Austin Radiological Association

LEVEEN SHUNT STUDY
(Tc-99m-Macroaggregated Albumin, Tc-99m-Sulfur Colloid)

Overview

- The LeVeen Shunt Study evaluates the patency of connections between the peritoneal cavity and the venous system or other cavities by tracing the movement of non-absorbable labeled particles.

Indications

- Evaluation of the patency of peritoneo-venous (LeVeen) shunts.
- Evaluation of the patency of other connections with the peritoneal cavity.

Examination Time

- 1 hour; delayed images may be necessary.

Patient Preparation

- None.

Equipment & Energy Windows

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

Radiopharmaceutical, Dose, & Technique of Administration

- Radiopharmaceutical: Tc-99m-sulfur colloid.
  > Tc-99m-macroaggregated albumin (Tc-99m-MAA).
  > Tc-99m-albumin colloid.
- Dose:
  > Colloid: 3 mCi (111 MBq).
  > Macroaggregated albumin: 5 mCi (185 MBq).
- Technique of administration: Intraperitoneal:
  1. Injection is performed by the nuclear medicine physician usually in RLQ or LLQ.

2. Ultrasound imaging may be useful in locating pockets of ascites.
3. Lidocaine injected by tuberculin syringe/needle followed by 22g, deeper.
4. 18 -20 gauge angiocath (2.5 – 3.5 inch) placed for injection
5. Pull back to ensure there is peritoneal fluid (ascites) in empty syringe
6. Replace with radiopharmaceutical and inject
7. Gently roll patient side to side for about a minute.

Patient Position & Imaging Field

- Patient position: Supine.

- Imaging field: Abdomen and chest.

Acquisition Protocol

- Mix the radiopharmaceutical within the ascites by ballottement of the anterior abdomen and/or rolling the patient side to side.

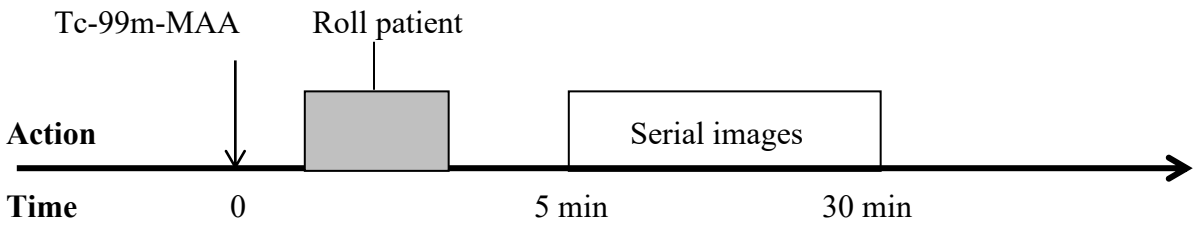
- Acquire dynamic ANT images of abdomen and chest (entire length of shunt tubing) for 30 minutes:
  1. Acquire each image for 1 minute.
  2. Expose the images so that background activity is just visible.

- Timing of delayed images, if any, will depend on the findings in the initial images. Show the images through 30 minutes to the nuclear medicine physician.

- If the activity does not reach the lungs within 30 minutes, one can take the patient off the table for 30-45 minutes and re-scan for an additional 30 minutes at 1min/frame.

- Note: normal shunts typically show activity in the lungs within 10 minutes. Partially obstructed shunts show lung activity in 25 – 60 minutes. High-grade obstruction leads to either no lung activity or lung activity > 60 minutes.

Protocol Summary Diagram



Data Processing

- None.

Optional Maneuvers

- Direct injection into shunt tubing: The radiopharmaceutical may be injected directly into the shunt tubing rather than the peritoneal cavity.

- Evaluation of pericardio-peritoneal windows and diaphragmatic disruptions.

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-Sulfur Colloid (will vary greatly with patency of shunt)

Organ	rads/3 mCi	mGy/111 MBq
Liver	1.02	10.2
Spleen	0.63	6.3
Bone marrow	0.03	0.3
Total body	0.04	0.4
Ovaries	0.02	0.2
Testes	0.002	0.02

Dosimetry - Tc-99m-Macroaggregated Albumin (will vary greatly with patency of shunt)

Organ	rads/6 mCi	mGy/222 MBq
Lungs	1.10	11.0
Bladder wall		
2 hour void	0.15	1.5
4.8 hour void	0.27	2.7
Liver	0.09	0.9
Spleen	0.08	0.8
Total body	0.08	0.9
Kidneys	0.06	0.6
Ovaries		
2 hour void	0.04	0.4
4.8 hour void	0.05	0.5
Testes		
2 hour void	0.03	0.3
4.8 hour void	0.039	0.39