: We recommend using ETT as a screening tool in patients who present with features simulating angina, this prevent unnecessary hospital admissions. (Rawal Med J 2013;38: 117-120).

Key Words: Exercise tolerance test, myocardial ischemia, angina.

INTRODUCTION

Ischemic Heart Disease (IHD) is now the leading cause of death in the Indo- Pakistan subcontinent.^{1,2} The prevalence of IHD is 6.8% in Pakistan and United States of America.³ Although age specific mortality due to heart diseases has declined to some extent but the rate of IHD has amplified in some group of population in the region. The prevalent IHD among different group of population may be dependent upon the diagnostic criteria employed.⁴⁻⁸ IHD is preventable and reversible if early screening and elimination of the risk factors like life style modification and dietary intervention can be done.⁹ ETT has become an important diagnostic tool to evaluate patient with suspected or known case of heart diseases.¹⁰ It is one of the least costly of all non-invasive investigation for the screening of IHD.¹¹ However, because of the low sensitivity and specificity, it just provides a basis for further planning and clinical decision making regarding coronary angiography. It is, therefore, very important to know the risk factor of IHD which

could lead the positive test result.¹² The aim of this study was to determine the indications for ETT and to determine the frequency of subject with positive test for ischemia and angina.

METHODOLOGY

This was a cross sectional study of 200 patients conducted from June 1st 2011 to December 30th 2011 at Department of Cardiology, Rehman Medical Institute, Peshawar, Pakistan. The standard Bruce protocol was used during ETT for evaluation of ischemia and angina. The result was considered positive if angina or ischemia (horizontal or descending ST-segment depression ≥ 1 mm, or ST-segment elevation), or inotropic failure appeared (fall of systolic arterial blood pressure [SBP] >10 mm Hg). Similarly, the test was considered negative if the sub maximum heart rate (85% of the expected rate for age) was reached without angina or ischemia. Data were analyzed using SPSS software v 17. Descriptive analysis was carried out for both continuous and discreet data. Baseline clinical and

procedural characteristics were analyzed.

RESULTS

Out of the total of 200) patients, there were 116 (58%) males and 84(42%) females with age range of 2070 years (mean 45.54±11.68). Chest pain was commonest indication for ETT and obesity was the commonest risk factor (Table 1).

Table1. Indication, current medication and risk factors (n=200).

Variable	Number	Percentages
Indication for ETT		
Shortness of Breath	24	12.00%
Chest Pain	124	62.00%
General well-being check up	24	12.00%
Others	28	14.00%
Current Medication used		
ACE blockers	16	08.00%
Nil	4	02.00%
	180	90.00%
Known Risk factors		
Smoking	8	04.00%
Diabetics	8	04.00%
Hypertension	12	06.00%
Obesity	64	32.00%
Nil	8	04.00%
	100	50.00%

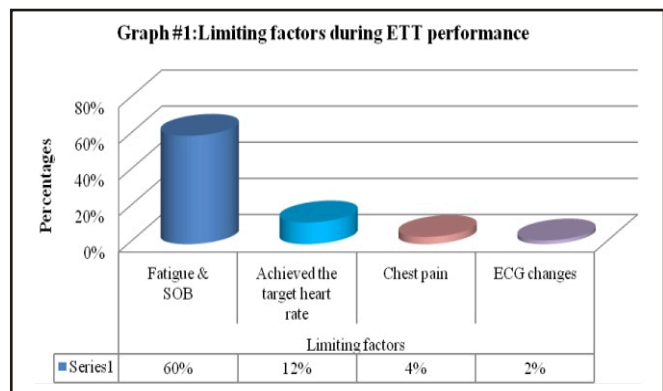
Table 2. Resting ECG.

Variable	Frequency	percentage
Normal sinus Rhythm	120	60%
Normal Sinus Rhythm with ST-T changes in inferior & V3-V6 leads	32	16%
sinus tachycardia	12	6%
Normal Sinus Rhythm with PVC,s	8	4%
Normal sinus rhythm with early repolarization in inferior and V4-V6 leads	8	4%
Normal sinus rhythm with non-specific ST-T changes in inferior and V3-V4 leads	4	2%
Sinus bradycardia	4	2%
Sinus Tachycardia with PVC's	4	2%
Sinus Tachycardia with ST-T changes in inferior and V3-V4 leads	4	2%
Mild ST changes in inferolateral leads	4	2%
Total	200	100%

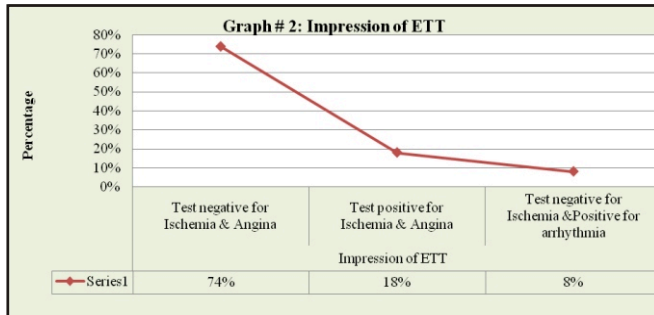
Baseline rhythm was sinus (Table 2) and ECG changes during ETT are shown in Table 3.

Table 3. ECG changes

Variable	Frequency	Percentage
NO ST changes seen.	100	50%
No acute changes seen	52	26%
1mm up sloping ST segment depression in inferior and V4-V6 leads.	8	4%
1.5mm ST segment depression in inferior and V4-V6 leads.	8	4%
1.5mm ST segment depression in inferior and <1mm ST Segment depression in	8	4%
ST-T changes in inferior & V3-V6 leads.	8	4%
1.5mm ST segment depression in inferior and V2-V6 leads	4	2%
>2mm ST segment depression in inferior and V4-V6 leads.	4	2%
>1mm ST segment depression in inferolateral leads	4	2%
<2mm ST segment depression in inferior and 1mm ST segment depression in v3 -v6 leads	4	2%
Total	200	100



The results of ETT are summarized as following, arrhythmia like exercise-induced atrial fibrillation (AF)/atrial flutter, supraventricular Tachycardia (SVT) or atrial ectopy were observed in 8%(figure 2).



All the 52 (26%) patients who turned out to be positive for angina ischemia or arrhythmia were subjected to coronary angiography. 42 (21%) had Left main stem or left anterior descending artery involvement. 10 (5%) patients had normal coronary angiogram.

DISCUSSION

Exercise testing has a sensitivity of 78% and a specificity of 70% for coronary artery disease detection and cannot therefore be used to rule in or rule out IHD unless the probability of coronary artery disease is taken into account. In a low risk population, like men aged less than aged 30 years and women aged less than 40, a positive test result probably is a false positive than true negative and adds little new information. In a high risk population, like those aged over 50 years with typical angina symptoms, a negative result cannot rule out IHD, though the results could also be of some prognostic value.¹³ It was noticed that changes in the resting ECG like ST-segment depression or T wave inversion also affect the test result.

Exercise induced chest discomfort without associated ECG changes may be the only signal that obstructive coronary artery disease is present.¹⁴ A completely normal ETT has been reported to be a good prognostic indicator in diabetic patients.¹⁵ In our study, diabetes was present in 12 (6%) patients. Compared with such imaging procedures as coronary computed tomography (CT), echocardiography, and stress single photon emission computed tomography myocardial perfusion imaging, the ETT is very cost effective. The ETT is preferable to a pharmacological stress test because it better represents cardiac strain with daily cardiac activity and thus depicts the heart's actual workload.¹⁶ Also, patients have the advantage

not to get exposed to ionizing radiation and contrast. The more recently developed non-invasive, multi-slice CT angiography is still recommended to rule out coronary artery disease, but has the associated risks of high radiation exposure and is not cost effective.¹⁶ An estimated 1 in 270 women who underwent CT coronary angiography at age 40 will develop cancer from radiation exposure during that CT, compared with an estimated 1 in 8,100 women who had a routine head CT scan at the same age.²⁷ This was the reason, we chose the ETT as a screening tool in our study.

The 1998 ADA Consensus Development Conference on the diagnosis of coronary artery disease in people with diabetes recommended performing stress screening for coronary artery disease in asymptomatic patients with ≥2 cardiovascular risk factors (smoking, arterial hypertension, hypercholesterolemia, family history of premature CAD, microalbuminuria).¹⁸ However, recent studies have shown that the presence of traditional risk factors did not help to identify asymptomatic patients with a higher prevalence of coronary artery disease.¹⁹ As previously reported, even when a satisfactory ETT test is completed, the PPV in detecting silent coronary stenosis is low, between 40 and 60%.²⁰⁻²² We did ETT in all patients regardless of age and risk factors that can be a limiting factor in our study.

CONCLUSION

Our study concludes that most of the subjects presenting with symptoms simulating myocardial ischemia were negative for ischemic heart disease and angina. Our study suggests that ETT must be done on patients presenting with signs and symptoms simulating angina. This will prevent unnecessary hospital admissions.

Author contribution:

Conception and design: Imran Khan
 Collection and assembly of data: Adnan Khan
 Analysis and interpretation of the data: Imran Khan
 Drafting of the article: Imran Khan, Rizwana Arif
 Critical revision of the article for important intellectual content: Imran Khan, Rizwana Arif
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