

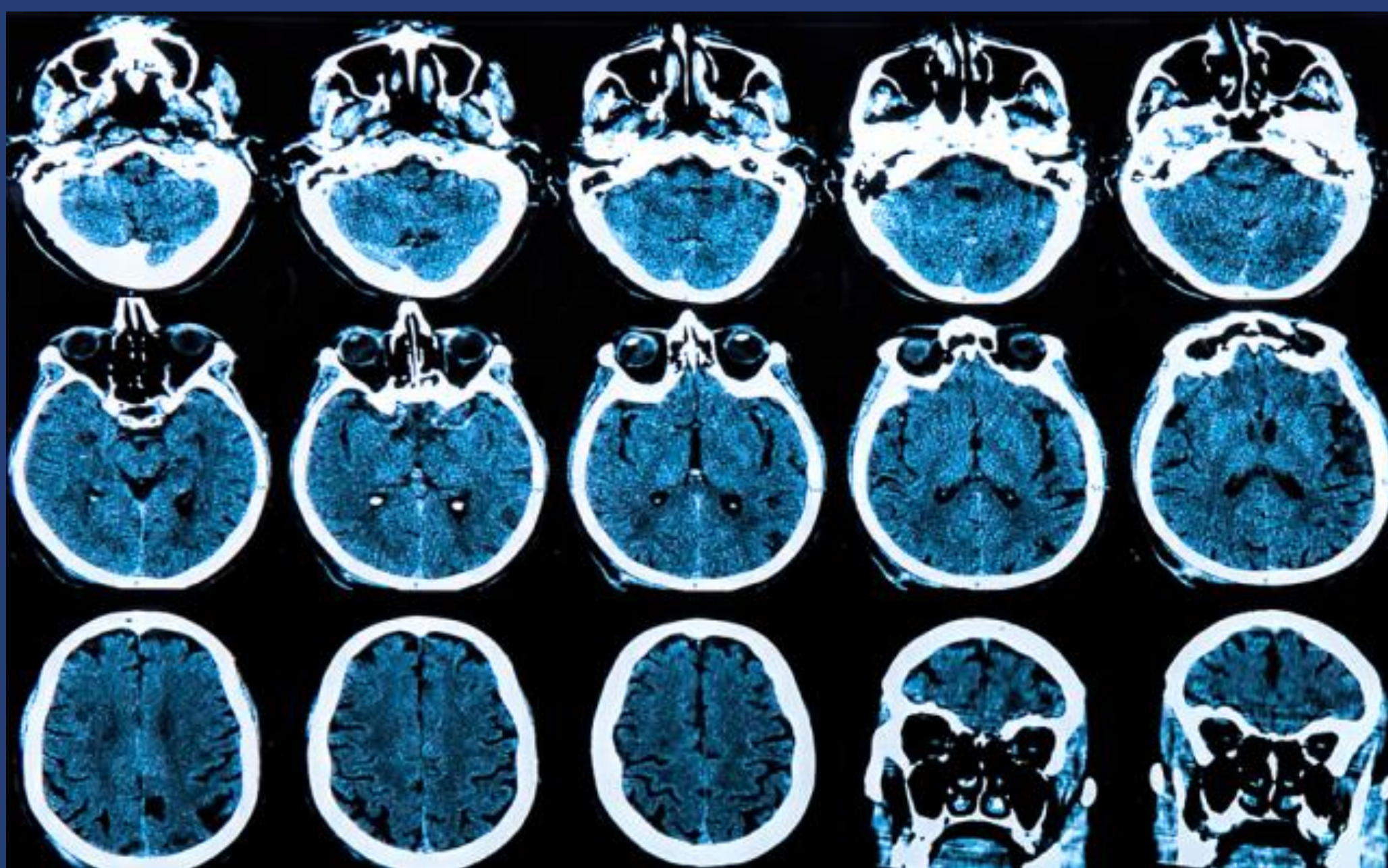
Alzheimer's Disease

Introduction

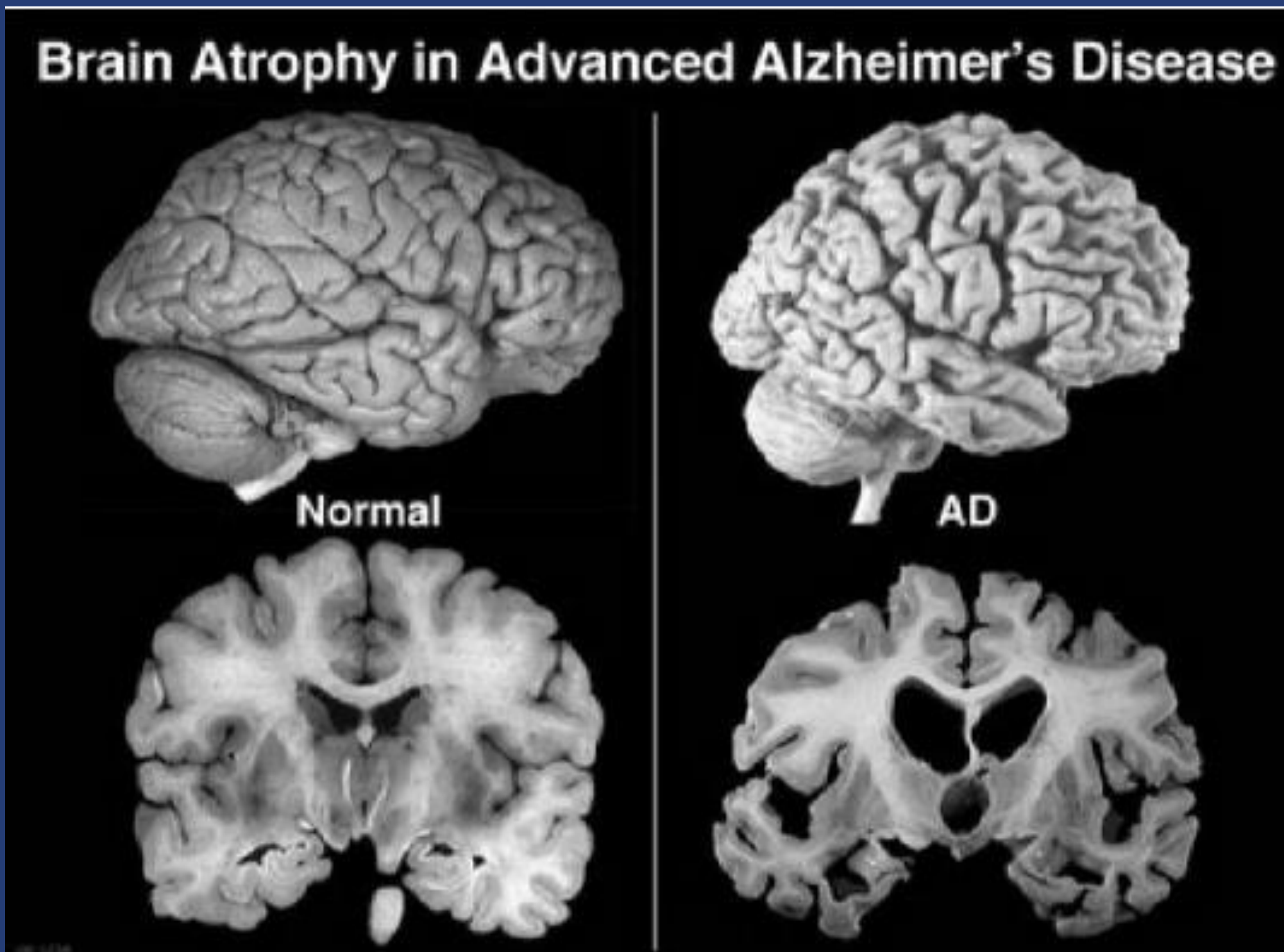
- Over 4.5 million Americans are affected daily by Alzheimer's disease in the United States. With this disease comes a loss of cognitive abilities that gradually worsen as time continues. There is a loss of the ability to remember, learn, and eventually function.
- Although the cause is unknown, plaques and neurofibrillary tangles within the brain are known to be factors in the diagnosis of Alzheimer's disease.
- With the vast advancements in imaging we have become able to better diagnose and track the progression of this disease by utilizing the structural, functional, and molecular imaging.

Structural Imaging

- Allow radiologists to view the size, shape and volume of various areas of the brain. This is used to monitor any changes in the dimensions of a part of the brain, which could resemble progression of the disease.
- UCLA has begun using neuroreaders that is FDA approved which evaluates different brain regions using Magnetic resonance imaging. This neuroreader can analyze volumetric changes in less than 5 minutes for specific lobes of the brain. And only 10 minutes to analyze the entire brain.
 - Monitors atrophy and healing by evaluating changes in the volumes of parts of the brain.
- Studies have found that changes in brain size are related to the progression of a decrease in cognitive abilities.



<https://www.dotmed.com/news/story/27594>



<http://www.alzforum.org/news/community-news/100m-ideas-cms-blesses-study-evaluate-amyloid-scans-clinical-practice>

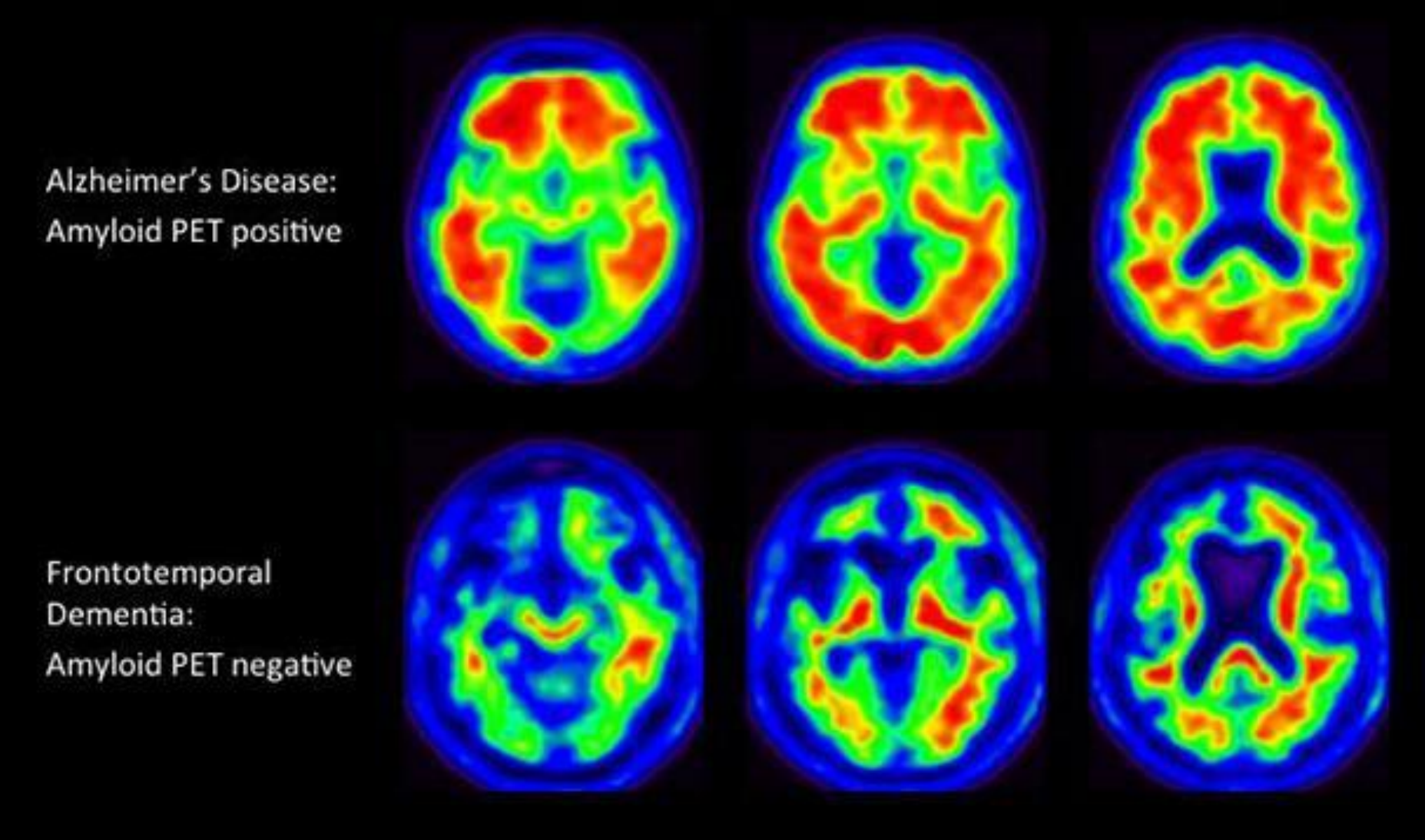
Functional Imaging

- Biomarkers are neuroindicators that are used to assess the risk or presence of a disease, even before symptoms occur.
- Biomarkers are being used by detecting beta-amyloid and tau levels in the cerebral spinal fluid of the brain.
- There are currently no biomarkers that have been proven to detect Alzheimer's disease, but several are currently being tested including brain imaging proteins in cerebral spinal fluid, proteins within the blood, and genetic risk profiling.
- Studies suggest that in the early stages of Alzheimer's, there are changes in the levels of beta-amyloid and tau levels.
- The challenge with this method of diagnosis is there is not currently a standard on how to analyze the data collected. There is not a set standard or a "normal", or "abnormal" level of beta-amyloids, or tau levels. Once there is a set standard, the tests and research will be much more efficient to evaluate and study.
- If there is in fact a connection between changes in these levels in the body and a person later developing Alzheimer's disease, this will allow for more accurate early detection and early treatment options for people.

Positron Emission Tomography (PET)

- Commonly used with functional imaging, this suggest that patients with Alzheimer's disease may have a reduction in brain cell activity in specific regions of the brain.
- Provides noninvasive procedure that measures cerebral blood flow, metabolism, and the binding of receptors.
- This is also commonly used to monitor the progression of the disease, including the patients response or outcome of a treatment option.
- Found that Alzheimer's disease is commonly associated with the reduction in the use of glucose in brain regions that are used for memory, problem solving, and learning.
 - This is currently not proven, but studies suggest a correlation.

Amyloid PET Imaging in Alzheimer's Disease and Frontotemporal Dementia



https://www.researchgate.net/figure/273768877_fig2_Fig-2-Brain-Atrophy-in-Advanced-Alzheimer%27s-Disease-41

Molecular Imaging

- One of the best and most efficient ways to detect Alzheimer's disease before the brain function or structures are affected.
- Pittsburgh Compound B (PIB) first radiotracer able to highlight deposits of beta-amyloid while patient has a PET scan.
- Clinical trials are beginning for radiotracers to detect tau protein levels, which tends to represent as an abnormally large amount in patinets with Alzheimer's disease.
- Again, radiotracers and biomarkers are not used to diagnose Alzheimer's disease, but show the levels of beta-amyloid and tau level. This data may suggest risk of Alzheimer's disease later on in life.

Conclusion

- Alzheimer's disease is the sixth leading cause of death of people in the United States.
- With improvements of imaging technology, Alzheimer's disease is being diagnosed at very early stages, allowing treatment plans to begin before permanent, irreversible damage is done to the brain.
- Imaging is also very valuable with a patient diagnosed with this disease to monitor the outcomes of treatment.
- Medical Technology is continuing to improve by using structural, function, and molecular imaging properties in order to more accurately and efficiently diagnose Alzheimer's in its early stages.

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