

Nuclear Medicine

Introduction

A nuclear medicine procedure is sometimes described as an "inside-out" x-ray because it records radiation emitting from the patient's body rather than radiation that is directed through the patient's body. Nuclear medicine procedures use small amounts of radioactive materials, called radiopharmaceuticals, to create images of anatomy.

Radiopharmaceuticals are substances that are attracted to specific organs, bones or tissues. They are introduced into the patient's body by injection, swallowing or inhalation. As the radiopharmaceutical travels through the body, it produces radioactive emissions. A special type of camera detects these emissions in the organ, bone or tissue being imaged and then records the information on a computer screen or on film.



Nuclear medicine is unique because it documents function as well as structure. For example, nuclear medicine allows physicians to see how a kidney is functioning, not just what it looks like. Most other diagnostic imaging tests, in comparison, reveal only structure. Nuclear medicine procedures are performed to assess the function of nearly every organ. Common nuclear medicine procedures include thyroid studies, brain scans, bone scans, lung scans, cardiac stress tests, and liver and gallbladder procedures.

Although nuclear medicine is primarily used for diagnosis, it can be used to treat disease as well. Therapeutic uses include treatment of hyperthyroidism and pain relief from certain types of bone cancers.

There are more than 100 different nuclear medicine examinations. This page offers a general introduction to six of the most common tests. For more detailed information, visit the Society of Nuclear Medicine's website at <http://www.snm.org>.

Patient Preparation

Before your examination, a nuclear medicine technologist will explain the procedure to you and answer any questions you might have. A nuclear medicine technologist is a skilled medical professional who has received specialized education in the areas of anatomy, radiation protection, patient care, radiation exposure, radiopharmaceuticals and nuclear medicine procedures.

Tell the technologist if you have any allergies and if you are undergoing radiation therapy, because these factors may require adjustments in how the examination is performed. Also, be sure to tell the technologist if you are pregnant or are breastfeeding. Nuclear medicine tests usually are not recommended for pregnant women.

During the Examination

For most nuclear medicine examinations, the patient is positioned on a scanning table underneath a scintillation or gamma camera. A radiopharmaceutical then is administered intravenously, orally or through inhalation. It travels through the patient's bloodstream to a specific area where it selectively accumulates. The camera then detects and records the radioactive emissions from the patient's body.

For some nuclear medicine studies, imaging takes place immediately. For others, images are taken an hour, two hours, or even several days after administration of the radiopharmaceutical. In most cases, the patient is permitted to leave the hospital and return later for the imaging procedure.

Most nuclear medicine procedures require several different images from different angles, and the technologist may ask you to change positions during the examination. You will need to lie still during each scan.

During a nuclear medicine brain scan, images are taken of the front, back, sides and sometimes top of the head. Scans usually are taken 30 to 60 minutes following the injection of a radiopharmaceutical, although some tests require the patient to return a day or two later for scanning. It's important that you not move, cough or touch your head while the scans are being taken. Brain scans are used to diagnose strokes, tumors and infections of the brain. A study of blood circulation in the brain is called a cerebral perfusion scan.

A thyroid uptake study shows how well the thyroid gland is functioning. If the radiopharmaceutical is administered orally, you will be asked to return the next day for scanning. If it is injected, the scans are performed immediately. You may be asked to avoid all foods and medicines that contain iodine for several days before the test, because they can distort the test results.

Lung scans usually are performed to detect blood clots in the lungs. Often, a chest x-ray is taken in conjunction with the lung scan. The x-ray image and the nuclear medicine image are compared to help your physician better identify a clot.

For most types of cardiac imaging, scans are taken two to four hours after the radiopharmaceutical is administered. For a cardiac stress-rest test, you probably will be asked not to eat three to four hours before the test because the images of your heart will be easier to interpret if your stomach is empty. During the test, you will be asked to perform mild exercise, such as walking on a treadmill or riding a stationary bicycle, while a radiopharmaceutical is administered. An electrocardiogram will monitor your heart rhythm while you exercise. Nuclear medicine scans will be taken immediately and then repeated several hours later. This study reveals blood flow to the heart to help detect coronary artery disease.

For gallbladder imaging, images usually are taken within an hour of administration of a radiopharmaceutical. You may be asked to return several hours later for additional images. The study can detect gallbladder disease and reveal how well the liver is functioning.

Bone scans can detect fractures, tumors and infections. Imaging may be performed immediately, although it usually is performed several hours after the radiopharmaceutical is injected. If your entire body needs to be scanned, the imaging portion of the procedure can last two to four hours. If you have trouble lying on your back for extended periods of time, be sure to let your physician know. Radiographs also may be taken to provide additional information.

Post-examination Information

After the examination, your nuclear medicine scans will be reviewed by a [radiologist](#), a physician who specializes in the interpretation of diagnostic medical images. Your personal physician will receive a report of the radiologist's findings. Your physician then will advise you of the results and discuss what further procedures, if any, are needed.

The radiation that you are exposed to during a nuclear medicine procedure is equal to or less than a standard x-ray or CT scan covering the same body area. In general, the radiopharmaceutical administered during the examination will be eliminated naturally from your body in one or two days. Drinking fluids will help clear the radiopharmaceutical from your system more quickly. You do not need to avoid contact with other people during this time, although your physician may recommend simple acts, such as flushing the toilet twice after using it, to reduce the small chance of radiation exposure to others in your household.

Please remember that the material presented here is for informational purposes only. If you have specific questions about a medical imaging procedure, contact your physician or the radiology department of the institution where your test will be performed.