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CORONARY ARTERY PROFILE IN CORONARY ANGIOGRAM IN TREADMILL TEST POSITIVE PATIENTS

Cardiology

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ABSTRACT

Need of the study: Coronary artery disease (CAD) in developing countries is emerging as a pandemic disease1,2. Many of patients presenting with angina have physiologically significant CAD which are at risk for developing into full-blown myocardial infarction or sudden death3. The clinical value of exercise treadmill testing (TMT) has been well studied in these patients for early diagnosis4. But this test has low sensitivity and specificity5.

Aim: The objective of this study is to analyze the coronary artery profile by conventional coronary angiogram (CAG) in patients with positive exercise stress electrocardiogram.

Materials & methods: This is a prospective observational study conducted in the Institute of Cardiology, Madras Medical College & RGGGH, Chennai from June 2016 - May 2017 on 117 TMT positive patients and who were subjected to CAG as per our institute protocol after excluding the contraindications for the procedure11.

Results: Out of 117 TMT positive patients, 63% patients were male & 24 % were female with Mean age 53 ± 3 years. On diseased vessel analysis, single vessel disease (SVD) was common with 27.4% followed by double vessel disease (DVD) (20.5%), triple vessel disease (TVD) (15.4%) and at last 12.8% patients had left main involvement with or without involvement of other vessel. Diabetes emerges as a single predominant risk factor for LMCA, TVD subgroups and hypertension is predominant DVD & SVD. Presence of more than one factor amplifies the risk.

Left main diseased showed poor functional capacity with termination of exercise less than 4 METS. ECG showed strong positive diffuse ST changes with at earlier stages and angina was the limiting factor. TVD diseased developed above ST segment changes at later METS (4.0- 5.5) with low function capacity. DVD diseased showed positive ST depression of average of 1.5mm with METS of 6.5 followed by SVD group patients showed positive ST depression in later stages of exercise with METS around 8.0. Functional capacity was fair enough and breathlessness was the limiting factor. TMT parameters are poor to predict branch vessel involvement. In women subgroup, premenopausal status is a protection against CAD8. The emergence of risk factors like diabetes abolishes this protection and makes them vulnerable.

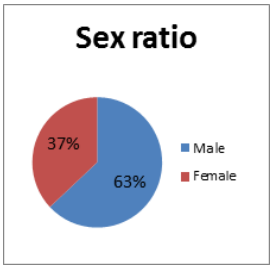
Conclusion: Treadmill test is effective in analyzing the patients with angina and its equivalent symptoms9. On amalgamation of clinical response, exercise capacity with ST segment changes, TMT can be to predict the presence of proximal vessel lesion with focus on left main disease prior to invasive coronary angiogram to certain extern7. TMT is ineffective for analyzing the branch vessel involvement and TMT has low predictive value to diagnose CAD in premenopausal female patients.

KEYWORDS

TMT – treadmill test, CAD – coronary artery disease CAG – coronary angiogram

Introduction:Exercise testing is an important diagnostic as well as prognostic procedure in the assessment of patients with cardiovascular disease[4]. Stress testing is ease to perform, inexpensive, accessible and to interpret[5]. With advent of coronary angiography, the role of exercise testing in diagnosis of ischemic heart disease became limited. However exercise testing has been used for more than half a century and when used in combination with clinical information can predict the outcomes and guide in management[4]. In analyzing the results of exercise electrocardiogram, ST segments changes was the major determinant factor. Criteria for myocardial ischemia in TMT is based on the horizontal ST segment depression observed when both the J point and ST 80 depression are 1mm (0.1mV) or greater and ST segment slope is within the range of 1.0mV/sec[6]. In case of down sloping ST segment depression the test is positive when the J point and ST 80 depression are 1mm (0.1mV) and the ST segment slope is – 1.0 mV/sec in three consecutive beats of at least a single lead[6]. Sensitivity and specificity of exercise testing is 68% & 77% respectively[5]. Beyond ST segment changes, incorporation of clinical response as well as exercise capacity in interpretation of results increases the sensitivity of test in the diagnosis[7].

Materials and methods: This is a prospective observational study conducted in Institute of Cardiology, Madras Medical College & RGGGH, and Chennai from June 2016 - May 2017. Patients were assessed for exercise testing as per Exercise standards for testing and training protocol by America Heart Association 2013[11] and enrolled for TMT. Bruce protocol was used in our study group. Out of 165 positive TMT patients, 117 patients were included in our study after well-built implementation of inclusion and exclusion criteria. Treadmill test was done with Schiller treadmill test machine. Coronary angiogram was done with Philips allura cath lab diagnostics and Iohexol was the contrast medium used for CAG



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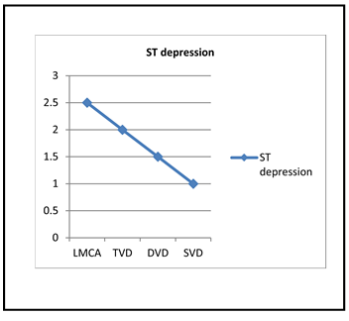
Results:

Out of 117 patients with exercise test positive, 64% patients had significant coronary artery disease. Mean age of the patient is 53 years. Patients were profiled on the basis of CAG as left main disease, triple (TVD), double (DVD) & single vessel disease (SVD), branch vessel involvement. Female were sub classified as postmenopausal or premenopausal status. Male over numbered than female in all subgroup than their counterpart.

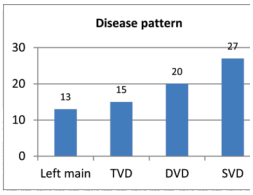
On risk factor stratification, diabetes emerges as a single predominant for LMCA&TVD whereas hypertension is the predominant risk factor in DVD&SVD. Presence of more than one factor in a patient amplifies the risk.

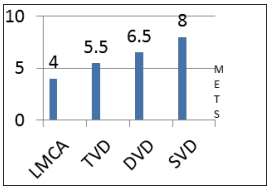
On analyzing the diseased vessel involvement pattern, single vessel disease was common with 27.4% followed by double vessel disease (20.5%), triple vessel disease (15.4%) and at last 12.8% patients had left main involvement in association with multivessel disease. In single vessel disease group left anterior descending artery involvement is common with 59% followed by RCA 22%.

On correlating the parameters of TMT with angiography, LMCA diseased patients exhibit poor functional capacity terminating the test with METS less than 4 & showing widespread down sloping ST depression in all leads more than 2mm with ST elevation more than 1mm in aVr[10]. TVD patient put on view the above ST parameter with METS above 4.0- 5.5 & low function capacity. The patient with proximal vessel critical stenosis in this group had low range MET with earlier ST segment changes than those without proximal vessel disease. ST changes also persist till the late stages of recovery in these groups. Reason for termination in early stages is angina in both the groups.



METS of average 6.5 with ST depression of 1.5mm magnitude in inferolateral leads with aVr elevation of 1mm may suggest double vessel disease. Patient with lower range of these average METS with poor functional capacity suggest the present of proximal disease in DVD sub group also. METS above 8.0 with ST depression of 1mm in all leads with ST elevation in aVr with immediate normalization in the recovery phase suggest presence of single vessel disease. TMT usefulness to assess the branch vessel involvement is not specific neither METS nor ST changes nor functional capacity. ST elevation in aVr is reciprocal changes as it is seen in subgroups not involving LMCA[10]. In women subgroup, premenopausal status is a protection against CAD[8]. The emergence of risk factors like diabetes mellitus abolishes this protection and makes them vulnerable.





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Discussion:

Exercise stress electrocardiogram is effective non invasive tool for the diagnosis of coronary artery disease[9]. By amalgamation of clinical response, exercise capacity with ST segment changes, diagnostic accuracy of this test can be amplified[7]. Patient with left main disease exhibit poor exercise capacity as measured in terms of METS achieving less METS with strong finding of ST depression in diffuse leads. Triple vessel disease patients have poor functional capacity with METS in the range of 4 to 5.5 in our analysis which is above left main diseased persons. ST segment depression is strongly positive with depression equal or more than 2mm in all leads and changes persist till late stages of recovery as in left main patients.

On analyzing the TMT parameters in patients with double vessel disease, these patients have average functional capacity with average METS around 6.5 with ST segment depression of about 1mm to 1.5mm in the inferolateral leads. Single vessel diseased patients have fair functional capacity with average METS around 8 with ST segment depression of 1mm in diffuse leads. Proximal critical diseased patient in the subgroup had lower range of function capacities in their respective group and earlier occurrence of ST segment changes. Prediction of branch vessel disease in isolation by TMT is very low. In subgroup analysis of TMT finding in women, TMT positive in premenopausal patient with few risk factors had false positive results[8] and usefulness of TMT in such subset of patients is of little value.

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