Renal Scintigraphy

Renal scintigraphy uses small amounts of radioactive materials called radiopharmaceuticals, a special camera and a computer to evaluate your kidneys' 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. 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 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 be asked to wear a gown during the exam or you may be allowed to wear your own clothing.

Women should always inform their physician or technologist if there is any possibility that they are pregnant or if they are breastfeeding. See the Safety page for more information about pregnancy and breastfeeding related to nuclear medicine imaging.

You should inform your physician and the technologist performing your exam of any medications you are taking, including vitamins and herbal supplements. You should also inform them if you have any allergies and about recent illnesses or other medical conditions.

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

Jewelry and other metallic accessories should be left at home if possible, or removed prior to the exam because they may interfere with the procedure.

You will receive specific instructions based on the type of scan you are undergoing.

What does the equipment look like?

The special camera and imaging techniques used in nuclear medicine include the gamma camera and single-photon emission-computed tomography (SPECT).

The gamma camera, also called a scintillation camera, detects radioactive energy that is emitted from the patient's body and converts it into an image. The gamma camera itself does not emit any radiation. The gamma camera is composed of radiation detectors, called gamma camera heads, which are encased in metal and plastic and most often shaped like a box, attached to a round circular donut shaped gantry. The patient lies on the examination table which slides in between two parallel gamma camera heads that are positioned above and below the examination table and located beneath the examination table. Sometimes, the gamma camera heads are oriented at a 90 degree angle and placed over the patient's body.

SPECT involves the rotation of the gamma camera heads around the patient's body to produce more detailed, three-dimensional images.

How does the procedure work?

With ordinary x-ray examinations, an image is made by passing x-rays through the patient's body. In contrast, nuclear medicine procedures use a radioactive material, called a radiopharmaceutical or radiotracer, which is injected into the bloodstream, swallowed or inhaled as a gas. This radioactive material accumulates in the organ or area of your body being examined, where it gives off a small amount of energy in the form of gamma rays. Special cameras detect this energy, and with the help of a computer, create pictures offering details on both the structure and function of organs and tissues in your body.

Unlike other imaging techniques, nuclear medicine imaging exams focus on depicting physiologic processes within the body, such as rates of metabolism or levels of various other chemical activity, instead of showing anatomy and structure. Areas of greater intensity, called "hot spots," indicate where large amounts of the radiotracer have accumulated 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 chemical activity.

How is the procedure performed?

Nuclear medicine imaging is usually performed on an outpatient basis, but is often performed on hospitalized patients as well.

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 three hour delay after tracer administration for imaging to begin.

You will be positioned on an examination 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 that you remain still while the images are being recorded. Though nuclear imaging itself causes no pain, there may be some discomfort from having to remain still or to stay in one particular position during imaging.

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.

When the examination is completed, you may be asked to wait until the technologist checks the images in case additional images are needed. Occasionally, more images are obtained for clarification or better visualization of certain areas or structures. The need for additional images does not necessarily mean there was a problem with the exam or that something abnormal was found, and should not be a cause of concern for you.

Unless your physician tells you otherwise, you may resume your normal activities after your nuclear medicine scan. If any special instructions are necessary, you will be informed by a technologist, nurse or physician before you leave the nuclear medicine department.

Who interprets the results and how do I get them?

A radiologist or other physician who has specialized training 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 the doses of radiotracer administered are small, diagnostic nuclear medicine procedures result in relatively low radiation exposure to the patient, acceptable for diagnostic exams. Thus, the radiation risk is very low compared with the potential benefits.
- Nuclear medicine diagnostic procedures have been used for more than five decades, and there are no known long-term adverse effects from such low-dose exposure.
- The risks of the treatment are always weighed against the potential benefits for nuclear medicine therapeutic procedures. You will be informed of all significant risks prior to the treatment and have an opportunity to ask questions.
- Allergic reactions to radiopharmaceuticals may occur but are extremely rare and are usually mild. Nevertheless, you should inform the nuclear medicine personnel of any allergies you may have or other problems that may have occurred during a previous nuclear medicine exam.
- Injection of the radiotracer may cause slight pain and redness which 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 techniques.

Disclaimer

Note: Images may be shown for illustrative purposes. Do not attempt to draw conclusions or make diagnoses by comparing these images to other medical images, particularly your own. Only qualified physicians should interpret images; the radiologist is the physician expert trained in medical imaging.

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