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ELDER CARE

A Resource for Interprofessional Providers

Amyloid Imaging for Alzheimer's Disease

Phillip H. Kuo, M.D., Ph.D., Department of Medical Imaging, University of Arizona

Alex Hishaw, M.D. and Geoffrey L. Ahern, M.D., Ph.D., Department of Neurology, University of Arizona

Since 2011, the US Food and Drug Administration (FDA) has approved three drugs for the imaging of beta-amyloid plaque in the brain. These drugs are florbetaben, florbetapir and flutemetamol (trade names NeuraCeq, Amyvid and Vizamy, respectively).

Beta-amyloid plaques in the brain are one of the hallmarks of Alzheimer's disease (AD). Previously, a definitive diagnosis of Alzheimer's disease required post-mortem autopsy of the brain to evaluate for amyloid plaque using a special stain and a microscope. With these new imaging agents, amyloid plaque in the brain can now be detected non-invasively in live patients with a positron emission tomography/computed tomography (PET/CT) scan.

These drugs are labeled with radioactivity and, when injected intravenously, they bind to amyloid in the brain and the radioactive label allows localization. The radioactivity decreases by half every 2 hours. Given this rapid decay, no special radiation precautions are required. The typical PET/CT scan with these agents delivers approximately the same amount of radiation as 3 years of background radiation.

For example, after florbetapir is injected, it is allowed to circulate for 30 minutes. The patient then lies down in a PET/CT scanner (Figure 1). A CT scan of the head is performed in a few seconds and is followed by a ten-minute PET scan. The radiologist then views the three-dimensional image of the brain as slices. Normal scans will show accumulation of radiolabeled florbetapir only in the white matter (Figure 2), while abnormal scans with significant amounts of amyloid plaque will show radioactivity in the white and gray matter out to the periphery of the brain (Figure 3).

Although approved by the FDA, amyloid imaging for AD was not initially covered by Medicare, and other health plans also did not provide coverage. One reason for the lack of coverage is concern about the costs (about \$3,500



Figure 1. High-Resolution PET/CT Scanner

per scan) that will be generated by extensive use of this imaging to diagnose AD when no therapy is approved to slow or stop the disease after it has been diagnosed. Concern has also been expressed that a positive scan does not by itself provide a definitive diagnosis of AD. For example, some cognitively normal older adults will have a positive scan, even though they do not have and may never develop AD. Conversely, a negative scan means that a patient has little or no amyloid plaque at the time of the scan. But, it does not mean that the patient will never develop amyloid plaque in the future.

Still, there are several clinical situations in which amyloid imaging has potential utility. One is when a patient exhibits findings of AD at a younger-than-expected age. A second is to determine if a patient with mild cognitive impairment who does not meet criteria for AD is simply demonstrating normal age-related memory changes or if the patient is in the early stages of AD. The third is when a patient's differential diagnosis includes conditions such as frontotemporal dementia, primary progressive aphasia, or posterior cortical atrophy/visual-variant AD, and the

TIPS ABOUT AMYLOID IMAGING FOR DIAGNOSIS OF ALZHEIMER'S DISEASE

- A patient with a typical presentation of Alzheimer's disease (AD) does not usually require amyloid imaging for confirmation of the diagnosis.
- Keep in mind that currently, except for patients enrolled in the IDEAS study, Medicare and most health insurance plans will not pay for amyloid scans. So, only order them if they will change the plan of care.
- Consider ordering an amyloid scan if it would be useful to identify the presence of amyloid, and thus confirm or exclude a diagnosis of AD in patients who present with Alzheimer's-like dementia at a younger-than-expected age, in patients with mild cognitive impairment who do not meet criteria for AD, and in those with an unclear diagnosis.

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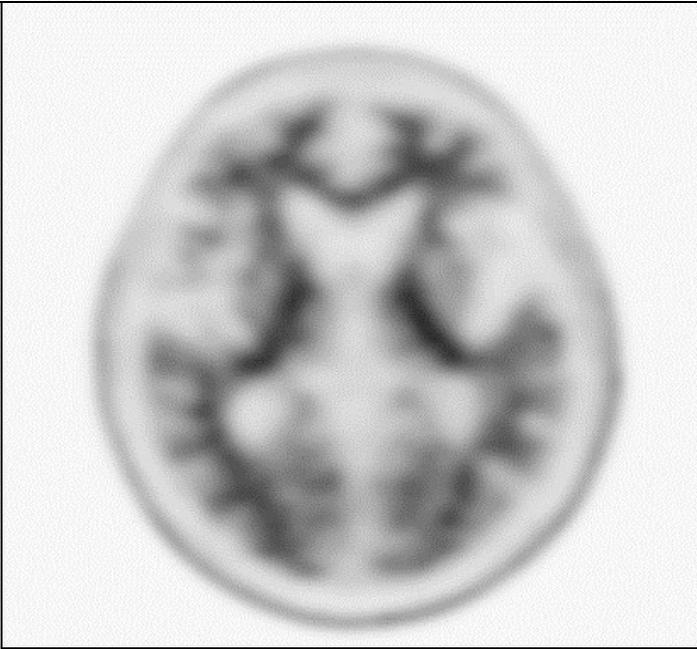


Figure 2. Negative Amyloid Scan. This PET/CT scan is negative for significant amyloid in the brain. The radiopharmaceutical (black) accumulates only in the white matter in a pattern that can be described as “mountain ridge”. This scan is not consistent with Alzheimer’s disease.

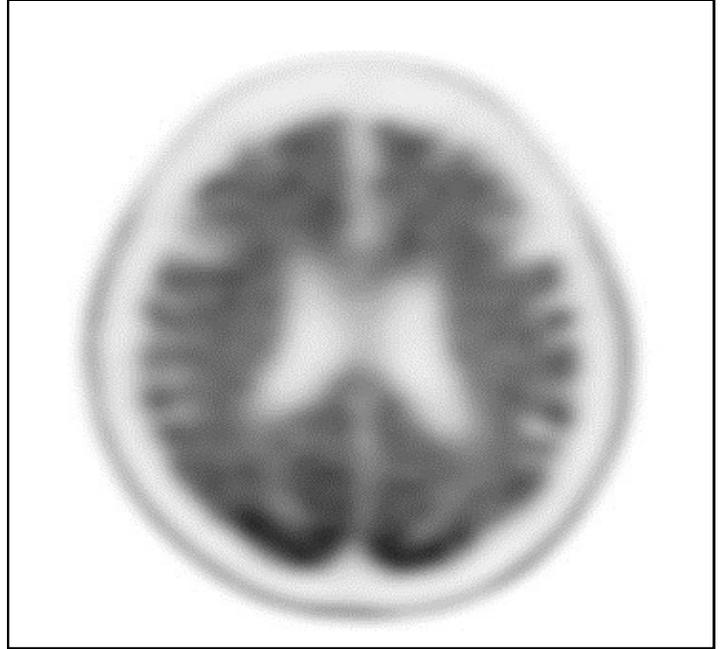


Figure 3. Positive Amyloid Scan. This PET/CT scan is positive for significant amyloid in the brain. The radiopharmaceutical (black) accumulates in both the white and gray matter, with distribution out to the periphery of the brain. This scan is consistent with Alzheimer’s disease.

correct diagnosis is unclear. In these situations, the presence of significant amyloid on PET/CT would suggest that amyloid pathology is causing the patient’s cognitive impairment.

To collect more data on the clinical utility of amyloid imaging, the Centers for Medicare & Medicaid Services (CMS) approved the Imaging Dementia—Evidence for Amyloid Scanning (IDEAS) study. The study is ongoing and will collect 18,488 scans from roughly 200 sites throughout the United States. The aims are to assess the impact of amyloid PET on the management of patients and on hospital admissions and emergency room visits (visit the IDEAS study website for more information at <https://www.ideas-study.org>).

At the 2017 Alzheimer’s Association International Conference, preliminary results from the first 4,000 patients from the IDEAS study were presented. It was reported that

References and Resources

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- Information about studies presented at the 2017 Alzheimer’s Association International Conference can be found at: www.alz.org/aaic/releases_2017/AAIC17-Wed-briefing-Developing-Topics.asp and www.alz.org/aaic/releases_2017/AAIC17-Sun-PET-Scan-Release.asp

obtaining a PET/CT scan changed the medical management in 68% of patients. These results exceed the hypothesized 30% change.

Other studies presented at the meeting found that underuse of PET amyloid imaging contributes to misdiagnosis of dementia. Additionally, a survey of individuals with cognitive impairment and their caregivers found the majority were receptive to imaging if recommended by their physician.

The other potential use of these scans is for research on new AD treatments. To determine the efficacy of such treatments, it will be essential to confirm that research subjects do, in fact, have AD. Detection of amyloid with a PET/CT scan will provide that confirmation. Similarly, when studying therapies targeting amyloid plaque with the intention of slowing the progression of AD, serial scans will assist with the longitudinal assessment of outcomes.

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The University of Arizona, PO Box 245069, Tucson, AZ 85724-5069 | (520) 626-5800 | <http://aging.arizona.edu>

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