Austin Radiological Association

BRAIN AMYLOID STUDY
Amyvid
(F-18-Florbetapir)

Overview

- The Brain Amyloid Study with F-18-florbetapir depicts the extracellular deposition of B-amyloid (Aβ) peptides (or "plaques") in the brain in a tomographic fashion. This deposition is one of the pathological hallmarks of Alzheimer's disease (AD).

Indications

- Persistent or progressive unexplained mild cognitive impairment (MCI),
- The core clinical criteria for possible AD are satisfied, but there is an unclear clinical presentation – either an atypical clinical course or an etiologically mixed presentation, or
- Patients with progressive dementia and atypically early age of onset (usually defined as 65 years or less in age).

Medicare Amyloid PET Reimbursement Guidelines:

Indication	CPT	Coverage Guidelines
Pending MAC coverage determination	**78814**	**TBD**

NOTE:
Private payer coverage for PET often reflects that of Medicare but may vary. Providers should obtain coverage and pre-authorization guidelines for PET from their private payers.

Examination Time

- Allow approximately 1.5 hours for the entire Amyloid PET/CT brain study.
- Prior to Scan: Allow 30 minutes for interview, IV, injection, followed by 30 – 50 minute uptake post injection.
- Image acquisition:
  1. 78814 (PET Limited)
     a. 15 minutes acquisition

Patient Preparation

- Prior to arriving for the study:
  1. None
  2. Explain exam to ensure patient can cooperate in remaining still
- Recent interventions, i.e. surgery, radiation therapy, biopsy, and chemotherapy:
  1. Record any interventions during the last 3 months.
- Place the patient in a dimly lit, quiet room for 30 – 50 minutes
- Have patient void prior to imaging.
- Sedation may be needed for claustrophobia. Alprazolam (Xanax) at 1 mg is commonly used to treat panic disorders including claustrophobia. Sedation for brain studies must be given approximately 30 minutes post injection to prevent interference with distribution.

Equipment & Energy Windows

- Imaging system:
  - Siemens Biograph Horizon Tru-v PET/CT scanner.
- Collimators:
  - 3D mode (septa out or absent) *(Siemens Biograph Horizon only has 3D function)*
- Energy windows (may vary with manufacturer and machine design): 30% window centered at 511 keV.

Radiopharmaceutical, Dose, & Technique of Administration

- Radiopharmaceutical: F-18-florbetapir
- Dosing:

	Siemens
Average Adult	10 mCi (370 MBq)

Pediatric Patients – not applicable

ARA RAM licensure allows +/- 20% dose variance.

- Technique of administration: Standard intravenous injection or through an existing intravenous line.

Patient Positioning & Imaging Field

- Patient position: Supine.
- Restrain the head: Position the patient's head in the standard head holder.
- Imaging field of view: Entire brain in the field of view, including cerebellum. Avoid extreme neck flexion or extension if possible. Use positioning aids and head restraints as necessary.

Acquisition Protocol

- Have the patient empty his/her bladder before image acquisition.
- Begin image acquisition approximately 50 minutes following injection of F-18-florbetapir
- Imaging times:

Siemens Biograph Horizon

  - Emission data acquisition: 15 minutes.

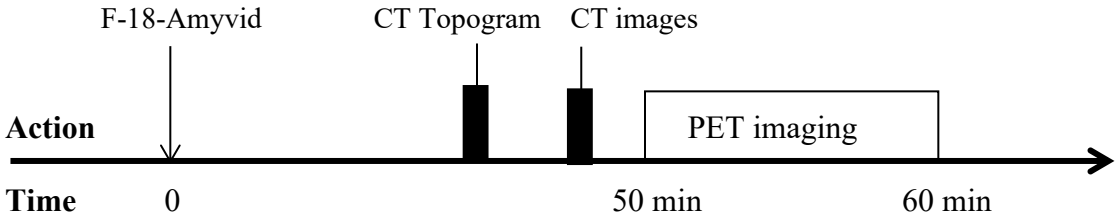
- Have the patient empty his/her bladder after image acquisition.

CT parameter values vary with patient size and machine specific factors:

1. Milliampere-seconds (mAs) and Kilovolts peak (kVp) guidelines:
   a) average adult: 55 eff mAs, 120 kVp.

2. Siemens Care Dose is not utilized on Brain studies due to the bone density in the head.

Protocol Summary Diagram



Data Processing

- The PET images are reconstructed using iterative reconstruction with TOF when available. Siemens settings include: matrix 360, 8 iterations, 10 subsets, Gaussian filter, filter FWHM 4.0, zoom 2.0.
- A rotating maximum intensity projection (MIP) display and surface-rendered 3D displays facilitate lesion evaluation.
- Images sent in black and white PET LUT only.

Principle Radiation Emission Data - F-18

- Physical half-life = 109.8 minutes.

Radiation	Mean % per disintegration	Mean energy (keV)
Positron	100	250
Gamma ±	200	511

Dosimetry - Computed Tomography

- Actual effective doses will depend on the user-specific exam protocols and the specific CT scanner used. It is important that each facility develop appropriate exam protocols and monitor the resultant patient doses for each machine in use.

Effective dose	rem	mSv
Diagnostic CT	0.15	1.5
Low dose CT	0.01	0.1

2.5 Radiation Dosimetry

The estimated radiation absorbed doses for adults from intravenous injection of Amyvid are shown in Table 1.

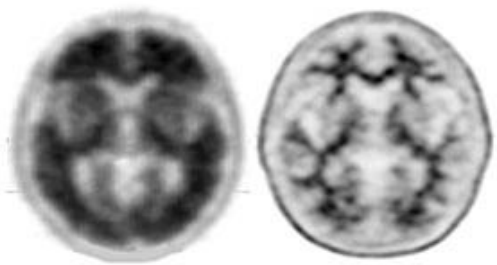
Table 1: Estimated Radiation Absorbed Dose, Amyvid (Florbetapir F 18 Injection)

ORGAN/TISSUE	MEAN ABSORBED DOSE PER UNIT ADMINISTERED ACTIVITY(μGy/MBq)
Adrenal	14
Bone - Osteogenic Cells	28
Bone - Red Marrow	14
Brain	10
Breasts	6
Gallbladder Wall	143
GI[a] - Lower Large Intestine Wall	28
GI - Small Intestine	66
GI - Stomach Wall	12
GI - Upper Large Intestine Wall	74
Heart Wall	13
Kidneys	14
Liver	64
Lungs	9
Muscle	9
Ovaries	18
Pancreas	14
Skin	6
Spleen	9
Testes	7
Thymus	7
Thyroid	7
Urinary Bladder Wall	27
Uterus	16
Total Body	12
Effective Dose (μSv/MBq)[b]	19

[a] Gastrointestinal

[b] Assumed radiation weighting factor, w_r, (formerly defined as quality factor, Q) of 1 for conversion of absorbed dose (Gray or rads) to dose equivalent (Sieverts or rem) for F 18. To obtain radiation absorbed dose in rad/mCi from above table, multiply the dose in μGy/MBq by 0.0037, (e.g., 14 μGy/MBq x 0.0037 = 0.0518 rad/mCi)

The effective dose resulting from a 370 MBq (10 mCi) dose of Amyvid is 7.0 mSv in an adult, (19 x 370 = 7030 μSv = 7.030 mSv). The use of a CT scan to calculate attenuation correction for reconstruction of Amyvid images (as done in PET/CT imaging) will add radiation exposure. Diagnostic head CT scans using helical scanners administer an average of 2.2 ± 1.3 mSv effective dose (CRCPD Publication E-07-2, 2007). The actual radiation dose is operator and scanner dependent. The total radiation exposure from Amyvid administration and subsequent scan on a PET/CT scanner is estimated to be 9 mSv.



*Reference: SNMMI Procedure Standard-EANM Practice Guideline for Amyloid PET Imaging of the Brain

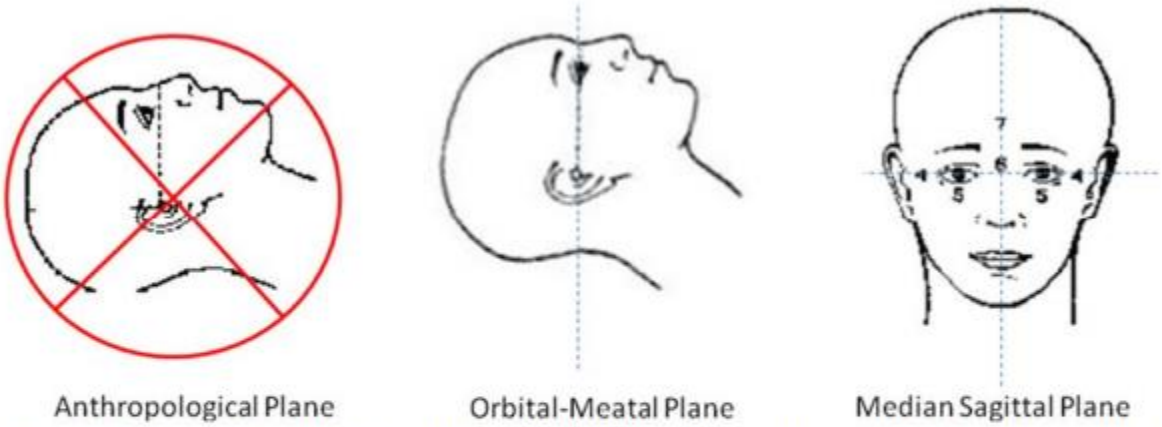


Figure 1: Schematic of Orbital-Meatal Plane. Patient should be positioned with scanner laser aligned to the orbital-meatal and median sagittal planes. Note that there is about a 10-15 degree difference between the anthropological and orbital-meatal planes. Aligning to the anthropological plane could result in the cerebellum or brain stem being cut off. Also note that some patients (e.g., kyphotic subjects) may not be able to be comfortably positioned in this ideal orientation. In this case, it is acceptable to slightly deviate from this position. It is more important that the subject be able to comfortably maintain their head position for the entire PET scan duration.

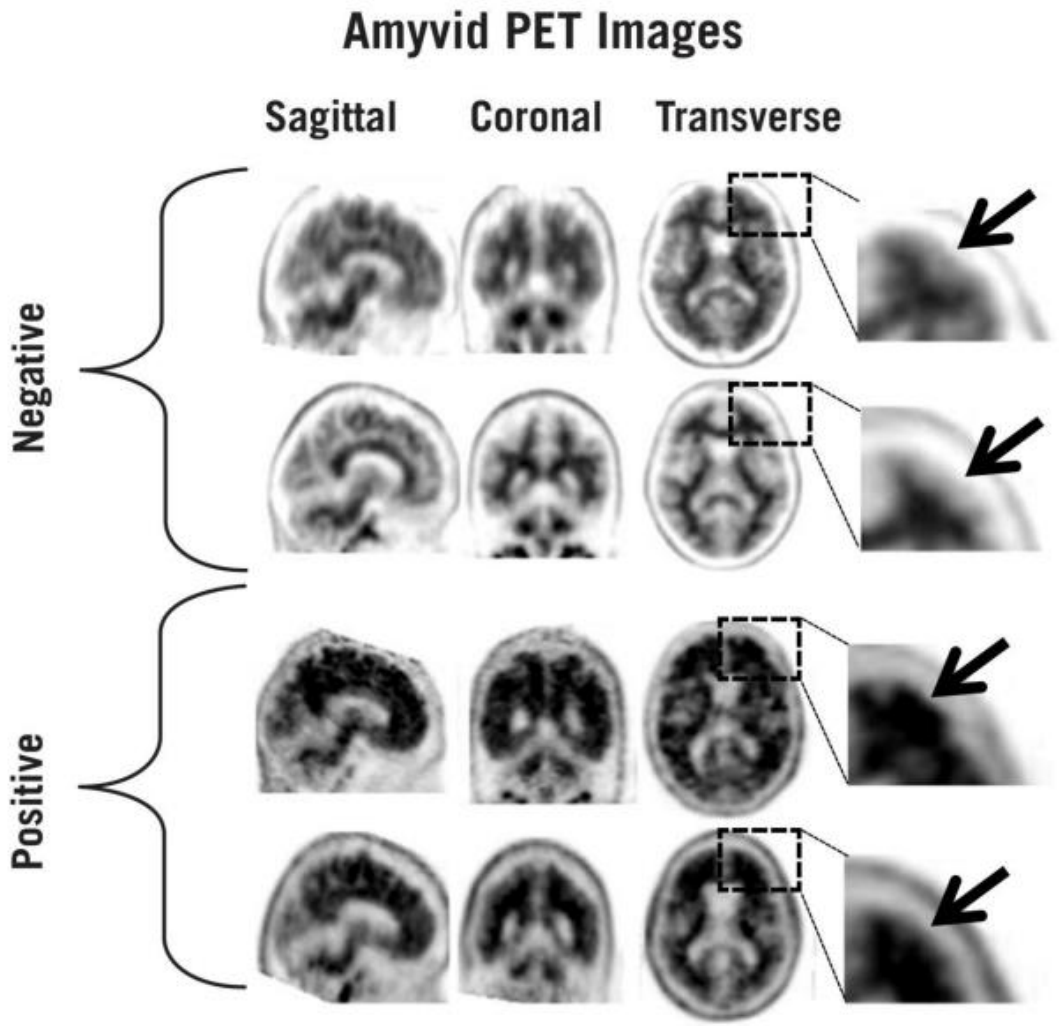


Figure 1: Examples of Amyvid negative scans (top two rows) and positive scans (bottom two rows). Left to right panels show sagittal, coronal, and transverse PET image slices. Final panel to right shows enlarged picture of the brain area under the box. The top two arrows are pointing to normal preserved gray-white contrast with the cortical radioactivity less than the adjacent white matter. The bottom two arrows indicate areas of decreased gray-white contrast with increased cortical radioactivity that is comparable to the radioactivity in the adjacent white matter.