



Austin Radiological Association

Nuclear Medicine Procedure

NEUROENDOCRINE TUMOR - SOMATOSTATIN RECEPTOR STUDY (In-111-Pentetreotide [OctreoScan®])

Overview

- The Neuroendocrine Tumor - Somatostatin Receptor Study primarily images neoplasms that arise from the embryologic neural crest and express a high density of somatostatin receptors on their cell membranes. These tumors are often referred to as neuroendocrine tumors because many of them secrete hormones. In-111-pentetreotide is a radiolabeled chemical analog of the naturally occurring hormone somatostatin which suppresses growth hormone secretion.

Indications

- Detection and localization of neuroendocrine tumors:
 1. Carcinoid tumors.
 2. Insulinomas.
 3. Paragangliomas.
 4. Gastrinomas.
 5. Pheochromocytomas.
 6. Neuroblastomas.
 7. Glucagonomas.
 8. Small cell lung cancers.
 9. Medullary thyroid cancers.
- Detection and localization of meningiomas.
- Selection of patients with carcinoid and other tumors who are likely to benefit from octreotide therapy.
- Diagnosis of rejection in cardiac transplants.

Examination Time

- Initially: 15 minutes for injection of the radiopharmaceutical.
- Later: 2 hours for imaging at 24 hours.

Patient Preparation

- Stop octreotide therapy for 72 hours prior to the study.

- Hydrate patients with at least two glasses of water to enhance renal clearance.
- A mild laxative, e.g. Bisacodyl, the day of injection of the radiopharmaceutical.
- In patients suspected of having an insulinoma, administer an intravenous drip of a glucose solution, e.g. D5W, just prior to and during injection of the radiopharmaceutical.
- OctreoScan should precede any study involving an oral barium prep.

Equipment & Energy Windows

- Gamma camera: Large field of view with SPECT capability, preferably with opposing dual heads.
SPECT/CT for attenuation correction and anatomic localization.
- Collimator: Medium (or high) energy, parallel hole.
- Energy windows:
 - One pulse height analyzer: 156 to 272 keV.
 - Two pulse height analyzers: 20% windows centered at 171 and 245 keV.
 - For SPECT/CT: 15% windows centered at 172 and 247 keV plus upper and lower scatter windows.
- Computer with SPECT processing software.

Radiopharmaceutical, Dose, & Technique of Administration

- Radiopharmaceutical: In-111-pentetreotide (OctreoScan®).
- Dose: 6 - 8 mCi (222 – 296 MBq) for planar and SPECT imaging. Pedi dose by NACG chart.
- Technique of administration: Standard intravenous injection via placed in-dwelling I.V. catheter.

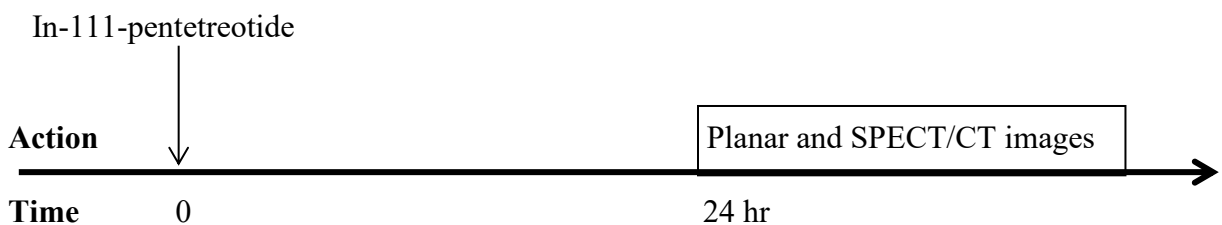
Patient Position & Imaging Field

- Patient position: Supine.
- Imaging field: Head to below pelvis.

Acquisition Protocol

- Acquire images at 24 hours. Delayed imaging at 48 hours if deemed necessary by the radiologist (this is usually to visualize change in bowel appearance after patient is given another round of laxatives).
- Moving acquisition protocol:
 1. Performed at 24 hours from the head to below the pelvis.
 2. Acquire ANT and POST images using a camera/table motion of approximately 8 cm/min.
- Static acquisition protocol, if needed:
 1. The nuclear medicine physician will specify the portion of the body to be imaged, usually chest, abdomen and pelvis.
 2. Acquire ANT and POST images for approximately 10-12 minutes each.
- SPECT imaging: usually routine for the abdomen and pelvis at 24 hours with additional SPECT imaging of the chest performed depending on site of tumors.
 1. Image acquisition parameters for dual-head SPECT:
 - a) degrees of rotation: 180°
 - b) number of images: 60.
 - c) time per image: 25 - 30 seconds.
- It is essential to have a recent computed tomography study of the abdomen and pelvis for correlation, if SPECT performed without SPECT/CT.

Protocol Summary Diagram



Data Processing

- SPECT image reconstruction:
 1. The exact procedure for processing SPECT images depends on the computer software being used. This varies with the manufacturer and, in general, the manufacturer's protocol should be followed.

2. The reconstruction process in general terms is:
 - a) correct the 60 planar images for uniformity (camera non-uniformity) using a high count, e.g. 30 million count, cobalt-57 flood acquisition.
 - b) check the images for patient motion and apply a motion correction algorithm if indicated and if available.
 - c) if the entire field of view is not of interest, indicate the region that is of interest to conserve computer time during reconstruction.
 - d) specify the filters to be used in the reconstruction process and the pixel thickness of the tomogram (usually 1 or 2 pixels).
 - e) reconstruct transverse, sagittal, and coronal images.

Optional Maneuvers

- Computed tomography and SPECT image fusion: May be accomplished by adding external fiducials to both studies.
- Intraoperative probes: Tumor deposits may be localized intraoperatively with hand held probes.

Method for timely correction of Data Analysis and reporting errors and notification of referring parties

- Data Analysis and reporting errors are reported to the interpreting physician and appropriate clinic manager for timely correction and notification of the referring physician via report addendum or STAT call if error is significant.

Principle Radiation Emission Data - In-111

- Physical half-life = 2.83 days.

Radiation	Mean % per disintegration	Mean energy (keV)
Gamma-2	90.2	171.3
Gamma-3	94.0	245.3

Dosimetry - In-111-Pentetreotide

Organ	rads/6 mCi	mGy/222 MBq
Spleen	14.8	147.7
Kidney	10.8	108.3
Bladder	6.1	60.8
Liver	2.4	24.3
Colon	1.6	15.5
Adrenals	1.5	15.1
Thyroid	1.5	14.9
Uterus	1.3	12.7
Stomach	1.1	11.4
Ovaries	1.0	9.8
Small intestine	1.0	9.6
Red marrow	0.7	6.9
Testes	0.6	5.8