

A decade of research proves PET effectively detects dementia

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In a new review of imaging studies spanning more than ten years, scientists find that a method of positron emission tomography (PET) safely and accurately detects dementia, including the most common and devastating form among the elderly, Alzheimer's disease. This research is featured in the January issue of the *Journal of Nuclear Medicine*.

Researchers reviewed numerous PET studies to evaluate a [molecular imaging](#) technique that combines PET, which provides functional images of biological processes, with an injected biomarker called 18F-FDG to pinpoint key areas of metabolic decline in the brain indicating dementia. Having physiological evidence of neurodegenerative disease by imaging [patients](#) with PET could give clinicians the information they need to make more accurate diagnoses earlier than ever before.

"The new data support the role of 18F-FDG PET as an effective addition to other diagnostic methods used to assess patients with symptoms of dementia," says Nicolaas Bohnen, MD, PhD, lead author of the study and professor of radiology and neurology at the University of Michigan, Ann Arbor, Mich. "The review also identified new literature showing the benefit of this imaging technique for not only helping to diagnose dementia but also for improving physician confidence when diagnosing a patient with dementia. This process can be difficult for physicians, especially when evaluating younger patients or those who have subtle signs of disease."

Dementia is not a specific illness but a pattern of symptoms

characterized by a loss of cognitive ability. These disorders can be caused by injury or [progressive disease](#) affecting areas of the brain that control attention, memory, language and mobility. While Alzheimer's is most commonly associated with progressive [memory impairment](#), dementia with Lewy bodies, another form of the disease, can be associated with symptoms of Parkinson's and prominent hallucinations, while another disorder, called frontotemporal dementia, can be seen in patients showing uncharacteristic personality changes and difficulties in relating and communicating. Physicians can use FDG-PET with high accuracy to not only help diagnose dementia but also differentiate between the individual disorders. The role molecular imaging plays in the diagnosis of dementia has expanded enough that the official criteria physicians use to diagnose patients now includes evidence from molecular imaging studies.

"For the first time, imaging biomarkers of Alzheimer's disease are included in the newly revised clinical diagnostic criteria for the disease," says Bohnen. "This is a major shift in disease definition, as previously an Alzheimer's diagnosis was based mainly on a process of evaluating patients to exclude possible trauma, hemorrhage, tumor or metabolic disorder. Now it is becoming a process of inclusion based on biomarker evidence from molecular imaging."

The PET biomarker ^{18}F -FDG comprises a radionuclide combined with fluorodeoxyglucose (FDG), which mimics glucose in the body. Cells metabolize FDG as fuel, and the variation in this uptake by cells throughout the body can then be imaged to detect a range of abnormalities. In the case of dementia, marked reductions in the metabolism of different lobes of the cerebral cortex can confirm a patient's disorder. Physicians can tell Alzheimer's disease apart from other dementias, depending on the specific cortices affected.

This review presents the most up-to-date and salient evidence of FDG-

PET's usefulness for the evaluation of patients with suspected dementia. The objective of the study was to replace prior retrospective reviews that were performed as the technique was just emerging and that suggested methodological improvements. The new review includes studies with better methodology, including confirmation of diagnoses with autopsy, more expansive recruitment of subjects and use of multi-center studies. After reviewing 11 studies that occurred since the year 2000 and that met more stringent study review standards, researchers conclude that 18F-FDG is highly effective for detecting the presence and type of dementia.

"Using 18F-FDG PET in the evaluation of patients with dementia can improve diagnostic accuracy and lead to earlier treatment and better patient care," says Bohnen. "The earlier we make a diagnosis, the more we can alleviate uncertainty and suffering for patients and their families."

The biomarker 18F-FDG is among a variety of imaging agents being investigated for its efficacy in Alzheimer's imaging. As treatments for [dementia](#) become available for clinical use, PET will no doubt play an important role in not only the diagnosis of these diseases, but also the assessment and monitoring of future therapies.

According to the World Health Organization, an estimated 18 million people worldwide are currently living with Alzheimer disease. That number is projected to almost double by 2025.

More information: "Effectiveness and safety of FDG-PET in the evaluation of dementia: a review of the recent literature" *Journal of Nuclear Medicine*. jnm.snmjournals.org/

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