

How can PET/CT amyloid imaging aid the diagnosis of Alzheimers Disease?

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What is Alzheimers disease?

- ◆ Progressive neurodegenerative disease, *currently* no prevention or cure.²
- ◆ Increased amount of Amyloid protein deposits found in the brain. Tau tangles and increased levels of acetylcholine are also present. The deposition of the protein in the brain results in the build-up of insoluble plaques and causes severe damage to neurons in the cortical memory pathways.⁵
- ◆ 20-30 years before symptoms develop.³
- ◆ Significant disease of 21st century – research strategies urgently needed to manage the impact of the disease.

What is Amyvid?

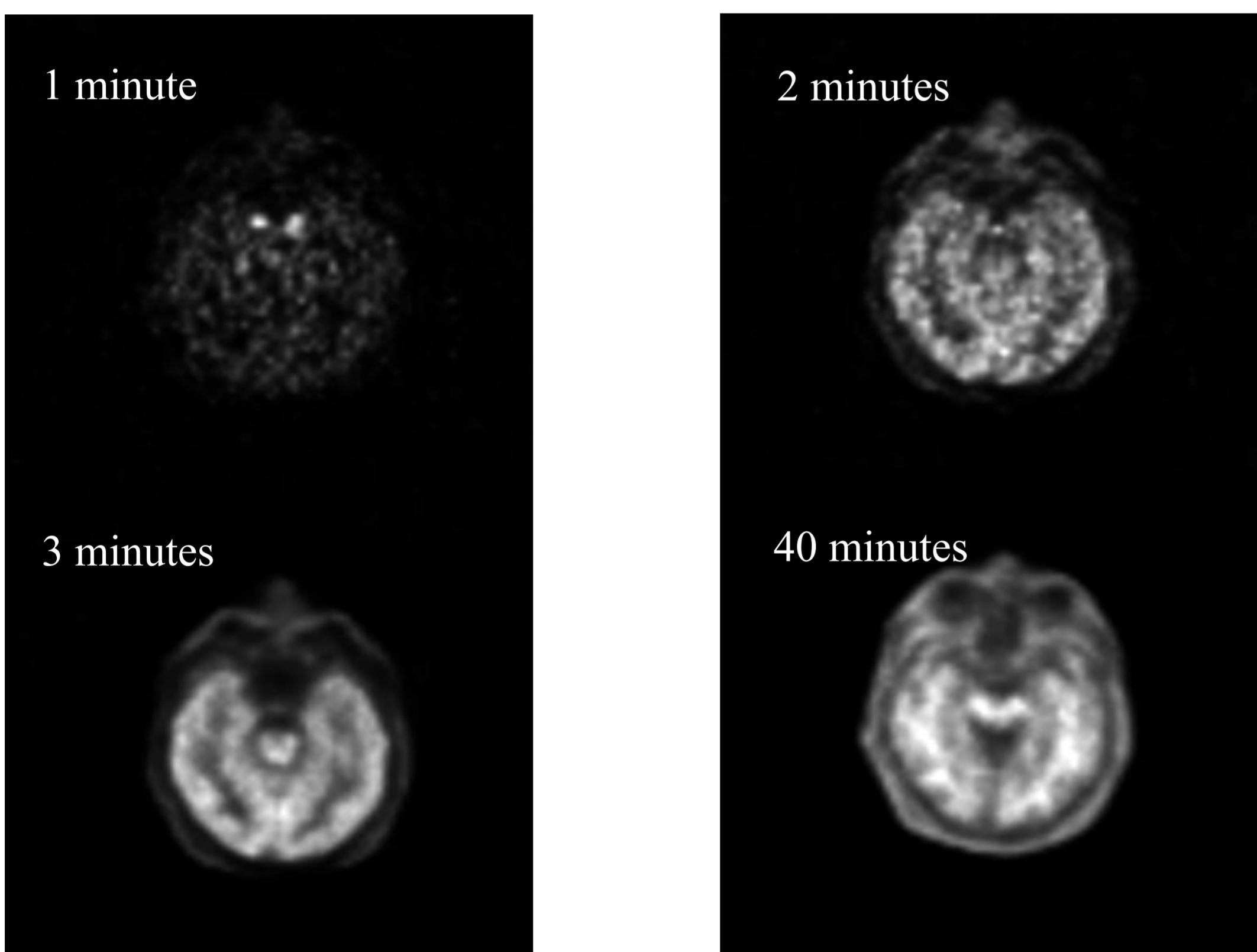
- ◆ ¹⁸F radionuclide called Florbetapir.
- ◆ Also known as ¹⁸F-AV-45
- ◆ Half life of 110 minutes.
- ◆ Manufactured by Eli Lilly and company and given the brand name 'AMYVID'.
- ◆ Selectively binds to beta-amyloid neuritic plaques in the brain³ in order to evaluate and help in the diagnosis of AD, based on the molecular pathology within the brain.²
- ◆ Approved by FDA for clinical use in PET imaging of the brain on April 6th 2013



Images of Amyvid Brain Scans

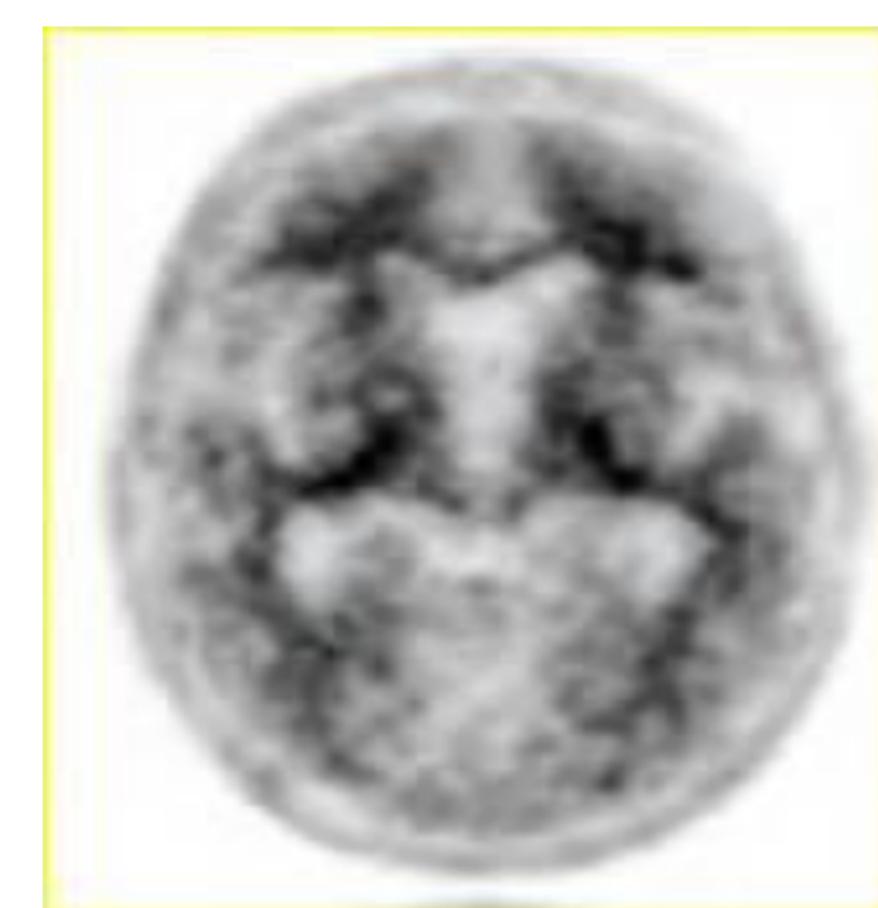
PET images below demonstrate time points after administration of Amyvid, acquired using LIST mode.

Amyvid (¹⁸F-florbetapir)

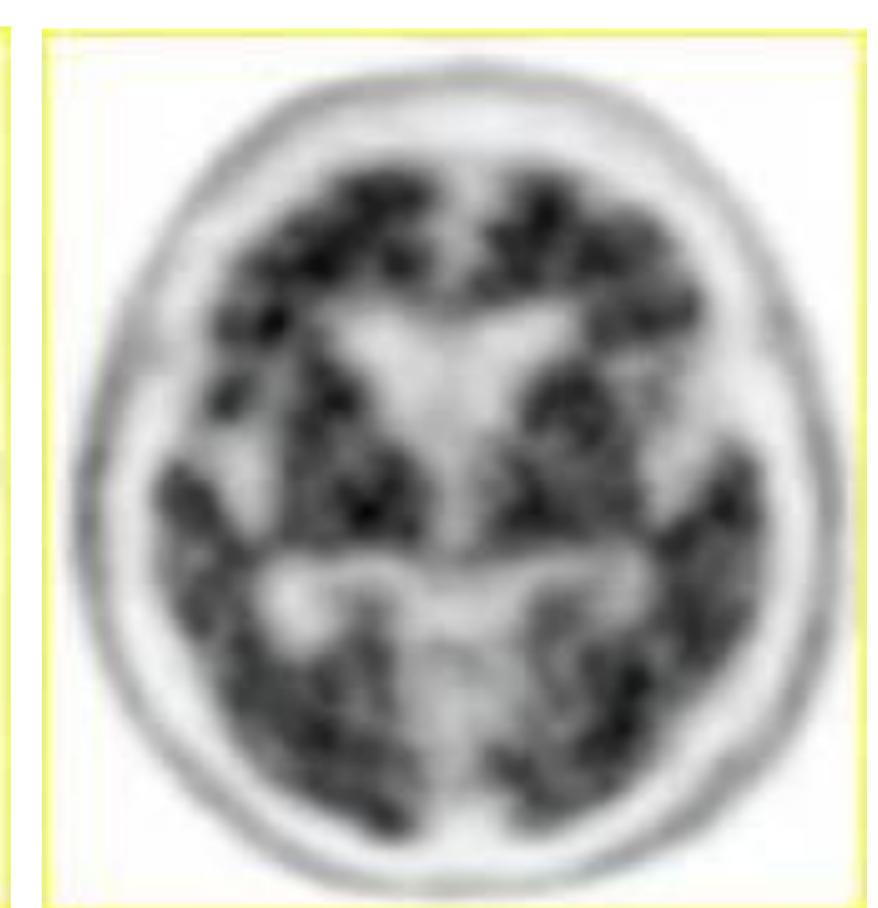


PET Images of an Amyvid brain scan

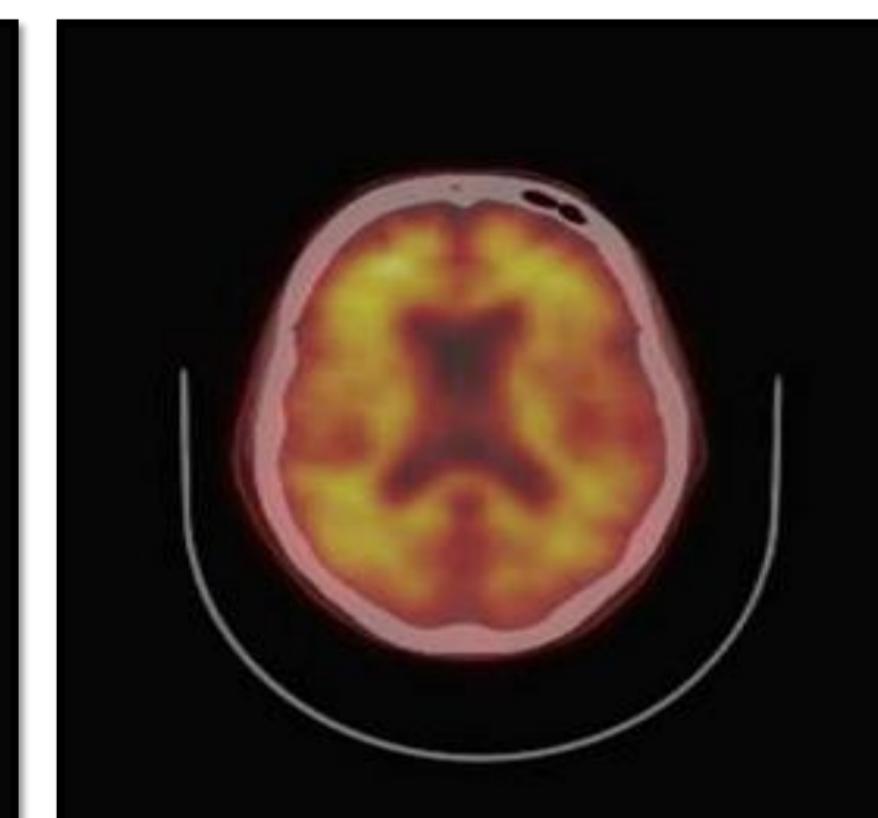
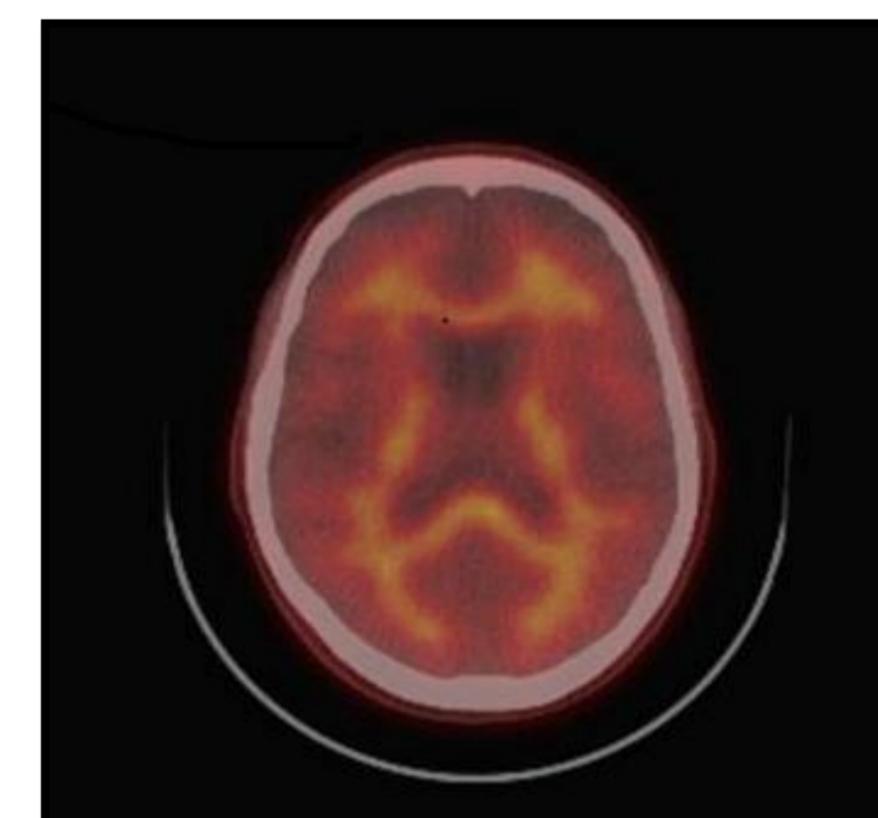
Negative Scan



Positive scan



Combined PET/CT Images of an Amyvid brain scan



Images supplied by Eli Lilly and Company

LIST Mode

In Newcastle, we acquire the data from some Amyvid scans in LIST mode. LIST mode is a research tool for **dynamic imaging**; it enables us to reconstruct the data into different time frames. In one of our studies we use LIST mode to acquire data as the Amyvid is being injected into the patient, to see how it interacts with the brain in those first few seconds and minutes.

Image Interpretation

A **negative** Amyvid scan demonstrates sparse to no amyloid plaques in the brain. The negative scan shows more radioactivity in the white matter than in the grey matter, creating a clear grey-white contrast. This scan can reliably **exclude the diagnosis of Alzheimers Disease**.²

The **positive** Amyvid scan demonstrates a high build up of amyloid plaque which is consistent with a diagnosis of Alzheimers Disease. There is a marked reduction in the normally distinct grey-white matter as a result of increased cortical radioactivity. A positive amyloid scan **increases the clinical certainty of Alzheimers Disease**.³

Limitations

Amyvid **cannot establish a definitive diagnosis** of Alzheimers Disease or any other cognitive disorder. It must be used in conjunction with other investigations to rule out thyroid disease, vitamin deficiencies and infection. Also MRI imaging to rule out pathology.³

In order to get FDA approval, Eli Lilly have set up a specialised **reader training programme** which all reporting clinicians must complete prior to reporting on the images.¹ The training aims to provide consistent and reliable interpretations, therefore reducing inter-reader variability.

Further Research

Florbetapir and other amyloid imaging tracers may be used in the future as **biomarkers** for the progression of Alzheimers Disease in asymptomatic individuals³, before the onset of dementia.

Florbetapir may also be used to assess the effect of **anti-amyloid therapies**.⁴

Ultimately, these tracers will hopefully clarify the pathophysiological role of amyloid in Alzheimers Disease and contribute to the development of **new treatments**.⁴

If amyloid plaques are detected early, before the onset of dementia where daily activities are impaired, there may be increased scope for improved patient management and treatment.^{2,4}

References

1. Amyloid Imaging: The Next Frontier in Alzheimers care. Howell, W.J.L, diagnostic Imaging, May 09, 2012.
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