



What You Should Know

About Pediatric Nuclear Medicine
and Radiation Safety

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What is nuclear medicine?

Nuclear medicine is a medical specialty that uses radioactive isotopes to create images of the human body. These images help doctors diagnose disease or abnormalities and assist in planning treatment. Nuclear medicine studies (also called scans) can reveal conditions such as infection, inflammation, birth defects, injury and tumors. These studies are highly sensitive and unique. They often provide information other imaging techniques cannot provide. Nuclear medicine is a functional imaging method. Unlike most other imaging studies that only show a picture of the structure imaged, nuclear medicine studies show how well these organs and structures are functioning. Often, nuclear medicine scans complement information obtained from x-rays, computed tomography (CT), ultrasound and magnetic resonance imaging (MRI).

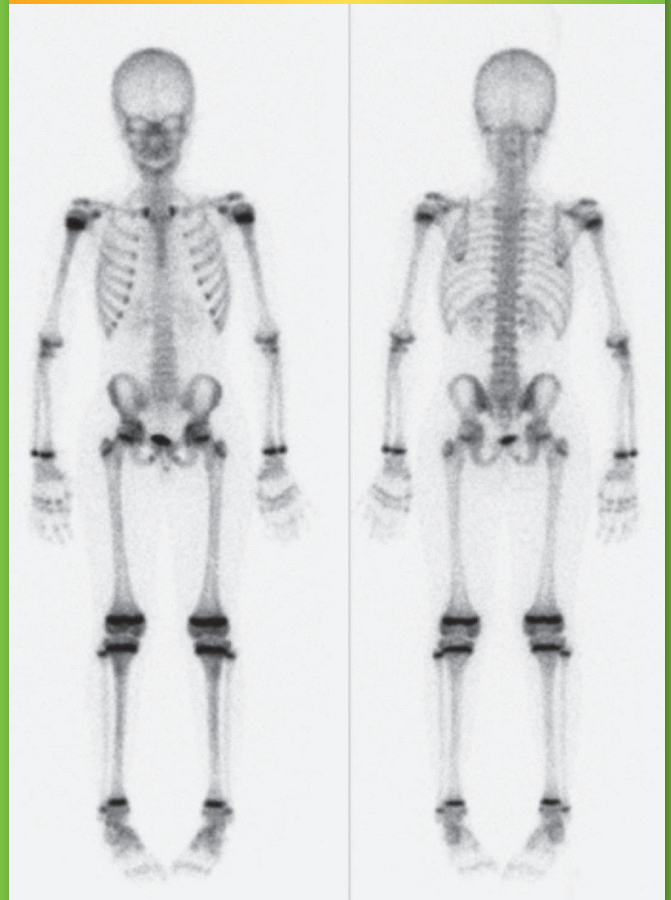
How are nuclear medicine studies done?

Patients are given a very small amount of a radiotracer, also referred to as a radiopharmaceutical or radioisotope. These radiotracers travel to the part of the body of interest. Radiotracers are most often given through a vein (intravenously) using a small needle. The insertion of the needle may be uncomfortable, but in most cases it is made easier with the help of supportive staff and parents. Depending on the exam, other routes of administration include drinking or eating food that contains a radiotracer; the radiotracer can be introduced through a small catheter placed gently into the bladder or the stomach, or it can be administered by breathing it. The radiotracer emits invisible energy called gamma rays, which can be seen by special cameras called gamma cameras or PET scanners. The camera does not touch the patient and it does not produce any radiation. These large cameras produce images of the movement and location of the radiotracer. These images help doctors to see structures within the body such as bones, heart, brain, liver, bladder and kidneys and assess how well they are functioning. For example, a radiotracer designed to show if the bones are healthy produces a “bone scan” like the one seen on the right.

Depending on the study being done, patients are given the radiotracer in the exam room and imaging begins immediately while at other times the patient needs to wait a period of time while the radiotracer



Bone scan



travels to the specific area of interest. Imaging time varies, depending on the type of study, and it may take from 2 minutes to 2 hours. In some tests it may be necessary to take images at different time intervals. It is important for the patient to lie still while the pictures are being taken to ensure high quality images.

How much radiation exposure is in a nuclear medicine study?

Your child will be exposed to a very small amount of radiation that is within the lower range of what is received from routine diagnostic imaging procedures using x-rays. Nuclear medicine studies have been done on babies and children of all ages for more than 40 years without any known adverse effects. The functional nature of these exams and the low doses of radiation used make it a safe and effective diagnostic tool in children. The radiation exposure that is received from a nuclear medicine study comes from the radiotracer (radioisotope) and the amount of radiation exposure varies, depending on the type of study.

Nuclear medicine specialists are committed to ensuring that your child receives the smallest radiation dose needed to obtain the desired result. They follow the ALARA principle (As Low As Reasonably Achievable). The dose of radiotracer is determined by the patient's body weight, the reason for the study and the body part being imaged. The radiotracers administered have very short physical half-lives which means they decay quickly into non-radioactive forms. In addition, part of the radiotracer leaves the body by natural means such as the urine. In some cases drinking plenty of fluids and frequent urination can help some radiotracers to pass through the body faster.

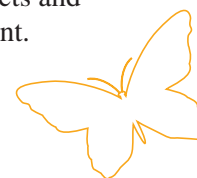
Some parents may wonder about the exposure to the radiation emanating from their child who has been administered radioactivity as part of a nuclear medicine procedure. In practically all cases, this exposure is a very small fraction (less than 2%) of the radiation all of us receive each year from natural sources. This is roughly equivalent to the radiation dose received from a flight between Boston and Los Angeles. Thus, in most cases, the parent can choose to stay with their child during the procedure.

How can we reduce radiation risk to my child?

We are all exposed to a certain amount of radiation in our everyday life from the earth, building materials and from space. This is called background radiation. People living at high altitudes or who travel by air are exposed to higher background radiation than those living near sea level. The amount of radiation a child would be exposed to from a nuclear medicine examination is small and has never been shown to be harmful. However, it is still important to reduce any potentially unnecessary radiation. Nuclear medicine professionals work to ensure that your child is exposed to the smallest amount of radiation possible during a nuclear medicine examination. In addition, the Image Gently Campaign and the Pediatric Imaging Council of the Society of Nuclear Medicine are promoting ways and means to achieve the lowest radiation exposures while maintaining high image quality such as:

- Image when the medical benefit is greater than potential risk
- Use the lowest amount of radiotracer for adequate imaging

Medical professionals balance the benefits and potential risks of imaging tests. Your doctor and the nuclear medicine physician will work together to decide which exam is best to do. Variations in testing may be recommended based on individual facts and circumstances specific to the individual patient.

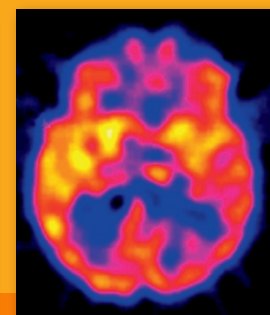


Here are some examples of other nuclear medicine scans.

Kidney scan



Brain scan



The Image Gently Campaign is the educational and awareness campaign created by the Alliance for Radiation Safety in Pediatric Imaging, formed in July 2007. It is a coalition of health care organizations dedicated to providing safe, high quality pediatric imaging nationwide. The Society for Pediatric Radiology and the Pediatric Imaging Council of the Society of Nuclear Medicine, as well as over 50 other societies, are members of this coalition, representing more than 700,000 health care professionals in radiology, pediatrics, medical physics and radiation safety. More information can be found at www.imagegently.org.

This pamphlet is written to provide patients, parents and caregivers with some information about nuclear medicine and radiation exposure. It is hoped that the information provided would calm any fears or concerns, answer some of your questions and help you to understand better your child's care. The information contained in this publication should not be used as a substitute for the advice from your doctor. If you are concerned or have any unanswered questions, you should talk with a nuclear medicine professional before the study begins and ask questions to help you feel comfortable with the test being performed.

References

www.imagegently.org
www.radiologyinfo.org
www.rpop.iaea.org
www.snm.org

