Austin Radiological Association

Nuclear Medicine Procedure

MOLECULAR BREAST IMAGING (MBI)
(Tc-99m-Sestamibi)

Overview

- The Molecular Breast Imaging Study has a high sensitivity and a high specificity for the detection of malignant breast lesions. It is primarily indicated as a complementary imaging test to mammography in patients with indeterminate mammographic findings or findings suggestive of a malignant breast lesion, in patients scheduled for breast surgery, in patients scheduled to neoadjuvant therapy and in patients who require additional evaluation but are unable to undergo a contrast-enhanced breast MRI. Recent reports have attested to the potential clinical usefulness of this agent in patients with suspected breast cancer.

Indications

- Screening with intermediate risk of breast cancer (increased by not $\geq$ 20%), specifically those with a personal history of breast cancer.
- Screening in patients with a history of silicone injections
- Patients who need but cannot undergo MRI (pacemaker, gadolinium allergy, body habitus, severe claustrophobia, severe renal disease)
- Problem solving indeterminate imaging findings
- Monitor neoadjuvant chemotherapy response
- Nipple discharge
- Persistent clinical concern with negative imaging
- Screening with average risk and D3/D4 breasts

Additional Considerations

- Verify that patient is not pregnant
- Best to image between days 1-10 of the menstrual cycle
- A current screening mammogram should be available

Examination Time

- 60 minutes

Patient Preparation

- None.

Equipment & Energy Windows

- Gamma camera: LumaGEM solid-state CZT small field of view.
- Collimator: registered optimized tungsten.
- Energy windows: 110 – 154 keV centered at 140 keV.
- Computer with Segami acquisition and processing.

Radiopharmaceutical, Dose, & Technique of Administration

- Radiopharmaceutical: Tc-99m-sestamibi.
- Dose: 4-8 mCi (148 - 296 MBq).
- Technique of administration: Standard intravenous injection in contralateral arm. Utilize three-way stopcock with extension tubing to flush syringe and tubing with 10cc normal saline.
- Measure residual activity in syringe and tubing and report actual administered dose.

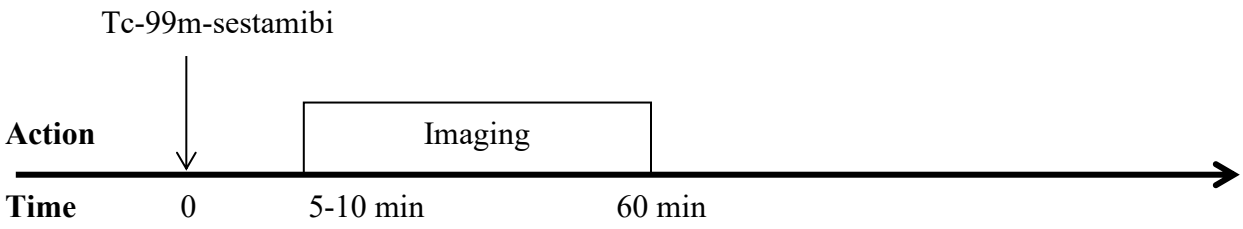
Patient Position & Imaging Field

- Patient position: Seated with the breast positioned between the two detectors in either the cranio-caudal (CC) or medio-lateral (MLO) projections.
- Light pain-free compression should be applied both to reduce breast thickness and to limit patient motion. The amount of compression applied will be dictated by the patients comfort level.
- Two images are acquired of each breast in the CC and MLO projections.
- Images are reviewed upon completion
- Imaging field:
    1. For patients with very large breasts, acquire two MLO views of the upper and lower portions of the breast, rather than acquiring both CC and MLO. If no abnormality present, exam is complete. Confer with radiologist to determine if additional views are required.

Acquisition Protocol

- Images are acquired for 10 minutes each.

Protocol Summary Diagram



Data Processing

- Review images and evaluate for adequate counts and no motion artifact

Optional Maneuvers

- Additional projections as ordered by the radiologist

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-Sestamibi

Radiation Dose Estimates for Tc-99m Sestamibi*

	Estimated Radiation Dose (mGy/MBq)	
ORGAN	Rest patients	Stress patients
Adrenals	4.3E-03	3.9E-03
Brain	1.8E-03	1.9E-03
Breasts	1.7E-03	1.6E-03
Gallbladder Wall	1.8E-02	2.5E-02
LLI Wall	3.7E-02	2.9E-02
Small Intestine	2.7E-02	2.2E-02
Stomach	5.2E-03	4.7E-03
ULI Wall	5.0E-02	4.0E-02
Heart Wall	4.4E-03	4.8E-03
Kidneys	1.8E-02	1.5E-02
Liver	5.1E-03	3.7E-03
Lungs	2.4E-03	2.2E-03
Muscle	3.7E-03	3.3E-03
Ovaries	1.4E-02	1.2E-02
Pancreas	5.0E-03	4.6E-03
Red Marrow	4.5E-03	4.0E-03
Bone Surfaces	5.8E-03	5.4E-03
Skin	1.9E-03	1.8E-03
Spleen	5.2E-03	4.0E-03
Testes	3.5E-03	3.1E-03
Thymus	2.3E-03	2.3E-03
Thyroid	2.2E-03	2.2E-03
Urinary Bladder Wall	3.7E-02	2.7E-02
Uterus	1.2E-02	1.0E-02
Effective Dose Equivalent (mSv/MBq)	1.5E-02	1.3E-02

* Based on data gathered in human volunteers.

Estimate calculated using phantom of Cristy & Eckerman (Report ORNL/TM-8381/V1 & V7)

Radiation Internal Dose Information Center