

**CORONARY ARTERY PROFILE ON CORONARY ANGIOGRAPHY IN TMT POSITIVE FEMALE PATIENTS**

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**ABSTRACT****BACKGROUND**

Coronary Artery Disease (CAD) is one of the leading cause of mortality and morbidity worldwide. Earlier thought to be a disease of modern world, it is now equally prevalent in developing countries. This disease is increasingly being witnessed in younger population. Exercise stress test or 'treadmill test' (TMT) is one of the cheap and widely available investigation for evaluating myocardial ischemia, but has a relatively low sensitivity and specificity, especially in single and double vessel disease. TMT in women have a relatively low diagnostic yield for CAD compared to men, especially when symptoms are atypical or non-specific.

**AIM AND OBJECTIVE**

To analyse the coronary artery profile on Coronary Angiography (CAG) in TMT positive female patients.

**MATERIAL AND METHOD**

This study was conducted in Departments of Internal Medicine, Govt. Medical College, Srinagar and Cardiology Unit, Khyber Medical Institute, Srinagar, from January 2013 to July 2015 on 100 TMT positive female patients, who were subjected to coronary angiography after categorizing into three groups on the basis of pre-test probability score.

**RESULTS**

Of the 100 TMT positive female patients, 25% patients had coronary artery disease on angiography; of these 78% belonged to high pre-test probability group and 3% low pre-test probability group. Single vessel disease was seen in 60% of the patients followed by triple vessel disease in 32% and double vessel disease in 8%.

**CONCLUSION**

TMT has a low predictive value of CAD in female patients, except those with high pre-test probability score who have more chances of CAD on coronary angiography.

**KEYWORDS**

Coronary Artery Disease, TMT.

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**INTRODUCTION**

CAD is one of the leading causes of mortality and morbidity.<sup>1,2</sup> Earlier thought to be a disease of the Western Nations, it is now equally prevalent in developed and developing nations.<sup>2</sup> TMT remains a cost effective, easily available and widely applicable approach for early diagnosis of CAD for averting any major mishap like myocardial infarction.<sup>3,4</sup> Interpretation of TMT on conventional ST segment parameters still remains an accepted method for diagnosis of myocardial ischemia, but has a relatively low sensitivity (80%) and specificity (75%) especially in single and double vessel disease.<sup>3,4</sup>

A positive TMT is defined as ST- segment depression of 1mm or greater of 'J'-Point from the PQ junction with a relatively flat ST-segment slope (<0.7 to 1mv/sec), depression 1mm or more 80m second after 'J' point in three consecutive leads with a stable baseline. TMT in women have a relatively low diagnostic yield for CAD compared with men, especially when symptoms are atypical or non-specific.<sup>4,5,6,7,8,9</sup> TMT has been reported to have sensitivity of 70% and specificity of 61% for detection of CAD in women.<sup>6,7,8</sup> The relative lack of evidence regarding the diagnostic accuracy of TMT in females is challenging.<sup>6,7,8</sup> TMT in women has questionable reputation both with cardiologist and the primary care physician.

Women tend to have a greater release of catecholamines during exercise, which could potentiate coronary vasospasm and augment the incidence of abnormal exercise results. False positive results have been reported to be more common during menses and preovulation. Data from a meta-analysis depicting a specificity of 70% suggests false positivity of around 30% in TMT positive patients.<sup>5</sup> Coronary angiography is used to establish the presence or absence of coronary artery stenosis due to CAD. This provides the most

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reliable anatomical information for definite therapeutic options.

#### MATERIAL AND METHOD

This study was conducted on 100 TMT positive female patients at Internal Medicine Department of Government Medical College Srinagar and Cardiology Unit of Khyber Hospital Srinagar from Jan 2013 to July 2015. Patients were categorised into low, intermediate and high pre-test probable groups on the basis of pre-test probability score system (Table 1 and Table 2). These patients were subjected to coronary angiography and the prevalence of CAD (>1 vessel, >50% stenosis) was analysed by using descriptive statistical methods.

#### RESULTS

Out of 100 TMT positive female patients, 25 were having CAD on angiography (25%) indicating a low predictive value of TMT in females. The prevalence of CAD was 78% in high pre-test probability group compared to 3% in low pre-test probability group indicating high predictive value of TMT in high pre-test probability group. Single vessel disease was the most common (60%) followed by triple vessel disease (32%) and double vessel disease (8%). Left Anterior Descending (LAD) artery disease was seen in 68% followed by Right Coronary Artery (RCA) 40%, Left Circumflex Artery (LCX) 36%, Left Main Coronary Artery (LMCA) in 4% (Fig 1). Hypertension, diabetes mellitus, obesity, sedentary lifestyle and postmenopausal status were the most common associated risk factors.

#### DISCUSSION

Coronary artery disease is one of the leading cause of mortality and morbidity worldwide.<sup>2</sup> Hypertension, diabetes mellitus, smoking, obesity, dyslipidemia, insulin resistance states, syndrome X, obstructive sleep apnoea, hyperhomocysteinemia and strong family history are known risk factors for CAD.<sup>2</sup> Coronary artery disease is not curable, but is preventable and treatable. Modifications of lifestyle and prevention of risk factors has shown a dramatic decline in incidence of CAD.

For early diagnosis of CAD exercise stress test still remains a cost effective, non-invasive and widely available test, but has a relatively low sensitivity (80%) and specificity (70%), especially in single and two vessel disease.<sup>4</sup> TMT is a cardiovascular stress test using treadmill bicycle exercise with ECG, blood pressure and heart rate monitoring. The treadmill is stopped when the patient achieves a target heart rate (85% of the maximum predicted for the patient's age). Contraindications for TMT are acute myocardial infarction, symptomatic heart failure, acute arrhythmia, symptomatic aortic stenosis, aortic dissection, accelerated hypertension (BP >200/110) and AV blocks.

Values of ST segment parameters for detection of myocardial ischemia has been questionable in many studies and is found to be irrelevant in the face of an already existing abnormal ECG showing a pattern of bundle branch block, ventricular hypertrophy and pre-excitation phenomenon. TMT in females have a relatively low diagnostic yield for CAD compared with men, especially when symptoms are atypical or nonspecific.<sup>4,5,6,7</sup> Symptomatic women who have a positive test have a lower probability of CAD than men and have fewer coronary events.<sup>6</sup> Exercise stress test has been reported to have a sensitivity of 70% and specificity of 61% for the detection of CAD in women.<sup>4,5</sup> In a review of nine studies correlating exercise induced ST segment changes with angiographic findings in female patients, the prevalence of CAD ranged from 18% to 40% (Fig 2). In our study, the

prevalence of angiography documented CAD (>1 vessel, stenosis >50%) was 25%.

In a retrospective analysis conducted by Mories, Beckner et al.<sup>10</sup> nine hundred and fifteen patients with suspected CAD and normal resting ECG were subjected to TMT of which 348 were TMT positive had undergone coronary angiography. Analysis included logistic regression with significant coronary disease (= or >1 vessel with 50% stenosis) as the dependable variable and clinical variables as independent variable. For the entire validation group the prevalence of significant CAD was 16% in low probability group, 44% in intermediate probability and 69% in the high probability group consistent with our study of 78% in high pre-test probability group and 20% in the intermediate and 3% in the low pre-test probability group. The correlation between vessel disease and probability score was significant ( $p < 0.05$ ).

In another study conducted by Anthony et al. angiographically documented CAD prevalence was 32%.<sup>11</sup> In our study, the prevalence of CAD was 25%. Single vessel disease 60%, double vessel disease 8% and triple vessel disease 32%.

The prevalence of risk factors in these patients of angiography documented CAD was hypertension in 100%, diabetes mellitus in 48%, obesity in 72%, dyslipidemia in 2%, postmenopausal status in 80%, smoker 32% and family history of CAD in 52%.

In our study of 100 female patients 62% belonged to rural areas, but among those patients of angiography documented CAD 76% belonged to urban areas indicating sedentary life as an important risk factor for CAD.

In a study by Tartangoglu et al.<sup>12</sup> one hundred and twenty postmenopausal females with typical angina or atypical chest pain underwent TMT of which 110 had undergone angiography. A positive predictive value of 78% and a negative predictive of 80% were determined. Single Vessel Disease (SVD) was found to be the most common form of CAD. In our study, single vessel disease was seen in 60% consistent with the above study. Among single vessel LAD artery disease was seen in 87% followed by RCA 40%, LCX 36% and LMCA 4%.

TMT in women to detect CAD has low sensitivity and specificity.<sup>4,5,6,7</sup> The diagnostic yield of TMT in females results from lower prevalence of CAD in females.<sup>2,3,4,5</sup> Women tend to have a greater release of catecholamines during exercise, which could potentiate coronary vasospasm and augment the incidence of abnormal ECG results, moreover false positive results have been reported to be more common during menstruation and preovulation.<sup>8</sup>

Glasser and Clark correlated the ST fluctuation with estrogen and progesterone levels concluding that only estrogen fluctuation has a correlation with ST segment changes.<sup>8</sup>

In a study by Morise and Beckner.<sup>10</sup> sixty percent of patients had CAD on angiography belonging to high probability group compared with 40% with intermediate group and 16% in low pre-test probability group. In our study, the incidence of CAD was 78% in high pre-test probability group compared to 3% in low pre-test probability group.

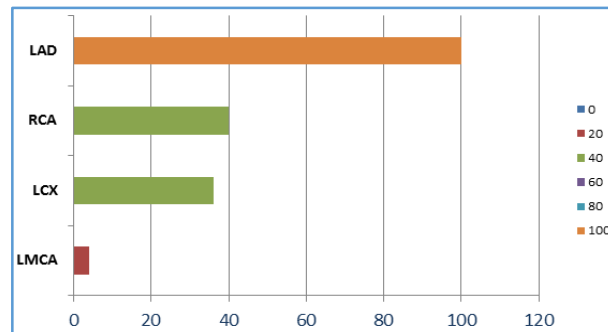
In a study by Martin and Conalay et al.<sup>2</sup> and Bruce Hossack et al.<sup>3</sup> maximum (75% to 80%) diagnostic value of ST segment depression is contained in leads V4-V6 and at times in V5R. In our study patients having severe CAD, i.e. triple vessel disease, ST depression was seen in leads V4-V6, thereby indicating ST segment depression in leads V4-V6 of severe degree of CAD.

**CONCLUSION**

TMT has a low predictive value for detecting CAD in female patients except those with a high pre-test probability score.

**REFERENCES**

- Lloyd-Jones, Adams RJ, Brown TM, et al. Heart disease and stroke statistics. A report from American Heart Association; Circulation. 2010;121:948-54.
- Celermajer DS, Chow CK, Marijon E, Anstey NM, Woo KS. Cardiovascular disease in the developing world: prevalences, patterns and the potential of early disease detection. J Am Coll Cardiol 2012;60:1207-16.
- Froelicher VF, Yanowitz FG, Thompson AJ, Lancaster MC. The correlation of coronary angiography and the electrocardiographic response to maximal treadmill testing in 76 Asymptomatic Men. Circulation. 1973;48:597-604.
- Bruce RA, DeRouen TA, Hossack KF, Blake B, Verona RNL. Value of maximal exercise tests in risk assessment of primary coronary heart disease events in men. Am J Cardiol 1980;46:371-378.
- Junker J, Meyer A, Flake D. Is exercise testing helpful for detecting heart disease in women? Journal of family practice. 2004;53:308-331.
- Kwok Y, Kim C, Grady D, et al. Meta-analysis of exercise testing to detect coronary artery disease in women. Am J Cardiol 1999;83:660-666.
- Dere, Burnard, David, et al. Diagnostic accuracy of TMT in clinical subsets of women. Circulation. 1982;65:1465-1472.
- Glaser and Clark, et al; Interpretation of exercise test results in women. Practical Cardiol 1998;14:85-95.
- Sketch MH, Mohiuddin SM, Lynch JD, Zencka AE, Runco V. Significant sex differences in the correlation of electrocardiographic exercise testing and coronary arteriograms. Am J Cardiol 1975;36:169-73.
- Morise AP, Haddad WJ, Bekner D. Development and validation of a clinical score to estimate the probability of coronary artery disease in men and women presenting with suspected coronary disease. Am J Med 1997;102:350-356.
- Morise AP, Michael S Lauer, Victor F Froelicher, et al. Development and validation of a simple exercise test score for use in women with symptoms of suspected coronary artery disease. Am Heart J 2002;144:818-25.
- Cin VG, Tartanoglu O, Düzenli A, Sariguzel A, Seker M. The use of basic clinical and exercise variables in postmenopausal women for the diagnosis of coronary artery disease. International Journal of Angiology. 2000;9:135-37.



**Fig.1: Coronary Angio Profile in TMT positive females with CAD**

LAD=100, RCA= 40, LCX=36, LMCA=04

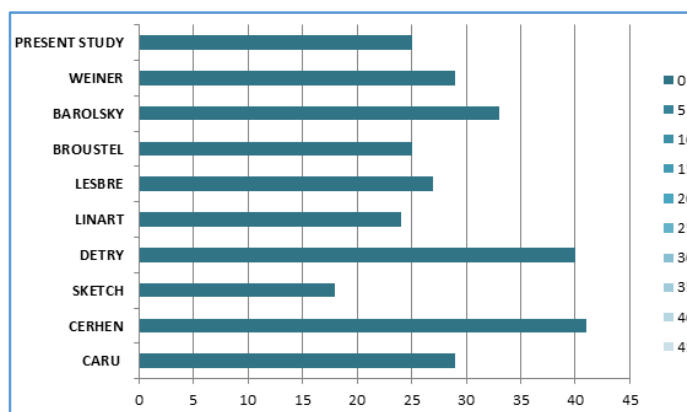
	Low Probability	Intermediate Probability	High Probability
No. of patients	36	45	19
CAD	1(3.2%)	9(20%)	15(78.9%)
SVD	0	5(55.5%)	10(67%)
DVD	0	1(11.1%)	1(6.7%)
TVD	1(100%)	3(33.3%)	4(27%)

**Table 1: Prevalence of CAD by Pre-test score**

X<sup>2</sup>= 2.546 (P>0.05) Non-significant

RISK FACTOR	SCORE
<b>Age</b>	
<50	03
50-60	06
>65	09
<b>Symptoms</b>	
Typical angina	05
Atypical angina	03
Non-specific chest pain	01
<b>Co-morbid Illness</b>	
Diabetes mellitus	02
Hypertension	01
Obesity	01
Dyslipidemia	01
Smoking	01
<b>Estrogen Status</b>	
Positive	03
Negative	-03
<b>Total Probability Score</b>	
Low	06 to 08
Intermediate	09 to 15
High	16 to 24

**Table 2: Pre-test score method**



**Fig. 2: Prevalence of coronary angiography documented CAD in TMT positive female patients**