Austin Radiological Association

Nuclear Medicine Procedure

LYMPHOSCINTIGRAPHY
(Tc-99m-Sulfur Colloid [Filtered])

Overview

- The Lymphoscintigraphy Study demonstrates the flow of lymph from the site of injection in the interstitial space through the draining lymphatics and into the sentinel lymph node(s).

Indications

- Identification and localization of draining lymph node groups and sentinel nodes in melanoma.
- Identification and localization of draining lymph node groups and sentinel nodes in breast cancer.
- Identification and localization of draining lymph node groups and sentinel nodes in cancers other than melanoma and breast cancer.
- Evaluation of primary and secondary lymphedema.

Examination Time

- Routine study: 2-3 hours.

Patient Preparation

- None, unless study is for lymphedema and patient wears elastic stockings, then remove them 3-4 hours prior to start of exam.
- Topical anesthetic, such as EMLA, is applied 45 minutes pre-injection, for pain control.

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, filtered through a 0.1-0.25 μm filter.
- Dose: 0.5-2 mCi (74 MBq) total. Pedi dose by NACG chart.
- Technique of administration:
  - Melanoma:
    1. To prevent skin contamination (which complicates interpretation), drape the area of lesion with a large waterproof drape. Cut a small window to expose the lesion.
    2. Use 0.5 mCi in a small total volume of about 1.0 mL in TB syringe with 26g needle. Have multiple needles on hand for injections.
    3. Draw 0.1ml 1% lidocaine into syringe.
    4. Make several (5-10) intradermal injections of 0.1 mL each around the primary lesion. It is essential that the injection is intradermal (producing a wheal) and not subcutaneous.
    5. Carefully place a small square of gauze over the puncture site before withdrawing the needle to absorb any excess extruded radiopharmaceutical.
  - Breast cancer:

    Subdermal/periareolar injection:

    1. Use a volume of about 1.0 mL in each of 4 TB syringes with 26g needle, 125 uCi per syringe.
    2. Draw 0.1ml 1% lidocaine into each syringe.
    3. Inject just underneath the areola subdermally, around the areola at 3, 6, 9, and 12 o'clock.
    4. Alternative: use one syringe containing 0.5 mCi and 0.1ml 1% lidocaine for one subdermal areolar injection. If multiple injections are performed with one syringe, use a new needle for each injection.
  - Lymphedema of the extremities:
    1. Pain control: Apply EMLA cream to injection site 45 min before injecting the radiopharmaceutical.
    2. Order 4 small volume filtered sulfur colloid doses run through a .1-.2micron filter (special pharmacy request) of 500 uCi each.
    3. Inject 0.5 mL subcutaneously into two web spaces of the foot or hand, usually between the second and third, third and fourth rays. It is essential that the injection is subcutaneous. The contra lateral side is also injected for comparison and for evaluation of disease.
    4. Patient to perform toe lifts or squeeze ball prior to imaging.

Patient Position & Imaging Field

- Patient position: Same position that is to be used for surgery if sentinel node exam.

- Imaging field: Depends on location of the primary tumor. Include all possible drainage pathways.
  - > For melanoma of the torso: Always include both axilla and both inguinal areas.
  - > For melanoma of the head and neck: Drainage is always inferior, so do not inject below lesion or you may obscure a nearby sentinel node.
  - > For breast cancer: Always include the axilla and mammary nodes regardless of the position of the lesion in the breast.
  - > For lymphedema of the extremities: Both lower extremities, pelvis, and abdomen, or both upper extremities including the chest.

Acquisition Protocol

- Image projection:
  - > Melanoma: Usually ANT or ANT and POST projections, other projections such as LAT as needed.
  - > Breast: ANT and appropriate LAT projections. (May be obtained simultaneously with variable angle dual head gamma camera).
  - > Lymphedema of the extremities: ANT or ANT and POST projections, whole body imaging from liver to toes for lower extremities, done immediate, 1 hour and 2.5 – 3 hour delays.

- Acquire ANT images of the entire imaging field from 0 - 60 minutes:
  Whole body technique with a scan rate of 8-10 cm/min.
  SPECT/CT as requested by the Radiologist.

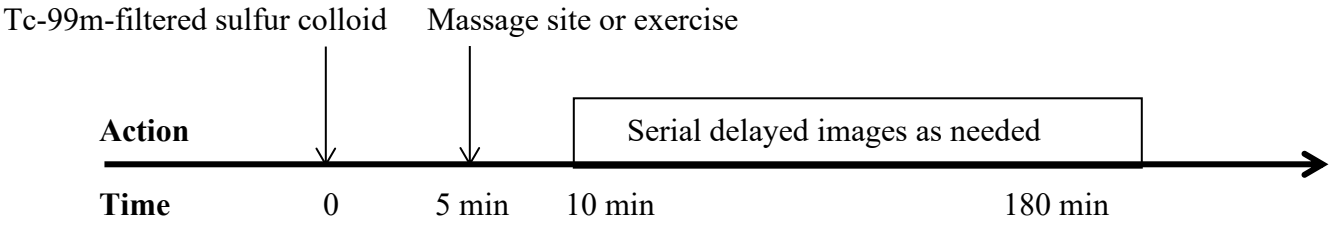
  If no migration of tracer is seen after 15 minutes, gently massage injection site.

- Optional: Using an indelible marker, carefully mark the major lymph channels, node groups, and sentinel node (the first draining lymph node in a given direction to accumulate tracer) on the patient's skin. Use a radioactive source and persistence scope to determine where to place the marks. (These marks will guide surgery.)

- Acquire a delayed image(s) of the drainage territory at 1-2 hours if the sentinel node has not been identified earlier.

- If using SPECT/CT imaging, mark the injection site with a fiducial marker.

Protocol Summary Diagram



Data Processing

- Expose digital images so that background counts are just visible.

Intraoperative Localization

- Intraoperative localization of lymph nodes is done with a gamma probe or with both a gamma probe and blue dye.

Optional Maneuvers

- Two-day protocol: The radiopharmaceutical may be injected the day before surgery without a decrease in accuracy of identifying the sentinel node. Use 2.0 mCi for late in the day injection.

- Localization of lymph structures relative to the patient's body:
  > A simultaneous transmission image may be obtained with a dual head camera.
  > The body may be outlined with a radioactive source.

- Postoperative lymphoscintigraphy: May be performed to evaluate the completeness of surgical lymph node dissection.

- Standing stress test for lymphoscintigraphy of the legs: Lymphoscintigraphy may be performed both supine and erect in the same session.

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-Sulfur Colloid

Organ	rads/1 mCi	mGy/37 MBq
Injection site	0.44	4.4
Regional lymph nodes	0.03	0.3