Austin Radiological Association

Nuclear Medicine Procedure

RENAL STUDY – TUBULAR FUNCTION – CORTICAL IMAGING (Tc-99m-DMSA)

Overview

- Tc-99m-DMSA is cleared from blood into the renal tubular cells, but not secreted into the tubular lumen. Thus, the Tubular Function Study depicts tubular function without interference from radioactivity in the collecting system.

Indications

- Diagnosis of acute and chronic pyelonephritis.
- Differentiation of renal masses from normal variants.
- Quantification of regional renal function.

Examination Time

- Initially: 15 minutes for injection of the radiopharmaceutical.
- Delayed images at 3 hours: 1 hour for image acquisition.

Patient Preparation

- None.

Equipment & Energy Windows

- Gamma camera: Large field of view.
  Rotating gamma camera.
- Collimator: Low energy, high resolution, parallel hole.
- Energy window: 20% window centered at 140 keV.

Radiopharmaceutical, Dose, & Technique of Administration

- Radiopharmaceutical: Tc-99m-dimercaptosuccinic acid (Tc-99m-DMSA).
- Dose: 5 mCi (185 MBq). Pediatric patients use NACG.
- Technique of administration: Standard intravenous injection.

Patient Position & Imaging Field

- Patient position: Supine and prone.
- Imaging field: Kidneys (upper abdomen).

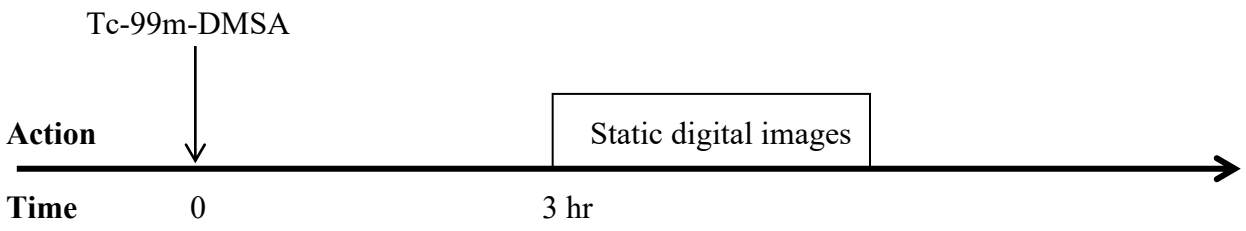
Acquisition Protocol

- Convert the large field of view electronically to a 10-inch field of view or use a small field of view camera. Use 1.45 Zoom on e.cam.
- 3 hours following injection, position the patient supine and acquire POSTERIOR image for approximately 400 K counts.
- Next, acquire RAO and LAO images for the same time as the initial POST image.
- Acquire RPO and LPO images for the same time as the initial POST image.
- Optional SPECT tomography:
  1. Image acquisition parameters:
     a) degrees of rotation: 360°.
     b) number of images: 60.
     c) time per image: 30 seconds.
  2. Data processing:
     a) reconstruct transverse, sagittal, and coronal image.
     b) filter selection depends on computer software package. Preferred method is Flash 3D iterative processing with Gaussian filter.

Optional Maneuvers

- May use pinhole collimator on infants or small children.
- May use SPECT/CT if available

Protocol Summary Diagram



Data Processing

- Using the POST digital image, place regions of interest around both kidneys and below both kidneys for background (if manually calculating).

- Calculate the background corrected counts in each kidney and the percent of total counts in each kidney:

$$\text{Percent function right kidney} = \frac{(A-B)\ R}{(A-B)\ R + (C-D)\ L} \times 100\%$$

Where: A = counts per pixel in right kidney region of interest
B = counts per pixel in right background region of interest
R = pixels in right kidney region of interest
C = counts per pixel in left kidney region of interest
D = counts per pixel in left background region of interest
L = pixels in left kidney region of interest

- Send two screen saves to PACS –
  - Static Images
  - Split function display

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 - Tc-99m

- Physical half-life = 6.01 hours.

Radiation	Mean % per disintegration	Mean energy (keV)
Gamma-2	89.07	140.5

Dosimetry - Tc-99m-DMSA

Organ	rads/5 mCi	mGy/185 MBq
Renal cortices	4.25	42.5
Kidneys (total)	3.15	31.5
Bladder wall	0.35	3.5
Liver	0.16	1.6
Total body	0.08	0.8
Bone marrow	0.11	1.1
Ovaries	0.07	0.7
Testes	0.03	0.3