

# YYYY Nuclear Medicine Laboratory

## Exercise Stress Test Protocol

- I. Purpose:

The purpose of myocardial perfusion imaging is to visualize perfusion and function of the myocardium utilizing radiopharmaceuticals and nuclear medicine imaging equipment. The purpose of the stress EKG procedure is to provide sufficient stress to the myocardium to allow dilation of the coronary arteries, which will increase blood perfusion.
- II. Principle:

Radiopharmaceuticals are distributed within the myocardium based on blood perfusion at the time of injection. See the Nuclear Radiology Myocardial Perfusion Imaging Procedure for more information on the theory and principle of this imaging.
- III. Policy
  - a. The patient questionnaire and consent will be reviewed by staff before start of exam.
  - b. The supervising cardiologist will evaluate the patient and the patient's history before start of exam to determine possible contraindications to stress testing.
- IV. Indications for Procedure (as defined in NM MPI procedure)
  - a. Detection of coronary artery disease.
  - b. Evaluation of extent of coronary artery disease.
  - c. Evaluation of effects of therapy for CAD.
    - i. Medical therapy
    - ii. Thrombolytic therapy
    - iii. P.T.C.A.
    - iv. Coronary bypass surgery
  - d. Evaluation prognosis in CAD.
- V. Contraindications
  - a. Recent angina, increasing angina, recent myocardial infarction, arrhythmias that would limit heart rate response such as atrial fibrillation, complete heart block, second degree heart block, pacemaker, diastolic hypertension (110+), etc.
  - b. Other diseases that would limit exercise capacity such as severe pulmonary disease, muscle disease, anemia, hyperthyroidism, arthritis, vertigo, artificial limbs
  - c. Recent drugs that would interfere with tests—Digitalis, tranquilizers, low potassium, Inderal, unless response to drug is sought.
  - d. Relative contraindication: Poor motivation, anxiety.
- VI. Equipment (for stress ECG only)
  - a. Nuclear Radiology staff will have already established patent I.V. site and will provide appropriate radiopharmaceuticals.
  - b. Keep-em-alive ECG Monitor/ECG cart (Case 8000) and Meditrace Recording Charts paper
  - c. Stress Electrodes
  - d. Stethoscope and sphygmomanometer

- e. Patient's doses of radiopharmaceutical (provided by nuclear radiology staff)
- f. Crashcart with defibrillator
- g. Patient's stress ECG worksheets, pens

## VII. Procedure

- a. After the patient's initial resting thallium images, the patient is called from NM waiting area by EKG Technician, and escorted back to stress room
- b. Two patient identifiers are checked
- c. Stress test consent form is reviewed with the patient and patient signature is obtained.
- d. Obtain an accurate clinical history
- e. Apply stress electrodes and connect lead wires
- f. Patient information is entered into the Case 8000 stress system
- g. A resting EKG is obtained as well as a resting blood pressure which are both recorded on the stress EKG worksheet
- h. Bruce protocol is selected on Case 8000 stress system (Parameters listed below)
- i. Select EXERCISE START on Case 8000
- j. Patient is asked to step on treadmill, instructed on how to walk on treadmill, treadmill is started.
- k. Treadmill speed and incline will increase every three minutes according to Bruce protocol outlined below.
- l. Serial EKG's, BP's, HR's and symptoms are obtained and recorded every three minutes immediately prior to speed and incline increase once procedure has started.
- m. The radiopharmaceutical will be injected when the patient has achieved predicted heart rate and the patient feels he cannot exercise much longer. The patient must continue to walk one to two minutes after the injection
- n. Once the treadmill has stopped, the patient is assisted to the table. Patient monitoring is continued for five minutes with the EKG, blood pressure, heart and symptoms recorded every minute. If symptoms are still present, patient is monitored until absence of symptoms or patient has returned to baseline state.
- o. At the end of the procedure, select TEST END on the Case 8000 stress system
- p. Remove all but 3 electrodes (LA, RA and LL) and the IV. Complete the stress test portions of the worksheet for nuclear radiology.
- q. Patient is to be escorted to the waiting room or allowed to go have something to eat (as directed by nuclear radiology nurse or technologist)

## VIII. Indications for Termination (End Points)

**END POINTS:** Exercise should be symptom limited and patient should reach at least 85% of maximum predicted rate (2,5). If the patient is unable to reach the target heart rate, a pharmacologic stress test should be considered.

- a. Limit of physical capacity from dyspnea, fatigue, leg pain, abnormal blood pressure response
- b. Symptoms of cerebro-vascular insufficiency (dizziness, feeling faint)
- c. A drop in systolic blood pressure to below reasonable level (Hypotension)
- d. Progressive worsening of anginal pain (Chest Pain)
- e. Signs of poor perfusion (pallor, cyanosis, cold skin)
- f. Serious dysrhythmias
- g. Technical problems with monitoring equipment
- h. Development of prolonged 3<sup>rd</sup> degree AV block
- i. Patient's request to stop
- j. Wheezing, severe respiratory difficulties

k. Marked ECG changes (e.g. more than 2 mm of horizontal or down-sloping ST segments depression from baseline, ST elevation, tachycardias, LBBB)

IX. Treatment of the adverse effects of exercise

Common adverse effects of exercise include:

- a. Extreme shortness of breath – stop exercise, have patient sit or lay down, administer Oxygen at 2 liters, monitor
- b. Chest pain – stop exercise, have patient sit down, administer sublingual nitroglycerin
- c. Dizziness – stop exercise, have patient lay down, elevate feet, monitor,
- d. Hypertension – stop exercise, have patient sit down, monitor, consider

KEY POINTS:

- 1) Use Standard Bruce Protocol unless modified by supervising cardiologist.
- 2) Exercise duration should be symptom limited or when patient reaches maximum effort as determined by supervising cardiologist.
- 3) Check I.V. line periodically to make sure saline is infusing freely.
- 4) Sestamibi is injected through I.V. line approximately 1-2 minutes prior to termination of exercise by supervising cardiologist or nuclear medicine personnel. Rinse syringe once. If patient is unable to continue for required time after injection, speed and elevation may be reduced to allow continuation as determined by supervising cardiologist.
- 5) Record on myocardial perfusion worksheet:
  - a. Time of injection.
  - b. Minutes exercised at time of injection
  - c. Total minutes exercised
  - d. Maximum heart rate at time of injection
  - e. Maximum blood pressure at time of injection.
  - f. Predicted maximum heart rate.
  - g. Chest size (Males) or Bra size (Females)
  - h. Height and Weight
  - i. Doses of all pharmaceuticals administered

COMMENTS: Bruce protocol:

3 MINUTE STAGES	MPH	GRADE%
1	1.7	10
2	2.5	12
3	3.4	14
4	4.2	16
5	5.0	18
6	5.5	20
7	6.0	22

If exercise is terminated at a low level, a normal study cannot rule out possibility that abnormal perfusion may be apparent at higher levels. An abnormal perfusion pattern is significant at any level of exercise. The majority of radiopharmaceutical extraction occurs within the first minute after injection and the images reflect the distribution of myocardial blood flow at time of extraction