



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 imaging uses small amounts of radioactive material to diagnose, evaluate or treat a variety of diseases. These include many types of cancers, heart disease, gastrointestinal, endocrine or neurological disorders and other abnormalities. Because nuclear medicine exams can pinpoint molecular activity, they have the potential to identify disease in its earliest stages. They can also show whether a patient is responding to treatment.

Nuclear medicine imaging procedures are noninvasive. With the exception of intravenous injections, they are usually painless. These tests use radioactive materials called radiopharmaceuticals or radiotracers to help doctors diagnose and evaluate medical conditions.

Radiotracers are molecules linked to, or "labeled" with, a small amount of radioactive material that can be detected on the PET scan. Radiotracers accumulate in tumors or regions of inflammation. They can also

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 are more metabolically active and may absorb glucose at a higher rate. This higher rate can be seen on PET scans. This 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.

Depending on the type of exam, the radiotracer is injected, swallowed or inhaled as a gas. It eventually accumulates in the area of the body under examination. A special camera or imaging device detects radioactive emissions from the radiotracer. The camera or device 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 wear a gown during the exam or be allowed to wear your own clothing.

Women should always tell their doctor and technologist if there is any possibility that they are pregnant or they are breastfeeding. See the [Safety in X-ray, Interventional Radiology and Nuclear Medicine Procedures](#) page for more information about pregnancy and breastfeeding related to nuclear medicine imaging.

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

Leave jewelry and other metallic accessories at home or remove them prior to the exam. Such objects 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. 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?

Ordinary x-ray exams create an image by passing x-rays through the body. Nuclear medicine exams use a radioactive material called a radiopharmaceutical or radiotracer. This material is injected into the bloodstream, swallowed or inhaled as a gas. The material accumulates in the area of your body under examination, 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 that offer details on the structure and function of organs and tissues.

How is the procedure performed?

Nuclear medicine imaging is performed on outpatients and hospitalized patients.

You will lie 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 your type of nuclear medicine exam, the radiotracer is 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 (IV) line inserted for the procedure, it will usually be removed unless you are scheduled for another procedure that same day that requires an IV line.

What will I experience during and after the procedure?

Except for intravenous injections, most nuclear medicine procedures are painless. They 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. You may feel a cold sensation moving up your arm when the radiotracer is injected. Generally, there are no other side effects.

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

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 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.

The small amount of radiotracer in your body will lose its radioactivity over time through the natural process of radioactive decay. It may also pass out of your body through your urine or stool during the first few hours or days following the test. Drink plenty of water to help flush the radioactive material out of your body.

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

- Nuclear medicine examinations provide unique information—including details on the function and anatomy of body structures—that is often unattainable using other imaging procedures.
- Nuclear medicine scans provide the most useful diagnostic or treatment information for many

diseases.

- A nuclear medicine scan is less expensive and may yield more precise information than exploratory surgery.

Risks

- Because only a small dose of radiotracer is used, nuclear medicine exams have a relatively low radiation exposure. This is acceptable for diagnostic exams. Thus, the radiation risk is very low when 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.
- Treatment risks are always weighed against the potential benefits for nuclear medicine therapeutic procedures. Your doctor will inform you of all significant risks prior to the 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 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. This should rapidly resolve.
- Women should always tell their doctor and radiology technologist if there is any possibility that they are pregnant or they are breastfeeding. See the Safety in X-ray, Interventional Radiology and Nuclear Medicine Procedures page for more information about pregnancy, breastfeeding and nuclear medicine imaging.

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 area of interest, and imaging may take up to several hours to perform. In some cases, newer equipment can substantially shorten the procedure time.

The image resolution of nuclear medicine images may not be as high as that of CT or MRI. However, nuclear medicine scans are more sensitive for a variety of indications, and the functional information they yield is often unobtainable by other imaging techniques.

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