FDG PET Body Scan

Updated 9/8/2024

- **Indications**
  - Oncology Indications
    - To differentiate benign from malignant lesions; searching for an unknown primary tumor when metastatic disease is discovered as the first manifestation of cancer or when a patient presents with a paraneoplastic syndrome; staging patients with known malignancies; monitoring the effect of therapy on known malignancies; determining whether residual abnormalities detected on physical examination or on other imaging studies following treatment represent tumor or post treatment fibrosis or necrosis; detecting tumor recurrence (especially in the presence of elevated tumor markers); selection of the region of tumor most likely to yield diagnostic information for biopsy; guiding radiation therapy planning.
  - Infection/Inflammation Indications
    - Evaluation of sarcoidosis; peripheral bone osteomyelitis in non postoperative and non diabetic patients; spondylodiscitis / vertebral osteomyelitis in non postoperative patients; fever of unknown origin; postoperative fever and recurrent sepsis; induced and acquired immunodeficiency-related FUO; neutropenic fever; isolated elevated acute-phase inflammation markers (ESR, CRP); evaluation of metastatic infection and of high-risk patients with bacteremia; primary evaluation of vasculitides; evaluation of potentially infected liver and kidney cysts in polycystic disease; suspected infection of intravascular devices, pacemakers and catheters; AIDS-associated opportunistic infections, associated tumors and Castleman disease; assessment of metabolic activity in tuberculosis.
- **Radiopharmaceutical:**
  - Weight-based F-18 FDG administered IV per table below.
  - Dose table uses a linear equation taking into account patient weight and bed speed up to a maximum dose of 20 mCi (assuming a PET bed overlap of ≤30%).

Dose (mCi) by Weight

Wt (lbs)	Mins Per Bed Position		
	2.5	3.0	4.0
100	6.9	5.7	4.3
110	7.6	6.3	4.7
120	8.2	6.9	5.1
130	8.9	7.4	5.6
140	9.6	8.0	6.0
150	10.3	8.6	6.4
160	11.0	9.2	6.9
170	11.7	9.7	7.3
180	12.4	10.3	7.7
190	13.0	10.9	8.2
200	13.7	11.4	8.6
210	14.4	12.0	9.0

Dose (mCi) by Weight

Wt (lbs)	Mins Per Bed Position		
	2.5	3.0	4.0
220	15.1	12.6	9.4
230	15.8	13.2	9.9
240	16.5	13.7	10.3
250	17.2	14.3	10.7
260	17.8	14.9	11.2
270	18.5	15.4	11.6
280	19.2	16.0	12.0
290	19.9	16.6	12.4
300		17.2	12.9
310		17.7	13.3
320		18.3	13.7
330		18.9	14.2

Dose (mCi) by Weight

Wt (lbs)	Mins Per Bed Position		
	4.0	4.5	5.0
340	14.6	13.0	11.7
350	15.0	13.3	12.0
360	15.4	13.7	12.4
370	15.9	14.1	12.7
380	16.3	14.5	13.0
390	16.7	14.9	13.4
400	17.2	15.3	13.7
410	17.6	15.6	14.1
420	18.0	16.0	14.4
430	18.5	16.4	14.8
440	18.9	16.8	15.1
450	19.3	17.2	15.4

- **Patient Preparation:**
  - Patients undergoing imaging for oncologic indications should avoid caffeine for 24 hrs prior to the exam.
  - All patients should avoid strenuous activity for 24 hrs prior to the exam.
  - All patients should be NPO (other than plain water and medications) for at least 4-6 hrs prior to the exam.
  - All patients should drink 16-20 oz of water 30-60 mins prior to the exam to ensure adequate hydration.
  - All patients should have their glucose level checked. Patients undergoing imaging for oncologic indications should have a blood glucose of 70-200 mg/dL prior to the exam. Patients undergoing imaging for infectious/inflammatory indications to have blood glucose levels above 200 mg/dL.
  - Diabetes medications:
    - Oral diabetes medications should be taken normally.
    - Rapid-acting insulin should be held for at least 4 hrs (Humalog/lispro, NovoRapid/aspart, Apidra/glulisine).
    - Short-acting insulin should be held for at least 6 hrs (regular, Humulin-R, Entuzity).

- Intermediate-acting insulin should be held for 18 hrs (NPH, Humulin-N and Novolin NPH).
- Long-acting insulin should be held for 24 hrs (Levemir/detemir, Lantus/glargine).
- Ultra long-acting insulin should be held for 42 hrs (Tresiba/degludec, Toujeo/glargine).

➢ All patients should remain seated or recumbent, not speak and be kept warm from before radionuclide administration until after the completion of imaging,

➢ All patients should empty their bladder immediately prior to imaging and should void frequently for a day following the exam.

- **Conflicting Examinations:**
  - ➢ No Nuclear Medicine exams within the previous 24 hrs.
  - ➢ No barium GI exams within the previous 48 hrs.
- **Pregnancy/Lactation:**
  - ➢ Pregnancy testing is only needed in potentially pregnant patients who state they could be pregnant. See Pregnant, Potentially Pregnant and Lactating Patients policy for specifics.
  - ➢ Breast milk does not need to be discarded following radionuclide administration, however the mother should limit direct contact with the infant for 12 hours to reduce the infant's radiation dose emanating from the mother's body.
- **Imaging Technique:**
  - ➢ PET Bed Time
    - Chose a mins/bed speed that balances FDG dose and exam time and does not exceed the peak count rate of the PET system.
    - Legs - 1 min/bed
    - Table weight limit is 450 lbs.
  - ➢ Matrix Size - 128 x 128
  - ➢ Patient Positioning
    - supine with arms by side for head/neck cancers, infectious conditions or when imaging the whole body
    - supine with arms overhead for all other indications
- **Imaging Views**
  - ➢ Begin imaging 1 hr after radionuclide administration.
  - ➢ Obtain axial low-dose CT images from the skull base to mid thigh using a soft tissue window and kernel.
  - ➢ Obtain axial non attenuation corrected and attenuation corrected PET images from the skull base to mid thigh.
  - ➢ Obtain a 3D horizontal spinner of the axial attenuation corrected PET images.
  - ➢ Create axial, coronal and sagittal fused PET-CT images using a soft tissue window and kernel for the CT portion.
  - ➢ Image the whole body (top of head to toes) when the indication is melanoma or Merkel cell carcinoma (regardless of the body location of primary skin lesion), lymphoma or other cancer involving the legs or for any infectious/inflammatory conditions.
- **Notes:**
  - ➢ FDG is an analogue of glucose and is taken up by viable cells via cell membrane glucose transporters (GLUT) and subsequently incorporated into the first step of the normal glycolytic pathway (hexokinase).
  - ➢ FDG accumulation in tissue is proportional to the amount of glucose utilization. Increased consumption of glucose is characteristic of most cancers and is in part related to overexpression of the GLUT glucose transporters and increased hexokinase activity. Cells involved in infection and inflammation (especially neutrophils, monocytes and macrophages) also express high levels of glucose transporters (especially GLUT1 and GLUT3) and hexokinase activity.
  - ➢ Physiologic FDG uptake is generally noted in the brain, heart, kidneys, and urinary tract at 60 min after administration.
  - ➢ In a typical fasting state the myocardium primarily uses free fatty acids but uses glucose after a glucose load. In the fasting state, FDG uptake in the myocardium should be low (however this is variable).
  - ➢ FDG uptake in the GI tract varies from patient to patient and may be increased in patients taking metformin.
  - ➢ FDG uptake may also be noted in muscles depending on recent motor activity and insulin.
  - ➢ FDG uptake is common in the lymphoid tissue of the Waldeyer ring and in the lymphoid tissue of the terminal ileum and cecum.
  - ➢ Physiologic thymic FDG uptake may be present (especially in children and young adults).
  - ➢ FDG uptake in brown fat may be observed mainly in young patients and when the ambient temperature is low.
  - ➢ No physiologic FDG uptake is noted in the bone itself (unless free 18F-fluoride is present as a contaminant). Bone marrow FDG uptake can be noted to a variable level (especially in infected or inflamed patients and in patients with hematopoietic regeneration following chemotherapy or after administration of hematopoietic growth factors).

- An interval of at least 10 days between the last dose of chemotherapy and the PET-CT exam is generally considered adequate for measurement of response.
- Radiation-induced inflammation can demonstrate FDG uptake for 2-3 months after the end of treatment.
- The effects of hematopoietic growth factors on FDG uptake (due to enhanced bone marrow uptake) generally last for greater than 2 weeks after administration.
- It is recommended to delay PET-CT imaging for at least 6 weeks following surgery due to postsurgical inflammation if imaging is primarily being done to assess the surgical field.
- SUV cutoffs have not been validated for inflammation and infection, although a max SUV mcutoff of 3.0 has been suggested for spondylodiscitis and a vessel:liver max SUV ratio of 1.0 has been suggested.
- Concurrent treatment with steroids can result in false-negative assessments in the setting of infection or inflammation.