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Finding Answers with Amyloid Imaging

Amyloid imaging provides physicians with a new tool for the evaluation of Alzheimer's disease and other causes of cognitive decline. For a professor in Atlanta, Georgia, USA, searching for the cause of her memory loss, amyloid imaging provided answers and changed her physician's treatment plan.

By Catherine Eby, Molecular Imaging Business Unit, Siemens Healthcare, Hoffman Estates, IL, USA

Shortly after moving to Atlanta seven years ago, Jacqueline Hibbert, PhD, an associate professor of biochemistry hemoglobinopathies/nutrition at the Morehouse School of Medicine in Atlanta, GA, USA, realized she was having memory problems. "They had a health fair here that I participated in because I wanted to see if my memory was okay," Hibbert said. "And maybe at the time, I had an inkling that something was not right. So I got my

memory tested, and that was when I realized I had a problem." Hibbert went to see a neurologist associated with the Morehouse School of Medicine. The neurologist gave her a detailed memory test and recommended a follow-up test, but because the neurologist left Morehouse, Hibbert did not return for further evaluation. "Then, quite recently, I realized that it was getting worse," says Hibbert.

Trouble with Memory Recall

"I was teaching the graduate students," says Hibbert, "and we were talking about the urea cycle, and I was saying that some bits of it occur in the mitochondria and some other bits occur in the..." "I could not remember the word *cytosol*, I just said, oh well, you know, in the other part of the cell..." "Afterward, I started to say something

more and needed the word *cytosol* again, and I said, 'I can't remember that word, will one of you please tell me?' The person who answered seemed sad, and I just said 'Oh, thank you,' with a laugh," says Hibbert chuckling at the memory, "and then they all lightened up." But, in reality, Hibbert was unable to recall simple words with which she was very familiar. She also was having problems recalling the names of people she knew very well.

Hibbert decided it was time to follow through on the testing she had let slide years earlier, scheduling an appointment with Mary Taylor, MD, internal medicine physician and neurologist.

Seeking Answers

"When she came in, you could see the anxiety on her face," says Taylor, who has been seeing Hibbert as a patient for about a year now.

Taylor listened as Hibbert told her story, about the health fair, her first visit to a neurologist and how she was becoming increasingly forgetful. At first, Dr. Taylor was not particularly worried. Hibbert had no family history of dementia and had passed a basic neuro examination. Taylor decided to perform a mini-cognitive exam, during which the patient is asked to remember the names of several common objects and then repeat them back a few minutes later. The patient is also asked to draw the face of the clock, placing the hands to the time specified by the examiner. "She looked at the clock, became very confused and, finally, gave up in frustration. I was very surprised," says Taylor.

"It was at that point, I began to suspect Alzheimer's disease. She was highly educated, and has a high IQ, so I thought it may be more visible and easier to evaluate her as having the early stages of Alzheimer's disease." "Here is a university professor who is really having problems. As a result, it not only furthered her anxiety, but also created some anxiety for me," said Taylor, who decided to put Hibbert through a battery of tests.

"You want to make sure that when patients present with memory loss that

they have no physical causes of memory loss, so we ordered an EEG and blood tests to rule out other causes; things like glandular studies and thyroid functions and cardiovascular disease, even Lyme disease," she said. "All were negative, including MRI and ultrasound. When the opportunity arose to have her undergo a PET scan, I seized it."

Amyloid Imaging

Taylor referred Hibbert to Trident Medical Imaging Center in Fayetteville, GA, USA, for amyloid imaging using PET/CT. At the time she referred Hibbert for the PET/CT scan, Taylor said that all signs pointed to Alzheimer's disease. The scan was performed using technologies from Siemens Molecular Imaging, the first and only company to offer a comprehensive amyloid imaging solution* in the United States for use in the evaluation of Alzheimer's disease and other causes of cognitive decline. The solution is comprised of three elements, Siemens' PETNET Solutions PET imaging biomarker production and distribution expertise, the Biograph™ mCT PET•CT scanner with the industry's finest volumetric resolution** of 87 mm³ and syngo®.PET Amyloid Plaque quantification software.*

Amyloid protein occurs naturally in the body but, in a healthy person, is broken down into harmless components and naturally flushed from the brain. In people with Alzheimer's disease, amyloid forms a buildup between neurons. When combined with another protein to form neurofibrillary tangles, it leads to neurodegeneration and the

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Mary Taylor, MD
Internal Medicine Physician and Neurologist



Hibbert serves as co-director, mentor and instructor in the Morehouse Postdoctoral Training in Genomics & Hemoglobinopathies program, focusing primarily on the nutritional implications of altered metabolism in sickle cell disease.

eventual death of brain cells. Prior to the introduction of amyloid imaging with PET/CT, the only way to visualize amyloid plaque was during autopsy. Now, this plaque can be visualized in the living brain.

The first step in amyloid imaging is acquiring the PET imaging biomarker. Siemens' PETNET Solutions offers broad and reliable access to amyloid imaging biomarkers across the United States, leveraging the largest network of PET radiopharmaceutical manufacturing and distribution facilities in the nation. Through a dedicated staff and support infrastructure, practitioners gain the confidence that the radiopharmaceuticals they need will be delivered as scheduled. "You have a certain set appointment for patients and it is absolutely critical that your PET tracers, are delivered on time and are calibrated properly for the patients," says Guy Messer, chief financial officer of Trident Medical Imaging. "The reliability of PETNET Solutions has been excellent." After administration of a PET imaging biomarker, the patient undergoes a



positron-emission computed tomography (PET/CT) scan, e.g. with the new Biograph mCT PET•CT scanner from Siemens. PET/CT is an imaging modality that inherently allows for early detection because it visualizes information at the molecular level. In amyloid imaging, a PET/CT is able to record sectional images of the brain that can reveal the presence of high

Trident Medical Imaging performs 10 or more scans a day on its Biograph PET•CT scanner

Expanding Access to PET in Georgia

Trident Medical Imaging (TMI) was established in September 2003, with the vision of expanding access to PET/CT technology in Georgia, which the founders believe is a critical evaluation tool in the battle against cancer and, most recently, Alzheimer's disease. The company now consists of three PET imaging centers, including the center in Fayetteville, GA, USA, where Hibbert received her amyloid imaging scan, as well as one multimodality center. TMI prides itself on providing broad access to the most advanced scanners available to enable immediate and accurate information to its referring physicians, so they can determine the most effective methods of treatment for their patients.

The PET imaging center in Fayetteville performed the first amyloid imaging exam in Georgia using a Siemens Biograph PET•CT scanner. "We have had Siemens technology since the beginning," said Guy Messer—who along with Fred Stuvek, CEO, and Ken Manning, COO, founded TMI—oversees the operations at the Fayetteville location. "We have an appreciation for the technology that is inherent in the Siemens PET•CT," he said. "We are very happy with the resolution and sensitivity of the system, as well as the speed that enables high-patient throughput." Messer cites the reliability of the system

as another key benefit of the Siemens PET•CT scanner. "We perform 10 or more scans a day, so we need to be able to perform our scans as scheduled," he says. "It's also good to know, that if we need it, Siemens is available to provide prompt service." Reliable delivery of PET imaging biomarkers is critical for TMI. "We have only one scanner in Fayetteville, so if doses are not there on time, it can mess up the entire day's schedule," says Messer. "We can't just switch patients from one machine to another." TMI relies on Siemens' PETNET Solutions for its reliable production and distribution of amyloid imaging biomarkers. "They have been very, very reliable in delivering our doses," said Messer.

concentrations of amyloid. Traditional PET scanning technology often lacks the fine volumetric resolution and high-contrast ratio to precisely differentiate grey and white matter in the brain. Tracer signal from white brain matter is considered normal, whereas amyloid plaque in grey matter signals potential neurodegeneration. Thanks to the industry's finest** volumetric resolution of up to 87 mm³ and a four times improvement in contrast, Biograph mCT helps physicians distinguish between white and grey matter. With automatic daily calibrations and proven PET and CT alignment accuracy, Biograph mCT supports accurate quantification in dementia imaging. In addition, syngo.PET Amyloid Plaque quantification software,* recently introduced by Siemens for amyloid imaging, automatically registers the amyloid-PET image against an amyloid PET reference brain, identifying target regions of interest to allow for the computation of SUV ratios and standard deviations from normal.*** Quantification software, although it does not replace visual assessment by a physician, assists physicians in making an interpretation of the PET image.

Negative Results

When Hibbert received the results back from her amyloid imaging scan, both



The PET imaging center in Fayetteville performed the first amyloid imaging exam in Georgia, USA.



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The Value of Knowing

Taylor is no stranger to Alzheimer's disease. Her mother is a victim of the disease, which propelled Taylor to go back to school and pursue a fellowship in neuro-physiology. Between 5 and 10 percent of Taylor's practice is now comprised of patients being evaluated for cognitive decline.

“I think in the last decade, physicians and even the general public are more aware [of Alzheimer's disease and dementia]. They are aware that there are ways to stave off the process. We can't yet change the ultimate outcome [of Alzheimer's disease], but we can delay the severity of the disease.”

Taylor would recommend the amyloid imaging exam to her other patients. She especially likes that it is non-invasive. “I think the test speaks for itself,” says Taylor. “It is a great addition to the evaluation of Alzheimer's disease.”

Hibbert says that she would recommend this test for others, who like herself are experiencing memory issues. “Having the knowledge allows you to do whatever is available to help relieve some of the symptoms or, in time, possibly help find a cure,” says Hibbert. “I think it is important to know.”

* syngo.PET Amyloid Plaque is intended for use only with approved amyloid radiopharmaceuticals in the country of use. Users should review the drug labeling for approved uses.

** Based on competitive information available at time of publication. Data on file.

***Normal database 510(k) pending.

she and Taylor were in for a surprise. The scans came back negative for amyloid plaque, which meant Hibbert's cognitive impairment was not a symptom of Alzheimer's disease, and it is unlikely she will develop the disease. “It changed my projection as to how I was going to treat her,” Taylor said. After reviewing the negative test results, Taylor began looking for non-physical causes for the mild cognitive impairment. She called Hibbert in to discuss the findings.

“As we started talking, I realized maybe there were some other areas of her life that were contributing to her anxiety levels,” says Taylor, who explained that external factors, such as stress, anxiety

or even depression can lead to mild cognitive impairment. While this is more difficult to evaluate, the treatment is much more straightforward.

“I prescribed medication,” says Taylor, “and her memory is already showing signs of improvement.”

According to Taylor, leaping too quickly to an assessment of probable Alzheimer's disease can add additional stress and anxiety, causing further cognitive decline.

“People want to latch on to something organic—a physical cause for their symptoms—not something related to emotions,” she said. “But you remove that elephant from under the bed and people can deal with the other issues.”

“The reliability of PETNET Solutions has been excellent.”

Guy Messer,
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