

**Division of Nuclear Medicine Procedure / Protocol
University Hospital**

BRAIN SISCOM FOR LOCALIZATION OF EPILEPTIC EVENT

CPT CODE: 78607 or 78830

UPDATED: September 2021

Indications: SISCOM (single-photon emission CT coregistered to MRI) with the use of computer-aided subtraction, which can be employed to improve localization of the epileptogenic zone for electrode placement, surgical resections and determination of surgical prognosis. Visualize ictal activity in the brain and allows abnormal neural perfusion to be mapped onto surrounding neural structures. This technique may prove useful during several scenarios in the presurgical evaluation of refractory epilepsy

Patient Prep: **Inter-ictal:** See inter-ictal injection procedure.
Ictal: Patient to be admitted to IP floor. Seizure meds are withheld until seizure. Patient will have a detailed schedule of different procedures planned during their admission.

Scheduling:

- Requires ~2 ½ hours including 60 minutes on the camera.
- Patient needs to arrive at least 15 minutes prior to inter-ictal injection in the outpatient setting.
- A quiet room is recommended for a circulation time of 60min prior to imaging.

Radiopharmaceutical & Dose:
Inter-Ictal Exam or Exam for Other Causes (i.e. Dementia): 20 mCi \pm 20% (16-24 mCi) Tc-99m-HMPAO (Exametazime) or Tc-99m-ECD (Bicisate) preferred; based on availability which one will be utilized. Dose adjusted for patient weight per NMIS or nomogram. If the inter-ictal exam is following a recent ictal exam, use \pm 20 of the administered dose given for ictal exam.

Ictal/Seizure: 20 mCi \pm 30% (14-26 mCi) Tc-99m-HMPAO (Exametazime) or Tc-99m-ECD (Bicisate) preferred; based on availability which one will be utilized. The dose will be calibrated for the beginning of the middle of the 4-hour window. If the window is 8A-12P the calibration time is 10AM. A new dose will be brought to the floor for the second 4-hour window, if needed, to maintain a proper dose range. (If Tc-99m-HMPAO (Exametazime) is used, this will also be due to expiration.)

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Injection Procedure:

Inter-Ictal Exam

1. Start filing in patient Data form.
2. Interictal exam to be performed at least 30hrs after Ictal to allow for appropriate radioisotope decay.
3. Patient should be "seizure free" for at least 12 hours prior to this exam, if not consult with the NM physician for determination of continuation or reschedule options. In-patient inter-ictal injections will be performed bedside. Patient will be asked to rest with minimal stimulation for 60min prior to imaging.
4. Explain procedure to patient and start IV if out-pt.
5. After injection, patient should remain in stimulus free room for 30-60 minutes post injection.
6. Due to room availability, 30 minutes after injection, patient may be moved to cardiac waiting room for remaining 30-minute wait.
7. Imaging may begin 60 minutes post injection \pm 15 minutes (45-75 minutes).

Ictal:

1. Patient should be "seizure free" for at least 1 hour prior to this exam, if not consult with the NM physician for determination of continuation or reschedule options.
2. Explain procedure to patient and check patency of the IV.
 - a. Discuss with patient/patient's parent and EEG technician to determine what the patient triggers are and what patient's seizure tends to look like
 - i. Ask EEG to visualize previously recorded seizure event if available
 - b. Have patient use the restroom prior to starting injection window.
3. Nuclear Medicine Technologist will perform the injection within 10 seconds of seizure onset as identified by EEG or patient's parent in pediatric setting. Rapid bolus injection followed by a 10cc saline flush. Patient is stabilized by attending nursing staff. Imaging begins ideally at one hour, but up to 3.5 hours is allowed. The patient will be transported to NM when stable and the camera is available.
4. A Nurse is to accompany patient the imaging in case patient has a seizure on the camera and medications need to be administered.

Imaging Device:

GE OPTIMA 640 is the preferred imaging system. GE Infinia Hawkeye 2, 3, 4 or Optima 640 can be used.

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Data Acquisition:

- Secure and position the patient headfirst supine with head holder and with straps provided
Adjust table height in order to iso-center patient.
- Bring detectors heads in as near patient as possible and verify that detector heads will not collide during SPECT acquisition.
 - Head radii should be as similar as possible between Head 1 and Head 2.

<i>Protocol:</i> UW BRAIN --> ICTAL INTERICTAL	
<i>Camera Information:</i> 128 x 128 matrix	Mode: H
<i>Scan Information</i>	
Rotation Type: Step Shoot Do not check "use body contour" Start Angle (deg): 0 Total Angular range: 360 Angle Step Size (deg): 36 Time per Acquisition (sec): Time variable, want 40k counts per stop. Arc per detector: 180 View angle: 3 View #: 120 Direction: CW	Patient Location: Head first-Supine CT/AC range: Partial Select on: Emission Click on <input type="checkbox"/> Emission First <input checked="" type="checkbox"/> Acquire CT/AC: Table In Zoom: 1.5 x Pan Y: -20

Note: Check for patient motion prior to patient leaving. Any motion requires the patient to be rescanned.

Data Analysis:

XELERIS

1. UWH Single and Multi BP for Ictal/Interictal processing.
2. Verify Motion Correction
 - a. If significant motion rescan patient
3. Verify Accurate SPECT/CT registration
 - a. Select Passed if okay
4. File Save MIP
 - a. Change Series Name to MIP Interictal or Ictal
5. File Save & Exit
6. Select TOMO INTERICTAL_IRACSC_TRANSAXIAL NM ORTHOGONAL file and TOMO ICTAL_IRAC_TRANSAXIAL NM ORTHOGONAL and transfer to MIM

MIM 7.1

1. Open MIM using UW login and password.
2. Select Neuro licensing box before loading MIM.
3. Select McKesson QUERY (Green Color Tab) in upper left hand corner of screen and search for patients most recent diagnostic MRI.
 - a. Find "Ax T1 BRAVO Stealth" MRI. With file highlighted, look to right of screen and locate "Send To" tab.
 - b. Send MRI file to AE_MIM_ENCORE

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4. Select MIM_NM_Server from upper left hand corner of screen and enter the Patients ID to view all images associated with the patients' exam.
5. Select TOMO ICTAL_EM_IRAC,TOMO INTERICTAL_EM_IRAC file along with diagnostic MRI or CT
6. On the right side of the screen select "Workflow" tab to bring up Neuro PET/SPECT Subtraction workflow.
 - a. Select "Launch Workflow" tab on bottom right corner of screen.
7. Verify Select Files
 - a. Confirm
8. Follow the prompts from the "Notifications" box in the top right corner of the screen.
 - a. This will lay out the instructions through the processing.
9. Verify registration SPECT image to MIM template
 - a. Scroll through brain slices to verify image registration to brain template.
 - b. Select the Finish Step-In Correction (green flag button) located on any of the three image plans.
10. Verify emission images to anatomical images for registration
 - a. Scroll through brain slices
 - b. Do Box based alignment if registration is off between emission and MRI images.
 - c. Click Resume workflow in top right corner of screen.
11. Verify Comparison to Baseline registration by scrolling through the brain
 - a. Resume workflow
12. Verify Normalization
 - a. This should not need to be adjusted according to MIM applications representative
 - b. Resume workflow
13. A "Cluster Analysis" tab will prompt in the notifications tab.
 - a. Select "Cluster Analysis" tab and change Z-Score to 2.0 in the minimum Z-Score box.
 - b. When done select Ok
 - c. Use "Annotation" tab on top tool bar and select the "cluster image" which should be the top row of displayed images.
 - i. Type in 2.0 Z-Score and apply to all images. Select "OK"
14. Double click on any MR_Cluster_Fusion image.
 - a. Use "Annotation" tab and type in 2.0 Z-Score making sure to apply to all images.
 - i. Repeat for each view on the same page.
15. Click on "Grey Floppy Disk" icon on top of screen toolbar.
 - a. Select "Save Session" and label in the "Series Description" row 2.0 Z-Score EX: Saved Session: 2.0 Z-Score.
 - b. Change Associated Series to Baseline file.
 - c. This allows any user to load directly into the post-processed images.
 - d. Reading physician will be the ones to change the Z-Score during dictation if needed.
16. Right click on any of the "MR_Cluster_Fusion" images at the bottom of the screen.
 - a. Select Save DICOM Image Data (floppy disk icon)
 - b. Select secondary capture
 - c. Select ok. A notification box will appear named "Save Secondary Capture"
 - d. Under Destination, select McKesson STORE
 - e. Click boxes for Transaxials, sagittal and coronal planes.
 - f. Select the "Cluster" File under the "Keep Association" tab.
 - g. In Study Description box type: 2.0 Z-Score before ICTAL INTERICTAL
 - h. Erase contents in Series Description box and type: 2.0 Z-Score
 - i. This allows files to show the 2.0 Z-Score label in PACs.
 - i. Select Ok

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17. Select the screen cap icon on the top right side of the page that looks like a camera.
 - a. Select the first three screen captures which will apply a green check mark to them.
 - b. Under the "Send To" tab Send to McKesson Store and select "Save DICOM"
 - i. Verify that Associated Series has Baseline selected.

PACS:

Send to PACS:

- All screen captures noted above.
- All IRAC, CT TOMO corrected file, Interictal and Ictal MIPs
- 2.0 Z-Score Transaxial, Sagittal and Coronal MR/SPECT files from MIM.
- QA images created by MIM during processing as noted above.

Interpretation:

Abnormal brain areas in the inter-ictal state demonstrate decreased radiotracer uptake, such as those recently suffering a stroke or epileptic foci. During an ictus the focal cause will be "hot". Dementia imaging-abnormal areas appear as hypo perfused regions in the brain.

Comments:

A Nuclear Medicine staff or resident physician should be consulted to determine if additional views are indicated. See attached page for notifying who will be the physician responsible for dictation.

Bibliography:

SNM Procedure Guideline for Brain Perfusion SPECT using Tc99m Radiopharmaceuticals 3.0, 2009

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