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Treadmill stress test in diagnosis and evaluation of Ischemic heart disease

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Abstract

Introduction: Exercise Electrocardiography remains a safe, simple, relatively inexpensive and noninvasive tool for the diagnosis and evaluation of ischaemic heart disease.

Methodology: All the tests were done on case 12 computerized treadmill. Following exercise protocols were adopted depending on the patients exercise capability viz. Bruce/ Modified Bruce/ Naughtons protocol. Patients were instructed to report for their stress tests either after on overnight fast of three hours after a light meal.

Results: 75% of patients who achieved less than 5 METS and 47.8% of patients who achieved 6-8 METS and 20% of patients who achieved 9-10 METS were positive for IHD. If higher workloads were achieved, the percentage of positive results were significantly less.

Conclusion: Cardiovascular disease (CVD) is a dominating cause of mortality and morbidity in modern society. Arterial hypertension is a well-documented risk factor for CVD but other factors also contribute to increased CVD risk.

Keywords: CVD, TMT, Risk factor

1. Introduction

The lost few decades have seen ischaemic Heart Disease (IHD) emerging as the leading cause of mortality in the developed countries. The developing countries like India are fast catching up with them. In the whole world one-third of all deaths in men and about a quarter of all deaths in women are due to IHD. Apart from mortality it accounts for an equal amount of morbidity with various psychosocial and economic effects [1].

Despite breathtaking advances made in the field of management like THROMBOLYSIS, ANGIOPLASTY, BY-PASS SURGERY, etc., Coronary artery disease remains the main killer all over the world. Hence, quite appropriately, the present focus is on prevention, early diagnosis and treatment [2].

While CORONARY ARTERIOGRAPHY is the GOLD STANDARD for diagnosis of coronary artery diseases, EXERCISE ELECTROCARDIOGRAPHY remains a safe, simple, relatively inexpensive and noninvasive tool for the diagnosis and evaluation of ischaemic heart disease. Exercise stress testing will not only help us in solving the problems of atypical chest pain, but also helps us to screen people with multiple risk factors [3, 4].

2. Methodology

FIFTY Hypertensive patients who underwent treadmill stress testing in the Cardiac clinics attached were studied prospectively.

All the tests were done on case 12 computerized treadmill. Following exercise protocols were adopted depending on the patients exercise capability viz. Bruce/ Modified Bruce/ Naughtons protocol. Patients were instructed to report for their stress tests either after on overnight fast of three hours after a light meal.

Detailed history was taken and thorough clinical examination was done as per the proforma with particular reference to coronary risk factors. Relevant biochemical investigations and risk factor stratification was carried out in every case of IHD. Routine pre-test electrocardiogram was taken in every case. Careful consideration was given to rule out any possible contraindication for stress testing. Medications which would interfere with the interpretation of the test (Digitalis, Nitrates, Calcium channel blockers etc.,) were withdrawn 48-72 hours before the procedure wherever possible. All the patients were fully instructed regarding the entire procedure of the exercise ECG test. Necessary cardio-pulmonary resuscitative equipments including a defibrillator were ready for emergencies.

3. Results

After compiling data from all the patients the following observations were made.

Table 1: Results of Test

Total Number of cases	50 (100%)
Number of positive tests	22 (44%)
Number of negative tests	28 (56%)

Table 2: The various presenting symptoms noted in the patients are as follows.

Symptoms	No. of patients
Chest pain	42 (84%)
Dyspnoea	17 (34%)
Palpitation	18 (35%)
Giddiness	21 (42%)

Note: More than one symptom may be present in a single individual.

Chest pain was the commonest symptom followed by Giddiness, Palpitation & dyspnoea.

Table 3: Various indications for tread mill testing.

Indications	No. of patients
Chest pain	33 (66%)
Dyspnoea	7 (14%)
Abnormal resting ECG	5 (10%)
Screeing	5 (10%)

Note: Single patient may be having more than one indication.

Table 4: Correlation of nature of chest pain with the test results.

Chest pain type	Total No.	Negative	Positive
Typical angina	27	10	17 (62.96%)
Atypical angina	16	12	4 (25)
Non angina pain	6	5	1 (16.66)

This table shows that the patients with typical angina had greater change of giving a positive test for IHD.

Table 5: Various reasons for termination of TMT.

Reason for termination	No. of patients
Exhaustion	8 (16%)
Leg fatigue	25 (50%)
100% THR achieved	1 (2%)
Chest Pain	3 (6%)
Dyspnoea	5 (10%)
Hypotension	0 (0)
ST depression (>2-3 mm)	8 (16%)
Arrhythmias	0 (0)
Giddiness / Syncope	0 (0)

* A single patient may be having more than one reason

Table 6: Correlation of work load achieved and test results.

Work Load (METS)	Total No.	Negative	Positive
5 or less	12	3	9 (75%)
6-8	23	12	11 (47.8%)
9-10	10	8	2 (20%)
11-12	3	2	0 (0)
13 or more	2	2	0 (0)

This table shows that 75% of patients who achieved less than 5 METS and 47.8% of patients who achieved 6-8 METS and 20% of patients who achieved 9-10 METS were positive for IHD. If higher workloads were achieved, the percentage of positive results were significantly less.

Table 7: Correlation with other risk factors.

Other Risk factors	Total	Negative	Positive
Diabetes	12	3	9 (75%)
Smoking	13	4	9 (69.2%)
Raised cholesterol	17	7	10 (58.8%)
F/H of hypertension	7	3	7 (57.1%)

Diabetes, smoking, raised, F/H of IHD are major risk factors of IHD. And if they are associated with hypertension the risk is almost double for ischaemic heart disease.

Table 8: Comparison with Traetment

	Total No.	Negative	Positive
On treatment	42	25	17 (40.5%)
Not on treatment	8	3	5 (62.5%)

4. Discussion

Only a few years ago during the hay days of the Masters Test stress testing was primarily used to identify or confirm the presence of CAD. Prior to World War II, it was mainly a research tool applied to problems of exercise in athletes. Only in the past decade has its application been extended into a number of previously excluded areas like post myocardial infarction, after revascularization surgery, etc. Its use in screening population at risk has been increasing.

Goldschlarger and Selzer [5], Frederick McNeer [6], Julian L. Burman, Gupta [7], have all demonstrated that an exercise stress test with electrocardiographic monitoring provides data which discriminate patients with and without significant coronary artery obstruction.

The results of the present study of fifty hypertensive patients who underwent treadmill test have been found to correlate in many ways with the previous reports.

The age distribution of positive results in the present showed increase in incidence of coronary artery disease with increasing age. This results are compared below with the study done at Memorial Hospital Cardiology Laboratory (mHCL) published by Myrvin H. Ellestad [8].

Table 9: Percentage of positive stress tests according to age.

Age in years	MHCL study[8]	Present study
21-30	2.5	-
31-40	11.7	12.5
41-50	29.5	38.09
51-60	48.0	60
>60	58.2	70
Mean	34.3	44

The sex distribution of disease prevalence noted in my study was 48.7% in males and 27.2% in females. MHCL study noted a positive test in 34.3% in of males and 23.3% of females.

Physical activity of an individual is well known to play an important role as a risk factor for CAD. In accordance with this observation of Framingham and many other studies about 54.5% of sedentary individuals in the present study were positive for ischaemic heart disease. The incidence of test positive was much less in the active individuals.

5. Conclusion

Treadmill stress test represents a very valuable and noninvasive method for diagnosing myocardial ischaemic and by implication the presence of coronary artery disease.

6. References

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