UNM HOSPITALS

PET-CT FDG Cardiac Viability

Special Instructions

Consult with the attending radiologist about the appropriateness of the examination and regarding the patient's blood sugar measurements during the examination.

Outpatients with diabetes who take insulin should be instructed to bring their short-acting insulin and/or other diabetic medications with them. For inpatients with diabetes, consult with the patient's nurse to make sure they have a sliding-scale insulin ordered before starting the test. If an outpatient with diabetes does not bring insulin, it may be necessary to reschedule. Check with radiologist. Please have patient bring snack from home, for after the study.

Recent chest/mediastinal radiation and recent myocardial infarction may affect the results of the study. Check with attending radiologist prior to scheduling/starting the study.

When feasible, schedule the patient as the last PET patient of the day to allow for delays in imaging due to blood sugar control. **Order the FDG dose timed for at least 1 hour later than anticipated earliest administration time,** so that administration can be delayed if blood glucose is too high.

To be performed ***ONLY at UNMH***

Radiopharmaceutical: F-18 fluorodeoxyglucose (FDG) for viability PET-CT and either Tc-99m tetrofosmin (Myoview) or Tc-99m sestamibi (Cardiolite) for cardiac rest perfusion

Dose (Adult/Pediatric): Refer to Nuclear Medicine Dose Chart

Route of Administration: Intravenous.

Patient Preparation:

Please ensure the following:

- NPO for 6-12 hours
- 50 g (typically for non-diabetic patients) or 25 g (preferred for diabetic patient) oral glucose load (confirm with radiologist, see below for timing)

Equipment Setup: Refer to Cardiac Perfusion – Technetium agents protocol for the rest gated acquisition.

Cardiac PET-CT time (delay between FDG injection and imaging):

45-60 minute delay (for non-diabetic patients):

- 20 min/bed (1 bed position)

60-90-minute delay (for diabetic patients):

- 20 min/bed (1 bed position)

CT imaging protocol: Care dose, 3 mm slice thickness.

Patient Positioning: Supine. Arms raised and supported (at or above shoulder level). If unable to do this, please secure arms by the patient's side.

Procedure:

Perform cardiac PET-CT in conjunction with a resting gated cardiac study as follows:

1) Intravenously administer Tc-99m tetrofosmin or sestamibi for the resting gated cardiac SPECT study (use stress dose of activity).
2) Measure blood glucose (usually with CBG) and check with radiologist regarding dose of oral glucose.
    a. If blood glucose < 200-250 mg/dl, will likely administer oral glucose (45 minutes prior to anticipated FDG injection).
    b. If CBG ≥ 200-250 mg/dl, will likely not administer oral glucose, but may need insulin.
3) Consult with the attending radiologist about whether the patient should receive insulin, and how much. (Insulin Guidelines below are *for reference only*.)
4) Obtain resting gated cardiac SPECT images approximately 30 minutes after sestamibi/tetrofosmin injection (follow Cardiac Perfusion – Technetium Agents Stress Protocol for ECAM or SPECT-CT but change name to Rest).
5) Recheck CBG; consult with attending radiologist about whether to proceed with FDG injection or whether the patient needs insulin first. Typically blood sugar should be less than 150 mg/dl prior to FDG administration, although higher levels may be acceptable if the blood sugar has stabilized or gone down (rather than increasing from earlier measurements).
6) When instructed by the attending radiologist to proceed, inject FDG and flush with normal saline (10 mL for butterfly needles; 20 mL for angiocatheters, 40 mL or greater for indwelling catheters).
7) Perform CT examination of heart, followed by PET of the same region. Confirm delay time to imaging after FDG injection with the radiologist, approximately:
    a. Nondiabetic patients: 45-60 minutes
    b. Diabetic patients: 60-90 minutes (if images are poor, additional insulin and delay of 45-60 min can be considered). Bed time may need to be extended.
8) For outpatients who have taken insulin, recheck blood glucose prior to releasing the patient and have them eat a snack before leaving.
9) Process images immediately and have them checked by the radiologist before releasing the patient. If there is extensive blood pool activity, the patient may need additional insulin and/or repeat imaging approximately 30-60 minutes later.

Acquisition:

1. On chronicle, enter PET dose and time administered.
2. Load topogram
3. Set parameters for scan

4. Load → move → start
5. When CT is complete (approximately 25 secs), you will be prompted to move patient for PET scan (table moves all the way to the back of the gantry)
6. Options → PET monitor to view scan length
7. When acquisition is complete, load fusion on Wizard before sending to PACS, Leonardo and Syngo Via

Processing:

Resting gated perfusion study:

- Follow processing instructions in Cardiac Perfusion – Technetium Agents protocol

PET-CT:

- Process CT in B 5 31 algorithm
- Process PET into attenuation corrected and non-attenuation corrected PET files

Insulin Guidelines*:

Blood Glucose (mg/dl)	Possible restorative measure
130-140	1U insulin
140-160	2U
160-180	3U
180-200	5U
>200	Notify attending radiologist

*based on ASNC guidelines for blood glucose maintenance after oral glucose administration, 45-90 minutes after FDG administration. As the above guidelines are written for intravenous insulin, larger amounts and/or longer delays after insulin administration prior to FDG administration may be required for subcutaneous insulin. **Preferred are fast-acting versions of insulin: lispro (Humalog), glulisine (Apidra), or aspart (Novolog).** Inpatients may alternatively be administered sliding-scale insulin as prescribed by the referring physicians.

See also pharmacokinetics of the most commonly used insulin preparations table (UpToDate) at https://www.uptodate.com/contents/image?imageKey=ENDO%2F73676&topicKey=ENDO%2F17252&search=insulin,%20comparison,%20peak%20time&source=outline_link&selectedTitle=1~150

Items Required For Complete Study:

- Enter protocol, protocoling physician, FDG dose, sestamibi/tetrafosmin dose, blood glucose measurements, and injection site in comments section on PACS
- Processing and transfer of all images to PACS, Syngo Via and/or Leonardo as appropriate
  - Topogram to PACS
  - CT, PET Corrected, and PET Uncorrected to PACS, Syngo Via and Leonardo.
  - Resting Gated Sestamibi/Tetrofosmin images to PACS as per Cardiac Perfusion – Technetium Agents Protocol
  - Fused Axial images to PACS
  - Resting - Corrected raw data to Leonardo and Syngo Via
- Complete the examination in RIS

References:

- ACR–SPR–STR Practice Parameter For The Performance Of Cardiac Positron Emission Tomography - Computed Tomography (PET/CT) Imaging (2017; amended 2018). https://www.acr.org/-/media/ACR/Files/Practice-Parameters/CardiacPET-CT.pdf

- ASNC imaging guidelines/SNMMI procedure standard for positron emission tomography (PET) nuclear cardiology procedures (2016). Dilsizian, V., Bacharach, S.L., Beanlands, R.S. et al. J. Nucl. Cardiol. (2016) 23: 1187. https://doi.org/10.1007/s12350-016-0522-3

- Pharmacokinetics of the most commonly used insulin preparations table (UpToDate, 2019) at https://www.uptodate.com/contents/image?imageKey=ENDO%2F73676&topicKey=ENDO%2F17 52&search=insulin,%20comparison,%20peak%20time&source=outline_link&selectedTitle=1~150