Quiz: True or False?

- Alzheimer’s disease can not be diagnosed without an autopsy of brain tissue.
- Today there are medications that cure Alzheimer’s disease.
- Alzheimer’s symptoms do not usually appear until 20 or more years from the onset.
- Brain tissue does not regenerate.

Objectives

- Learn epidemiology & pathogenesis of Alzheimer’s Disease.
- Understand the impact of uncontrolled diabetes mellitus (DM) on the pathology of Alzheimer’s.
- Recognize the importance of partnership between Alzheimer’s Association and DM programs.
- Evaluate appropriate Alzheimer’s screening in clinical practice.
Dementia

Dementia is a set of symptoms with many causes. Some forms of dementia, such as a drug interaction or a vitamin deficiency, are actually reversible or temporary.

https://www.alzheimers.net/difference-between-alzheimers-and-dementia/

Possible Causes of Dementia

- medication side effects
- chronic alcoholism
- tumors or infections in the brain
- blood clots in the brain
- vitamin B12 deficiency
- some thyroid, kidney, or liver disorders
- stroke
- Parkinson’s disease
- Sleep disturbances
- National Institute on Aging

National Institute on Aging Last Updated: May 4, 2017
https://vivacare.com/nwn/HealthTopic/Alzheimers_Disease_Overview

Risk factors

- Age major risk factor
- Damaged proteins
- Genetics (family history of Alzheimer’s)
- Neuronal energy failure
- Neuro-inflammation
- Vascular disease
Alzheimer’s disease (AD) is the most common cause of dementia and one of the leading sources of morbidity and mortality in the aging population.

Alzheimer’s is not a reversible disease. It is degenerative and incurable at this time.

https://www.alzheimers.net/difference-between-alzheimers-and-dementia/

10.4 million Americans living with Alzheimer’s Disease

Costs

- $259 billion in 2017
- Between 2017 and 2013 $7.7 trillion in health care costs.
Diagnosis & Treatments

Currently Dx is made 90% of the time using:
- Questions about patient’s health, past medical problems and ability to carry out daily tasks.
- Cognitive tests including memory, problem solving, attention level and language.
- Medical tests: brain scans

Currently there are no treatments to stop or reverse the progress of Alzheimer’s.

There are medications to relieve symptoms for a limited time.

Pathogenesis

- The neuropathological hallmarks of Alzheimer disease include diffuse and neuritic extracellular amyloid plaques in brain that are frequently surrounded by dystrophic neurites and intraneuronal neurofibrillary tangles.

Diagnostc Markers

- MRI (magnetic resonance imaging)
- PET scan (positron emission tomography to measure amyloid in brain)
- Spinal Cord Fluid
- Glucose Metabolism in the Brain
- Genetic Markers
PET Scans

Can Brain Cells Regenerate?

- Conventional medical wisdom has held that people are born with all of the brain cells they will ever have, and once they are gone, they are permanently gone.
- Now, however, scientists have found that cells in the region of the brain responsible for memory and learning (hippocampus) are capable of being regenerated in a laboratory.
- Although there are currently no practical applications for this new finding, it could have implications in the future for the treatment of neurodegenerative diseases and brain trauma.

• WebMD Health News
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Glucose Levels and Risk of Dementia

“It may be that with the brain, every additional bit of blood sugar that you have is associated with higher risks. It changes how we think about thresholds, how we think about what is normal, what is abnormal.”

Published 2013, New England Journal of Medicine


Multistep System
Stage 1

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Presentation</th>
<th>Markers</th>
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<tbody>
<tr>
<td>Preclinical Alzheimer’s disease</td>
<td>Unnoticeable. May not display clinical signs of cognitive deficits as memory loss.</td>
<td>• Measurable changes in the brain. • Cerebrospinal fluid • Blood biomarkers</td>
</tr>
<tr>
<td>National Institute on Aging &amp; Alzheimer’s Association</td>
<td>Changes can occur 20 years prior to symptoms.</td>
<td>Reduce confusion in diagnosing and care for patient’s with cognitive disorders.</td>
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https://www.huffingtonpost.com/entry/the-importance-of-revamping-the-guidelines-for-alzheimers_us_5981deede4b0b35d274c5ef6

Stage 2

<table>
<thead>
<tr>
<th>Stage 2</th>
<th>Presentation</th>
<th>Biomarkers</th>
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<tbody>
<tr>
<td>Mild cognitive impairment</td>
<td>Easier to identify mostly areas of cognitive and social functioning. Changes from previous level. Impairment in: orientation, language, attention, executive function, memory, problems in performing complex tasks.</td>
<td>MRI shows atrophied gray matter especially in the hippocampus and entorhinal cortex. PET scans show reduced metabolism in tempropartial cortex and decreased glucose metabolism in posterior cingulate cortex</td>
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### Stage 3

<table>
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<tr>
<th>Stage 3</th>
<th>Clinical Presentation</th>
<th>Markers</th>
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<tr>
<td>Dementia due to Alzheimer’s disease</td>
<td>Distinct presentation in episodic memory, executive function, language, social dysfunction severe enough to impair the ability to function in daily life.</td>
<td>MRI Pronounced atrophy of the hippocampus and middle temporal lobe</td>
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### Current Rx Treatment for AD

Cholinesterase Inhibitors stop destruction of neurotransmitter acetylcholine.

- Donepezil (Aricept®)
- Rivastigmine (Exelon®)
- Galantamine (Razadyne®)

Memantine (Namenda®) used with Cholinesterase Inhibitor

**NAMZARIC®** (memantine HCl and donepezil HCl)

Combination of Aricept and Namenda.

### 126 drugs in Clinical Trials

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<thead>
<tr>
<th>Trials</th>
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<tr>
<td>Immune System</td>
<td>Epigenetics harness gene alterations</td>
</tr>
<tr>
<td>Amyloid-Beta</td>
<td></td>
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<tr>
<td>Tau (protein)</td>
<td>AADvac1 Vaccine</td>
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<tr>
<td>Brain Blood Glucose</td>
<td>Pioglitazone and exanetide</td>
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<tr>
<td>Reduce inflammations</td>
<td>Antioxidant agents</td>
</tr>
<tr>
<td>Improving Cognition</td>
<td>Serotonin</td>
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Pharmaceutical Targets

- Amyloid: clumps of abnormal proteins leading target of pharmaceutical companies. Aim to remove from brain. A hallmark of Alzheimer’s.


- APOE ( apoipoprotein E) genetic risk factor for late-onset. Target for AADF-funded scientists developing drugs to modify risk.

- Inflammation & Vascular: Target for drugs to protect against injury-induced inflammation.

Research with Victoza

- King’s College London, University of Cambridge, University of Southampton, University of Bristol, Birmingham University, University of Brighton, St Georges University of London evaluating the novel diabetic drug, liraglutide in the treatment of Alzheimer’s disease (ELAD study).

Cost of Victoza: $2,336.00 Insurance pays 50% Manufacturer’s coupon

Research with Brain Ketones Metabolism

Ketogenic Interventions in Alzheimer’s
Found that 40% decrease glucose metabolism in some area of the brain.

Recent studies show the brain is able to use ketones in place of glucose.

A Ketogenic Diet is being tested by Dr. Swerdlow, University of Kansas Alzheimer’s Disease Center.
Breaking News

- February 2018
- Enzyme, BACE1 inhibitor shown to “completely” reverse build up of beta-amyloid plaque in the brain.
- Study on mice only by scientists at Cleveland Clinic Research Institute in Ohio.
- Further study needed as spaces between neuron synapses were only patricianly restored.

Prevention

- Alzheimer’s Prevention Tools
- Sherry Christiansen January 15, 2018https://www.alzheimers.net/alzheimers-prevention-tools/

Prevention is “Brain Health”

- The American Heart Association and American Stroke Association have issued an advisory on maintaining optimal brain health throughout life.
- After reviewing 182 scientific studies of brain and heart health, they issued a seven step plan for helping to keep the brain in top working order and to keep Alzheimer’s at bay in old age.
- The advisory reflects a growing body of evidence that what’s good for the heart is good for the brain.
**Steps to brain health**

- **Diet**: Mediterranean, Dash
- Don’t smoke: Smoking can damage blood vessels throughout the body, including in the brain.
- **Exercise**: Regular physical activity is good for the heart and the brain.
- Healthy weight: Obesity at midlife is a risk factor for Alzheimer’s disease and other forms of dementia.
- Blood pressure: Below 120/80, the same risk factors for stroke are also risk factors for Alzheimer’s disease.
- Maintain a healthy cholesterol. High cholesterol is a known risk factor for Alzheimer’s.
- Control blood sugar: Type 2 diabetes, a risk factor for Alzheimer’s disease.

ALZinfo.org, The Alzheimer’s Information Site. Reviewed by Marc Flajolet, Ph.D., Fisher Center for Alzheimer’s Research Foundation at The Rockefeller University.


Brain Training and Dementia

A newly published paper shows that one particular type of brain training exercise—called “speed of processing training” in the study—cut the long-term risk of dementia by 29%.

These new results are from a gold-standard randomized controlled clinical trial—and allow scientists for the first time to say that doing the brain training directly reduces the risk of dementia.

Brain HQ
https://www.brainhq.com/welcome?signup=succes#challenges/memory_basics_1_challenge

**Case Study: Type 1 DM**

Type 1 Dx  adult onset
Accountant, wife, mother of 4, 2 granddaughters
Early age Alzheimer’s DX; age 50  MRI & PET SCAN testing at Hospital in Seattle specializing in Alzheimer’s Early onset of aphasia & word finding problems  Died age 54 of Alzheimer’s complications
Case Study: Type 2 DM

Type 2 for 38 years A1C 14% at diagnosis 245 lbs. 6’4”

Age 78
Current wt. 190
A1C 5.7%
Metformin
Glipizide
Aspirin
Lisinpril
Multivit with B12

No cardiac problems
Good health besides arthritis
Stage 2 Alzheimer’s DX MRI & multiple testings
Attending various Alzheimer’s Associations Ed classes & support groups.

What Can You Do?

Early detection
Observe for questionable behavior
Refer for screenings

Education
Include in diabetic education programs:
Risk factors for Alzheimer’s
Brain Health Techniques
Importance of sleep
Enjoying life (music, dancing, games, learning second language, yoga, Sudoku

MMSE Test

- Mini–Mental State Examination (MMSE) or Folstein test is a 30-point questionnaire that is used extensively in clinical and research settings to measure cognitive impairment. Commonly used in medicine and allied health to screen for dementia.

Additional Resources


https://www.youtube.com/watch?v=jBvWadjjwXs&feature=youtu.be

The Self-Administered Gerocognitive Exam (SAGE) was developed by Ohio State University College of Medicine, Department of Neurology. The test is a cognitive screening instrument used to identify Mild Cognitive Impairment (MCI) and early dementia. The test is self-administered, so people questioning their own cognitive abilities can take the exam privately. www.elderguru.com/download-the-self-administered-geo...