

**University of Iowa Positron Emission Tomography Imaging Center
Clinical FDG Body Tumor Imaging Protocol**

Scheduling Considerations:

Chemotherapy:

Referring physicians will be encouraged to order FDG body scans prior to initiation of chemotherapy. After chemotherapy has been started, the study should not be undertaken until 6 - 8 weeks post-completion of the chemotherapeutic regimen. Exceptions will be made to these guidelines on a case-by-case basis. These exceptions will require special consultation between the referring physician and the Nuclear Medicine physician. The dictation will reflect the diagnostic uncertainties imposed by the chemotherapy.

Radiation Therapy:

Referring physicians will be encouraged to order FDG body scans prior to initiation of radiation therapy. After radiation therapy has been started, the study should not be undertaken until 6 - 8 weeks post-completion of the radiation therapy regimen. Exceptions will be made to these guidelines on a case-by-case basis. These exceptions will require special consultation between the referring physician and the Nuclear Medicine physician. The dictation will reflect the diagnostic uncertainties imposed by the radiation therapy. These limitations apply only to the primary site undergoing radiation therapy treatment. Remote sites may be imaged at any time.

Surgery:

Referring physicians will be encouraged to order FDG body scans prior to surgery. After surgery, the study should not be undertaken for a minimum of 6 - 8 weeks. Surgical complications, especially infection, may prolong this time. Exceptions will be made to these guidelines on a case-by-case basis. These exceptions will require special consultation between the referring physician and the Nuclear Medicine physician. The dictation will reflect the diagnostic uncertainties imposed by surgery. These limitations apply only to the primary surgical site. Remote sites may be imaged at any time.

Diabetic Patients:

The preferred fasting blood glucose is 60 - 120 mg/dl. If the blood glucose level is ≥ 200 mg/dl, consideration should be given to rescheduling the study. If the blood glucose level is between 120 and 200 mg/dl, the referring physician should be notified that the study may have decreased sensitivity and be given the option of rescheduling the patient. The dictation will reflect the diagnostic uncertainties imposed by non-ideal blood glucose levels.

Brain Imaging:

The brain will not be routinely included in body imaging. If a special need exists for the brain to be within the field of view (e.g., suspected scalp

lesions), the Nuclear Medicine physician will discuss this with the referring physician.

Sedation:

If sedation will be necessary during the study for pain control or due to a movement disorder, the referring physician will be asked to recommend an appropriate drug and dosage.

Patient preparation:

Adult:

NPO (except for water for medication administration) for 4 hours prior to injection of FDG. Patient may be allowed to drink a small amount of water or juice if necessary after the initial 20 minute uptake phase post-FDG injection.

Only diabetic patients are allowed to take small amounts of food (like crackers) to keep their glucose level under control if they cannot tolerate four hours without food. Diabetic patients will also be encouraged to regulate their blood sugars as much as they can prior to the imaging study. This will be discussed with the patient during the informational phone call by a PET nurse.

The patient should maintain his/her currently prescribed medication regimen prior to and during the imaging. The patient will be asked about pain medication at the time of scheduling and will be informed to bring any needed medication with them on the day of the study.

Radiopharmaceutical Dosage:

Adult: usual = 10 mCi ($\pm 10\%$) [^{18}F]fludeoxyglucose (FDG) I.V.

The dosage may be adjusted according to weight based on the following table:

Weight (kg)	Weight (lb)	Dose (mCi)	Dose (mCi/kg)	Max Volume Permitted (mL)
> 140	> 308	20.0	0.143	< 8.4
120 < wt \leq 140	264 < wt \leq 308	17.5	0.146 - 0.125	< 7.35
100 < wt \leq 120	220 < wt \leq 264	15.0	0.15 - 0.125	< 6.3
80 < wt \leq 100	176 < wt \leq 220	12.5	0.156 - 0.125	< 5.25
\leq 80	\leq 176	10.0	0.125	< 4.2

Pediatric: adjusted = 0.14 mCi / kg ($\pm 10\%$) [^{18}F]fludeoxyglucose (FDG) I.V.

Clinical Imaging Procedure:

1. Patient is interviewed for pertinent medical history and discussion of the PET procedure, and a physical exam may be performed by the attending Nuclear Medicine physician.
 - a. Any relevant medical history should be brought to the attention of the Nuclear Medicine physician. A PET staff member will assess blood pressure, pulse, height, weight, and blood glucose level. The presence or absence of diabetes and allergies will be ascertained based on patient history and information available in the medical record.
 - b. Any possibility of pregnancy and/or breast feeding must be ruled out prior to administration of the radiopharmaceutical. In rare circumstances, a PET study may be contemplated for a

pregnant patient, but as is the policy for any diagnostic procedure involving radiation, the benefits to the patient must be weighed against the potential risks to the fetus. The justification for any administration to a pregnant woman must be thoroughly documented in the patient's medical record. A breast feeding woman should be educated with respect to the potential risks to her infant and advised on the amount of time for which she should abstain from breast feeding. This physician/patient interaction should be documented in the patient's medical record.

2. Patient is asked to void if he/she is not to be catheterized.
3. Patient's height and weight are measured and recorded in the nursing notes and in the Patient Imaging Log.
4. If bladder irrigation is necessary to image the pelvic area, a triple lumen Foley catheter is inserted for bladder distention/irrigation.
5. Whole blood glucose level is determined via Accu-chek®. The value is recorded in the nursing notes, in the Patient Imaging Log and on the Physician Order for Radiologic/Nuclear Medicine Consultation/Request for Procedure Form referred to as the "requisition". The Nuclear Medicine physician will be notified when the value exceeds 120 mg/dl. There will be no intervention to regulate blood sugar above this value. The study may be canceled or proceed according to the decision of the Nuclear Medicine physician (see Scheduling Considerations: Diabetic Patients above).
6. An intravenous (I.V.) catheter is placed in an upper extremity vein. If a particular side of the body is of primary interest then the I.V. catheter should not be placed in the arm on that side. If a contralateral injection site cannot be accessed then the Nuclear Medicine Physician will determine if it is appropriate to place the I.V. in the arm on the side of primary concern or whether a foot vein should be used. For patients with an indwelling I.V. access (e.g., Hickman line), the attending Nuclear Medicine physician will determine if this port may be used for the injection.
7. FDG dose is injected. Time and location of the injection are recorded in the Patient Imaging Log as well as on the requisition.
8. The I.V. catheter is removed from the vein if other studies are not pending. The residual activity present in the syringe and I.V. tubing are assayed and used to determine the actual administered activity. Infiltration of the dose from the injection site is surveyed with either an ion chamber or Geiger counter.
9. Patient may be moved to imaging room and positioned on the imaging bed approximately 30 minutes post-injection.
 - a. If no foley catheter is used then the patient is encouraged to void prior to beginning the scan.
 - b. The exact areas to be imaged are determined by the Nuclear Medicine physician or based on predetermined protocols.

- c. If a patient has difficulty fitting into the tomograph with the arms by the sides, the Nuclear Medicine physician is contacted to evaluate the need to proceed with a compromised study.
 - d. Patient's skin is marked at the intersection of the laser lines in order to reposition the patient for the transmission scan which follows the emission scan.
 - e. Patient comfort is very important in controlling movement; pillows, leg bolsters, head holders, arm rests, elastic gauze, and warm blankets are used to improve patient comfort and for gaining the patient's cooperation.
 - f. Bladder irrigation may be necessary to image the pelvis.
 - g. Patient's head and arms are secured with a wrapped bedsheet to give support and to keep motion to a minimum.
 - h. If the brain is the organ that is of concern rather than the extracerebral structures, then a brain study will be performed separately according to the brain imaging protocol. Otherwise, the head and neck imaging will be performed as part of the body imaging procedure.
 - i. The head holder used for brain imaging research studies should not be used because the metallic bolts used to secure the headholder to the bed cause severe artifacts on the PET images.
10. Imaging will begin no sooner than 40 minutes post-injection.
- a. The length of the study, once acquisition begins is approximately 80 - 120 minutes. The patient is observed by a PET staff member at all times and direct communication is maintained at a minimum of 15 minute intervals during the imaging procedure to assess patient comfort.
 - b. Emission acquisition is performed first. Acquisition consists of a minimum of 6 minutes or a maximum of 10 minutes for each bed position (10 cm/bed position).
 - c. Transmission acquisition is performed immediately following the emission acquisition. The length of this acquisition is determined by the strength of the pin source, number of frames acquired, and the number of counts received from the patient in the emission scan.
 - 1. Transmission plus emission (T+E) count rate optimally should be 20 times that of just the emission count rate.
 - 2. The total counts acquired in the T+E scan should be at least 10 times the number of counts acquired in the emission scan.
11. After the transmission scan:
- a. The data are checked for completeness.
 - b. Lines drawn on patient are removed.
 - c. Bladder catheter is removed.
 - d. Patient is given juice.
 - e. Patient is assisted from the imaging table and asked to void.
12. The following post-study instructions are given:

- a. The patient should hydrate well and void frequently for the next few hours.
- b. The patient is reminded that for the next few hours he/she is radioactive and to be aware of this when around others.
- c. The patient is instructed to contact a physician if signs of a urinary tract infection develop.

Image Analysis and Display:

1. All images are reconstructed into a 128 x 128 matrix using 4 mm pixels.
2. Emission images are reconstructed first without attenuation correction.
3. Emission images are reconstructed with attenuation correction using the Hanning filter (Filter width:10) and attenuation filter width of 12 mm.
4. Reconstructed images are transferred to the ICON computer system for reformatting. Sagittal and coronal planes are created. Transmission-corrected and non-corrected images may be viewed side-by-side.
5. Hard copy image display will consist of summed transaxial slices (4mm x 4 slices = 16 mm thick slices) as well as sagittal and coronal reformatted non-attenuation corrected images resulting from 16 mm slicing. Hard copies of different formats may be obtained selectively by the Nuclear Medicine physician (e.g., SAVED SCREENS).
6. SUV Calibration Number worksheet is generated which will provide the necessary input information for the determination of SUV values from ROIs.

Protocol Review and Approval

Nuclear Medicine Physician

Date