# AmeriHealth Caritas Louisiana

| National Imaging Associates, Inc.* | |
|---|---|
| **Clinical guidelines**<br>**BRAIN PET SCAN** | **Original Date: July 1999** |
| **CPT Codes: 78608, 78609** | **Last Revised Date: June 2021** |
| **Guideline Number: NIA_CG_071** | **Implementation Date: January 2022** |

**INDICATIONS FOR BRAIN PET SCAN using FDG (Fluorodeoxyglucose)**
(Albano, 2018; de-Bonilla-Damiá, 2017; Jones, 2016; Lewitschnig, 2013; Maza, 2013)

**Known brain tumor or cancer**

- To differentiate radiation necrosis or post-treatment change from residual/recurrent tumor on brain MRI‡* (**NCCN, 2020**)
- To differentiate low from high grade glioma when brain MRI‡* is inconclusive (Dunet, 2016; Verger, 2017)
- For evaluation of primary brain lymphoma when brain MRI‡* is inconclusive
- To guide intervention/biopsy

**To determine operability of refractory seizures**
(Govil-Dalela, 2018; Jones, 2016; Tang, 2019)

**Post-treatment/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~~.

**Mild Cognitive Impairment or Dementia**

(Motara, 2017)

- **For the detection of early Alzheimer's disease†;**

* National Imaging Associates, Inc. (NIA) is a subsidiary of Magellan Healthcare, Inc.

- For t~~; t~~he differentiation between Alzheimer's disease, - Dementia with Lewy body disease (DLB) ~~versus~~and Frontotemporal lobar degeneration (FTD)†;; o~~o~~r
- ~~to~~To assess for the presence of Beta amyloid plaque in Alzheimer's disease when being considered for Aduhelm treatment†

†Note: ~~:~~

~~——~~AFTER an initial insufficient evaluation with a Brain MRI‡* and the following 2 criteria have been met (ACR, 2015; Bohnen, 2011):

- ~~——~~1.Objective cognitive impairment (Albert, 2011; Iaccarino, 2017) has been demonstrated by:
  - ~~————~~Either by Mini Mental Status Evaluation (MMSE) or Montreal Cognitive Assessment (MoCA) less than 26 (Davis, 2015)
  - ~~————~~OR by Neuropsychological testing showing at least mild cognitive impairment (Caminiti, 2018; Inui, 2017)
- ~~——~~2. Potential treatable causes have been assessed and addressed (Albert, 2011), such as:
  - ~~————~~Metabolic causes, such as thyroid or vitamin deficiency, anemia, or toxic metabolic encephalopathy
  - ~~————~~Medication side effects (Campbell, 2010)
  - ~~————~~Medical causes, such as vascular or traumatic or inflammatory

‡*Note: Brain CT is acceptable if brain MRI is contraindicated. However, Brain CT cannot be substituted for MRI when Brain PET is requested for evaluation of amyloid plaque because MRI is a prerequisite to Aduhelm treatment.~~For the detection of early Alzheimer's disease or the differentiation between Alzheimer's disease, Dementia with Lewy body disease (DLB) versus Frontotemporal lobar degeneration (FTD) after an initial insufficient evaluation with a **brain MRI* and both of the following have been met** (ACR, 2015; Bohnen, 2011):~~

---

- ~~Objective cognitive impairment (Albert, 2011; Iaccarino, 2017)~~
  - ~~Mini Mental Status Evaluation (MMSE) or Montreal Cognitive Assessment (MoCA) less than 26 (Davis, 2015); **OR**~~
  - ~~Neuropsychological testing showing at least mild cognitive impairment (Caminiti, 2018; Inui, 2017)~~
- ~~Potential treatable causes assessed and addressed (Albert, 2011)~~
  - ~~Metabolic such as thyroid or vitamin deficiency, anemia, or toxic metabolic encephalopathy~~
  - ~~Medication side effects (Campbell, 2010)~~
  - ~~Medical causes such as vascular or traumatic or inflammatory~~

~~***Note**: Brain CT if brain MRI is contraindicated~~

---

**BACKGROUND**

Positron Emission Tomography (PET) scanning using FDG (fluorodeoxyglucose) assesses brain metabolism and perfusion. Uses include identifying epileptic foci prior to surgery, differentiation of residual tumor versus scar, and causes of cognitive decline (Wippold, 2015).

Current agents which show promise in assessing plaques of the protein beta-amyloid include: florbetapir F 18, florbetaben F 18, and flutemetamol F 18 with PET. PET/MR is also being studied (Zhang, 2017). ~~Some other~~Other new agents ~~look at~~target the tau protein and microglial activation.

**POLICY HISTORY**

| Date | Summary |
|---|---|
| Julyne 2021 | • Added information on detection of amyloid for use with Aduhelm |
| May 2020 | • Added CNS lymphoma and glioma after inconclusive imaging<br>• For the detection of early Alzheimer's disease or the differentiation between Alzheimer's disease, Dementia with Lewy body disease (DLB) versus Frontotemporal lobar degeneration (FTD) after appropriate clinical work up and initial insufficient evaluation with a brain MRI<br>• Changed post-surgery to post treatment<br>• Removed longitudinal assessment of memory decline<br>• Added references |
| June 2019 | • Changed indications title to specify: 'using FDG (fluourodeoxyglucose)'<br>• For indication: Mild Cognitive Impairment or Dementia, added '*Brain MRI to rule out structural causes or Brain CT if MRI is contraindicated*'<br>• Added information to background section |

~~June 2019~~

- ~~Changed indications title to specify: 'using FDG (fluourodeoxyglucose)'~~
- ~~For indication: Mild Cognitive Impairment or Dementia, added '*Brain MRI to rule out structural causes or Brain CT if MRI is contraindicated*'~~
- ~~Added information to background section~~

~~May 2020~~

- ~~Added CNS lymphoma and glioma after inconclusive imaging~~
- ~~For the detection of early Alzheimer's disease or the differentiation between Alzheimer's disease, Dementia with Lewy body disease (DLB) versus Frontotemporal lobar degeneration (FTD) after appropriate clinical work up and initial insufficient evaluation with a brain MRI~~
- ~~Changed post-surgery to post treatment~~
- ~~Removed longitudinal assessment of memory decline~~
- ~~Added references~~

~~July 2021~~

- ~~Added information on detection of amyloid for use with Aduhelm~~

**REFERENCES**


Albano D, Bosio G, Bertoli M, et al. 18F-FDG PET/CT in primary brain lymphoma. *J Neurooncol*. 2018; 136(3):577-583. doi:10.1007/s11060-017-2686-3.

Albert MS, DeKosky ST, Dickson D, et al. The diagnosis of mild cognitive impairment due to Alzheimer's disease: Recommendations from the National Institute on Aging-Alzheimer's Association workgroups on diagnostic guidelines for Alzheimer's disease. *Alzheimers Dement*. May 2011; 7(3):270-279.

American College of Radiology (ACR). ACR Appropriateness Criteria®. https://acsearch.acr.org/list. Published 2017.

American College of Radiology (ACR). ACR-ASNR Practice Parameter for Brain PET/CT Imaging in Dementia. 2015.

American College of Radiology (ACR). ACR Appropriateness Criteria®. Seizures and epilepsy. 2014.

Bashir U, Mallia A, Stirling J, et al. PET/MRI in oncological imaging: State of the art. *Diagnostics.* 2015; 5:333-357.

Bohnen NI, Djang DS, Herholz K, et al. Effectiveness and Safety of $^{18}$F-FDG PET in the Evaluation of dementia: A review of the recent literature. J Nuc Med. 2012 Jan 1; 53(1):59-71. Epub 2011 Dec 15.

**Caminiti SP, Ballarini T, Sala A, et al. FDG-PET and CSF biomarker accuracy in prediction of conversion to different dementias in a large multicentre MCI cohort. *Neuroimage Clin*. 2018;18:167-177. doi:10.1016/j.nicl.2018.01.019.**

**Campbell NL, Boustani MA, Lane KA, et al. Use of anticholinergics and the risk of cognitive impairment in an African American population. *Neurology*. 2010; 75(2):152.**

Davis DH, Creavin ST, Yip JL, et al. Montreal Cognitive Assessment for the diagnosis of Alzheimer's disease and other dementias. *Cochrane Database Syst Rev*. 2015.

De-Bonilla-Damiá Á, Fernández-López R, Capote-Huelva FJ, et al. Role of $^{18}$F-FDG PET/CT in primary brain lymphoma. Utilidad de la $^{18}$F-FDG PET/TC en el linfoma cerebral primario. *Rev Esp Med Nucl Imagen Mol*. 2017; 36(5):298-303.

Duerden EG, Albanese MC. Localization of pain-related brain activation: a meta-analysis of neuroimaging data. *Human Brain Mapping.* 2013; 34(1):109-49. doi: 10.1002/hbm.21416.

Dunet V, Pomoni A, Hottinger A, et al. Performance of 18F-FET versus 18F-FDG-PET for the diagnosis and grading of brain tumors: Systematic review and meta-analysis. *Neuro-Oncology*. 2016 Mar; 18(3):426–34.

Govil-Dalela T, Kumar A, Behen ME, Chugani HT, Juhász C. Evolution of lobar abnormalities of cerebral glucose metabolism in 41 children with drug-resistant epilepsy. *Epilepsia*. 2018;59(7):1307-1315. doi:10.1111/epi.14404.

Grinenko O, Li J, Mosher JC, et al. A fingerprint of the epileptogenic zone in human epilepsies. *Brain*. 2018 Jan 1; 141(1):117-131.

Heiss W, Raab P, Lanfermann H. Multimodality assessment of brain tumors and tumor recurrence. *J Nucl Med*. October 2011; 52:1585-1600.

Iaccarino L, Sala A, Caminiti SP, et al. The emerging role of PET imaging in dementia. *F1000Res*. 2017; 6:1830.

Inui Y, Ito K, Kato T, SEAD-J Study Group. Longer-Term Investigation of the Value of 18F-FDG-PET and Magnetic Resonance Imaging for Predicting the Conversion of Mild Cognitive Impairment to Alzheimer's Disease: A Multicenter Study. *J Alzheimers Dis*. 2017;60(3):877-887. doi:10.3233/JAD-170395.

Ishii K. PET Approaches for diagnosis of dementia. *AJNR Am J Neuroradiol*. 2014 Nov; 35(11):2030-38.

Jones AL, Cascino GD. Evidence on use of neuroimaging for surgical treatment of temporal lobe epilepsy: A systematic review. *JAMA Neurol*. April 2016; 73(4):464-470.

Kawai N, Miyake K, Okada M, Yamamoto Y, Nishiyama Y, Tamiya T. *No Shinkei Geka*. 2013; 41(2):117-126.

Lewitschnig S, Gedela K, Toby M, et al. $^{18}$F-FDG PET/CT in HIV-related central nervous system pathology. *Eur J Nucl Med Mol Imaging*. 2013; 40(9):1420-1427. doi:10.1007/s00259-013-2448-1.

Maza S, Buchert R, Brenner W, et al. Brain and whole-body FDG-PET in diagnosis, treatment monitoring and long-term follow-up of primary CNS lymphoma. Radiol Oncol. 2013; 47(2):103-110. Published 2013 May 21. doi:10.2478/raon-2013-0016.

Motara H, Olusoga T, Russell G, et al. Clinical impact and diagnostic accuracy of 2-[$^{18}$F]-fluoro-2-deoxy-d-glucose positron-emission tomography/computed tomography (PET/CT) brain imaging in patients with cognitive impairment: A tertiary centre experience in the UK. *Clin Radiol*. 2017; 72(1):63-73. doi:10.1016/j.crad.2016.08.003.

National Comprehensive Cancer Network (NCCN) Clinical Practice Guidelines in Oncology. 2020. https://www.nccn.org/professionals/imaging/content.

Singhal T. Positron emission tomography applications in clinical neurology. *Semin Neurol.* 2012; 32(4):421-31. doi: 10.1055/s-0032-1331813.

Sperling RA, Johnson KA, Reiman EM, et al. Alzheimer's Plaques in PET Brain Scans Identify Future Cognitive Decline. *Science Daily.* 2012.

Steriade C, Martins W, Bulacio J, et al. Localization yield and seizure outcome in patients undergoing bilateral SEEG exploration. *Epilepsia*. 2019 Jan; 60(1):107-120.

Tang Y, Liow JS, Zhang Z, et al. The Evaluation of Dynamic FDG-PET for Detecting Epileptic Foci and Analyzing Reduced Glucose Phosphorylation in Refractory Epilepsy. Front Neurosci. 2019; 12:993. Published 2019 Jan 9. doi:10.3389/fnins.2018.00993.

Verger A, Langen KJ. PET Imaging in Glioblastoma: Use in Clinical Practice. In: De Vleeschouwer S, editor. Glioblastoma [Internet]. Brisbane (AU): Codon Publications; 2017 Sep 27. Chapter 9. Available from: https://www.ncbi.nlm.nih.gov/books/NBK469986/ doi: 10.15586/codon.glioblastoma.2017.ch9.

Widjaja E, Raybaud C. Advances in neuroimaging in patients with epilepsy. *Neurosurg Focus*. 2008; 25(3):E3.

Wippold FJ 2nd, Brown DC, Broderick DF, et al. ACR Appropriateness Criteria®. Dementia and movement disorders. *J Am Coll Radiol*. 2015 Jan; 12(1):19-28.

Zhang XY, Yang Zl, Lu GM, et al. PET/MR imaging: New frontier in Alzheimer's disease and other dementias. *Front Mol Neurosci*. 2017 Nov 1; 10:343.

**Reviewed / Approved by NIA Clinical Guideline Committee**

## GENERAL INFORMATION

**It is an expectation that all patients receive care/services from a licensed clinician. All appropriate supporting documentation, including recent pertinent office visit notes, laboratory data, and results of any special testing must be provided. If applicable: All prior relevant imaging results and the reason that alternative imaging cannot be performed must be included in the documentation submitted.**

Reviewed / Approved by  M. Atif Khalid, M.D., Medical Director, Radiology