



Austin Radiological Association
18F-FDG PET Cardiac Viability Study
(F-18-Fluorodeoxyglucose)

Overview

¹⁸F-FDG PET is an important diagnostic tool for detecting myocardial viability in patients with coronary artery disease and left ventricular (LV) dysfunction. The evaluation of myocardial viability is essential in the decision to intervene for revascularization, and has been a major concern in using PET cardiology. Myocardial viability testing can differentiate between stunned myocardium and hibernating myocardium. Stunning refers to the dysfunction in spite of preserved blood flow, which can recover function spontaneously with time (without revascularization). Hibernating myocardium refers to myocardium that recovers function only by revascularization. The term “perfusion-metabolism mismatch” is used to identify areas of ischemia that show increased ¹⁸F-FDG uptake. These areas indicate myocardial viability. If adequate treatment is not given, i.e. revascularization, the patient has a poor prognosis.

Indications

- Exam Code: 78459 Myocardial Imaging, PET, Metabolic Evaluation
- PET imaging; metabolic assessment for myocardial viability following inconclusive SPECT study
- PET imaging; heart muscle; determination of myocardial viability as primary or initial diagnosis prior to revascularization.
- Myocardial viability studies with FDG PET should be performed in patients with ischemic heart disease and left ventricular function who are potential candidates for coronary revascularization.

Examination Time

- Each patient should allow 3.5 – 4 hours for the entire exam, though may take less.
- Arrive 2 hours prior to PET/CT injection time for prep (BGL evaluation, IV established, glucose loading, insulin administration if indicated).
- Injection followed by 60-90 minute uptake phase.
- Image acquisition:
 1. 78459
~15 minutes
- Post-acquisition, the patient must meet discharge criteria before leaving ARA. This will be different for each patient (dependent on the amount of time for BGL to stabilize).

Patient Preparation

- NPO 6 hours prior to exam (water is okay). No carbs/sugar starting at noon the day before scan.
- No strenuous exercise 24 hours prior to exam.
- No sugar containing meds (cough syrup, cough drops, sugar coated aspirins, etc.)
- No oral diabetic meds day of exam (can take after exam.)
- No insulin within 4 hours of exam time.

Diet

Refrain from the following foods starting at noon the day before your scan.

Sugars

fruit/fruit juice
soft drinks
jellies
coffee
yogurt
desserts
oatmeal
alcohol (any)

Starches/Carbs

bread/rolls/cakes/tortillas
rice/pasta/crackers
potatoes or corn
snack chips (corn, potato, popcorn)
pastries
candy
pizza dough

Patient Interview and IV

- *A medic must be assigned to these patients per Nurse Manager.*
- **Blood Glucose Level (BGL)**

If fasting glucose level <125mg/dL, administer 25g glucose orally.

If fasting glucose level between 125 and 225mg/dL, give 13g glucose orally.

For glucose levels over 225mg/dL, no glucose is administered.

Blood glucose from this point on is monitored every 10 minutes.

If there are no contraindications to administer normal saline bolus, you can start giving fluid bolus to encourage the glucose level to come down on its own, beginning 15 minutes after the glucose is given.

After 30-60 minutes, if glucose level has not come down on its own to less than 140, start administering insulin according to scale below:

130-140mg/dL	1 unit regular insulin IV
140-160mg/dL	2 units regular insulin IV
160-180mg/dL	3 units regular insulin IV
180-200mg/dL	5 units regular insulin IV
200-220mg/dL	6 units regular insulin IV
>220mg/dL	6 units regular insulin IV and titrate if necessary using the following scale: (glucose level-50)/25

Blood glucose must be monitored every 10 minutes.

Once glucose has reached 150, consult technologist about FDG injection; goal is to administer FDG when glucose is 100-140.

Patient Uptake Phase

- Take appropriate measures to limit muscle uptake of F-18-fluorodeoxyglucose:
 1. The patient should lie still throughout the uptake period.
 2. The patient should not talk to minimize the uptake of F-18-fluorodeoxyglucose in the laryngeal muscles.

Equipment & Energy Windows

- Imaging system:
 - Siemens Biograph 6 PET-CT scanner
- Collimators (26):
 - 3D mode (septa out or absent) (*Siemens Biograph 6 only has 3D function*)
- Energy windows (may vary with manufacturer and machine design): 30% window centered at 511 keV.

Radiopharmaceutical, Dose, & Technique of Administration

- Radiopharmaceutical: F-18-fluorodeoxyglucose
- Dosing:

Average Adult	10-12 mCi
>300 lbs.	15 mCi

ARA RAM Licensure allows +/- 20% dose variance.
- Technique of administration: Standard intravenous injection.

Patient Positioning & Imaging Field

- Patient position:
 1. Supine with a triangular bolster under the knees.
 2. Arms:
 - Over head for most studies (if patient is able to tolerate).
 - At sides if patient unable to tolerate above head.
- Imaging field of view: Landmark at sternal notch for topogram. Select heart for scan.

Acquisition Protocol

- Approximately 60 minutes post injection, have the patient empty his/her bladder.
- Begin image acquisition approximately 60 minutes following injection of F-18-fluorodeoxyglucose.
- Have the patient empty his/her bladder after image acquisition.
- CT parameter values vary with patient size and machine specific factors:
 1. Kilovolts peak (kVp) guidelines:
 - a) Refer to pediatric protocols for all pedis
 - b) Average adult: 120 kVp.
 - c) Obese adult: 140 kVp.
 2. Milliampere-seconds (mAs) guideline: Varies between approximately 200 and 400 mAs depending on patient size. Utilize care dose when indicated.

Data Processing

- The PET images are reconstructed using iterative reconstruction.
- Settings for the Siemens PET/CT scanner include: 4 iterations, 8 subsets, Gaussian filter, filter FWHM 2.0, zoom 2.0. FOV 500.

Principle Radiation Emission Data - F-18

- Physical half-life = 109.8 minutes.

<u>Radiation</u>	<u>Mean % per disintegration</u>	<u>Mean energy (keV)</u>
Positron	100	250
Gamma ±	200	511

Dosimetry - F-18-Fluorodeoxyglucose

<u>Organ</u>	<u>rads/15 mCi</u>	<u>mGy/555 MBq</u>
Bladder	2.21	22.1
Heart	0.80	8.0
Spleen	0.80	8.0
Kidneys	0.42	4.2
Brain	0.41	4.1
Liver	0.38	3.8
Testes	0.35	3.5
Ovaries	0.26	2.6
Total body	0.20	2.0

Dosimetry - Computed Tomography

- Actual effective doses will depend on the user-specific exam protocol and the specific CT scanner used. Care dose should be used when indicated.

<u>Effective dose</u>	<u>rem</u>	<u>mSv</u>
Diagnostic CT	1.9	19.0
Low dose CT	0.3	3.0