Overview

The Brain Perfusion Study produces SPECT tomograms depicting the distribution of blood flow and perfusion to the various structures of the brain (1).

Indications

Diagnosis of Alzheimer's disease (2,3).
Localization of seizure foci (4,5).
Evaluation of location, size, and prognosis of cerebral ischemia (6,7).
Diagnosis of brain death (8,9).
Evaluation of AIDS dementia (10).
Mapping the distribution of brain perfusion during interventions (11,12).
Evaluation of brain injury (13).

*Exams ordered for indications which are not listed above need to be discussed with the Nuclear Medicine Physician.

Examination Time

2 hour.

Patient Instruction

This study can be performed on inpatients or outpatients. No special preparation is required. Be sure the patient understands that the procedure will require them to lie perfectly still with a camera rotating closely around the head for at least 40 minutes. Although it is not optimal, sedation can be given in certain instances after the Ceretec injection.

When possible, hold sedatives and benzodiazepines for 24 hours prior to the scan. Caffeine and alcohol should also be discontinued for 24 hours prior to the exam. See addendum A

Imaging Correlation

Have any recent CT /MRI scans of the brain available for correlation.

Patient Preparation
Have the patient in the Nuclear Medicine Department before the targeted preparation time for the radiopharmaceutical. Insert a 21 or a 23 gauge butterfly needle or reseal into an antecubital or forearm vein. Flush with normal saline.

Have the patient lie down in a darkened, quiet room for 15 minutes before proceeding with injection and imaging. Be sure the patient's eyes are open during the injection (14,15).

If the patient is agitated and unlikely to be able to cooperate with SPECT imaging, consult with the nuclear medicine physician and referring physician before proceeding.

**Equipment & Energy Windows**
- Camera: Dual head gamma camera (16,17). SPECT/CT if requested by the Nuclear Medicine Physician.
- Collimator: Low energy, high resolution parallel hole (18)
- Energy window: 20% window centered at 140 keV.
- Matrix 128x128

**Radiopharmaceutical, Dose, & Technique of Administration**

Radiopharmaceutical (19-22): Tc-99m-ethyl cysteinate dimer (Tc-99m-ECD).

or Tc-99m-hexamethylpropyleneamineoxime (Tc-99m-HMPAO).

Dose: 20-30 mCi (740 MBq – 1110MBq).

Technique of administration: Through an existing intravenous line.
- Patient's eyes will be open and ears unplugged.
- Room will be dimly lit and quiet.
- Patient will be instructed not to talk for 15 minutes after the injection.

**Patient Position & Imaging Field**

Patient position: Supine with the head in a head holder and/or secured with a velcro strap; the head is flexed so that the cerebellum is included in the field of view (23).

Imaging field: Entire brain including the cerebellum.

**Acquisition Protocol**

Begin acquisition 15 minutes post injection (23).

Image acquisition parameters:
1. Degrees of rotation: 360°.
2. Number of images: 128 (64 per head).
3. Time per image: Approximately 30 seconds.
5. Magnification: 1.0

Data Processing

Low pass, e.g. Butterworth filter should be used (24,25).

Optional Maneuvers

A. Diagnosis of brain death (8,9):

Radiopharmaceutical: Tc-99m-DTPA 20-30 mCi (740 MBq – 1110 MBq)
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 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.

B. Acetazolamide (Diamox) Scan: Used to increase the sensitivity of brain perfusion imaging for cerebrovascular ischemia (28-30):
1. Contraindications (30):
   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 (30):
   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 1-2 minutes.
4. Wait 25 minutes and then inject the radiopharmaceutical.
5. Wait 20 minutes and acquire images in the usual manner.
6. A baseline brain perfusion study without acetazolamide is performed one or more days later.

Principle Radiation Emission Data - Tc-99m (44)

Physical half-life = 6.01 hours.
### Radiation

<table>
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<th>Mean % per disintegration</th>
<th>Mean energy (keV)</th>
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### Dosimetry - Tc-99m-ECD (45)

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<td>4.8 hour void</td>
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<td>Large intestine</td>
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### Dosimetry - Tc-99m-HM-PAO (46)

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### References


**Normal Findings**


JSM
PROTOCOL\03-3
Rev. 6/1/2016

**Note:** This procedure conforms to the [Society of Nuclear Medicine procedure guideline](http://example.com) for Brain Perfusion Single Photon Emission Computed Tomography (SPECT), Version 2, 7 Feb 1999.

This procedure conforms to the ACR standard for the performance of cerebral scintigraphy for brain death, 2002-2003.
Addendum A

Medications to be held (On Doctors Order) for Ceretec brain imaging

1. Alprazolam (Xanax)
2. Chlordiazepoxide (Librium)
3. Clonazepan (Klonopin, Rivotril)
4. Diazepam (Valium)
5. Flurazepan (Dalmane)
6. Halazepam (Paxipam)
7. Lorazepam (Ativan)
8. Oxazepam (Serax)
9. Prazepam (Centrax)
10. Quazepam (Doral)
11. Temazepam (Centrax)
12. Triazolam (Halcion)