

Supplementary Material

ChatGPT as a Diagnostic Aid in Alzheimer's Disease: An Exploratory Study

The chat with ChatGPT

➤ Authors: Hi ChatGPT, we are working on patients' data and trying to understand their medical condition, can you assist us with the diagnosis?

➤ ChatGPT: I can certainly provide information and suggestions related to medical conditions, but I am not a substitute for professional medical advice or diagnosis. It's important to consult with qualified healthcare professionals for accurate diagnoses and treatment plans.

➤ Authors: Name: J S, Age: 75, Gender: Male, Education: College graduate, Occupation: Retired accountant, Medical History: Hypertension, Type 2 Diabetes, Family History: Father had late onset Alzheimer's Disease.

Presenting Complaint: J's wife brought him to the clinic, expressing concerns about his recent memory problems. She noticed that he frequently forgets names, appointments, and is becoming disoriented even in familiar places. He's experiencing difficulties to plan daily activities, such as preparing meals or organizing a schedule. Changes in mood are also observed. J is experiencing some mood swings, anxiety, and become sometimes frustrated. His condition has been progressively worsening over the past eight months.

1. Physical examination: J appears well-nourished, and has lost 10% of his weight since 6 month. Vital signs are within normal range. No neurological deficits or focal motor deficits are observed.

2. Neuropsychological assessment: Mini-Mental State Examination: Score of 24/30. Detailed neuropsychological testing reveals deficits in the following areas: short-term memory impairment, poor recall of recent events, difficulty with complex tasks, impaired judgment and problem-solving abilities.

3. Blood Tests: Complete Blood Count: Within normal limits, Comprehensive Metabolic Panel: Within normal limits, Thyroid Function Tests: Normal, Vitamin B12: Normal, Folate: Normal. HbA1c: Slightly elevated at 6.8%.

4. Neuroimaging: Magnetic Resonance Imaging of the brain shows significant atrophy in the temporal and parietal lobes, especially in the hippocampus, no evidence of acute infarcts or mass lesions, mild white matter hyperintensities.

5. Cerebrospinal Fluid analysis: elevated tau protein, elevated phospho-tau protein, and decreased amyloid-beta levels.

➤ ChatGPT: The information you provided suggests that J S, a 75-year-old male, is experiencing memory problems, disorientation, difficulties in planning daily activities, mood swings, anxiety, and frustration. Given his medical history, which includes hypertension and type 2 diabetes, as well as a family history of late onset Alzheimer's Disease in his father, the concerns about his cognitive function are significant. The findings from the examination, neuropsychological assessment, blood tests, neuroimaging, and cerebrospinal fluid analysis are consistent with a possible diagnosis of Alzheimer's Disease. Here are some key points based on the information provided:

1. Memory Impairment: J S is experiencing short-term memory impairment and poor recall of recent events, as indicated by the neuropsychological assessment.

2. Functional Impairment: Difficulties in planning daily activities, impaired judgment, and problem-solving abilities are suggestive of functional impairment, which is commonly associated with Alzheimer's Disease.
3. Weight Loss: The significant weight loss (10% over 6 months) may be related to changes in appetite or difficulties in meal planning and preparation, which can be associated with cognitive decline.
4. Neuroimaging: The MRI findings of significant atrophy in the temporal and parietal lobes, especially in the hippocampus, are consistent with structural changes seen in Alzheimer's Disease.
5. Cerebrospinal Fluid Analysis: Elevated tau and phospho-tau proteins, along with decreased amyloid-beta levels, are biomarkers associated with Alzheimer's Disease.
6. HbA1c Level: The slightly elevated HbA1c level (6.8%) indicates suboptimal blood sugar control, which may contribute to cognitive decline.

It's important to note that a comprehensive evaluation by a neurologist or a specialist in cognitive disorders is crucial for a definitive diagnosis. Alzheimer's Disease is a progressive neurodegenerative disorder, and early diagnosis can be valuable for planning appropriate interventions and support for both the patient and their family.

➤ Authors: can you specify the stage of Alzheimer's Disease for this patient?

➤ ChatGPT: Determining the specific stage of Alzheimer's disease in a patient can be complex and often requires a comprehensive assessment by a healthcare professional. However, based on the information provided, it appears that the patient may be in the early stages of Alzheimer's disease. Here's why:

- Memory Impairment: The presence of short-term memory impairment and poor recall of recent events suggests involvement of the early stages of Alzheimer's Disease.
- Functional Impairment: Difficulties in planning daily activities, impaired judgment, and problem-solving abilities are indicative of functional decline, which is often more prominent in the middle to later stages of the disease.
- Neuropsychological Assessment: The Mini-Mental State Examination (MMSE) score of 24/30 suggests some cognitive impairment. MMSE scores are often used to broadly categorize cognitive impairment, and a score of 24 could be associated with mild cognitive impairment or early-stage Alzheimer's Disease.
- Neuroimaging: Significant atrophy in the temporal and parietal lobes, especially in the hippocampus, is a common finding in the later stages of Alzheimer's Disease.
- Cerebrospinal Fluid Analysis: Elevated tau and phosphotau proteins, along with decreased amyloid-beta levels, are consistent with changes seen in the later stages of Alzheimer's Disease.

➤ Authors: Name: HT, Age: 78, Gender: Female, Education: High school graduate, Occupation: Retired nurse, Medical History: Hypertension, Type 2 Diabetes
Presenting Complaint: HT is brought to the clinic by her daughter. She frequently forgets names, has trouble recognizing her family, and is unable to perform basic and functional daily activities independently. Her condition has worsened over the last three years.

1. Physical Examination: General physical health is good. Vital signs are within normal range. No neurological deficits or focal motor deficits are observed.
2. Neuropsychological assessment: Mini-Mental State Examination: Score of 19/30. Deficits are observed on working memory tests and long-term memory tests, as well as on tests of language and executive function.

3. Blood Tests: Complete Blood Count: Within normal limits. Comprehensive Metabolic Panel: Within normal limits. Thyroid Function Tests: Normal. Elevated HbA1c (8.2%).
4. Neuroimaging: Magnetic Resonance Imaging (MRI) of the brain shows noticeable atrophy in the temporal and parietal lobes, including the hippocampus. This atrophy is consistent with structural changes seen in Alzheimer's Disease.
5. CSF Analysis: Elevated tau and phospho-tau and decreased amyloid-beta levels, consistent with biological Alzheimer's Disease.

➤ ChatGPT: Based on the information provided, it appears that HT may be in the moderate stage of Alzheimer's disease. Here's an assessment based on the data you've shared:

- Cognitive Symptoms: HT is experiencing significant memory and cognitive problems, difficulty recognizing her family, and an inability to perform daily activities independently. These symptoms suggest moderate cognitive impairment, which is often associated with the middle stages of Alzheimer's disease. HT's Mini-Mental State Examination (MMSE) score of 19/30 is significantly lower than the typical range for mild cognitive impairment, indicating moderate cognitive deficits.
- Neuroimaging: The presence of noticeable atrophy in the temporal and parietal lobes, including the hippocampus, as well as mild to moderate ventricular enlargement and moderate white matter hyperintensities, is indicative of the moderate stage of Alzheimer's disease. These findings suggest more advanced brain changes.
- Cerebrospinal Fluid Analysis: Elevated tau protein and decreased amyloid-beta levels in cerebrospinal fluid are consistent with Alzheimer's disease pathology and can be indicative of the disease's progression.

Given the severity of the cognitive and neuroimaging findings, it's likely that HT is in the moderate stage of Alzheimer's disease. However, staging Alzheimer's disease is a complex process that takes into account not only cognitive symptoms but also functional abilities and the impact on daily life. It's crucial for HT to receive a comprehensive evaluation by a healthcare professional to determine the specific stage of Alzheimer's disease and to develop an appropriate care plan.

➤ Authors: Name: WP, Age: 85, Gender: Male, Education: High school graduate, Occupation: Retired firefighter, Medical History: Hypertension, Coronary Artery Disease. Presenting Complaint: WP resides in a long-term care facility and is non-verbal. He is bedridden, unable to recognize family members, and at high risk for aspiration pneumonia due to difficulty swallowing.

1. Physical Examination: General physical health is frail, WP is malnourished. Vital signs are stable. Severe muscle atrophy is noted.
2. Neuropsychological assessment: WP cannot complete cognitive assessments due to his difficulties to communicate.
3. Blood Tests: Complete Blood Count: Within normal limits. Comprehensive Metabolic Panel: Within normal limits. Thyroid Function Tests: Normal.
4. Neuroimaging: Magnetic Resonance Imaging of the brain shows significant atrophy in the temporal and parietal lobes, including the hippocampus. Ventricular enlargement is evident. Severe white matter hyperintensities are observed.
5. CSF Analysis: CSF analysis is not performed, as the diagnosis is evident based on clinical presentation and neuroimaging.

- ChatGPT: Based on the information provided, it appears that WP is in an advanced stage of Alzheimer's disease. Here's an assessment based on the data you've shared:
- Clinical Presentation: WP is non-verbal, bedridden, unable to recognize family members, and at high risk for aspiration pneumonia. These are severe symptoms of cognitive and physical decline, indicative of advanced Alzheimer's disease.
 - Physical Examination: General physical health is frail, WP is malnourished, and severe muscle atrophy is noted. Vital signs are stable. This is often seen in the advanced stages of Alzheimer's disease when individuals may have difficulty with mobility and daily functions.
 - Neuropsychological Assessment: WP cannot complete cognitive assessments due to communication difficulties. Non-verbal status and the inability to engage in cognitive assessments further support the severity of cognitive impairment.
 - Blood Tests: Complete Blood Count, Comprehensive Metabolic Panel, and Thyroid Function Tests are within normal limits, suggesting that there may not be an acute medical issue contributing to the current presentation.
 - Neuroimaging: Magnetic Resonance Imaging (MRI) of the brain shows significant atrophy in the temporal and parietal lobes, including the hippocampus. Ventricular enlargement and severe white matter hyperintensities are observed. These structural changes are indicative of advanced neurodegenerative processes.
 - CSF Analysis: Although CSF analysis is not performed, the clinical presentation, neuroimaging findings, and lack of acute medical issues in blood tests are strongly suggestive of an advanced neurodegenerative disorder, likely Alzheimer's Disease.

Given the severity of the clinical presentation and neuroimaging findings, it's likely that WP is in the advanced stage of Alzheimer's disease. At this stage, individuals often require round-the-clock care and support to meet their daily needs. Staging Alzheimer's disease is not typically necessary at this point because the symptoms and clinical findings make the diagnosis evident.

- Authors: Name: MJ, Age: 70, Gender: Female, Education: High school graduate, Occupation: Retired librarian, Medical History: Hypertension & Hyperlipidemia. No family history of cognitive disorders.
- Presenting Complaint: M is concerned about her memory. She has noticed that she occasionally forgets where she put her keys and sometimes has difficulty recalling names. Her memory lapses do not significantly affect her daily life, but she is worried that they are happening more frequently.
1. Physical Examination: M appears well-nourished and healthy. Vital signs are within normal range. No neurological deficits or focal motor deficits are observed.
 2. Neuropsychological Assessment: Mini-Mental State Examination: Score of 28/30. While M shows difficulties on working memory tests, her performance on long-term memories are within normal ranges. Her performances on tasks of executive functions and language are also within normal ranges.
 3. Blood Tests: Complete Blood Count: Within normal limits, Comprehensive Metabolic Panel: Within normal limits, Thyroid Function Tests: Normal, Lipid Panel: Elevated LDL cholesterol levels.
 4. Neuroimaging: Magnetic Resonance Imaging of the brain shows: No significant atrophy. No evidence of acute infarcts or mass lesions. Minimal white matter hyperintensities for age.

➤ ChatGPT: The information provided suggests that MJ, a 70-year-old retired librarian with a medical history of hypertension and hyperlipidemia, is experiencing mild concerns about her memory. Here are the key points based on the information:

- Physical Examination: MJ appears well-nourished and healthy. Vital signs are within normal range, and no neurological deficits or focal motor deficits are observed. These findings suggest that there are no acute physical issues contributing to her memory concerns.

- Neuropsychological Assessment: The Mini-Mental State Examination (MMSE) score of 28/30 indicates generally intact cognitive function. While MJ shows difficulties on working memory tests, her performance on long-term memory, executive function, and language tasks is within normal ranges. These findings may suggest mild cognitive impairment (MCI) or age-related memory changes.

- Blood Tests: Complete Blood Count, Comprehensive Metabolic Panel, and Thyroid Function Tests are within normal limits. However, the Lipid Panel reveals elevated LDL cholesterol levels, which could be a risk factor for cardiovascular and cognitive health.

- Neuroimaging: Magnetic Resonance Imaging (MRI) of the brain shows no significant atrophy, no evidence of acute infarcts or mass lesions, and minimal white matter hyperintensities for age. These findings suggest a relatively normal structural brain status.

Given the overall picture, it appears that MJ may be experiencing mild cognitive changes, and her concerns about memory are valid. The elevated LDL cholesterol levels may be a cardiovascular risk factor, and addressing this could be important for overall health. It's advisable for MJ to follow up with a healthcare professional, preferably a neurologist or geriatrician, for a more in-depth evaluation. Further monitoring of cognitive function, consideration of cardiovascular risk factors, and lifestyle modifications (such as exercise and a heart-healthy diet) may be recommended. Regular follow-ups can help track any changes in cognitive function and address concerns as needed.