

## **PET/CT imaging distinguishes potentially treatable dementias**

*Staff must be prepared when Alzheimer's disease diagnosis prompts emotional response in family, caregivers*

--Robert Carroll, M.D.

Florida is home to a large aging population at risk for dementia. Palm Harbor, not far from St. Petersburg and Tampa, is also close to a retirement town. There are many nursing homes and extended care facilities throughout the region, and the reimbursement climate includes sizable expenditures for Alzheimer's disease care.

Dr. Anthony Aboud, director of West Coast Radiology, purchased the group's first PET/CT machine in October 2004. Oncology imaging was the primary target, with dementia imaging secondary. We started with an average of two to three patients per day, all tumor cases. We now average three brain patients and three tumor patients daily. During the summer, volume may dip, as Florida radiologists take vacations when their patients have migrated north.

Under the 2004 Centers for Medicare and Medicaid Services policy governing Medicare Part B reimbursement for differential diagnosis of Alzheimer's from frontotemporal dementia, we can now tell our clinicians that simply prescribing Alzheimer's medications for suspected dementia patients is no longer an acceptable standard of care. Medicare had recognized that management of frontotemporal dementia is fundamentally different from management of Alzheimer's disease.

We market our services to referring physicians through site visits by trained representatives. I go along if the target practice is a potentially large referrer. Laptop computer displays of typical cases and reports are effective. We use one-page flow sheets covering qualifications for the study and another sheet as the prescription. We have been audited, and all of our brain patients have qualified for reimbursement. We also stress the importance of finding normal looking brains in functionally impaired patients. Often a treatable psychiatric or endocrine disorder is discovered. White matter microvascular ischemia is a common treatable comorbidity.

A list of allowable diagnostic codes helps guide physicians through the ordering process. I personally call referring physicians to discuss any unusual finding and list my cell phone number next to my signature on every report.

Our imaging protocol uses a 10-mCi FDG dose 30 minutes before the beginning of imaging, given in a quiet room. We request that the patient close his or her eyes to minimize occipital lobe visual cortex uptake. Interpretation is made on the basis of whole-brain images viewed in lateral projections as well as transaxial, coronal, and sagittal planes. Quantitative software decreases subjectivity and facilitates interpretation of repeat studies.

Common diagnostic categories include mild, moderate, and advanced Alzheimer's disease; frontotemporal dementia; Lewy body disease; mild, moderate, and severe microvascular ischemia; stroke; and trauma. FDG-PET/CT is seldom used in patients with Parkinson's disease. The following cases illustrate some typical situations:

- Moderate AD. A typical case was referred for FDG-PET/CT when the spouse asked for an evaluation despite the patient's denial of memory impairment. Lateral whole-brain views as well as coronal, sagittal, and transaxial views through the hippocampal regions demonstrated severely decreased metabolism in the medial temporal lobes extending to the temporal poles. Moderate decreased metabolism in the lateral temporal lobes was accompanied by moderate decreased metabolism throughout the parietal lobes bilaterally. The sensorimotor strips directly anterior to the parietal lobes were well preserved.

Just anterior to the sensorimotor strips was mild diffuse decreased metabolism throughout the frontal lobes. Occipital lobes, cerebellar hemispheres, and brain stem were intact. Moderate microvascular ischemia appeared in the periventricular white matter best seen on transaxial views, but no evidence of stroke was apparent. These findings led the reader to form an impression of moderate Alzheimer's disease. Mild impairment of frontal lobe function was much less pronounced than would be expected with frontotemporal dementia.

- Early AD versus posterior cerebral artery insufficiency. A high-functioning patient presented with the anxious complaint of isolated memory impairment for recent events. Lateral whole-brain views as well as coronal, sagittal, and transaxial views through the hippocampal regions demonstrated moderately diminished glucose metabolism in the medial temporal lobes bilaterally. Temporal poles were well preserved. Lateral temporal, parietal, frontal, and occipital lobes were normal. Cerebellar hemispheres and brain stem were intact, and no evidence suggested microvascular ischemia or stroke.

The differential diagnosis suggested the presence of either very early Alzheimer's disease or focal decreased blood flow to the medial temporal lobes. MR angiography with particular attention to the vertebrobasilar system evaluated blood flow through the posterior cerebral arteries to the medial temporal lobes. Carotid artery disease could have also decreased perfusion pressure in the circle of Willis, manifested initially in the smallest vessels.

- Frontotemporal dementia. The patient did not understand the purpose for the visit to the imaging center. Lateral whole-brain views as well as coronal, sagittal, and transaxial views through the hippocampal regions demonstrated severe loss of frontal lobe metabolism with some impairment of sensorimotor strip as well as definite impairment of metabolism in the temporal lobes and, to a lesser extent, in the parietal lobes (see figure). Visual cortex and occipital lobes were well preserved, and the brain stem and basal ganglia were intact. There was no evidence of microvascular ischemia or stroke. These findings led to the diagnosis of frontotemporal dementia.

## REPORTING PROTOCOLS

Referring physician reporting occurs always within 48 hours and commonly within 24 hours. We make phone contact with every new referral as well whenever the results are unusual.

A typical case involves a retired person, often with a history of smoking, hypertension, and alcohol use, who has noted short-term memory loss. Follow-up MRA of the carotids as well as the vertebrobasilar system and intracranial vessels is suggested in patients with clinically unsuspected small strokes or a history of coronary artery disease. Vascular insufficiency in the posterior cerebral arteries can produce decreased metabolism in the medial temporal lobes, mimicking early Alzheimer's. Patients who have decreased uptake in the cerebellum as well as in the medial temporal lobes may be suffering from a basilar artery syndrome diagnosable with MRA.

Imaging has affected patient management in most of these cases. Ineffective, possibly harmful treatments being given to patients with frontotemporal dementia are stopped. Statins and angiotensin converting enzyme receptor blockers address previously unrecognized microvascular ischemia. Realistic plans for institutional assistance and provision of appropriate antidepressants and therapy may follow.

Reimbursement has rarely been a problem. We have rarely had difficulty getting paid for dementia-related imaging services. Occasionally, basics like lack of proper diagnosis on the prescription or failure to document duration of disease will delay payment. Many codes are now payable as documented on our prescription sheet. West Coast staff help new referrers through the ordering process.

We are adding a new PET scanner to our existing 16-slice CT at our Clearwater office and installing a new PET/CT in our new imaging center north of Orlando. Both machines are scheduled to begin producing patient studies by July 1.

From a public health standpoint, early accurate diagnosis leads to a longer period of time that patients can function outside of nursing homes. The economic impact is immense, and the emotional impact is even greater.

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