

## Can Brain Scans Help Diagnose ADHD?

Some ADHD doctors offer patients high-tech options for diagnosis. Are these technologies helpful in determining the cause of an ADHD child's behavioral and emotional symptoms?

*by Carl Sherman, Ph.D. (April/May 2006)*

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Most of the time, doctors can diagnose a child with attention deficit disorder (ADD/ADHD) simply by observing his behavior in the office, and asking his parents and/or teachers to describe his attention or behavior problems - when they started, where they occur, and so on.

But sometimes doctors have trouble making a definitive ADHD diagnosis. Maybe the symptoms don't precisely fit the profile of ADD. Maybe mood swings and anxiety muddy the picture. Or perhaps the child has been taking ADD medication for a while and things have gotten worse instead of better. What now?

When the diagnosis is iffy, the usual approach is to order one or more additional standard diagnostic tests (see Diagnosing Difficult Cases). But, in part because these tests have their own limitations, a handful of ADD docs have begun offering high-tech (and high-cost) diagnostic tests - notably a technique known as single photon emission computed tomography (SPECT) and quantitative electroencephalography (qEEG), which measures brain wave activity.

Can these tests really pinpoint the cause of a child's behavioral and emotional problems, as their proponents claim? Can the tests predict the most effective treatment? Or are they, as many mainstream ADD docs insist, a useful tool for research, but unproven as a means of diagnosing individual cases of ADD?

### SPECT and speculation

The neuroimaging technique that has aroused the most interest among parents of children suspected of having ADD is SPECT. This 20-minute test measures blood flow within the brain; it shows which brain regions are metabolically active ("hot") and which are quiescent ("cold") when an individual completes various tasks.

The procedure entails an injection of a radioactive isotope that is then picked up by the brain. This means exposure to a small amount of radiation - about the equivalent of an X ray. The child lies motionless as a camera rotates around his head. Several scans may be required, at a cost that can top \$1,000.

SPECT has an outspoken advocate in psychiatrist Daniel Amen, M.D., of Newport Beach, California. Dr. Amen heads a group of four clinics, which, he says, have performed a total of 31,000 SPECT scans of people with various psychiatric problems.

"Neuroimaging doesn't give you a diagnosis," says Dr. Amen. "It's one part of a full evaluation that you have to put in the context of what goes on in a patient's life." Low activity in the

prefrontal cortex is typical of ADD, he says, but it can also occur with schizophrenia, dementia, and head injury. "You can't read these things blindly."

By providing information that is impossible to obtain from a simple clinical examination, Dr. Amen claims, "SPECT adds to the richness of the diagnosis and helps target treatment." The images are useful in a range of psychiatric and neurological disorders, not just ADD, he says.

"No one with a simple problem comes to see us," Dr. Amen says. His average ADD patient carries at least three other diagnoses - usually anxiety, bipolar disorder, conduct disorder, or depression. "Head trauma is much more common than people think. Forty percent of my patients have some sort of injury."

According to Dr. Amen, SPECT can do more than show who has ADD. He says it can identify which of his six ADD "subtypes" a person has. Each subtype requires its own kind of treatment, claims Dr. Amen.

He describes one of his patients, a boy from Atlanta, who had been diagnosed with ADD. "When he was put on stimulants, he picked his skin and was frightened at bedtime." SPECT showed a pattern of over- rather than underactivity, Dr. Amen says. "He had a hot, not a cold, brain. It wasn't appropriate for stimulants. I put him on a handful of supplements, including fish oil, to calm his brain rather than stimulate it, and he did much better."

Michael Uszler, M.D, a nuclear medicine specialist who heads a clinic in Santa Monica, California, occasionally performs SPECT scans on children referred to him by pediatricians and family physicians. He agrees that SPECT cannot be used to make a final diagnosis, but that it adds to the picture presented by examination and other tests.

## Brain waves

Researchers have also found distinctive brain patterns in ADD by using qEEG, which, like SPECT, is available in clinics across the country. Unlike SPECT, qEEG uses no radiation; a layer of gel is applied to the head to conduct electrical impulses, and the child dons an electrode-studded cap. For each scan, the child must remain very still for about 20 minutes, and several scans are customary. The cost varies by location, but \$500-\$900 for a full evaluation is not unusual.

**Daniel Hoffman, M.D., a Denver-based neuropsychiatrist, often uses qEEG to confirm a diagnosis of ADD and to determine which medication to prescribe.** "About 35 percent of the people we see who were diagnosed with ADD don't seem to have the neurophysiology for it. And most clinical research shows that about the same number don't respond to stimulants. I think these are the same people."

Brain wave patterns, like the blood flow images produced by SPECT, reveal abnormalities in the frontal area of the brain. Some children with ADD symptoms have an excess of slow waves, while others have too much fast-wave activity, according to Dr. Hoffman. "On the surface, you can't tell them apart," he says. "They have the same symptoms. qEEG shows the cause of the symptoms."

By comparing a patient's qEEG to a database derived from thousands of drug trials, Dr. Hoffman says he can better predict which ADD medication will be the most effective. "The more I use this," he says, "the more I realize I was shooting in the dark without it."

## Skeptics and believers

Few ADD experts consider SPECT a particularly useful tool in diagnosing or treating ADD. The work of people like Dr. Amen, many experts say, has not been available for the scrutiny of the scientific community, and his findings haven't been duplicated by the research of others - a basic criterion of scientific validity.

Some mainstream doctors give SPECT only qualified approval. Barton Blinder, M.D., clinical professor of psychiatry and director of the eating disorders program at the University of California, Irvine, has referred some patients with apparent ADD for SPECT studies. But he has only referred "about 1 percent to 2 percent of the people I see," he says, usually in cases involving a head injury, a prior seizure disorder, or an infectious disease that may have damaged the brain.

The scan "may supply some clues," says Dr. Blinder. "On rare occasions," he says, "it has been of some help." But on the whole, he sees SPECT and other neuroimaging technologies as tools of the future: "They hold a great deal of promise, which will one day have diagnostic and treatment implications."

qEEG seems to have a bit more mainstream support than SPECT. Patricia Quinn, M.D., a developmental pediatrician, member of the *ADDitude* scientific advisory board, and co-founder/director of the National Center for Gender Issues and ADHD, is not currently in clinical practice, but she says that if she were, "I would be using qEEG for confirmation of diagnosis, to determine whether medication treatment is effective, and to help sort out coexisting conditions that look like ADD."

Robert Chabot, Ph.D., associate professor of psychiatry and a researcher at the Brain Research Laboratories at New York University School of Medicine, agrees that qEEG is clinically useful. "Kids with ADD have very specific EEG patterns - it's a much more definitive way of making the diagnosis than just looking at symptoms." Its application in choosing medication and in following response, on the other hand, "needs more research," he says.

Most of the medical profession would apply that phrase to any use of qEEG in ADD diagnosis and treatment. Although EEG is used to investigate seizure disorders and other neurological conditions, most experts, as well as professional bodies, such as the American Psychiatric Association and the American Neurological Association, maintain that information obtained through EEG isn't reliable enough to detect the more subtle changes of psychiatric disorders.

More generally, the American Academy of Pediatrics doesn't recommend any lab tests for ADD - making specific reference to neuroimaging techniques, including SPECT, and qEEG. The American Academy of Child and Adolescent Psychiatry is similarly skeptical: ADD is "a clinical diagnosis," and brain imaging and the like provide "insufficient data."