Teaching File

Silent Myocardial Ischaemia

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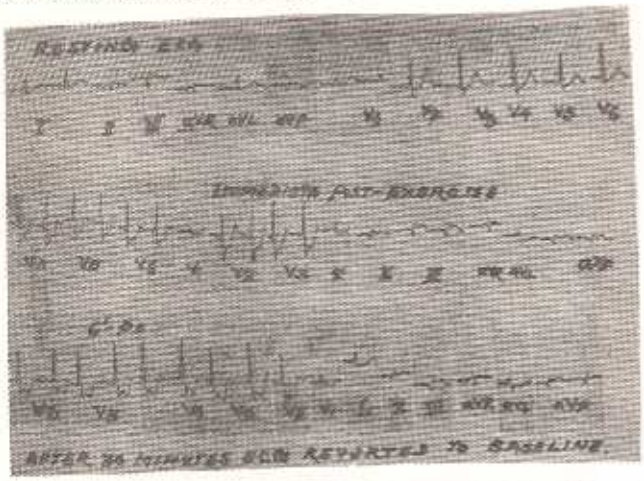
Silent myocardial infarction (SMI) and extensive inducible silent myocardial ischaemia (ISI) in young male without preceding history of IHD or associated risk factors is detected during medical evaluation for initial issue of commercial pilot's licence. The case is reported with a brief review of exercise testing in IHD and implications of SMI in management of these cases.

Part I : Initial Clinical Evaluation

A male aged 34 years reported for medical examination for initial issue of commercial pilot's licence. He was in good health, asymptomatic and leading a normal active life both at home and at work. He was not on drugs , denied history of previous ischaemic heart disease (IHD), hypertension and diabetes mellitus. He was non-smoker, teetotaller and used to do regular exercises. No family history of IHD. Clinical examination revealed normal body weight, no xanthomas/ xanthelasmas and general and sytemic examination was normal. Routine haematological parameters were normal. Blood sugar (fasting = 78 mg%, post-prandial = 110 mg%), serum cholesterol (178 mg%) and renal parameters were normal. Chest X-ray PA was normal.

Electrocardiogram (Figure) taken at rest showed normal sinus rhythm, QRS axis - 30° and QS in leads II,II and aVF. In immediate post exercise (heart rate 135 per minute) record, there was 4.0 mm horizontal (Hz) ST-depression in leads V2 to V6, 2 mm Hz to down sloping (DS) ST-depression in leads I, aVL and exaggeration of ST-coving in leads III and aVF. At 6 minutes, the changes were aggravated and ST-segment shows 4-5 mm downsloping ST-depression in precordial leads. The changes reverted to normal by 30 minutes post exercise. Echocardiography showed a normal size left ventricle with inferior wall hypokinesia and an ejection fraction of 55%. Other valves and chambers were normal.



Question No.I : What is your diagnosis ?

Question No II : How do you interpret post exercise test ECG to predict coronary artery disease ?

Question No III : What other noninvasive tests you think could be done to detect inducible (reversible) myocardial ischaemia ?

Question No IV : Does this patient require coronary arteriography ?

Part II : Diagnosis

This young individual was diagnosed to have ischaemic heart disease (IHD) with old inferior Q-wave (transmural) myocardial infarction (silent) and strongly positive exercise test, indicating underlying severe coronary artery disease and large area of left ventricular myocardium being at risk.

Exercise testing and its importance in coronary artery disease

The exercise test is interpreted according to the Selzer's criteria[1]. The interpretation of exercise test using ST-segment depression measured at 0.08 seconds from J point is taken as mildly positive (1.6 to 2.5 mm upsloping or 1 -

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1.5 mm Hz ST depression), moderately positive (more than 2.5 mm upsloping ST depression or 1-2 mm downsloping ST depression or 1.6-2.5 mm Hz ST depression) and strongly positive (more than 2.5 mm Hz or more than 2.0 mm downsloping ST depression). Occurrence of angina, hypotension, transient left ventricular dysfunction during exercise, the ST-segment changes appearing in stage I and changes lasting longer than eight minutes post exercise are positive modifiers of exercise test, indicating underlying severe and multivessel coronary artery disease[2-4]. The negative modifiers being left bundle branch block, left ventricular hypertension, pre-excitation syndrome, hypokalemia, digoxin therapy, mitral valve prolapse and young females. The SMI occurs due to variety of causes and is gaining increasing importance with symptomatic ischaemia being only the tip of the iceberg[1,3,4].

It has been observed over long term follow up that given the equal clinical status, patients with positive exercise test are at 6.3 times higher risk of developing acute coronary events (myocardial infarction or sudden cardiac death) as compared to patients with negative exercise tests[2]. Therefore, current myocardial infarction or induction of severe ischaemia in young (as in this patient) constitutes one of the indications for coronary arteriography even if he is asymptomatic as intervention favourably affects the longevity. Similarly, SMI following acute myocardial infarction (symptomatic) suggests severe underlying coronary artery disease involving either infarct related artery or multivessel coronary artery disease. These cases are also to be subjected to coronary angiography as they are at risk of reinfarction and sudden cardiac death[5]. This case also drives home the point that some cases can have IHD without obvious associated risk factors.

Other non-invasive investigations complementary to exercise testing

These tests combined with treadmill exercise testing enhance the positive predictive accuracy of coronary artery disease detected at coronary arteriography. This is especially so in settings of high positive exercise tests and low prevalence rate as in young females and mitral valve prolapse syndrome. These tests include radionuclide ventriculography (RNV) commonly called as multigated acquisition (MUGA) study and thallium (Tl -201) myocardial perfusion scintigraphy, the latter being more sensitive than the former. Ambulatory ECG (Holter) monitoring is essential to detect ischaemia (both symptomatic and silent) during daily activities (apart from exercise) which can not be simulated in the laboratory and Holter monitoring also helps us to quantify total ischaemic burden which carries a therapeutic and prognostic value[1,4]. The ideal test to detect smallest area of myocardium rendered ischaemic is positron emmission tomography (PET)[3,4]. In asymptomatic and doubtful cases, it is advisable to combine treadmill testing with MUGA or Tl - 201 scintigraphy to improve diagnostic accuracy of CAD.

Need for coronary arteriography

Ischaemic heart disease in young (less than 40 years age) constitutes an important indication for coronary arteriography firstly because of his age (to prolong longevity by interventional procedures if needed) as he may be the sole bread winner for the family and secondly, to restore near normal quality of life by requisite treatment and allaying fear and apprehension. This is true both in symptomatic and asymptomatic CAD in the young.

Question No V : What is the aeromedical disposal of the case?

Part III : Aeromedical Disposal

The current policy in Indian Air Force (and equivalent standards for civil aviation) states that ECG abnormalities other than right bundle branch block and nonspecific T wave inversion (physiological nature ascertained after complete cardiovascular evaluation and excluding cardiac disorders) constitute cause for unfitness for flying duties at initial evaluation. The underlying common disorders need to be excluded are mitral valve prolapse and occasionally atrial septal defect. The extent of ECG changes encountered in this case were obviously incompatible with

flying duties and hence he was declared permanently unfit.

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