C3 DIAGNOSTIC IMAGING & ALZHEIMER'S

OBJECTIVES

- Identify the 7 stages of Alzheimer's disease (AD)
- Learn about the first patient with AD
- Discuss possible causes of AD
- Examine how AD can be seen radiographically
- Discuss various treatment options for AD

WHAT IS ALZHEIMER'S?

- Alzheimer's Disease (AD) is a progressive neurodegenerative disorder that primarily impacts memory and cognitive functions.
  - Patients diagnosed with AD have accelerated rates of loss in brain volume.
  - As the disease continues to advance, individuals may have trouble recognizing familiar faces, and may also exhibit changes in behavior and personality.
    - Due to destroying of neurons and connections in parts of the brain involving memory, including the entorhinal cortex and hippocampus.
  - As the disease progresses, other areas of the brain become affected including the cerebral cortex which is responsible for language, reasoning, and social behavior.
- AD was initially regarded as a rare condition in 1907 following Alois Alzheimer's description.
- It is now the leading cause of dementia, accounting for 60-80% of all dementia cases.
- Sporadic Alzheimer's is the most common type.

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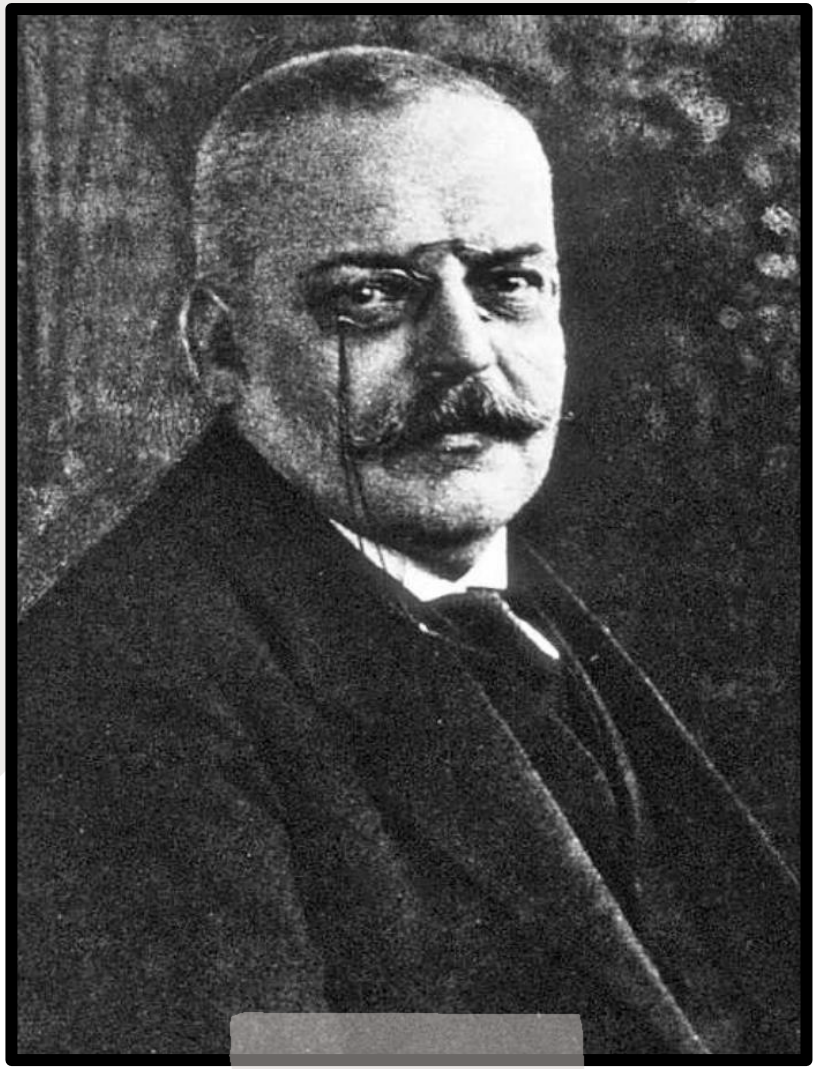
7 STAGES OF ALZHEIMER'S

- **Stage 1: Pre-clinical Alzheimer's disease.**
  - Changes in the brain related to Alzheimer's are seen.
  - Begins approximately 10-15 years before symptoms are noticeable.
- **Stage 2: Basic forgetfulness.**
  - Memory lapses.
  - Forgetting people's names, or where they left their keys, but can still drive, go to work, and be social.
- **Stage 3: Noticeable memory difficulties**
  - Trouble remembering material recently read, remembering plans, and have more difficulty recalling names or words.
  - Person may experience challenges in social settings or at work.

- **Stage 4: More than memory loss**
  - Damage to the brain involves aspects outside of memory.
  - Performing daily tasks become more challenging.
  - Confusion on day and time, increased risk of wondering or getting lost, changes in sleep patterns, difficulty dressing appropriately for weather or occasions.
- **Stage 5: Decreased independence**
  - Emotional changes are common during this stage including hallucinations, delusions, and paranoia.
- **Stage 6: Severe symptoms**
  - Communication becomes challenging especially with specific thoughts.
  - Significant personality changes and increases anxiety.
  - Person may become more frustrated or appear easily angered and their independence decreases.
- **Stage 7: Lack of self-control**
  - Body may begin to shut down as their mind struggles to communicate and perform tasks effectively.
  - May need round-the-clock care with walking, sitting, and eventually swallowing.



DR. ALOIS ALZHEIMER

- 1906: November 3rd, Alzheimer's disease was first described as:
  - "A peculiar severe disease process of the cerebral cortex"
- German physician researching a correlation between symptoms and microscopic brain changes.
- Set a new standard for understanding neurodegenerative disorders by using new scientific tools to determine how symptoms relate to physical brain changes.
- 1915: Dr. Alzheimer dies.

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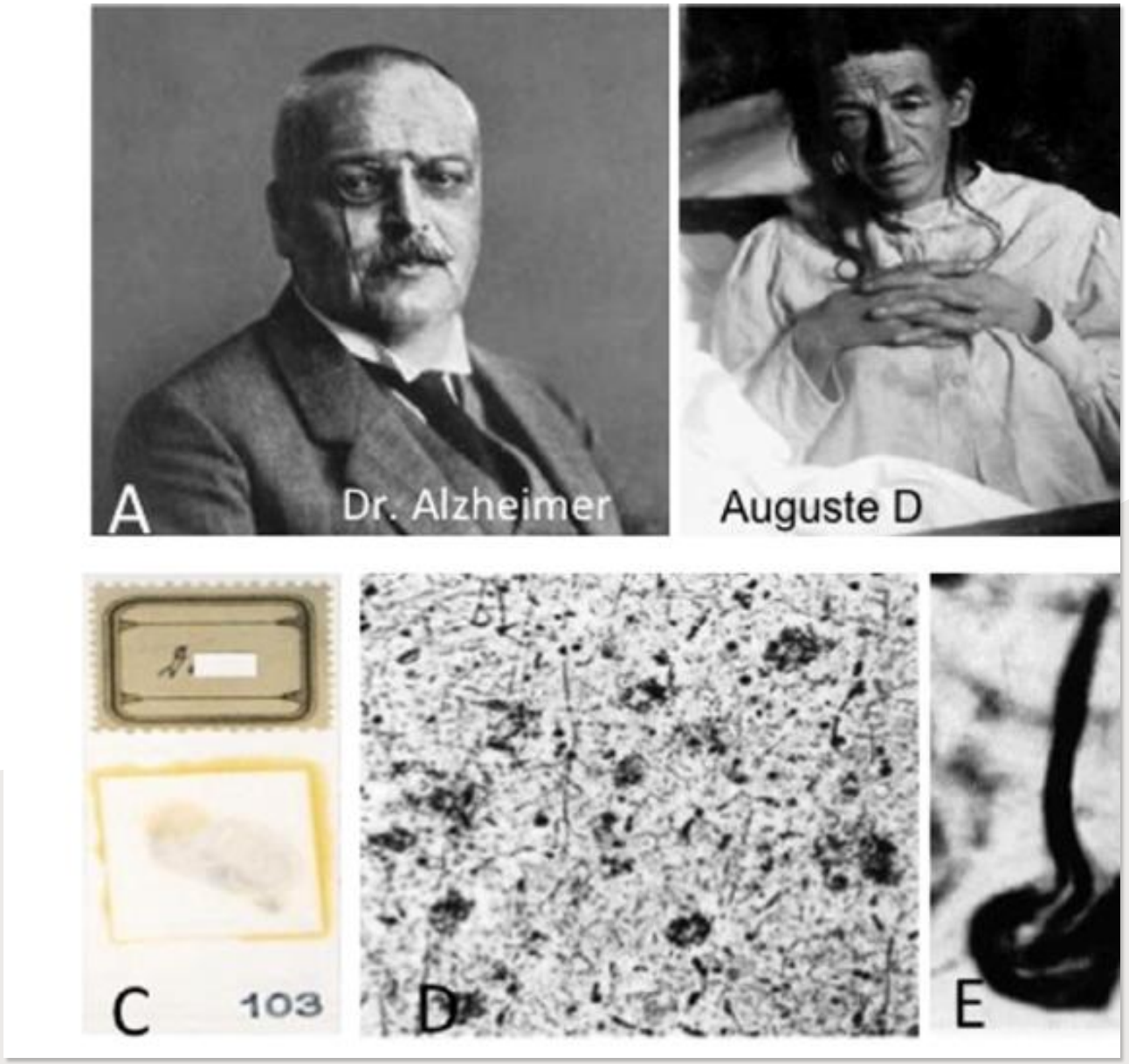
AUGUSTE DETER

- 1901: Dr. Alzheimer's first patient at the Frankfurt Psychiatric Hospital.
- 50-year-old female patient who developed memory loss and other behavioral consequences.
  - Admitted by husband for paranoia, progressive sleep and memory disturbance, aggression, and confusion.
- 1906: Deter dies at age 55.
- Brain autopsy revealed dramatic brain shrinkage, presence of distinctive plaques, and neurofibrillary tangles (NFTs)
  - NFT's are composed of tau proteins that interfere with cytoskeletal integrity and disrupts synapse and neuronal function.



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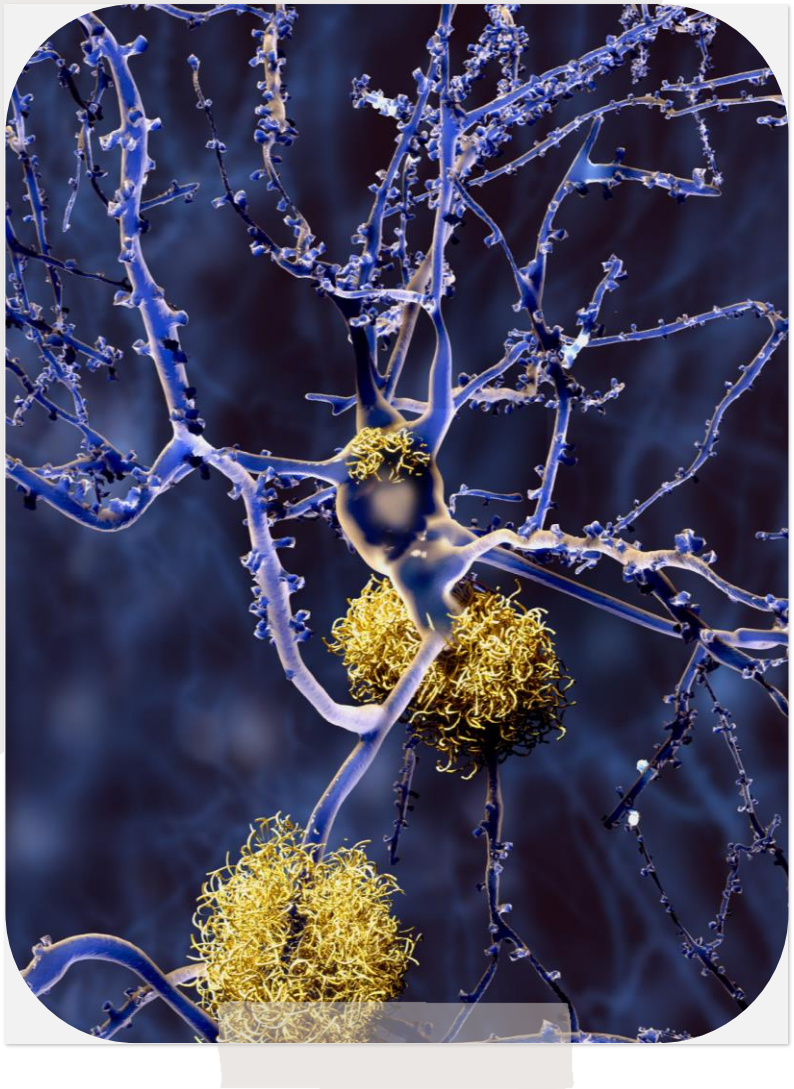

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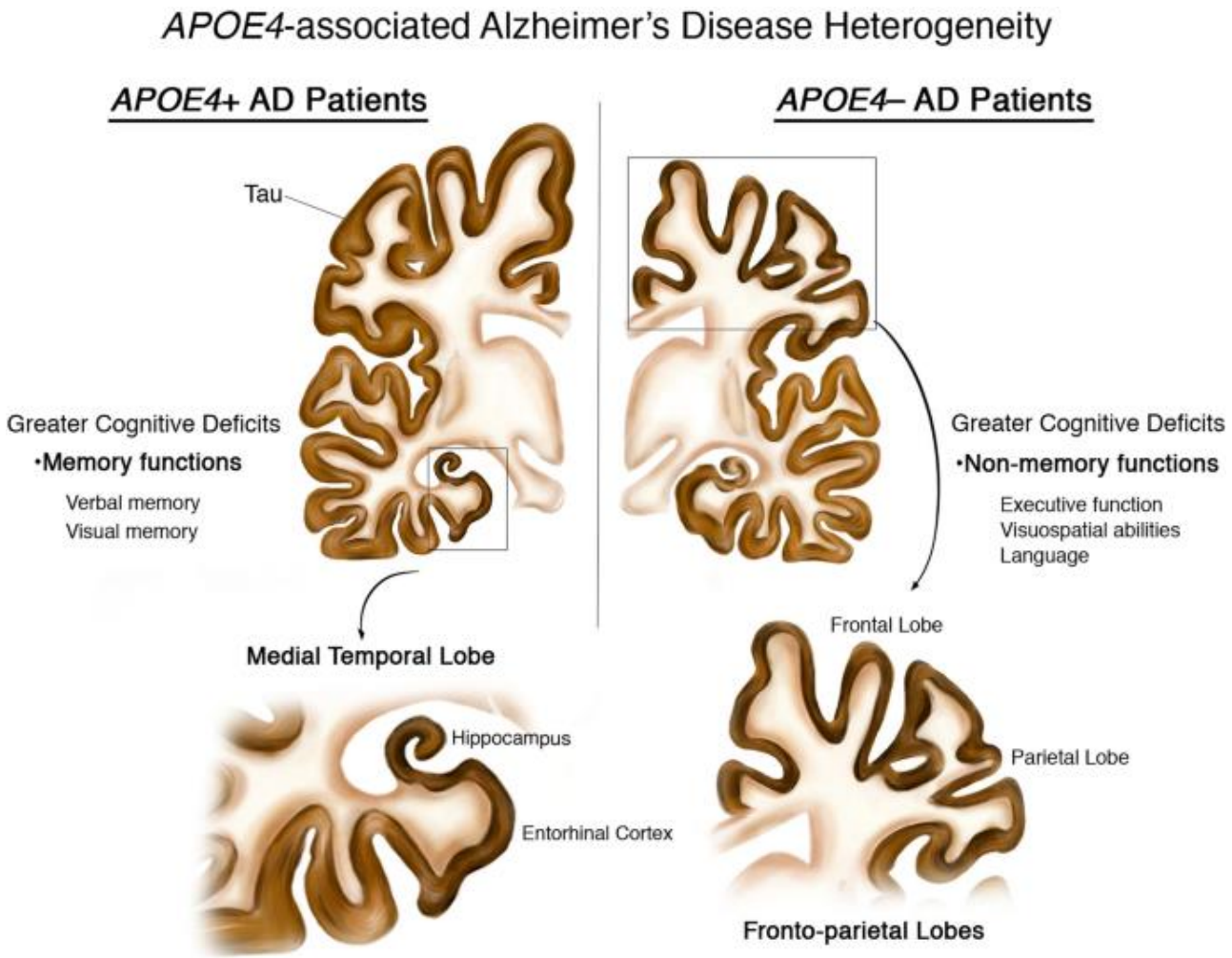
CAUSE OF ALZHEIMER'S

- No exact cause.
- Risk factors: genetics, environmental, lifestyle, age.
  - Chances of developing AD increases after the age of 65.
- Gene variants such as the Apolipoprotein E (ApoE) ε4 allele.
  - ApoE: a major cholesterol carrier that supports lipid transport and injury repair in the brain.
  - Individuals carrying the ε4 allele are at increased risk of developing AD compared to those carrying the ε3 allele, which is more common.

CAUSE OF ALZHEIMER'S

- Characterized by the accumulation of 2 abnormal protein structures in the brain: amyloid plaques and tau tangles.
  - Amyloid plaques: Protein fragments that clump together and disrupt communication between neurons.
  - Tau tangles: Formed by misfolded tau proteins that accumulate within neutrons leading to the breakdown of their internal transport system.
- Researchers have determined a connection between age and the tipping point in amyloid accumulation.
  - Individuals with low Cerebrospinal fluid levels of amyloid and a high number of total taus are more prone to developing sporadic AD.



- APOE4 positive: Shows more tau accumulation and brain atrophy in the medial temporal lobe.
  - Experience greater memory impairment

- APOE4 negative: Shows more tau accumulation and brain atrophy in the frontal and parietal lobes.
  - Experience greater impairment in executive function, visuospatial abilities, and language.

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Healthy brain AD brain

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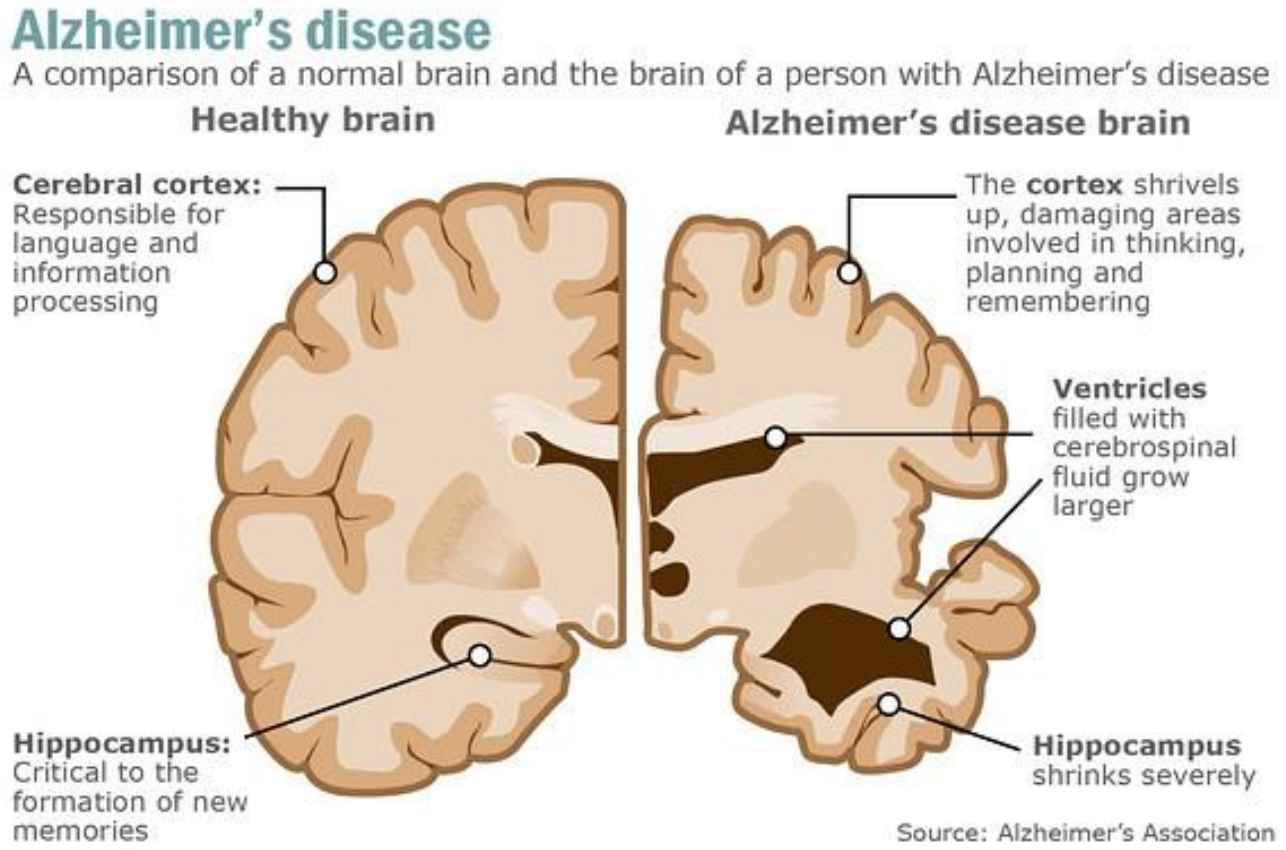

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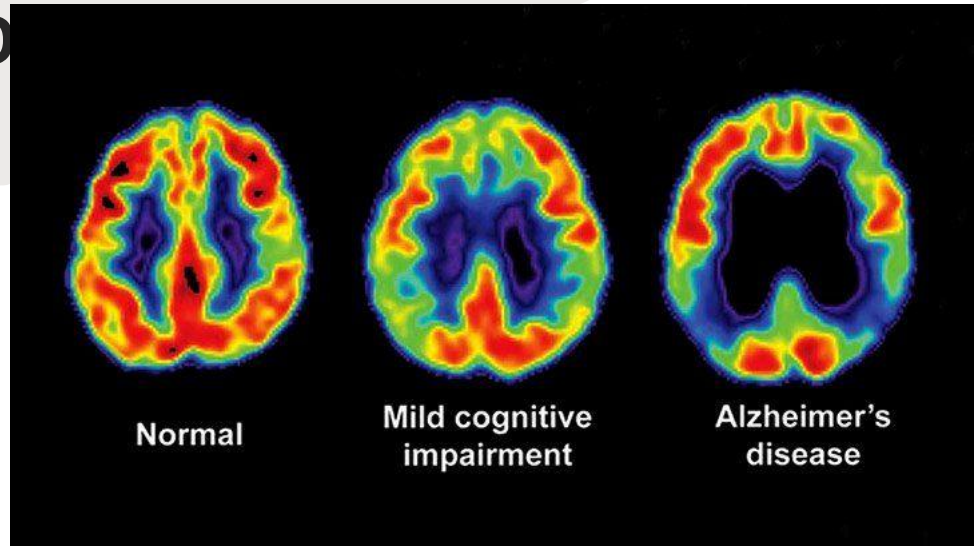
WHAT IT LOOKS LIKE RADIO

- Dilation of ventricles.
- Loss of gyral volume.
- Enlargement of cerebral sulci.
- Cortical thinning.
- Reduced brain volume.



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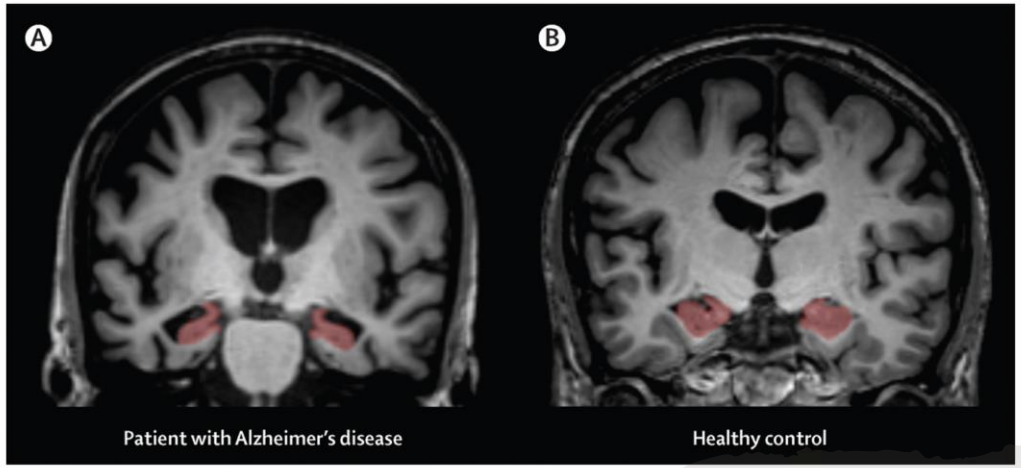

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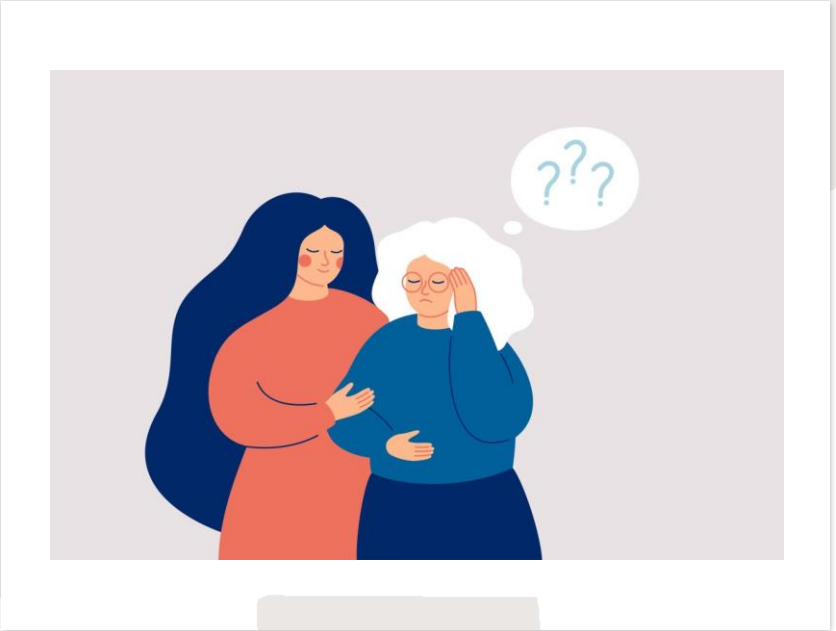
IMPORTANCE OF ACHIEVING OPTIMUM IMAGE QUALITY

- Medical imaging is an essential component in the early detection and diagnosis of Alzheimer's.
- PET scan: Provides valuable insights into the brain function and potential neurodegeneration.
  - Scans reveal increased amyloid deposition.
- MRI scan: Offers detailed structural images of the brain.
  - Allows physicians to receive accurate measurements of brain volume.
- It is essential to carefully position the patient and calibrate imaging machines so the tech can capture high-quality images that provide crucial insights into a patient's condition.
  - Enables interpreting radiologist or physician to receive more detailed images that help to accurately diagnose and create a well-informed treatment plan.

TREATING ALZHEIMER'S



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- AD currently has no cure.
- Various medications, such as cholinesterase inhibitors and memantine, can help manage symptoms and improve cognition temporarily by slowing down the breakdown of Acetylcholine, a neurotransmitter responsible for learning and memory.
- As disease advances, individuals may require assistance with performing daily activities and will eventually need round-the-clock care.

https://dicentra.com/wp-content/uploads/2018/05/erase-1024x538.jpg

ALTERNATIVE TREATMENTS

- Use of natural health products referred to as herbal remedies and dietary supplements.
  - Gingko biloba, melatonin, omega-3 fatty acid, aromatherapy, coconut oil, massage therapy, medicinal cannabis, music therapy, and pet therapy.
- It is important to remember that they can be helpful options, but they do not alter the course of the disease.
- Supportive therapies including cognitive training and occupational therapy can help to enhance the quality of life for patients and their caregivers.

HOLISTIC/PERSON-CENTERED CARE

- Addresses not only the cognitive and physical symptoms, but also the emotional, social, and spiritual aspects of the person's life.
- Recognizes that the disease impacts the individual as a whole, including their relationships, emotions, and sense of self.
  - Involves family members and caregivers in the care process.
- Uses positive reinforcement to meet emotional needs of elders and helps them rediscover their identity.
- Aims to improve the quality of life for patients by incorporating various therapeutic modalities such as cognitive exercises, physical activities, psychotherapy, and social engagement.

https://pixabay.com/vectors/yoga-man-person-sitting-holistic-159810/

COMFORT CARE HOMES




https://comfortcarehomes.com/better-memory-care/commitment-to-care

- Offer professional services that can help ease the stress of being a primary caregiver of a family member suffering from dementia or Alzheimer’s.

CONCLUSION

- AD stands as a formidable challenge in the realm of neurodegenerative disorders, impacting millions worldwide.
- Through advancements in medical imaging techniques, particularly PET scans and MRI, we've gained invaluable tools in the early detection and diagnosis of this condition.
  - These imaging modalities offer structural insights into the degenerative changes within the brain and provide a window into its functional decline.
  - Achieving optimum imaging quality directly influences the accuracy of the assessments and treatment plans.

CONCLUSION CONTINUED

- There is no cure, but our understanding of its pathology and progression continues to evolve.
  - Treatment strategies aim at managing symptoms and improving cognition temporarily, offering hope and support to both patients and their families.
  - Alternative therapies, supportive care, and holistic approaches play crucial roles in enhancing the quality of life for individuals living with AD.
- As we navigate the complexities of AD, it's essential to encourage collaborative efforts among researchers, clinicians, caregivers, and policymakers. Together, we can continue to advocate for greater awareness, research funding, and compassionate care for all those affected by this condition.

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