

Editorial

Nuclear Medicine :A New Aspect In Medicine

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EDITORIAL NOTE

Nuclear medicine is a medical specialty that uses radioactive tracers (radiopharmaceuticals) to assess bodily

functions and to diagnose and treat disease. Specially designed cameras allow doctors to track the path of these

radioactive tracers. Single Photon Emission Computed Tomography or SPECT and Positron Emission

Tomography or PET scans are the two most common imaging modalities in nuclear medicine.

Radioactive tracers are made up of carrier molecules that are bonded tightly to a radioactive atom. These carrier molecules vary greatly depending on the purpose of the scan. Some tracers employ molecules that interact with a specific protein or sugar in the body and can even employ the patient's own cells. For example, in cases where doctors need to know the exact source of intestinal bleeding, they may radiolabel (add radioactive atoms) to a sample of red blood cells taken from the patient. They then reinject the blood and use a SPECT scan to follow the path of the blood in the patient. Any accumulation of radioactivity in the intestines informs doctors of where the problem lies.

For most diagnostic studies in nuclear medicine, the radioactive tracer is administered to a patient by intravenous injection. However a radioactive tracer may also be administered by inhalation, by oral ingestion, or by direct injection into an organ. The mode of tracer administration will depend on the disease process that is to be studied.

Approved tracers are called radiopharmaceuticals since they

must meet FDA's exacting standards for safety and appropriate performance for the approved clinical use. The nuclear medicine physician will select the tracer that will provide the most specific and reliable information for a patient's particular problem. The tracer that is used determines whether the patient receives a SPECT or PET scan.

What are nuclear medicine scans used for?

SPECT scans are primarily used to diagnose and track the progression of heart disease, such as blocked coronary arteries. There are also radiotracers to detect disorders in bone, gall bladder disease and intestinal bleeding. SPECT agents have recently become available for aiding in the diagnosis of Parkinson's disease in the brain, and distinguishing this malady from other anatomically-related movement disorders and dementias.

The major purpose of PET scans is to detect cancer and monitor its progression, response to treatment, and to detect metastases. Glucose utilization depends on the intensity of cellular and tissue activity so it is greatly increased in rapidly dividing cancer cells. In fact, the degree of aggressiveness for most cancers is roughly paralleled by their rate of glucose utilization. In the last 15 years, slightly modified radiolabeled glucose molecules (F-18 labeled deoxyglucose or FDG) have been shown to be the best available tracer for detecting cancer and its metastatic spread in the body.

A combination instrument that produces both PET and CT scans of the same body regions in one examination (PET/CT scanner) has become the primary imaging tool for the staging of most cancers worldwide.

Recently, a PET probe was approved by the FDA to aid in the accurate diagnosis of Alzheimer's disease, which previously could be diagnosed with accuracy only after a patient's death. In the absence of this PET imaging test, Alzheimer's disease can be difficult to distinguish from vascular dementia or other

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forms of dementia that affect older people.

Creating new technology

A SPECT tracer is currently available for accurate diagnosis of Parkinson's disease. However, the small region in the brain that must be imaged requires a dedicated brain SPECT imager with special gamma cameras to provide high resolution, which adds to the cost of the procedure. NIBIB is supporting research

to create an inexpensive adapter for the conventional SPECT imagers that most hospitals already have. The adapter would allow standard clinical SPECT cameras to provide the same high resolution that currently only dedicated SPECT brain imaging systems can produce. These improvements would make Parkinson's diagnosis less costly and more widely available.