

PHB



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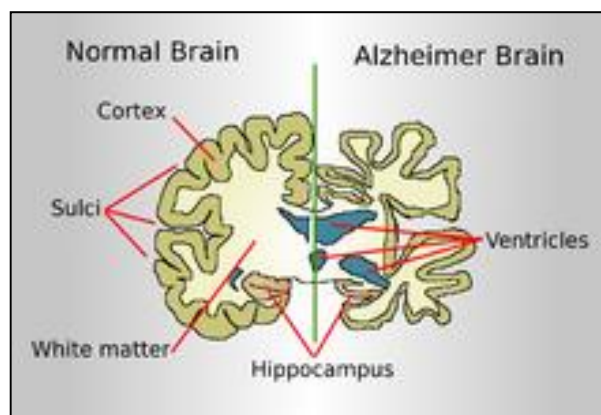
Chapter– 5 Central Nervous System

Topic: ALZHEIMER'S DISEASE

5.1

Introduction

Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by cognitive decline, memory loss and functional impairment.



5.2

Etiopathogenesis

The exact cause of Alzheimer's disease is not fully understood, but it is believed to result from a combination of genetic, environmental, and lifestyle factors. The primary neuropathological hallmarks of AD include the accumulation of abnormal protein aggregates in the brain, including beta-amyloid plaques and tau protein tangles.

Some factors implicated in the etiology of Alzheimer's disease include:

- 1. Genetic predisposition:** Mutations in several genes, including amyloid precursor protein (APP), presenilin 1 (PSEN1), and presenilin 2 (PSEN2), have been associated with familial forms of AD.
- 2. Beta-amyloid hypothesis:** Abnormal accumulation and aggregation of beta-amyloid protein fragments into plaques, leading to neuronal dysfunction and death.
- 3. Tau protein pathology:** Abnormal phosphorylation and aggregation of tau protein, leading to the formation of neurofibrillary tangles and disruption of neuronal communication.

4. **Neuroinflammation:** Chronic inflammation and immune activation in the brain, contributing to neuronal damage and neurodegeneration.
5. **Oxidative stress and mitochondrial dysfunction:** Impairment of cellular energy production and antioxidant defense mechanisms, leading to neuronal damage and synaptic dysfunction.

5.3**Types**

Alzheimer's disease is typically classified into two main types based on age of onset and genetic factors:

1. **Late-onset Alzheimer's disease:** The most common form of AD, typically occurring after the age of 65 and often with a multifactorial etiology involving both genetic and environmental factors.
2. **Early-onset Alzheimer's disease:** Less common form of AD, occurring before the age of 65 and often associated with genetic mutations in genes such as APP, PSEN1, and PSEN2.

5.4**Symptoms**

Alzheimer's disease are progressive and may include:

- Forgetting things or recent events
- Losing or misplacing things
- Getting lost when walking or driving
- Being confused, even in familiar places
- Losing track of time
- Difficulties solving problems or making decisions
- Problems following conversations or trouble finding words
- Misjudging distances to objects visually.

5.5

Diagnosis

Diagnosis of Alzheimer's disease involves:

- Detailed history of cognitive symptoms, onset, progression, and associated medical conditions.
- Assessment of cognitive function, memory, language, attention, and visuospatial skills.
- Neuropsychological testing, include standardized tests to evaluate cognitive function, memory, and other domains of mental status.
- Magnetic resonance imaging (MRI) or computed tomography (CT) scans to assess for structural abnormalities or changes in brain volume.
- Cerebrospinal fluid (CSF) analysis or positron emission tomography (PET) imaging to detect beta-amyloid protein abnormalities in the brain.

5.6

Pharmacological managements

Pharmacological treatment of Alzheimer's disease aims to slow disease progression, alleviate symptoms, and improve quality of life. Commonly prescribed medications for AD include:

1. Cholinesterase inhibitors: e.g. Donepezil, rivastigmine, and galantamine; increase acetylcholine levels in the brain to enhance cognitive function.

2. NMDA receptor antagonist: e.g. Memantine; modulates glutamate neurotransmission to improve memory and cognitive function.

3. Combination Therapy: e.g. Memantine - Donepezil

- **Mechanism:** Fixed-dose combination combines the NMDA receptor antagonist properties of memantine with the cholinesterase inhibition effects of donepezil to provide complementary mechanisms of action in managing cognitive symptoms of Alzheimer's disease.

4. Symptomatic Treatments: e.g. Antidepressants, anxiolytics, antipsychotics.

- **Mechanism:** Symptomatic treatments may be prescribed to manage behavioral and psychological symptoms of Alzheimer's disease, such as depression, anxiety, agitation, aggression, and psychosis.

5.7

Non - Pharmacological managements

Non-pharmacological interventions for Alzheimer's disease may include:

- **Cognitive stimulation:** Activities such as puzzles, games, music therapy, or reminiscence therapy to engage and stimulate cognitive function.
- **Behavioral interventions:** Strategies to address challenging behaviors, agitation, or aggression, such as environmental modifications, structured routines, or caregiver education.
- **Supportive care:** Assistance with activities of daily living, safety measures, and social support for patients and caregivers.

5.8

Complications

Complications of Alzheimer's disease may include:

- Progressive loss of independence and ability to perform activities of daily living, leading to caregiver burden.
- Behavioral and psychological symptoms, such as agitation, aggression, psychosis, or wandering, which can increase caregiver stress and safety concerns.
- Medical complications, such as infections, malnutrition, dehydration or pressure ulcers, resulting from impaired mobility, poor self-care or medication side effects.
- Advanced stages of Alzheimer's disease may increase the risk of complications such as pneumonia, sepsis, or cardiovascular events, contributing to premature death.

Practice Questions

MULTIPLE CHOICE QUESTIONS

1. Alzheimer's disease is characterized by the accumulation of which abnormal protein in the brain?
 - A) Tau protein
 - B) Amyloid-beta protein
 - C) Alpha-synuclein protein
 - D) Prion protein
2. Which of the following is NOT a common early symptom of Alzheimer's disease?
 - A) Memory loss, especially recent memories
 - B) Difficulty with language and communication
 - C) Impaired judgment and decision-making
 - D) Muscle weakness and atrophy
3. The mini-mental state examination (MMSE) is a commonly used tool for:
 - A) Screening for depression
 - B) Assessing cognitive function in Alzheimer's disease
 - C) Evaluating motor function in Parkinson's disease
 - D) Diagnosing sleep disorders
4. The cholinergic hypothesis of Alzheimer's disease suggests that cognitive decline is primarily due to:
 - A) Deficient levels of acetylcholine in the brain
 - B) Abnormal accumulation of tau protein
 - C) Excessive production of amyloid-beta protein
 - D) Dysfunction of dopamine receptors
5. Which of the following medications is approved for the treatment of Alzheimer's disease and works by inhibiting the breakdown of acetylcholine?
 - A) Donepezil
 - B) Memantine
 - C) Rivastigmine
 - D) Galantamine

6. The term "sundowning" refers to:
 - A) Agitation and confusion that worsen in the late afternoon or evening
 - B) A sudden loss of consciousness in the morning
 - C) Hallucinations and delusions experienced at night
 - D) Difficulty sleeping due to restless leg syndrome
7. Which brain imaging technique is commonly used to visualize amyloid plaques and neurofibrillary tangles in Alzheimer's disease?
 - A) Magnetic resonance imaging (MRI)
 - B) Positron emission tomography (PET)
 - C) Computed tomography (CT)
 - D) Electroencephalography (EEG)
8. Behavioral and psychological symptoms of dementia (BPSD) in Alzheimer's disease may include:
 - A) Euphoria and excessive laughter
 - B) Hypertension and tachycardia
 - C) Agitation, aggression, and wandering
 - D) Dry mouth and constipation
9. Which of the following is NOT a potential risk factor for Alzheimer's disease?
 - A) Advanced age
 - B) Family history of Alzheimer's disease
 - C) High levels of education and intellectual activity
 - D) Cardiovascular risk factors such as hypertension and diabetes
10. Alzheimer's disease is characterized by progressive neurodegeneration, leading to:
 - A) Gradual improvement in cognitive function over time
 - B) Stable cognitive function with occasional fluctuations
 - C) Progressive decline in memory, thinking, and behavior
 - D) Abrupt onset of symptoms followed by rapid deterioration

FILL IN THE BLANKS

1. Alzheimer's disease is a progressive.....disorder. (**Neurodegenerative**)
2. The hallmark brain changes in Alzheimer's include.....plaques andtangles. (**Amyloid, tau**)
3. Memory loss, confusion, and difficulty with tasks are early signs of.....(**Alzheimer's disease**)
4. The risk of developing Alzheimer's increases with..... (**Age**)
5. There is currently no.....for Alzheimer's disease. (**Cure**)

SHORT ANSWER TYPE QUESTIONS

1. What is Alzheimer's disease?
2. What are the pathological hallmarks of Alzheimer's disease?
3. What are some common early symptoms of Alzheimer's disease?
4. How is Alzheimer's disease diagnosed?
5. What are the treatment options for Alzheimer's disease?

LONG ANSWER TYPE QUESTIONS

1. Discuss the pathophysiology of Alzheimer's disease.
2. Describe the typical clinical progression and stages of Alzheimer's disease.
3. Explain the diagnostic criteria used for diagnosing Alzheimer's disease.
4. Discuss the pharmacological and non-pharmacological treatment approaches for managing Alzheimer's disease.
5. What are the long-term implications of Alzheimer's disease?

MCQ Answer

1.	B	3.	B	5.	A	7.	B	9.	C
2.	D	4.	A	6.	A	8.	C	10.	C