



Austin Radiological Association
Nuclear Medicine Procedure
BRAIN PERFUSION STUDY
Neurolite (Tc-99m Bicisate)

Overview

- The Brain Perfusion Study produces SPECT tomograms depicting the distribution of blood flow and perfusion to the various structures of the brain.

Indications

- Dementia (to distinguish Alzheimer's from other dementias).
- Localization of seizure foci.
- Evaluation of carotid blood flow prior to surgical occlusion.
- Diagnosis of brain death.
- Evaluation of brain injury.
- Cerebrovascular disease: acute stroke, chronic stroke, TIA
- Psychiatric disorders
- Infectious processes
- Degenerative cortical processes

Examination Time

- 90 minutes.

Patient Preparation

- Place an intravenous line in advance so the patient does not experience pain from the needle puncture at the time of radiopharmaceutical injection.
- Instruct patient to void prior in injection. Remove any earrings, glasses, necklaces, hair clips.
- The imaging room should be quiet and dimly lit.
- Instruct the patient not to read or speak; rest quietly.

Equipment & Energy Windows

- Camera: Rotating gamma camera. Two or three-headed gamma camera imaging system is preferred. Perform SPECT/CT when available.
- Collimator: Low energy, high resolution, parallel hole collimator.
- Energy window: 20% window centered at 140 keV.
- Computer with SPECT software – SPECT/CT with iterative processing.

Radiopharmaceutical, Dose, & Technique of Administration

- Radiopharmaceutical: Tc-99m Bicisate.
- Dose: 25 mCi (925 MBq). Pedi dose by NACG chart.
- Technique of administration: Through an existing intravenous line, flush well.

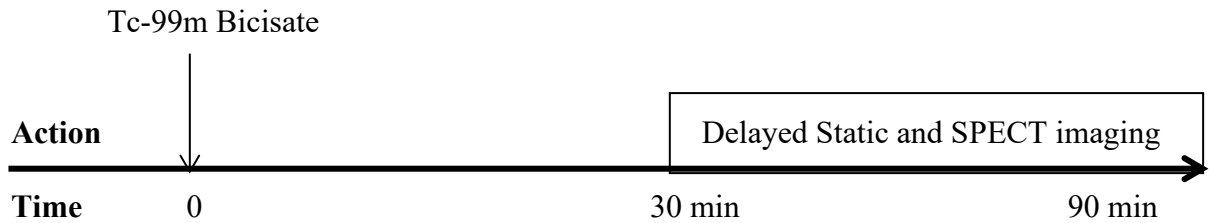
Patient Position & Imaging Field

- Patient position:
 1. Supine, head first into gantry, with the head in a head holder secured with a Velcro strap.
 2. Flex the head so that the cerebellum is included in the field of view.
- Imaging field: Entire brain including the cerebellum.

Acquisition Protocol

- Time from injection to beginning image acquisition:
 - > Tc-99m Bicisate: 30 minutes.
- Have the patient void prior to image acquisition to maximize patient comfort.
- Image acquisition parameters:
 1. Static images:
 - a. Anterior/Posterior, Right Lateral/Left Lateral for 5 minutes each.
 - b. Zoom 1.78 or 2.0 based on skull size
 2. SPECT/CT
 - a. Degrees of rotation: 360°.
 - b. Number of images: 60 per head
 - c. Time per image: Approximately 45 seconds.
 - d. Matrix: 128 x 128 pixels.
 - e. Zoom 1.0

Protocol Summary Diagram



Data Processing

- Reconstruct transverse, sagittal, and coronal images using Flash 3D iterative processing with a Gaussian filter.
- Correct for attenuation using CT transmission map.
- Construct a 3 dimensional surface display of the brain for dynamic viewing (MIP).

Optional Maneuvers

- Fast acquisition: Fast acquisition methods may be used in patients who are unable to hold still for prolonged periods of time.
- Seizures may be produced pharmacologically with pentylenetetrazol for ictal imaging.
- Acetazolamide (Diamox) may be used to increase the sensitivity of brain perfusion imaging for cerebrovascular ischemia:
 1. Contraindications:
 - a) allergy to sulfonamides (Acetazolamide is a non-bacteriostatic sulfonamide.).
 - b) active transient ischemic attacks (This is not an absolute contraindication.).
 2. Side effects - occur in about 50% of patients & last for about 15 minutes:
 - a) numbness around mouth or fingers.
 - b) lightheadedness or blurred vision.
 - c) flushed feeling around face and neck.
 3. Inject 1 gm of acetazolamide intravenously over 5 minutes.
 4. Wait 20 minutes and then inject the radiopharmaceutical.
 5. Wait 25 minutes and acquire images in the usual manner.
 6. A baseline brain perfusion study without acetazolamide is performed one or more days later.
 7. Adenosine or dipyridamole may be used instead of acetazolamide.

- Diagnosis of brain death:
 1. Position the gamma camera for an ANT dynamic study of the head.
 2. Inject radiopharmaceutical in a bolus fashion and acquire 2 second serial analog and/or digital images for at least 30 seconds.
 3. Approximately 15 minutes after injection, acquire planar images in the ANT and right or left LAT projections.
 4. SPECT imaging may be performed if necessary and feasible.
- Quantification: Activity in the tomograms may be quantitated on a regional basis.
- Interictal images may be subtracted from ictal images in the same patient.
- Superimposition of perfusion and anatomic images: Images may be superimposed on corresponding magnetic resonance images with computer assistance.

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 Bicisate

Organ	rads/20 mCi	mGy/740 MBq
Bladder wall		
2 hour void	2.2	22.0
4.8 hour void	5.4	54.0
Gallbladder wall	1.8	18.0
Large intestine	1.2	12.0
Small intestine	0.7	7.0
Kidneys	0.5	5.4
Brain	0.4	4.0