

## ■ SPECT Techniques in Evaluating Childhood Learning Disorders Promise Better Diagnosis and Treatment

Learning and behavioral problems, which are said to affect about 5% of school age children, can be caused by a variety of underlying maladies, including depression, schizophrenia, seizure disorders, obsessive-compulsive disorders, psychoses, and a condition called "attention-deficit hyperactive disorder" (ADHD). Also, a large percentage of children who are hyperactive are afflicted with a combination of ADHD and some other disorder. According to researchers, however, single-photon emission computed tomography (SPECT) imaging techniques may ultimately improve the diagnosis, management, and prevention of learning and behavioral problems in children.

In a two-year study directed by Samuel H. Mehr, MD, Director of Nuclear Medicine, Archbishop Bergan Mercy Hospital, Omaha, NE, and James K. O'Donnell, MD, Director of Nuclear Medicine, Marymount Hospital, Garfield Heights, OH, physicians and psychiatrists sought to relate the difference between the many diseases — both psychiatric and neurologic — that can harbor pediatric learning disorders and hyperactivity. By evaluating more than 500 subjects with SPECT in conjunction with technetium-99m-HMPAO, Dr. Mehr's group found that brain SPECT can diagnose and confirm pathologic conditions related to a child's learning and behavior. SPECT images enabled investigators to make note of changes in cerebral blood flow patterns and functional activity and subsequently correlate them with different disease conditions. For example, the study group associated ADHD with excessive blood flow in certain areas of the brain, while depression was discovered to be linked with decreased blood flow in certain areas of the brain.

Dr. Mehr's group also found that SPECT images can reveal whether or

not hyperactivity in conjunction with some other underlying disease causes learning and behavioral difficulties. By revealing a second disorder in patients with ADHD, brain SPECT imaging can illustrate why treatment designed purely for ADHD is not working as effectively as expected. With this information, physicians can alter treatment accordingly.

In the abstract (see *J Nucl Med* 1990;31:741) of their investigative report, Dr. Mehr's group concluded, "in children with disorders of learning or behavior, SPECT brain imaging . . . is valuable in establishing a specific diagnosis, directing therapy, and [monitoring] the effect of therapy." Dr. Mehr's research findings were reported at The Society of Nuclear Medicine's June 1990 Annual Meeting in Washington, DC.

"SPECT, most importantly provides clinicians with an objective differential diagnosis of brain disorders," says Dr. O'Donnell. "Quite frequently, teenagers with behavioral problems are mistakenly diagnosed to be mentally slow or prone to violence. But by observing an adolescent's blood flow patterns on a SPECT image, we often find that he is suffering from some

cerebral disorder and, thereby, start appropriate treatment on the troubled patient. SPECT scanning can, thus avoid lengthy psychiatric evaluations and long stays in the hospital."

Although Dr. Mehr does not advocate using brain SPECT as the only tool for diagnosing cerebral disorders, he advised that it should be used in concert with the more traditional methods — clinical history and psychological testing — of evaluating the patients. "Brain SPECT may become an important part of the diagnostic process," says Lorcan O'Tuama, MD, Division of Nuclear Medicine, Children's Hospital, Boston, MA, "and quite often gives information that is not available from other testing modalities."

According to Patricia Chapman, RT (N), Coordinator of Nuclear Medicine, Marymount Hospital, brain SPECT is effective in identifying symptoms linked to depression, seizures, dementia, schizophrenia, mood disorders, and evidence of chronic drug and alcohol abuse. Ms. Chapman further maintains "that a brain SPECT scan can find information in less than an hour. With that ability to obtain some visual confirmation and impression of what the physicians may suspect clinically, they can initiate appropriate treatment faster."

## Special Problems in Performing SPECT on Children

The prospect of undergoing a brain SPECT scan can be a frightening and traumatic experience, especially for very small children. According to Ms. Chapman, many measures are taken to alleviate the child's fears and apprehensions. "First of all, the scan procedure is done in a dark room because light stimulus causes a different [perfusion] pattern and can distort the results," she says. "We want to make the young patients as comfortable as possible. We gently talk to them and try to explain the procedure step-by-step and assure them there is nothing to [fear]. For very young children, we provide toys so they feel they are in a friendly, nonthreatening envi-

### Examination Dates The Nuclear Medicine Technology Certification Board

1991-1992

Year	Exam Date	Application Deadline
1991	June 22	April 20
1991	September 28	July 20
1992	June 27	April 18
1992	September 26	July 18

For more information or to request an application, contact:

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ronment. A complete scan requires about 40 minutes. The patient has to be still for that length of time. If the child moves, we have to repeat the scan, but that does not pose a big problem because the agent we use [ $^{99m}\text{Tc}$ -HMPAO] grants us the ability to scan for up to four or five hours after the injection. But in order to gently remind them to remain still, we place a tape over the child's forehead." "If the children are uncooperative they are sometimes sedated," comments Dr. O'Donnell. "But sedation is a double-edged sword because on the one hand, it leads to a good scan because it prevents patient movement. But, if the child is sedated first, the medication actually suppresses the brain's activity and may lead to an inaccurate reading. In addition, the patient cannot be sedated, however, until after they have been given the isotope." Ms. Chapman points out that of well over 100 young patients who have undergone brain SPECT imaging at Marymount, sedation has rarely been applied.

Ms. Chapman explains that SPECT scans can help physicians make better decisions about which medications to use by enabling them to target a more specific drug rather than going through trial and error. She also indicates that aside from helping physicians to ascertain suitable treatment, brain SPECT provides an objective, concrete, tangible piece of evidence with which to monitor treatment, thus enabling physicians to determine how long to keep a child on therapy. "The effects of the medication can be seen on the brain SPECT images before they manifest themselves clinically," Ms. Chapman said.

### Future Prospects

SPECT's role in the diagnosis and treatment of pediatric learning behavioral disorders will be heightened as clinical research focuses more upon the quantitative analyses of cerebral perfusion functions. According to Dr. O'Donnell, who frequently lectures across the nation to promote the use of SPECT in this field, "the majority of clinical psychiatrists and neurologists are excited over the prospects of

brain imaging in their practices. Academia, however, wants to see more control studies and more quantitative data generated by SPECT studies. SPECT images still provide qualitative evaluations of brain activity, but research is underway that will ultimately lead to quantitative analyses of cerebral perfusion functions."

"Brain SPECT certainly cannot be expected to replace any of the conventional methods of diagnosis, but [it] can serve as a valuable complement," says Dr. O'Tuama. He further cautions that "this effort is really just under way and may take at least another year of research with SPECT to really make inroads into treating pediatric learning disorders."

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### ■ Early Planning for NMW Results in Successful Promotions

The key to a successful Nuclear Medicine Week (NMW) is to plan ahead; now is the time to motivate nuclear

medicine departments to start organizing for NMW 1991, July 30–August 6. During the week, departments should be committed to increasing public awareness and understanding of this beneficial, but often misunderstood discipline.

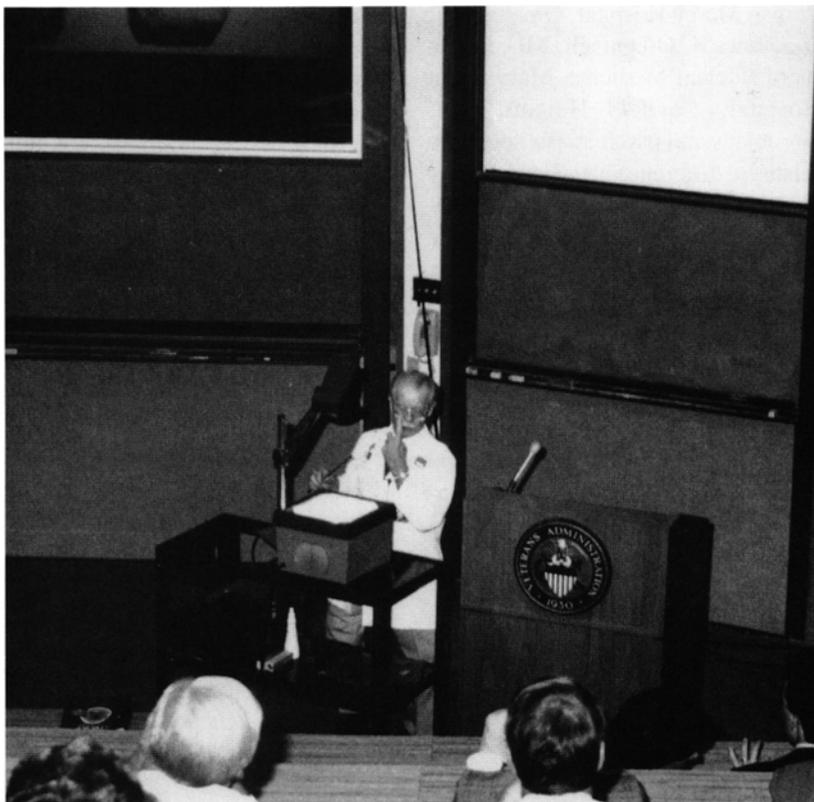
In previous years, NMW has proven to be one of the most positive, informative means of promoting the profession. A greater understanding of the discipline can translate into such tangible results as increased referrals from area physicians, higher recruitment of qualified graduates into nuclear medicine technology programs, and greater community support.

Last year's participants demonstrated their commitment to the profession through innovative and creative programs and events.

For instance, Francisco E. Gomez, CNMT, Director of Imaging Services at Pan American Hospital in Miami, FL, recognized an opportunity to promote nuclear medicine in the largely Spanish-speaking city of Miami.

"If you mention to them the words

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Dr. F. Charlie Petty, Director of The Nuclear Medicine Department at the Olin E. Teague Veterans' Center Hospital in Temple, TX, conducts a live teleconference link-up over the VA's communications system during NMW 1990.

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'nuclear medicine' they get scared," said Gomez, who coordinated his hospital's NMW activities. "Many are Cuban-Americans. They are older and have never been exposed to nuclear medicine. The word 'nuclear' to them means disaster."

In order to allay his community's fears about nuclear medicine, Gomez planned early and sought the greatest exposure outside the confines of the medical environment. Gomez and Dr. Carlos Llanes, Medical Director of Pan American Hospital's Nuclear Medicine Department, participated in a two-hour regional Spanish-language radio program devoted entirely to nuclear medicine during NMW. The live program included an open phone line to which many people called to ask questions.

The week after NMW, Gomez was a guest on the Spanish-language cable TV program "La Salud y Usted" (You and Your Health), where he further

discussed nuclear medicine. The program was broadcast daily for a week.

Through Gomez's efforts, countless members of Miami's Hispanic community developed a greater appreciation and understanding of nuclear medicine.

At the Olin E. Teague Veterans' Center Hospital in Temple, TX, Celeste W. Kasberg coordinated her hospital's NMW activities. The hospital is associated with two satellite VA hospitals about 40 miles away. Only the Temple, TX VA center has a nuclear medicine department. Many staff members at the satellite hospitals could not attend the activities, so a live, teleconference link-up over the VA's communication system brought the activities to them. The noon program was conducted by Dr. F. Charlie Petty, Chief of the hospital's nuclear medicine department and the past president of the American College of Nuclear Medicine.

About 50 physicians participated in the VA satellite hook-up, and doctors had the opportunity to ask questions, even those who could not leave their respective hospitals.

"If nuclear medicine is your profession," said Kasberg, "your pride should stimulate a desire to share information with others."

Even an MRI clinic celebrated NMW. All it took was the enthusiasm and dedication of one person, Stephen E. Wagner, CNMT, Chief Technologist of the outpatient South Brevard MRI Center in Melbourne, FL.

Gomez, Kasberg, and Wagner attribute the success of their NMW programs to early planning with hospital staff and the community. They also took advantage of the SNM's "Guidelines for Promoting Nuclear Medicine Week" pamphlet, which outlines information on various promotional activities.

As a tie-in to NMW, General Elec-