A large number of diagnostic and prognostic tests are available to evaluate coronary artery disease (CAD). Exercise ECG Testing still remains the choice of test used for this purpose. In the developing scenario with wide variety of available imaging modalities like stress echocardiography, nuclear imaging, CT/MRI based myocardial viability and non-invasive coronary angiography and the coronary angiography – the gold standard, there has been question on the usefulness of Exercise ECG Testing.

Exercise ECG Testing is still the most important tool, if evaluated properly, can give useful prognostic and diagnostic information in evaluation of not only coronary artery disease but also in various other cardiovascular diseases\(^1,2\).

**EXERCISE ECG TESTING IN EVALUATION OF CAD**

Exercise ECG Testing still remains the first choice of the test in evaluation of suspected coronary artery disease. The sensitivity and the specificity of test is 68% and 77% respectively. In patients with single vessel disease, the sensitivity ranges from 25 to 71%, exercise induced ST depression most frequent with Left Anterior Descending Artery (LAD), followed by Right Coronary Artery (RCA) and then by Left Circumflex Artery (LCx). Patients with multivessel disease, the sensitivity and specificity of the test are approx. 81% and 66% respectively\(^1\). Exercise ECG Testing is basically done to look for ischaemia by seeing the horizontal or downsloping ST segment depression of 1 mm or more at 80 msec from J point.

**EXERCISE ECG TESTING IN SPECIAL SITUATIONS**

There are some situations where the ability of Exercise ECG testing is in doubt. Let us analyze such situations and see how useful Exercise ECG Testing in such situations is:

**WOMEN**

As compared to men, the sensitivity & specificity of Exercise ECG Testing in women for evaluation of obstructive CAD is less. In the largest published series of Exercise ECG Testing in women, Alexander et al. reported 19.1, 34.9 and 89.2% of 976 subjects evaluated, showed more than 75% or greater luminal narrowing with low, medium and high risk Duke Treadmill Score (DTS) respectively and 3.5, 12.4 and 46% of the subjects had multivessel CAD in same subjects. Comparing DTS in 976 women to 2249 men, Alexander et al. reported 1, 2.2 and 3.6% mortality over 2 years in low, medium and high risk DTS scores in women, compared to 1.7, 5.8 and 16.6% in men\(^1\).

In an ongoing study at our center, women presenting with chest pain and having negative exercise test almost excludes the presence of obstructive CAD.

With an experience of over 13000 Exercise ECG Testing at our hospital, following points have been observed as far as Exercise ECG Testing in women is concerned:

- If Exercise ECG Testing is negative at >= 7 METs – almost excludes obstructive CAD
- If basal ECG shows postural or hyperventilation changes and positive Exercise ECG shows similar, but enhanced changes and rapid recovery – indicates false positive test
- If Exercise ECG Test is positive only in inferior leads (LII, LIII & aVf) – likely to be false positive test
- If Exercise ECG Test is positive at =< 5 METs with typical horizontal or downsloping ST segment depression of >= 2 mm in more than 5 leads, having delayed recovery and associated with typical chest pain, chances of obstructive CAD is very high.

In our center, we divide women undergoing Exercise ECG Testing in 4 groups:

- Negative Test
- Low Risk DTS
- Moderate Risk DTS
- High Risk DTS

Women with negative Exercise ECG Test are not subjected for any further tests. Women with low and moderate risk DTS are evaluated more in detail with then history and risk factors and Exercise ECG is interpreted considering all the points mentioned above and then either kept under observation alone and advised to undergo repeat Exercise ECG Testing after 6-12 months or subjected to one of the non-invasive imaging test and if any suggestion, then subjected for coronary angiography. However
women with high-risk DTS scores are subjected for coronary angiography.

It is concluded that very important prognostic and diagnostic information can be obtained from Exercise ECG Testing in women if history and Exercise ECG Test are carefully evaluated and interpreted.

EXERCISE ECG TESTING WITH RESTING ST SEGMENT ABNORMALITIES

2 mm or more additional ST segment depression is useful marker in interpreting the Exercise ECG Test with resting ST segment depression.

EXERCISE ECG TESTING WITH CONDUCTION DISTURBANCES

RBBB: Exercise induced ST segment depression is commonly seen in anterior leads (v1 – v3) and has no relevance to the presence of ischaemia. However, ST segment depression in lateral leads (v4 – v6) and inferior leads (LII, LIII and aVF) has same significance as of normal ECG while interpreting the Exercise ECG Test.

LBBB: Exercise ECG Test is not useful test to evaluate ischaemia in presence of LBBB as upto 10 mm ST segment depression may be seen in exercise without the presence of CAD. However, Exercise ECG Test can give information like functional capacity, development of symptoms, chronotropic response, BP response, HR-BP product, which may be taken as indirect parameters to assess the presence of obstructive CAD.

WPW Syndrome: Exercise ECG Test is again not a good test for evaluation of ischaemia in presence of WPW Syndrome. However, abrupt loss of pre-excitation on exercise is good evidence of longer antegrade effective refractive period of the accessory pathway and these persons are unlikely to develop fast ventricular response during episodes of atrial arrhythmias.

Pacemakers: Exercise ECG Test is not useful in patients who are on permanent pacemakers. However, Exercise ECG Test can be performed in Rate-Adaptive Pacemakers to fine-tune these devices.

CONCLUSION

To conclude, Exercise ECG Test not only can give information regarding presence or absence of ischaemia in suspected obstructive CAD either in general population or in special situations, but also can give a wealth of information in other cardiovascular diseases. It is cost effective and a very safe. In spite of pitfalls and limitations, Exercise ECG Testing still remains the most useful test because of wide availability, reasonable cost, proven safety and easy interpretation.

REFERENCES