



Austin Radiological Association

Nuclear Medicine Procedure

CYSTOGRAM

(Tc-99m-Pertechnetate as Sodium Pertechnetate)

Overview

- The radionuclide retrograde or direct Cystogram is used for the diagnosis and follow-up of vesicoureteral reflux. In general, the study is more sensitive than radiographic methods because of the high contrast between instilled radioactivity in the bladder and the lack of radioactivity outside of the bladder.

Indications

- Evaluation of vesicoureteral reflux.

Examination Time

- 45 minutes.

Patient Preparation

- Obtain written informed consent.
- Cover the examination table with absorbent paper to avoid contamination with the radiopharmaceutical.
- Cleanse the urethral meatus and surrounding tissues with an aseptic solution; anesthetic jelly (lidocaine) may be used in males.
- Insert an age appropriate Foley catheter and inflate the balloon.
- Connect the catheter to a 500 mL bottle of normal saline that is positioned not more than 100 cm above the table; keep the tubing clamped.

Equipment & Energy Windows

- Gamma camera: Large field of view (small field of view may be used for a small child).
- Collimator: Low energy, high resolution, parallel hole.
- Energy window: 20% window centered at 140 keV.
- Computer: Optional.

Radiopharmaceutical, Dose, & Technique of Administration

- Radiopharmaceutical: Tc-99m-pertechnetate as sodium pertechnetate.
- Dose: 1 mCi (37 MBq). Pedi dose by NACG chart.
- Technique of administration: Inject into rubber injection port of Foley catheter.

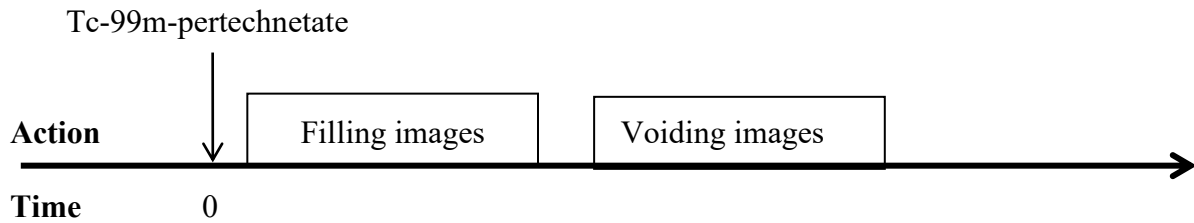
Patient Position & Imaging Field

- Patient position: Supine.
- Imaging field: Base of bladder to top of kidneys.

Acquisition Protocol

- Position the camera under the table for POST images.
- Open the clamp on the tubing; once flow into the bladder is established, inject the radiopharmaceutical.
- Acquire serial images during filling and voiding:
 - Acquire serial 30-second digital images for cine display.
 - Acquire serial 30-second analog images.
- The amount of saline required to fill the bladder varies greatly and ranges from 200 to 500 mL. If the child is too young to say when his bladder is full, watch for restlessness, up going toes, etc.:
 1. Peak bladder volume may be estimated from the formula:
$$\text{Bladder volume (ounces)} = \text{age} + 2. \quad [1 \text{ ounce} = 30 \text{ mL}]$$
- Record the volume required to fill the bladder.
- LPO and RPO images may be obtained at this time by moving the patient (place a wedge under first one side, then the other).
- For voiding images, infants remain supine and older children sit with the camera positioned upright behind them. Deflate the balloon and then remove the catheter while the child voids.
- Acquire at least 1 post-void image.

Protocol Summary Diagram



Data Processing

- None.

Optional Maneuvers

- Quantitation of residual volume:
 1. Measure the volume of urine, which was voided (this measurement must be accurate).
 2. Place regions of interest over the bladder in the digital images corresponding to maximum filling and maximum emptying (post-void).
 3. Determine the counts per minute in each region of interest.

4. Residual volume (mL) =
$$\frac{B \times V}{A - B}$$

Where: A = radioactivity in bladder when full (cts per min)

B = radioactivity in bladder post void (cts per min)

V = voided urine volume (mL)

- Cyclic voiding cystography: Multiple fillings and voidings of the bladder may increase sensitivity for ureteral reflux.
- Indirect radionuclide cystography: May be used as an alternative method of assessing vesicoureteral reflux using Tc-99m DTPA.

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.

<u>Radiation</u>	<u>Mean % per disintegration</u>	<u>Mean energy (keV)</u>
Gamma-2	89.07	140.5

Dosimetry - Tc-99m-Pertechnetate as Sodium Pertechnetate

<u>Organ</u>	<u>rads/1 mCi</u>	<u>mGy/37 MBq</u>
Bladder	0.025	0.25
Ovaries	0.002	0.02