UW Health
University of Wisconsin Hospital and Clinics

Division of Nuclear Medicine Procedure / Protocol

MYOCARDIAL SPECT PERFUSION STRESS &/OR REST
FOR USE WITH TECHNETIUM 99M AGENTS ONLY

CPT CODE: 78460-61, 78464-65, 78478, 78480
UPDATED: JANUARY 2014

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
- Risk stratify patients prior to surgery especially prior to intermediate and high risk surgery
- Risk stratify with low level (+) Troponin
- Evaluation of patients with borderline lesion on angiogram

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 60-90 minutes for imaging and processing.
For a Stress only study, allow 90 minutes for the stress test, imaging, and processing.
For a Rest and Stress study, allow 180 minutes for the entire test.

Radiopharmaceutical & Dispensed Dose: Please see the current weight-based Nomogram for all doses. **Per the physicians, for all patients with a BMI at or above 35, the dose is to be a full dose.** Patients below a BMI of 35 are to be half dose. It is still the discretion of the technologist to ask for a dose to be changed after interviewing the patient and taking into account the patients' body habitus. The pharmacy will need additional time to redraw the updated dose.

Imaging Device: GE Infinia 4 Hawkeye with LEHR collimators.

Data Acquisition: For half dose full time patients or full dose full time patients, select **USER**, then select the **Cardiology Folder,** then select the **One Day HWKY FF** protocol.

Use **RGate HWKY FF** for rest gated images
Use **Rest HWKY FF** for rest non-gated images.
Use **SGate HWKY FF** for the stress gated images.
Use **Stress HWKY FF** for the stress non-gated images.

For full dose half time patients, select **USER**, then select the **Cardiology Folder**, then select the **One Day HWKY FF HTIME** protocol.

Use **RGate HWKY FF** for rest gated images
Use **Rest HWKY FF** for rest non-gated images.
Use **SGate HWKY FF** for the stress gated images.
Use **Stress HWKY FF** for the stress non-gated images

*** 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. ***

***If HWKY cannot be acquired, uncheck the "Acquire CT/AC" box on the Tomo Key Parameters page.

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

Infinia Hawkeye 4	REST FF	REST HWK	REST FF HTIME	REST HWKY FF HTIME
Tomo Key Parameters				
Mode	L	L	L	L
Start Angle	0	0	0	0
Patient Location	Feet First Supine	Feet First Supine	Feet First Supine	Feet First Supine
Use Body Contour	No	No	No	No
Acquire CT/AC		Check		Check
Select		Table Out		Table Out
Select		Emission First		Emission First
CT/AC range		Partial		Partial
Select On		Emission		Emission
Zoom	1.3	1.3	1.3	1.3
Matrix	64 x 64	64 x 64	64 x 64	64 x 64
Pan Y	0	0	0	0
Select	Step & Shoot	Step & Shoot	Step & Shoot	Step & Shoot
Seconds	25	25	16	16
Tomo Corrections				
Energy session	Tc99m	Tc99m	Tc99m	Tc99m
Collimator	LEHR	LEHR	LEHR	LEHR
COR Correction	Check	Check	Check	Check
Tomo CT/AC Parameters				
Select		Helical		Helical
Pitch		1.9		1.9
Voltage		140.0		140.0
Current		1.0		1.0
Velocity		2.0		2.0
Matrix		256 x 256		256 x 256
Filter		Stnd		Stnd
Extended FOV		Check		Check
Tomo Location Parameters				
Mode	L	L	L	L
Start Angle	0	0	0	0
Patient Location	Feet First Supine	Feet First Supine	Feet First Supine	Feet First Supine
Use Body Contour	No	No	No	No
Detectors 1 and 2	Check	Check	Check	Check
Total Angular Range	180	180	180	180
View Angle	3	3	3	3
Direction	CCW	CCW	CCW	CCW
Number of FOVs	1		1	
FOV time multiplier	1.0		1.0	
Rough Overlap	4		4	
Direction	Table In		Table In	
Select	Default	Default	Default	Default
Motorized Pallet Support	Check		Check	
Tomo Admin Parameters				
Auto Apply	No	No	No	No
Release at end of scan	Check	Check	Check	Check
NM	None	None	None	None
CT/AC		None		None
FOV		None		None
Body Part	Chest	Chest	Chest	Chest
Acquisition Context	Unknown	Unknown	Unknown	Unknown
Body Side	Other	Other	Other	Other

Infinia Hawkeye 4	RGate FF	RGate HWKY FF	RGate FF HTIME	RGate HWKY FF HTIME
Gated Tomo Key Parameters				
Mode	L	L	L	L
Start Angle	0	0	0	0
Patient Location	Feet First Supine	Feet First Supine	Feet First Supine	Feet First Supine
Body Contour	No	No	No	No
Time/view	25	25	16	16
Frames/cycle	8	8	8	8
Time	Check	Check	Check	Check
Acquire CT/AC		Check		Check
Select		Table Out		Table Out
Select		Emission First		Emission First
CT/AC range		Partial		Partial
Select On		Emission		Emission
Zoom	1.3	1.3	1.3	1.3
Matrix	64 x 64	64 x 64	64 x 64	64 x 64
Pan Y	0	0	0	0
Gated Tomo Triggers				
High%	20	20	20	20
Low %	20	20	20	20
Check	Display R-Waves	Display R-Waves	Display R-Waves	Display R-Waves
Display Length	5	5	5	5
Gspect Corrections				
Energy session	Tc99m	Tc99m	Tc99m	Tc99m
Collimator	LEHR	LEHR	LEHR	LEHR
COR Correction	Check	Check	Check	Check
Gspect CT/AC Parameters				
Scan Type		Helical		Helical
Pitch		1.9		1.9
Voltage		140.0		140.0
Current		1.0		1.0
Velocity		2.0		2.0
Matrix		256 x 256		256 x 256
Filter		Stnd		Stnd
Extended FOV		Check		Check
Gspect Location Parameters				
Mode	L	L	L	L
Start Angle	0	0	0	0
Patient Location	Feet First Supine	Feet First Supine	Feet First Supine	Feet First Supine
Body Contour	No	No	No	No
Select	Detectors 1 and 2	Detectors 1 and 2	Detectors 1 and 2	Detectors 1 and 2
Total Angular Range	180	180	180	180
View Angle	3	3	3	3
Direction	CCW	CCW	CCW	CCW
Table Height	Default	Default	Default	Default
Motorized Pallet Support	Check		Check	
GSPECT Admin Parameters				
Auto Apply	No	Check	No	No
Release at end of scan	Check	Check	Check	Check
NM	None	None	None	None
CT/AC		None		None
FOV		None		None
Body Part	Chest	Chest	Chest	Chest
Acquisition Context	Unknown	Unknown	Unknown	Unknown
Body Side	Other	Other	Other	Other

Infinia Hawkeye 4	Stress FF	Stress HWK FF	Stress FF HTIME	Stress HWK FF HTIME
Tomo Key Parameters				
Mode	L	L	L	L
Start Angle	270	0	0	0
Patient Location	Feet First Supine	Feet First Supine	Feet First Supine	Feet First Supine
Use Body Contour	No	No	No	No
Acquire CT/AC		Check		Check
Select		Table Out		Table Out
Select		Emission First		Emission First
CT/AC range		Partial		Partial
Select On		Emission		Emission
Zoom	1.3	1.3	1.3	1.3
Matrix	64 x 64	64 x 64	64 x 64	64 x 64
Pan Y	0	0	0	0
Select	Step & Shoot	Step & Shoot	Step & Shoot	Step & Shoot
Seconds	20	20	12	12
Tomo Corrections				
Energy session	Tc99m	Tc99m	Tc99m	Tc99m
Collimator	LEHR	LEHR	LEHR	LEHR
COR Correction	Check	Check	Check	Check
Tomo CT/AC Parameters				
Scan Type		Helical		Helical
Pitch		1.9		1.9
Voltage		140.0		140.0
Current		1.0		1.0
Velocity		2.0		2.0
Matrix		256 x 256		256 x 256
Filter		Stnd		Stnd
Extended FOV		Check		Check
Tomo Location Parameters				
Mode	L	L	L	L
Start Angle	270	0	0	0
Patient Location	Feet First Supine	Feet First Supine	Feet First Supine	Feet First Supine
Use Body Contour	No	No	No	No
Detectors 1 and 2	Check	Check	Check	Check
Total Angular Range	180	180	180	180
View Angle	3	3	3	3
Direction	CCW	CCW	CCW	CCW
Number of FOVs	1		1	
FOV time multiplier	1.0		1.0	
Rough Overlap	4		4	
Direction	Table In		Table In	
Select	Default	Default	Default	Default
Motorized Pallet Support	Check		Check	
Tomo Admin Parameters				
Auto Apply	No	No	No	No
Release at end of scan	Check	Check	Check	Check
NM	None	None	None	None
CT/AC		None		None
FOV		None		None
Body Part	Chest	Chest	Chest	Chest
Acquisition Context	Unknown	Unknown	Unknown	Unknown
Body Side	Other	Other	Other	Other

Infinia Hawkeye 4	**SGATE FF**	**SGATE HWKY FF**	**SGATE FF HTIME**	**SGATE HWKY FF HTIME**
Gated Tomo Key Parameters				
Mode	L	L	L	L
Start Angle	270	0	0	0
Patient Location	Feet First Supine	Feet First Supine	Feet First Supine	Feet First Supine
Body Contour	No	No	No	No
Time/view	20	20	12	12
Frames/cycle	8	8	8	8
Time	Check	Check	Check	Check
Acquire CT/AC		Check		Check
Select		Table Out		Table Out
Select		Emission First		Emission First
CT/AC range		Partial		Partial
Select On		Emission		Emission
Zoom	1.3	1.3	1.3	1.3
Matrix	64 x 64	64 x 64	64 x 64	64 x 64
Pan Y	0	0	0	0
Gated Tomo Triggers				
High%	20	20	20	20
Low %	20	20	20	20
Check	Display R-Waves	Display R-Waves	Display R-Waves	Display R-Waves
Display Length	5	5	5	5
Gspect Corrections				
Energy session	Tc99m	Tc99m	Tc99m	Tc99m
Collimator	LEHR	LEHR	LEHR	LEHR
COR Correction	Check	Check	Check	Check
Gspect CT/AC Parameters				
Scan Type		Helical		Helical
Pitch		1.9		1.9
Voltage		140.0		140.0
Current		1.0		1.0
Velocity		2.0		2.0
Matrix		256 x 256		256 x 256
Filter		Stnd		Stnd
Extended FOV		Check		Check
Gspect Location Parameters				
Mode	L	L	L	L
Start Angle	270	0	0	0
Patient Location	Feet First Supine	Feet First Supine	Feet First Supine	Feet First Supine
Body Contour	No	No	No	No
Select	Detectors 1 and 2	Detectors 1 and 2	Detectors 1 and 2	Detectors 1 and 2
Total Angular Range	180	180	180	180
View Angle	3	3	3	3
Direction	CCW	CCW	CCW	CCW
Table Height	Default	Default	Default	Default
Motorized Pallet Support	Check		Check	
GSPECT Admin Parameters				
Auto Apply	No	No	No	No
Release at end of scan	Check	Check	Check	Check
NM	None	None	None	None
CT/AC		None		None
FOV		None		None
Body Part	Chest	Chest	Chest	Chest
Acquisition Context	Unknown	Unknown	Unknown	Unknown
Body Side	Other	Other	Other	Other

Procedures:

Rest 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 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. 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 30-45 minutes or until the imaging technologist is ready to image the patient.
5. The appropriate protocol is selected (see the **Data Acquisition** section).
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 imagine table with their arms above their head. 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. Attach 3 leads to three EKG patches to acquire the gated 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.
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. 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 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.
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.
6. Patients may wait between 15-45 minutes before the stress images are acquired.
7. When the imaging technologist is ready for the patient, the appropriate imaging protocol is selected (see the **Data Acquisition** section). The patient is asked to lie supine on the imagine table with their arms above their head. 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. Attach 3 leads to the existing EKG patches from the stress test to acquire the gated data. The imaging technologist will place the patient in the camera and adjust the orbit so the camera faces do not touch the patient. The patient is instructed to lay still and breathe normally during the pictures.

8. Upon completion of the images, the patient is assisted up from the imaging table and asked to wait in the cardiac waiting room until the images are processed and reviewed. 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.
9. 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. 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.
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. The radiopharmaceutical will 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 approximately 30 minutes or until the imaging technologist is ready to image the patient.
5. The appropriate protocol is selected (see the **Data Acquisition** section).
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. 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. Attach 3 leads to three EKG patches to acquire the gated 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, breath normally during the pictures.
8. Upon completion of the images, the patient is assisted up from the table and the images are reviewed. If it is determined that the images need to be repeated, follow steps 5-8 again.
9. Once it is determined that the images quality is good, the patient may proceed to the stress portion of the test.
10. Follow the **Myocardial Stress Test Procedure Protocol** for the stress portion of the test.
11. Upon termination of the stress portion of the test, the request will be given to the appropriate imaging technologist.
12. Patients may wait between 15-45 minutes before the stress images are acquired.
13. When the imaging technologist is ready for the patient, the appropriate imaging protocol is selected (see the **Data Acquisition** section). Attach 3 leads to the existing EKG patches from the stress test to acquire the Gated data. The patient is asked to lie supine on the imagine table with their arms above their head. 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. The imaging technologist will place the patient in the camera and adjust the orbit so the camera faces do not touch the patient. The patient is instructed to lay still

and breathe normally during the pictures.

14. Upon completion of the images, the patient is assisted up from the table and asked to wait in the cardiac waiting room until the images are processed and reviewed. 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.
15. 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.

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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