



Nuclear Medicine - Hepatobiliary

Hepatobiliary nuclear medicine imaging helps evaluate the parts of the biliary system, including the liver, gallbladder and bile ducts, using small amounts of radioactive materials called radiotracers that are typically injected into the bloodstream, inhaled or swallowed. The radiotracer travels through the area being examined and gives off energy in the form of gamma rays which are detected by a special camera and a computer to create images of the inside of your body. Nuclear medicine imaging provides unique information that often cannot be obtained using other imaging procedures.



Tell your doctor if there's a possibility you are pregnant or if you are breastfeeding and discuss any recent illnesses, medical conditions, allergies and medications you're taking. Depending on the type of exam, your doctor will instruct you on what you may eat or drink beforehand, especially if sedation is to be used. Leave jewelry at home and wear loose, comfortable clothing. You may be asked to wear a gown.

What is Hepatobiliary Imaging?

Hepatobiliary imaging is a type of nuclear medicine imaging that helps evaluate the liver, gallbladder and the ducts that are part of the biliary system.

Nuclear medicine is a branch of medical imaging that uses small amounts of radioactive material to diagnose and determine the severity of or treat a variety of diseases, including many types of cancers, heart disease, gastrointestinal, endocrine, neurological disorders and other abnormalities within the body. Because nuclear medicine procedures are able to pinpoint molecular activity within the body, they offer the potential to identify disease in its earliest stages as well as a patient's immediate response to therapeutic interventions.

Nuclear medicine imaging procedures are noninvasive and, with the exception of intravenous injections, are usually painless medical tests that help physicians diagnose and evaluate medical conditions. These imaging scans use radioactive materials called radiopharmaceuticals or radiotracers.

Radiotracers are molecules linked to, or "labeled" with, a small amount of radioactive material that can be

detected on the PET scan. They are designed to accumulate in cancerous tumors or regions of inflammation. They can also be made to bind to specific proteins in the body. The most commonly used radiotracer is F-18 fluorodeoxyglucose, or FDG, a molecule similar to glucose. Cancer cells may absorb glucose at a higher rate, being more metabolically active. This higher rate can be seen on PET scans, and that allows your doctor to identify disease before it may be seen on other imaging tests. FDG is just one of many radiotracers in use or in development for a variety of conditions throughout the body.

Depending on the type of nuclear medicine exam, the radiotracer is either injected into the body, swallowed or inhaled as a gas and eventually accumulates in the organ or area of the body being examined. Radioactive emissions from the radiotracer are detected by a special camera or imaging device that produces pictures and provides molecular information.

What are some common uses of the procedure?

Physicians perform hepatobiliary imaging to evaluate disorders that affect liver cells, the ducts of the biliary system and the gallbladder.

Hepatobiliary imaging is also used to help diagnose symptoms such as:

- abdominal pain that may be caused by a sudden inflammation of the gallbladder called cholecystitis
- pain or fever following surgery on the gallbladder or the upper gastrointestinal tract

- biliary atresia in newborns, a blockage in the ducts that carry bile from the liver to the gallbladder

How should I prepare?

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.

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 should not eat or drink for at least four hours before your exam. You should not have tests that use barium for 48 hours before hepatobiliary imaging.

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 the patient and 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.

How is the procedure performed?

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

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.

Depending on the type of nuclear medicine exam you are undergoing, the dose of radiotracer is then injected intravenously, swallowed or inhaled as a gas.

Pediatric patients are given a smaller dose of radiotracer.

When it is time for the imaging to begin, the camera or scanner will take a series of images. The camera may rotate around you or it may stay in one position and you may 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. 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 initial series of images is taken, you may be given a medication that causes your gallbladder to empty. Additional images will be taken as your gallbladder empties.

Hepatobiliary imaging is usually completed within one to four hours. Occasionally, patients may need to return for additional imaging up to 24 hours later.

If you had an intravenous line inserted for the procedure, it will usually be removed unless you are scheduled for an additional procedure that same day that requires an intravenous line.

What will I experience during and after the procedure?

Except for intravenous injections, most nuclear medicine procedures are painless and are rarely associated with significant discomfort or side effects.

When the radiotracer is given intravenously, you will feel a slight pin prick when the needle is inserted into your vein for the intravenous line. When the radioactive material is injected into your arm, you may feel a cold sensation moving up your arm, but there are generally no other side effects.

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.

If you receive a medication that causes your gallbladder to empty, you may experience slight abdominal discomfort or nausea, but it should pass within a few minutes. Although imaging may be performed over a period of several hours, you may not be on the imaging table the entire time.

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.

Through the natural process of radioactive decay, the small amount of radiotracer in your body will lose its radioactivity over time. It may also pass out of your body through your urine or stool during the first few hours or days following the test. You should also drink plenty of water to help flush the radioactive material out of your body as instructed by the nuclear medicine personnel.

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

- Nuclear medicine examinations provide unique information—including details on both function and anatomic structure of the body that is often unattainable using other imaging procedures.

- For many diseases, nuclear medicine scans yield the most useful information needed to make a diagnosis or to determine appropriate treatment, if any.
- A nuclear medicine scan is less expensive and may yield more precise information than exploratory surgery.

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

What are the limitations of Hepatobiliary Imaging?

Nuclear medicine procedures can be time consuming. It can take several hours to days for the radiotracer to accumulate in the body part of interest and imaging may take up to several hours to perform, though in some cases, newer equipment is available that can substantially shorten the procedure time.

The resolution of structures of the body with nuclear medicine may not be as high 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 other imaging techniques.

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