IMPORTANT NOTE: This PET scan applies to the fluorodeoxyglucose (FDG) imaging agent only.

INTRODUCTION:

The basis of fluorodeoxyglucose (FDG)-PET imaging is the differential utilization of glucose by tissues based on their metabolic activity. Positron Emission Tomography (PET) scanning is useful in brain tumor imaging and in the preoperative evaluation of refractory epilepsy. It is useful in the identification of epileptic foci in the brain as an adjunct to surgical planning and is useful for follow-up of brain tumor surgery or treatment. It helps in the evaluation of known brain tumor with new signs or symptoms indicative of a recurrence of cancer. In the evaluation of dementia, studies with fluorodeoxyglucose (FDG)-PET indicate that diseases resulting in impairment of cognitive function (memory, learning and problem solving) are associated with reduced use of glucose in brain areas important in these functions.

INDICATIONS FOR BRAIN PET SCAN:

For evaluation of known brain tumor or cancer:
- Known brain tumor or cancer with new signs or symptoms indicative of a reoccurrence of cancer.
- Brain tumor follow-up after surgery and/or after treatment recently completed.

For pre-operative evaluation:
- Pre-surgical evaluation for refractory epilepsy.

Post-operative/procedural evaluation:
- A follow-up study may be needed to help evaluate a patient’s progress after treatment, procedure, intervention or surgery. Documentation requires a medical reason that clearly indicates why additional imaging is needed for the type and area(s) of requested imaging.

For patients with Dementia:
- A scan is reasonable and necessary in patients (who meet all 3 bullets below) with:
  1. A recent diagnosis of dementia or fronto-temporal dementia (FTD) AND have documented cognitive decline of at least six months (request date of onset of symptoms).
  2. Who have had more than one assessment done of patient’s mental status - documented by neuro-diagnostic testing, such as:
     - Change in mental status with a mental status score of either MMSE or MoCA of less than 26 or other similar mental status exams showing at
least mild cognitive impairment AND a completed basic metabolic workup (such as thyroid function testing, liver function testing, complete blood count, etc).

- EEG and long-term EEG monitoring
- Transcranial Dopplers
- Evoked Potentials
- Intraoperative Monitoring

3. Has had an appropriate baseline work-up for other treatable causes, including appropriate medication restriction or reduction to test for reversibility. (Refer to the Additional Information section of this document).

**ADDITIONAL INFORMATION RELATED TO BRAIN PET:**

**Information applicable to Dementia/Alzheimer’s:**

- Cognition is the act or process of thinking, perceiving, and learning.
- Symptoms develop when the underlying condition affects areas of the brain involved with learning, memory, decision-making, and language.
- Memory impairment is often the first symptom to be noticed. Someone with dementia may be unable to remember ordinary information, such as their birth date and address, and may be unable to recognize friends and family members.
- There is progressive decline in these cognitive functions as well:
  - Decision making
  - Judgment
  - Orientation in time and space
  - Problem solving
  - Verbal communication
- Behavioral changes may include the following:
  - Eating, dressing, toileting (e.g., unable to dress without help; becomes incontinent)
  - Interests (e.g., abandons hobbies)
  - Routine activities (e.g., unable to perform household tasks)
  - Personality (e.g., inappropriate responses, lack of emotional control).
- Frontotemporal dementia diagnostic criteria:
  - Behavioral symptoms that should be recorded include apathy, aspontaneity, or, oppositely, disinhibition.
  - Executive function should also be assessed: patients would show impairment in ability to perform skills that require complex planning or sequencing (multi-step commands, drawing the face of a clock).
  - Primitive reflexes showing frontal release should be assessed including palmomental reflex, rooting reflex and palmar grasp.
- Alzheimer’s criteria:
  - Memory impairment (assessed as part of mini-mental status exam MMSE)
  - Cognitive disturbance (one or more) evidenced by
  - Aphasia (language disturbance)
  - Apraxia (impaired ability to carry out motor activities despite intact motor function)
  - Agnosia - failure to recognize or identify objects despite intact sensory (vision, touch, etc) function
Disturbance in executive function: patients would show impairment in ability to perform skills that require complex planning or sequencing (multi-step commands, drawing the face of a clock).

- Metabolic testing (in addition to neurologic examination, MMSE):
  - Urinalysis (to r/o urinary tract infection as a cause of dementia)
  - CBC (to r/o infection or anemia as a cause of impaired mental function)
  - Serum electrolytes, including magnesium
  - Serum chemistries, including liver function testing
  - Thyroid function tests (TSH or super sensitive (ss) TSH)
  - Vitamin B12
  - Erythrocyte Sedimentation Rate (ESR, “Sed Rate”, etc)
  - Serologic test for syphilis (to r/o tertiary syphilis)
  - Possibly toxicology tests to r/o poisoning or overdose: salicylates, alcohol, other

- Medicines that may be causing cognitive impairment:
  - Anti-diarrheals
  - Anti-epileptic medications
  - Antihistamines, cold and flu medications
  - Lithium
  - Sleeping pills
  - Tricyclic antidepressants
  - Opiates
  - Salicylates

**PET in Seizure Disorders** – Refractory epilepsy is defined as epilepsy that does not respond to medical treatment. These patients struggle with recurrent seizures even while undergoing treatment with antiepileptic drugs (AEDs). However, the definition is unclear as some of these patients will partially respond to treatment or will worsen when AEDs are discontinued. PET is helpful in locating the area of the brain causing seizures and is used in the preoperative evaluation of patients who have failed to respond to conventional medical treatment of epilepsy.

**PET and Known Brain Tumor/Cancer** – Studies have shown that PET is useful in patients who have undergone surgery. PET, a biochemical and physiologic technology, provides precise information about brain tumors which helps to distinguish between brain tumors and other anatomic structures or surgical scars. It is useful in identifying tumors in the brain after surgery, radiation or chemotherapy. With the sensitivity and specificity of the radiotracer 18-F FDG, PET is able to evaluate recurrent tumor and treatment-induced changes.
REFERENCES


