

MYOCARDIAL SPECT PERFUSION STRESS &/OR REST
FOR USE WITH THALLIUM 201 AGENTS ONLY

CPT CODE: 78460-61, 78464-65, 78478, 78480
UPDATED: MARCH 2012

Indications:

- Diagnosis of CAD, especially in patients with moderate probability of CAD.
- Evaluation of patients with potential false positive stress EKG's
- Diagnosis of CAD in patients with abnormal resting EKG
- Management and prognosis of CAD
- Evaluation of CABG and PTCA patency
- Evaluation of LV disease
- The use of Thallium is indicated when Tc99m agents are not available

Acute infarct/chest pain is an indication for a rest only perfusion study. Resting myocardial perfusion images can be used to define the presence, location and extent of acute infarction or significant myocardial scar and for determination of changes in perfusion with resting chest pain.

Patient Prep:

See the Myocardial Stress Test Prep Protocol.

Scheduling:

For a Rest only study, allow 60 minutes for imaging and processing.
For a Stress only study, allow 90 minutes for the stress test, imaging, and processing.
For a 1-Day Rest & Stress study, two separate appointments are made. The first for stress portion for 60 minutes, the second for the rest portion for 60 minutes, 4 hours after the start of the stress portion.

Radiopharmaceutical

& Dispensed Dose: For a rest only or a stress only test (2 day study), the dose is 3mCi Thallium adjusted per the current age & weight nomogram.

For a rest and stress test (1-day study) is as follows:

Stress dose is 3mCi weight adjusted per the current nomogram.

An optional rest dose of 1mCi may be needed.

Imaging Device:

GE Millennium VG or GE Infinia Hawkeye with LEHR collimators.
Please note, that at this time Hawkeye is not being used.

Data Acquisition:

For the Millennium VG, select the following from the Myocardial Folder:

Select Rest TL201 ECT for the non-gated rest images

For Rest-Gated images, select ****Stress GSPECT TL****for gated SPECT, and change the time to 45 sec

Select ****Stress GSPECT TL****for gated Stress SPECT

Select Stress TL201 ECT for non-gated Stress SPECT

*** The Millennium VG cannot switch protocols in the middle of imaging like the Infinia Hawkeye. The imaging technologists must determine whether the patients' gate can be used or not before starting imaging. If too many heart beats are being dropped, the acquisition should be terminated. A new acquisition can then be selected but imaging needs to re-start from the beginning. ***

For the Infinia Hawkeye, select USER, then select one of the following from the UW CARDIAC FOLDER:

Select One Day TL for all images. Delete the images not needed.

*** The Infinia' EKG will automatically prompt the imaging technologist if the patients' gate cannot be used. The gated acquisition automatically saves 2 sets, a gated set and a non-gated

set. The technologist can then choose, upon receiving the prompt from the acquisition computer, to either continue with the gated images, continue imaging the patient without the gate or discontinue the images altogether. ***

Acquisition Parameters:

The Infinia Hawkeye cameras must be in the "L Mode" configuration.

<i>Infinia Hawkeye</i>	Rest	Stress	Redistribution
<i>Tomo Key Parameters</i>			
Mode	L	L	L
Start Angle	270	270	90
Patient Location	Feet First Supine	Feet First Supine	Feet First Supine
Acquire CT/AC	No	No	No
<i>Image Settings</i>			
Zoom	1.3	1.3	1.3
Matrix	64 x 64	64 x 64	64 x 64
Pan Y	0	0	0
<i>Scan Mode</i>			
Step & Shoot	Check	Check	Check
Seconds	45	35	45
<i>Tomo Corrections</i>			
Energy session	TL201 (70 & 167)	TL201 (70 & 167)	TL201 (70 & 167)
Collimator	LEHR	LEHR	LEHR
COR Correction	Check	Check	Check
<i>Tomo CT/AC Parameters</i>			
<i>Tomo Location Parameters</i>			
Mode	L	L	L
Start Angle	270	270	270
Patient Location	Feet First Supine	Feet First Supine	Feet First Supine
<i>Detector Settings</i>			
Detectors 1 and 2	Check	Check	Check
<i>Rotation</i>			
Total Angular Range	180	180	180
View Angle	3	3	3
Direction	CCW	CCW	CW
<i>Workflow</i>			
Release at end of scan	Check	Check	Check
<i>FOV Settings</i>			
Number of FOVs	1	1	1
FOV time multiplier	1.0	1.0	1.0
Rough Overlap	4	4	4
Direction	Table In	Table In	Table In
<i>Table Height</i>			
Select	Default	Default	Default
<i>Tomo Admin Parameters</i>			
Body Part	Chest	Chest	Chest

<i>Infinia Hawkeye</i>	StressGate	RestGate
<u>Gated Tomo Key Parameters</u>		
Mode	L	L
Start Angle	270	270
Patient Location	Feet First Supine	Feet First Supine
<u>Stop Conditions</u>		
Time/view	35	45
<u>Gating Parameters</u>		
Frames/cycle	8	8
Time	Check	Check
Acquire CT/AC	No	No
<u>Image Settings</u>		
Zoom	1.3	1.3
Matrix	64 x 64	64 x 64
Pan Y	0	0
<u>Gated Tomo Triggers</u>		
High%	20	20
Low %	20	20
<u>Gspect Corrections</u>		
Energy session	TL201 (70 & 167)	TL201 (70 & 167)
Collimator	LEHR	LEHR
COR Correction	Check	Check
<u>Gspect Location Parameters</u>		
<u>Detector Settings</u>		
Select	Detectors 1 and 2	Detectors 1 and 2
<u>Rotation</u>		
Total Angular Range	180	180
View Angle	3	3
Direction	CCW	CCW
<u>Workflow</u>		
Release at end of scan	Check	Check
<u>Table Height</u>		
Select	Default	Default
<u>Gspect Admin Parameters</u>		
Body Part	Chest	Chest

Millennium VG	REST TL201 ECT	STRESS TL201 ECT	STRESS GSPECT TL201
<u>ECT Tab</u>			
Label	TL201 Spect	TL201 Spect	TL201 Spect
Pharmaceutical	TL201	TL201	TL201
Dose	3.0	3.0	3.0
Isotope: Select	TL201	TL201	TL201
Heads: Head 1 and Head 2	Check	Check	Check
Head 1			
Collimator	VP45	VP45	VP45
View	RST_ECT	RST_ECT	RST_ECT
Head 2			
Collimator:	VP45	VP45	VP45
View			
<u>Gspect Parameters</u>			
Frames/Cycle:			8
Acquisition Mode: Select			Phase
<u>ECT Parameters</u>			
Angular Range	90.0	90.0	90.0
Angular Step	3.0	3.0	3.0
Frame Time	45	35	35
Velocity	2.0	2.0	
Direction: CCW	Check	Check	Select
ECT Type: Step & Shoot	Check	Check	
Stop Conditions			35
Select			Time/Step
Gantry Position	0.0	0.0	0.0
PVC Thresholds			
High%:			50
Low%:			50
<u>Extended Tab</u>			
<u>Energy Window</u>			
Center	70.0 167.0	70.0 167.0	70.0 167.0
Low	15 10	15 10	15 10
High %	15 10	15 10	15 10
<u>Corrections</u>			
Energy	Check	Check	Check
Linearity	Check	Check	Check
Sensitivity	Check	Check	Check
COR	Check	Check	Check
<u>Home Position</u>			
Factory	Check	Check	Check
Select	Thallium	Thallium	Thallium
Rate: Normal	Check	Check	Check
Frame Size: Select	64	64	64
Mirror: Select	NO	NO	NO
<u>Transform</u>			
Center X	0.0	0.0	0.0
Center Y	0.0	0.0	0.0
Zoom	1.28	1.28	1.28
Rotation	0.0	0.0	0.0
Patient Position: Select	Supine	Supine	Supine
Patient Orientation: Select	Legs In	Legs In	Legs In

Procedures:

Rest Only Study (only if stress is not indicated):

1. For outpatients upon arrival to the nuclear medicine department, females will be asked to change from the waist up into 2 hospital gowns (alternating front and back openings); the brassiere needs to be removed for imaging. This is per the physicians. Male patients have no immediate prep. **For all patients, it is important to check for nitro patches, paste or nitro drip. If nitro is active in any form, it is necessary to ask the reading physician of the day as to the decision to inject with the nitro in place or not.**
2. A nuclear medicine technologist will interview the patient, verifying the patient with 2 forms of identification (i.e. DOB, spelling the name, MR #). A brief description of the test will be given and the patient allowed to ask any questions. If the patient is having active chest pain, the technician is to consult the reading physician of the day as to when to do the rest injection.
3. The radiopharmaceutical can be directly injected into a vein, making sure to flush the syringe with blood at least once. For inpatients or outpatients with an IV in place, the radiopharmaceutical shall be injected and flushed with a 0.9% Sodium Chloride 10cc syringe.
4. The patient will be asked to wait in the cardiac waiting room for 15 minutes or until the imaging technologist is ready to image the patient.
5. The appropriate protocol is selected (see the **Data Acquisition** section) depending on the camera being used.
6. Patients are asked to remove any metal objects from the chest/torso areas as to not interfere with the imaging of the heart.
7. The patient is asked to lie supine on the imaging table with their arms above their head. If gating is being used, attach 3 leads to 3 EKG patches to acquire the necessary data. The imaging technologist will place the patient in the camera and adjust the orbit of the heads so the camera faces do not touch the patient. The patient is instructed to lay still and breathe normally during the pictures. The only exceptions to this are if there is a major shoulder, arm injury impairing movement or a recent device implantation that restricts the movement of the shoulder. Consult the reading physician of the day if this happens.
8. Upon completion of the images, the patient is assisted up from the table and asked to wait in the cardiac waiting room until the processing is complete.
9. The images are processed per the **Myocardial Processing Protocol**. The necessary screen captures are sent to PACS. It may be necessary to have the reading physician of the day review the images before the patient is released to leave.
10. Once it is determined that the patient may leave, in-patients may be sent back to the floor. For out-patients, they may re-dress and the IV is to be removed, if one is in place, before the patient leaves the department.

Stress Only Study (2-day):

1. For outpatients upon arrival to the nuclear medicine department, females will be asked to change from the waist up into 2 hospital gowns (alternating front and back openings); the brassiere needs to be removed for imaging. This is per the physicians. Male patients have no immediate prep. **For all patients, it is important to check for nitro patches, paste or IV drip. If nitro is active in any form, it is necessary to ask the reading physician of the day as to the decision to inject with the nitro in place or not.**
2. A nuclear medicine technologist will interview the patient, verifying the patient with 2 forms of identification (i.e. DOB, spelling the name, MR #). A brief description of the test will be given and the patient allowed to ask any questions.
3. An IV will be placed. For in-patients or out-patients with an IV in place, flush the existing IV first to ensure it is working.
4. Follow the **Myocardial Stress Test Procedure Protocol** for the stress portion of the test.
5. Once the stress test is complete, the request will be given to the appropriate imaging technologist, and the patient is taken directly to the imaging table, as soon as possible.
6. The imaging technologist will select the appropriate imaging protocol (see the **Data Acquisition** section) depending on which camera is being used and the extent of the heart

- rhythm and if the patient is able to tolerate the Hawkeye portion of the test.
7. If gating is being used, 3 leads will be attached to the existing EKG patches from the stress test to acquire the necessary data. The patient is asked to raise their arms above their head for all types of images. The imaging technologist will place the patient in the camera and adjust the orbit of the heads so the camera faces do not touch the patient. The patient is instructed to lay still and breathe normally during the pictures. The only exceptions to this are if there is a major shoulder, arm injury impairing movement, or a recent device implantation that restricts the movement of the shoulder. Consult the reading physician of the day if this happens.
 8. Upon completion of the images, the patient will be assisted up from the imaging table and asked to wait in the cardiac waiting room until the images are processed and reviewed.
 9. The images are processed per the **Myocardial Processing Protocol**. The necessary screen captures are sent to PACS. It may be necessary to have the reading physician of the day review the images before the patient is released to leave.
 10. Once it is determined that the patient may leave, in-patients may be sent back to the floor. For out-patients, they may re-dress, and the IV is to be removed before the patient leaves the department.

Rest & Stress Study (1-day):

1. For outpatients upon arrival to the nuclear medicine department, females will be asked to change from the waist up into 2 hospital gowns (alternating front and back openings), the brassiere needs to be removed for imaging. This is per the physicians. Males have no immediate prep. **For all patients, it is important to check for nitro patches, paste or nitro drip. If nitro is active in any form, it is necessary to ask the reading physician of the day as to the decision to inject with the nitro in place or not.**
2. A nuclear medicine technologist will interview the patient, verifying the patient with 2 forms of identification (i.e. DOB, spelling the name, MR #). A brief description of the test will be given and the patient allowed to ask any questions.
3. An IV will be placed. For in-patients or out-patients with an IV in place, flush the existing IV first to ensure it is working. Patient is now ready for the stress portion of the test.
4. Follow the **Myocardial Stress Test Procedure Protocol** for the stress portion of the test.
5. Upon termination of the stress portion of the test, the request will be given to the appropriate imaging technologist, and the patient is escorted directly to the imaging table as soon as possible.
6. The imaging technologist will select the appropriate imaging protocol (see the **Data Acquisition** section) depending on which camera is being used and the extent of the heart rhythm.
7. If gating is being used, 3 leads will be attached to the existing EKG patches from the stress test to acquire the necessary data. The patient will be asked to raise their arms over their head for all types of images. The imaging technologist will place the patient in the camera and adjust the orbit of the heads so the camera faces do not touch the patient. The patient is instructed to lay still and breathe normally during the pictures. The only exceptions to this are if there is a major shoulder or arm injury impairing movement, or a recent device implantation that restricts the movement of the shoulder. Consult the reading physician of the day if this happens.
8. Upon completion of the images, the patient will be asked to wait in the cardiac waiting room until the images are processed and reviewed.
9. The images are processed per **Myocardial Processing Protocol**. The necessary screen captures are sent to PACS. It may be necessary to have the reading physician of the day review the images before the patient is released to leave. If it is determined that the images need to be repeated, do so immediately.
It is the physicians option that the resting image may be performed as soon as 2 hours post stress without a re-injection, this is to rule out an attenuation artifact. Consult the reading physician of the day. If it is determined that a resting injection is needed, the patient should return 3-4 hours post stress for the second injection and resting images.

10. Once it is determined that the patient may leave, in-patients may be sent back to the floor. For out-patients, they may re-dress, but leave the IV in for the resting injection during the second appointment. If needed, a copy of the Myocardial Dietary Restrictions for Thallium Cardiac Stress Test is explained and sent with the patient.
11. At the time of the second appointment (resting part of the study), the nuclear medicine technologist will interview the patient, verifying the patient with 2 forms of identification (i.e. DOB, spelling the name, MR #). Female patients will be asked to change from the waist up into 2 hospital gowns (alternating front and back openings), the brassiere needs to be removed for imaging. Male patients have no immediate prep.
12. The radiopharmaceutical (Thallium) will be injected, if needed, into the IV and flushed with a 0.9% Sodium Chloride 10cc syringe. For out-patients, the IV may now be discontinued.
13. The patient will be asked to wait in the cardiac waiting room for 15 minutes.
14. The appropriate protocol is selected (see the **Data Acquisition** section) depending on the camera being used.
15. Patients are asked to remove any metal objects from the chest/torso areas as to not interfere with the imaging of the heart.
16. The patient is asked to lie supine on the imaging table with their arms above their head. The imaging technologist will place the patient in the camera and adjust the orbit of the heads so the camera faces do not touch the patient. The patient is instructed to lay still, breath normally during the pictures. If gating is being used, attach 3 leads to 3 EKG patches to acquire the necessary data. The only exceptions to this are if there is a major shoulder or arm injury impairing movement, or a recent device implantation that restricts the movement of the shoulder. Consult the reading physician of the day if this happens.
17. Upon completion of the images, the patient is assisted up from the imaging table and asked to wait in the cardiac waiting room while the images are reviewed. If it is determined that the images need to be repeated, do so immediately.
18. The images are processed per Myocardial Processing Protocol. The necessary screen captures are sent to PACS. It may be necessary to have the reading physician of the day review the images before the patient is released to leave.

Image Processing & PACS:

See the Myocardial Processing Protocol.

Interpretation:

The stress test is interpreted according to physiological stress level attained and the EKG changes. This is the responsibility of the exercise physiologists and the cardiology staff and fellows.

The images are examined for perfusion defects and to determine whether they are present only at stress (ischemia) or both at rest and stress (infarct). With large ischemic defects, the referring physician should be contacted to determine patient disposition.

The change in ventricular cavity size from stress to rest and the appearance of lung activity in the stress images both indicate extensive coronary disease, and the referring physician should be contacted immediately.

Acute Chest Pain: The same criteria apply as for stress studies, but as increased coronary flow is not induced then ischemia cannot be precipitated. Only if there is active ischemia at the time of injection will it be recognized. The study is very sensitive for acute infarctions.

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