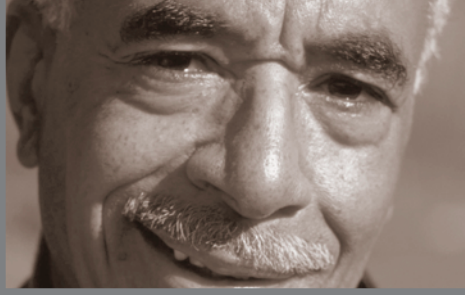


Case Study

Alzheimer's Disease

Differential Diagnosis of Dementia with Motor Symptoms

63-year-old male, referred by neurologist.

Patient History

- This patient had decreased memory, language, and visual skills over a 2-year period.
- The patient also had sensory and motor deficits of his left upper extremity.
- Past medical history was positive for pyelonephritis, prostatitis, and prostate surgery for benign enlargement.
- Recent general exam and blood laboratory tests were normal.
- However, the patient's neurologic exam revealed lower than expected orientation and memory scores, marked apraxia of the upper extremities (left worse than right), and mild Parkinsonism.

Initial Diagnosis and Treatment

Neurologist diagnosed the patient with corticobasal degeneration and depression. He was treated with the antidepressant sertraline.

Clinical Problem

There are no specific findings by general history, physical exam, laboratory screen or structural neuroimaging tests to explain the patient's cognitive decline and motor symptoms.

A PET scan was ordered to assist with the differential diagnosis for the dementia symptoms.

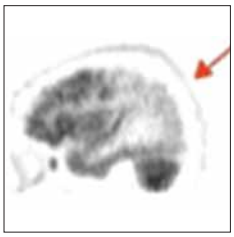
PET Findings and Quantitative Analysis

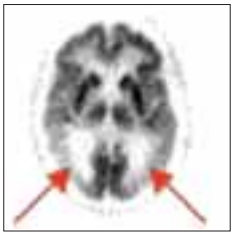
- The PET scan revealed that the basal ganglia, thalamus and cerebellum are well preserved. This evidence does **not** support the working diagnosis of corticobasal degeneration.
- The classic pattern of biparietal and temporal hypometabolism, with concomitant sparing of the basal ganglia, thalamus, and cerebellum, is consistent with the presence of Alzheimer's disease. This is supported by the NeuroQ™ displays.
- The frontal cortex is becoming affected (most evident on the right side) which suggests a more advanced stage of Alzheimer's disease.

- The PET scan further revealed profound hypometabolism of associative visual cortex (quantified by NeuroQ™ as 12 standard deviations below normal metabolic levels) suggesting Lewy Body involvement.

Differential Diagnosis

- PET scan provided a positive diagnosis of Alzheimer's disease due to the posterior-predominant pattern of hypometabolism affecting the parietotemporal cortex and the posterior cingulate cortex consistent with Lewy Body variant of Alzheimer's disease.
- Because of the hypometabolism also occurring in the occipital cortex, Lewy Body involvement is suggested. Lewy bodies can produce central motor symptoms, a documented feature of the patient's medical history.





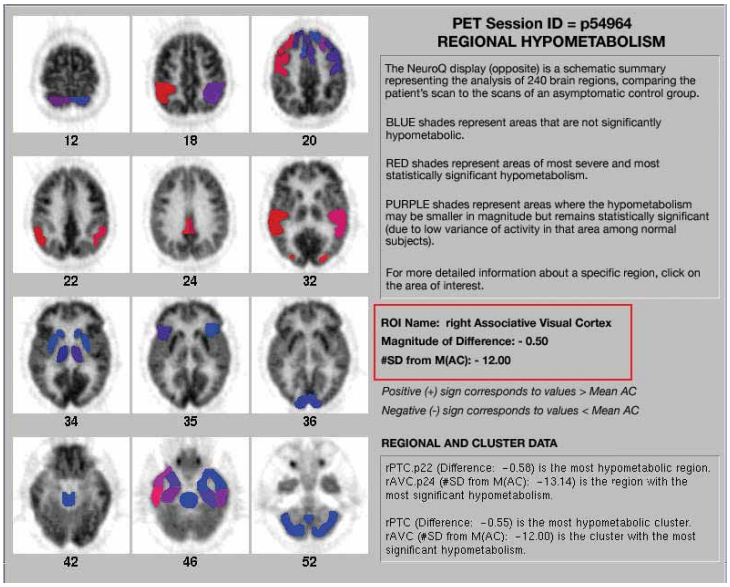
Moderately severe posterior-predominant cerebral hypometabolism affecting the parietal and temporal cortex, with relative preservation of basal ganglia, thalamus and cerebellum.

Clinical Follow-up

- The patient continued to progressively deteriorate with respect to cognitive and motor symptoms until his death.
- The Alzheimer's disease diagnosis was confirmed by autopsy after the patient's death.

PET FOUNDATIONS

Case study courtesy of Daniel Silverman, M.D., Ph.D., UCLA Medical Center, Los Angeles, California



The NeuroQ™ display also revealed profound hypometabolism (red) of parietal, temporal, right frontal, occipital and posterior cingulate cortex.

Positron Emission Tomography (PET)

Positron Emission Tomography (PET) is a non-invasive, advanced diagnostic imaging procedure that can provide unique information to aid in the differential diagnosis of Alzheimer's disease versus other dementias as well as assist with the management of stroke, brain tumors and epileptic seizures. Since glucose is the primary source of energy for cells in the brain, the radiopharmaceutical FDG, a glucose derivative, helps to create a normal versus abnormal map of brain function, as imaged in a PET scan. Distinctive patterns of glucose metabolism assist physicians in accurately diagnosing patients and treating them appropriately.

Differential Diagnosis of Alzheimer's Disease

Sensitivity 94%[1]

Specificity 87%[2]

1 Silverman, et al., JAMA 2001, 268: 2120 - 2127.
2 Silverman, Journal of Nuclear Medicine 2004; Vol 45, April 2004; pages 594-607

"The Association supports the use of FDG PET for patients with dementia or patients with mild or moderate cognitive impairment of at least 6 months duration."

Criteria for appropriate use:

- *Diagnosis remains uncertain after an experienced physician performs a standard comprehensive evaluation for dementia*
- *The information available through PET reasonably is expected to help clarify the diagnosis and/or help guide future treatment.*

– **Alzheimer's Association Statement on Positron Emission Tomography, January 2004**

"PET improves the overall accuracy of diagnosis compared to accuracy of an examination based on American Academy of Neurology (AAN) guidelines."

– **Agency for Healthcare Research and Quality U.S. Dept. of Health and Human Services, April 2004**

"The evidence is adequate to conclude that a FDG-PET scan is reasonable and necessary in patients with documented cognitive decline of at least six months and a recently established diagnosis of dementia who meet diagnostic criteria for both Alzheimer's disease (AD) and fronto-temporal dementia (FTD), who have been evaluated for specific alternate neurodegenerative diseases or causative factors, and for whom the cause of the clinical symptoms remains uncertain."

– **U.S. Centers for Medicaid and Medicare Services, 15 September 2004**

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