

Renal (Kidney) Scintigraphy

Renal scintigraphy uses small amounts of radioactive material called radiopharmaceuticals, a special camera and a computer to evaluate your kidney function and anatomy and determine whether they are working properly. It can provide unique information that is often unattainable using other imaging procedures.

Tell your doctor if there's a possibility you are pregnant or if you are breastfeeding. Discuss any recent illnesses, medical conditions, allergies and medications you're taking, including nonsteroidal anti-inflammatory drugs (NSAIDs). Your doctor will instruct you on how to prepare and may advise you to stop taking some medications or increase fluid intake prior to your exam. Leave jewelry at home and wear loose, comfortable clothing. You may be asked to wear a gown.



What is renal scintigraphy?

Renal scintigraphy, also known as "renal scans" refers to several examinations using radiopharmaceuticals that evaluate the function and anatomy of the kidneys. Renal scintigraphy is one of many imaging methods used to evaluate the kidneys. Ultrasound, computed tomography (CT), and magnetic resonance imaging (MRI) can also be used. Your doctor will determine which of these examinations will provide the best information about your kidneys.

The different types of renal scans are used to examine different functional aspects of the kidneys; however, all of these procedures involve the injection of a radiopharmaceutical or radiotracer that emits a tiny amount of radioactivity into the patient. Because the radiotracer interacts differently in different kinds of tissue, it can help physicians determine if something is wrong with the kidneys or if the kidneys are functioning normally. Renal scintigraphy can also be used to evaluate a kidney transplant.

After injection, the radiotracer travels throughout the body to the kidneys, where it gives off energy in the form of gamma rays. This energy is detected by a device called a gamma camera. The camera works with a computer to produce special pictures offering details on both the structure and function of organs and tissues.

What are some common uses of the procedure?

Four types of renal imaging help determine whether the kidneys are working normally or abnormally.

- Renal cortical scintigraphy detects the amount of functioning renal cortical tissue through images taken with a gamma camera approximately two hours after radiopharmaceutical injection.
- Renal perfusion and functional imaging examines blood flow to the kidneys and identifies potential narrowing of the renal arteries. It can also examine whether a renal mass is a focus of benign tissue or a space occupying lesion, such as a cyst or neoplasm. Through a series of images taken over 20 to 30 minutes immediately after radiopharmaceutical injection, it also helps determine how well the kidneys are working.
- Diuretic renal scintigraphy detects kidney blockages or obstruction of urine flow through images taken before and after the introduction of a diuretic, which is used to move urine through the kidneys.
- ACE-inhibitor renal scintigraphy helps determine if the cause of a patient's high blood pressure is coming from the kidneys, due to narrowing of the renal artery or arteries, by comparing kidney images before and after taking a blood pressure

medication called an "ACE-inhibitor."

These procedures can be valuable for identifying kidney failure and/or transplant-related complications, as well as discovering kidney-related injuries.

How should I prepare?

Preparation can vary widely based on the type of scan being conducted. You may be asked to drink extra fluid or possibly receive intravenous (IV) fluids. You may also be given a diuretic to increase urine production. In some cases, the bladder may need to remain empty during the scan, necessitating the insertion of a catheter. In other cases, you may be asked to go to the bathroom and empty your bladder prior to imaging. You also may be asked to discontinue use of some medications prior to your exam.

You may wear a gown during the exam or be allowed to wear your own clothing.

Women should always tell their doctor and technologist if they are pregnant or breastfeeding. *See the Radiation Safety* (<https://www.radiologyinfo.org/en/info/safety-radiation>) page for more information about pregnancy and breastfeeding related to nuclear medicine imaging.

Tell the doctor and your exam technologist about any medications you are taking, including vitamins and herbal supplements. List any allergies, recent illnesses, and other medical conditions.

Also tell your physician if you are taking non-steroidal anti-inflammatories (NSAIDs).

Leave jewelry and accessories at home or remove them prior to the exam. These objects may interfere with the procedure.

Your doctor will tell you how to prepare for your specific exam.

What does the equipment look like?

Nuclear medicine uses a special gamma camera and single-photon emission-computed tomography (SPECT) imaging techniques.

The gamma camera records the energy emissions from the radiotracer in your body and converts it into an image. The gamma camera itself does not emit any radiation. It has radiation detectors called gamma camera heads. These are encased in metal and plastic, often shaped like a box, and attached to a round, donut-shaped gantry. The patient lies on an exam table that slides in between two parallel gamma camera heads, above and beneath the patient. Sometimes, the doctor will orient the gamma camera heads at a 90-degree angle over the patient's body.

In SPECT, the gamma camera heads rotate around the patient's body to produce detailed, three-dimensional images.

How does the procedure work?

Ordinary x-ray exams pass x-rays through the body to create an image. Nuclear medicine uses radioactive materials called radiopharmaceuticals or radiotracers. Your doctor typically injects this material into your bloodstream. Or you may swallow it or inhale it as a gas. The material accumulates in the area under examination, where it gives off gamma rays. Special cameras detect this energy and, with the help of a computer, create pictures that detail how your organs and tissues look and function.

Unlike other imaging techniques, nuclear medicine focuses on processes within the body. These include rates of metabolism or levels of various other chemical activities. Areas of greater intensity are called "hot spots." These may show large concentrations of the radiotracer and where there is a high level of chemical or metabolic activity. Less intense areas, or "cold spots," indicate a smaller concentration of radiotracer and less activity.

How is the procedure performed?

Doctors perform nuclear medicine exams on outpatients and hospitalized patients.

Prior to imaging, you will be injected with a small amount of radiotracer. Diuretic renal scintigraphy, ACE-inhibitor renal scintigraphy, renal perfusion and function imaging will typically begin imaging while the tracer is being administered. Cortical imaging requires a two- to three-hour delay after tracer administration for imaging to begin.

You will lie on an exam table. If necessary, a nurse or technologist will insert an intravenous (IV) catheter into a vein in your hand or arm.

When it is time for the imaging to begin, the gamma camera will take a series of images. The camera may rotate around you or it may stay in one position and you will be asked to change positions in between images. While the camera is taking pictures, you will need to remain still for brief periods of time. You may be asked to sit or lie down for the exam.

Depending upon the type of procedure, renal imaging can last from 30 minutes to 2 hours.

What will I experience during and after the procedure?

You will feel a slight pin prick when the radiotracer is injected. After the injection, you could experience a brief metallic taste.

You will be asked to lie on your back or sit up, and will need to remain as still as possible while the camera takes each picture.

It is important to remain still during the exam. Nuclear imaging causes no pain. However, having to remain still or in one position for long periods may cause discomfort

In some cases, the camera may move very close to your body. This is necessary to obtain the best quality images. If you are claustrophobic, you should inform the technologist before your exam begins.

After the exam, you may need to wait until the technologist determines if more images are needed. Sometimes, the technologist takes more images to clarify or better visualize certain areas or structures. The need for more images does not necessarily mean there was a problem with the exam or that something is abnormal. It should not cause you concern.

Unless your doctor tells you otherwise, you may resume your normal activities after your exam. A technologist, nurse, or doctor will provide you with any necessary special instructions before you leave.

Who interprets the results and how do I get them?

A radiologist or other doctor specially trained in nuclear medicine will interpret the images and send a report to your referring physician.

What are the benefits vs. risks?

Benefits

- The information provided by nuclear renal imaging is unique and often unattainable using other imaging procedures.
- Renal imaging yields useful information needed to make a diagnosis or to determine appropriate treatment, if any.

Risks

- Because nuclear medicine exams use only a small dose of radiotracer, they have a relatively low radiation exposure. This is acceptable for diagnostic exams. Thus, the potential benefits of an exam outweigh the very low radiation risk.
- Doctors have been using nuclear medicine diagnostic procedures for more than six decades. There are no known long-term

adverse effects from such low-dose exposure.

- Your doctor always weighs the benefits of nuclear medicine treatment against any risks. Your doctor will discuss the significant risks prior to treatment and give you an opportunity to ask questions.
- Allergic reactions to radiotracers are extremely rare and usually mild. Always tell the nuclear medicine personnel about any allergies you may have. Describe any problems you may have had during previous nuclear medicine exams.
- The radiotracer injection may cause slight pain and redness. This should rapidly resolve.

What are the limitations of renal imaging?

Nuclear renal images cannot reliably differentiate between cysts and tumors.

Nuclear medicine procedures can be time-consuming. You will be informed as to how often and when you will need to return to the nuclear medicine department for further procedures.

The resolution of structures of the body with nuclear medicine may not be as clear as with other imaging techniques, such as CT or MRI. However, nuclear medicine scans are more sensitive than other techniques for a variety of indications, and the functional information gained from nuclear medicine exams is often unobtainable by any other imaging technique.

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