Austin Radiological Association

Detectnet NEUROENDOCRINE TUMOR STUDY
(Cu-64 dotatate)

Overview

• Detectnet Cu-64 binds to somatostatin receptors to indicate the presence and density of somatostatin positive neuroendocrine tumors (NETs) in adult patients.

Indications

• Detectnet (Cu-64 dotatate) is indicated for use with positron emission tomography (PET) for localization of somatostatin receptor positive neuroendocrine tumors (NETs) in adult patients.

Medicare Oncologic PET Reimbursement Guidelines:

Indication	CPT	Coverage Guidelines
Localization of NETs in adult patients	78815	Tumor imaging, positron emission tomography (PET) with concurrently acquired computed tomography (CT) for attenuation correction and anatomical localization; skull base to mid-thigh
ICD-10	C61	Malignant neoplasm of prostate
	PS	Subsequent treatment strategy modifier

NOTE:
Private payer coverage for PET often reflects that of Medicare but may vary. Providers should obtain coverage and pre-authorization guidelines for PET from their private payers.

Examination Time

• Allow approximately 1.5 hours for the entire Detectnet PET/CT study.

• Prior to Scan: Allow 15 minutes for interview, IV, injection

• Image acquisition:
  1. 78815 (PET/CT skull base to mid-thigh)
     a. 24 - 32 minutes acquisition

Patient Preparation

- Hydration:
  Adequately hydrate prior to administration of Detectnet and for the first few hours following administration to reduce radiation exposure
- Somatostatin Analogs:
  - Image patients just prior to dosing with somatostatin analogs.
  - For patients on long-acting somatostatin analogs, a wash-out period of 28 days is recommended prior to imaging.
  - For patients on short-acting somatostatin analogs, a wash-out period of 2 days is recommended prior to imaging.
- Breastfeeding / Lactating Patients:
  - Advise these patients to interrupt breastfeeding for 12 hours after Detectnet administration in order to minimize radiation exposure to a breastfed infant.

Patient Uptake Phase

- 60 min uptake (45-90 min allowed by package insert)

Equipment & Energy Windows

- Imaging system:
  - ➢ Siemens Biograph Horizon PET-CT scanner.
  - ➢ GE Discovery ST PET-CT scanner.
- Collimators:
  - 3D mode (septa out or absent) *(Siemens Horizon 6 only has 3D function)*
  - 2D mode for GE Discovery ST, unless it has had the Dimension upgrade.

- Energy windows (may vary with manufacturer and machine design): 30% window centered at 511 keV.

Radiopharmaceutical, Dose, & Technique of Administration

- Radiopharmaceutical: Cu-64 Detectnet

- Dosing:

	Siemens	**GE**
Average Adult	4 mCi (148 MBq)	4mCi (148 MBq)

  Pediatric Patients – not applicable

  ARA RAM licensure allows +/- 20% dose variance.

- Technique of administration: Via standard intravenous injection or through an existing intravenous line.

Patient Positioning & Imaging Field

- Patient position: Supine, arms up

- Imaging field of view: Scan craniocaudal.

Acquisition Protocol

- Begin image acquisition 60 minutes

- Imaging times:
    ### Siemens Horizon
    ➢ Emission data acquisition: 4 minutes per bed

    - Bed 1 – 4 minutes
    - Bed 2 – 4 minutes
    - Bed 3 – 4 minutes
    - Bed 4 – 4 minutes
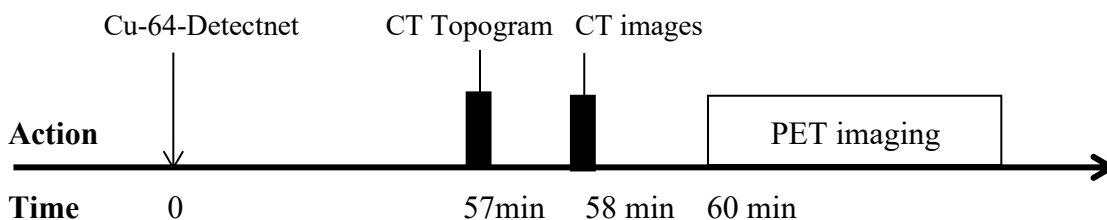   - Bed 5 – 4 minutes
    - Bed 6 – 4 minutes

    ### GE Discovery ST
    ➢ Emission data acquisition: 5 minutes per bed

CT parameter values vary with patient size and machine specific factors:
1. Milliampere-seconds (mAs) and Kilovolts peak (kVp) guidelines:
   a. Average adult: 90 eff mAs, 130 kVp.
   b. Siemens Care Dose may be utilized if available.

Protocol Summary Diagram

Data Processing

- The PET images are reconstructed using iterative reconstruction. <u>Siemens settings include:</u> matrix 180, 4 iterations, 10 subsets, Gaussian filter, filter FWHM 3.0, zoom 1.0. <u>GE settings include:</u> 180 matrix, 4 iterations, 10 subsets, OSEM, post filter 86.0, loop filter 4.69, Z axis filter – yes, diameter 70, center L 0, center P 0, attenuation type is measured.
- A rotating maximum intensity projection (MIP) display and surface-rendered 3D displays facilitate lesion evaluation.

Principle Radiation Emission Data – Cu-64

- Physical half-life = 12.7 hours

Radiation	Mean % per disintegration	Mean energy (keV)
Positron (β^+)	17.6	278
Beta (β^-)	38.5	190.7
Gamma ±	35.7	511

Dosimetry - Computed Tomography

- Actual effective doses will depend on the user-specific exam protocols and the specific CT scanner used. It is important that each facility develop appropriate exam protocols and monitor the resultant patient doses for each machine in use.

Effective dose	rem	mSv
Diagnostic CT	0.15	1.5
Low dose CT	0.01	0.1

The (radiation absorbed) effective dose resulting from the administration of the recommended activity of 148 MBq (4 mCi) of Detectnet is 4.7 mSv. For an administered activity of 148 MBq (4 mCi), the typical radiation dose to the critical organs, which are the liver, the kidneys/adrenals, and the spleen, are about 24 mGy, 21 mGy, and 17 mGy, respectively. Because the spleen has one of the highest physiological uptakes, higher uptake and radiation dose to other organs or pathologic tissues may occur in patients with splenectomy. If a CT scan is simultaneously performed as part of the PET procedure, exposure to ionizing radiation will increase in an amount dependent on the settings used in the CT acquisition.

Table 1: Estimated Radiation Absorbed Doses in Various Organs/Tissues in Adults who Received Detectnet	
Organ/Tissue	**Mean Absorbed Dose per Unit Administered Activity (mGy/MBq)**
Adrenal glands	0.137
Brain	0.013
Breasts	0.013
Gallbladder wall	0.040
Lower large intestine wall	0.043
Small intestine wall	0.066
Stomach wall	0.019
Upper large intestine wall	0.022
Heart wall	0.019
Kidneys	0.139
Liver	0.161
Lungs	0.017
Muscle	0.019
Ovaries	0.019
Pancreas	0.093
Red bone marrow	0.027
Osteogenic cells	0.034
Skin	0.012
Spleen	0.115
Testes	0.014
Thymus gland	0.015
Thyroid	0.014
Urinary bladder wall	0.037
Uterus	0.019
Total body	0.025
Effective dose	**0.032 (mSv/MBq)**