Austin Radiological Association

Ga-68 NETSPOT
(Ga-68 dotatate)

Overview

- Ga-68 dotatate binds to somatostatin receptors, with highest affinity for subtype 2 receptors (sstr2). It binds to cells that express somatostatin receptors including malignant cells, which overexpress sstr2 receptors. Gallium 68 (68Ga) is a β+ emitting radionuclide with an emission yield that allows positron emission tomography (PET) imaging.

Indications

- NETSPOT^{TM} (Ga-68 Dotatate) injection is indicated for positron emission tomography (PET) for localization of somatostatin receptor positive neuroendocrine tumors (NETs) in adult and pediatric patients.

Medicare Oncologic PET Reimbursement Guidelines:

Indication	Coding	Coverage Guidelines
NETs	78815	Tumor imaging, positron emission tomography (PET) with concurrently acquired computed tomography (CT) for attenuation correction and anatomical localization; skull base to mid-thigh
HCPCS	A9587	Gallium Ga-68 dotatate, diagnostic, 0.1 mCi
ICD-10	C7A.00 C7A.098	Malignant carcinoid tumor of unspecified site - through Malignant carcinoid tumor of other sites
	PI	Initial treatment strategy modifier
	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 - 2 hours for the entire NETSPOT 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. 20 - 30 minutes acquisition
            i. <50cm = 4 minutes per bed
            ii. 50cm> = 5 minutes per bed

Patient Preparation

- Instruct patients to hydrate before and after examination, as tolerated.
- Image just prior to dosing with long-acting analogs of somatostatin.
- Short-acting analogs of somatostatin may be used up to 24 hours prior to imaging.
- Question patient on analog type and last dose. Question if on steroids, can increase expressed receptors.

Equipment & Energy Windows

- Imaging system:
    - ➤ Siemens Biograph 16 PET-CT scanner.
    - ➤ GE Discovery ST PET-CT scanner.
- Collimators:
    - 3D mode (septa out or absent) *(Siemens Biograph 16 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: Ga-68 dotatate

- Dosing:

	Siemens	**GE**
Average Adult	5.4 mCi (200 MBq)	5.4mCi (200MBq)

Pediatric Patients – 2 MBq/kg of body weight (0.054 mCi/kg) up to 200MBq

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

- Technique of administration: Inject via standard intravenous injection or through an existing intravenous line. Flush with saline post injection.

Patient Positioning & Imaging Field

- Patient position: Supine, arms up.

- Imaging field of view: Scan cranial – caudal from skull base to mid-thigh.

Acquisition Protocol

- Have the patient empty his/her bladder before image acquisition.

- Begin image acquisition 60 minutes post-injection with a 40 – 90 minute imaging window.

- Imaging times:

  ### Siemens Biograph 16
  - Emission data acquisition: 4 - 5 minutes per bed based on body habitus.

  ### GE Discovery ST
  - Emission data acquisition: 4 - 5 minutes per bed based on body habitus.

- Have the patient empty his/her bladder after image acquisition.

CT parameter values vary with patient size and machine specific factors:
1. Milliampere-seconds (mAs) and Kilovolts peak (kVp) guidelines:
   a. Average adult: 55 eff mAs, 120 kVp.
   b. Siemens Care Dose may be utilized if available.

Protocol Summary Diagram

	Ga-68 NETSPOT		CT Topogram	CT images		
Action					PET imaging	
Time	0		57min	58 min	60 min	
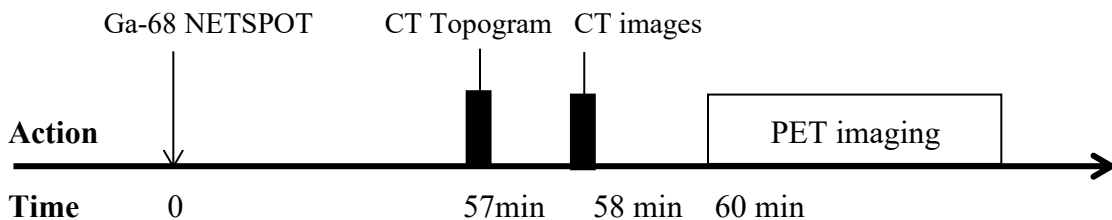
Data Processing

•   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> 128 matrix, 2 iterations, 20 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 – Ga-68

•   Physical half-life = 68 minutes.

Radiation	Mean % per disintegration	Mean energy (keV)
Positron	89	836
Gamma ±	178	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

Table 1 Estimated Radiation Absorbed Dose per Injection Activity in Selected Organs and Tissues of Adults after a Ga 68 Dotatate Injection Dose

Absorbed Dose per Injection Activity in Selected Organs and Tissues of Adults	mGy/MBq		mGy/150 MBq
	Mean	**SD**	
Adrenals	0.086	0.052	12.90
Brain	0.010	0.002	1.50
Breasts	0.010	0.002	1.50
Gallbladder wall	0.016	0.002	2.40
Lower large intestine wall	0.015	0.002	2.25
Small intestine	0.025	0.004	3.75
Stomach wall	0.013	0.002	1.95
Upper large intestine wall	0.021	0.003	3.15
Heart wall	0.018	0.003	2.70
Kidneys	0.093	0.016	13.95
Liver	0.050	0.015	7.50
Lungs	0.006	0.001	0.90
Muscle	0.012	0.002	1.80
Ovaries	0.016	0.001	2.40
Pancreas	0.015	0.002	2.25
Red marrow	0.015	0.003	2.25
Osteogenic cells	0.021	0.005	3.15
Skin	0.010	0.002	1.50
Spleen	0.109	0.058	16.35
Testes	0.010	0.001	1.50
Thymus	0.012	0.002	1.80
Thyroid	0.011	0.002	1.65
Urinary bladder wall	0.098	0.048	14.70
Uterus	0.015	0.002	2.25
Total body	0.014	0.002	2.10
Effective dose per injection activity	**mSv/MBq**		**mSv/150 MBq**
	0.021	0.003	3.15

Table 2 Estimated Radiation Effective Dose per Injection Activity after a Ga 68 Dotatate Injection Dose

Age	Effective Dose per Injection Activity (mSv/MBq)
Adult	0.021
15 years	0.025
10 years	0.040
5 years	0.064
1 year	0.13
Newborn	0.35

Table 2 indicates how effective dose per injection activity scales with body habitus in computational models of adult and pediatric patients.

Table 3 Principal Radiation Emission Data (>1%)

Radiation /Emission	% Disintegration	Mean Energy (MeV)
beta+	88%	0.8360
beta+	1.1%	0.3526
gamma	178%	0.5110
gamma	3%	1.0770
X-ray	2.8%	0.0086
X-ray	1.4%	0.0086

Table 6 Physical Decay Chart for Gallium Ga 68

Minutes	Fraction Remaining
0	1.000
15	0.858
30	0.736
60	0.541
90	0.398
120	0.293
180	0.158
360	0.025