Parathyroid Imaging

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Responsible Division: Division of Nuclear Medicine, Department of Radiology, UT Southwestern

POLICY BASIS FOR PROCEDURE

- To establish a clinical protocol for parathyroid imaging with Tc-99m-sestamibi

SCOPE

All NUCLEAR MEDICINE Technologists and Physicians must adhere to these guidelines when performing planar parathyroid imaging and parathyroid imaging with SPECT/CT.

INDICATION

- Detect and localize parathyroid adenomas

PROCEDURE:

Examination Time

Single isotope, dual phase method:

- Injection and Early Planar Imaging: 20 minutes.
- Delayed imaging (SPECT-CT and Planar Imaging): 60 minutes

Patient Preparation

- For the pregnant or potentially pregnant and breastfeeding mothers, a pregnancy screening form must be administered. The attending physician must be notified of a positive pregnancy test result and will provide instruction on how to proceed.

Equipment and Energy Windows:

- Gamma camera: Large field of view
- SPECT-CT
- Collimator:
  Parallel hole, high resolution
  Energy windows: 20% window centered at 140 keV

Radiopharmaceutical, Dose and Techniques of Administration

- Radiopharmaceutical: Tc-99m-sestamibi
- Dose: 25 mCi (925 MBq)

Technique of administration:

- Standard intravenous injection

Patient Position and Imaging Field

- Patient position:
  Supine with head and neck extended and immobilized
- Imaging field:
  Tip of nose to the upper two thirds of the mediastinum

Acquisition Protocol

- Single isotope, dual phase method
  Imaging at 10 minutes (early) and 60 minutes – 120 minutes (delayed) post injection

Images at each time period:

- Early (10 minutes post injection): 10 minute ANT image of neck and upper mediastinum.
- Delayed (60 minutes post injection): 10 minute ANT image of neck and upper mediastinum. Additionally, a 1 minute static planar image of the neck and upper mediastinum with radioactive marker at the sternal notch should be obtained and merged with the 10 minute delayed planar acquisition.
- Delayed (60-120 minutes post injection): SPECT-CT of neck and upper mediastinum.
- Delayed SPECT-CT imaging:
  - Degrees of rotation: 360°.
  - Number of images: 64.
  - Time per image: 20 seconds.
  - Acquisition time: 30 minutes
  - CT parameters: Care Dose 4D to modulate mAs; quality reference mAs 200; kVp 120; rotation time 0.5s; Pitch 0.5s; Slice 5.0mm; direction craniocaudal. Reconstruct 3mm axial CT images using smooth reconstruction kernel

Data Processing

- Display Immediate and delayed images with substernal marker
- Process SPECT/CT with AC correction and fuse images with CT
- Send processed data to physicians for review before releasing patient

Optional Maneuvers

- Intraoperative localization of parathyroid tissue: A gamma probe or hand-held miniature gamma camera may be used at the time of surgery with injection of Tc-99m-sestamibi 1-2 hour prior to surgery
- Parathyroid autografts: May be evaluated for hyperfunction with the same technique

Principle Radiation Emission Data (Tc99m)

- Physical half-life: 6.01 hours
- Radiation: Gamma

- Mean % per disintegration: 89.07%
- Mean energy: 140.5 keV

Dosimetry - Tc-99m-Sestamibi (3)

Effective dose	rems/25 mCi	mSv/925 MBq
Whole body	0.838	8.38

References:

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3. Wackers FJT, Berman DS, Maddahi J, et al: Technetium-99m hexakis 2-methoxyisobutyl isonitrile: Human biodistribution, dosimetry, safety, and preliminary comparison to thallium-201 for myocardial perfusion imaging. 1989. J Nucl Med 30:301-311.

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