Hepatobiliary Nuclear Medicine



Hepatobiliary nuclear medicine imaging helps evaluate the parts of the biliary system, including the liver, gallbladder, and bile ducts. It uses 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. Gamma rays 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 you are pregnant or you are breastfeeding. 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 need to change into a gown for this procedure.

What is hepatobiliary imaging?

Hepatobiliary imaging is a type of nuclear medicine imaging that helps evaluate the liver (http://www.radiologyinfo.org) , gallbladder (http://www.radiologyinfo.org) , and the ducts that are part of the biliary system (http://www.radiologyinfo.org) .

Nuclear medicine uses small amounts of radioactive (http://www.radiologyinfo.org) material called radiotracers. Doctors use nuclear medicine to diagnose, evaluate, and treat various diseases. These include cancer, heart disease, gastrointestinal, endocrine, or neurological disorders, and other conditions. Nuclear medicine exams pinpoint molecular activity. This gives them the potential to find disease in its earliest stages. They can also show whether you are responding to treatment.

Nuclear medicine is noninvasive. Except for intravenous injections, it is usually painless. These tests use radioactive materials called radiopharmaceuticals (http://www.radiologyinfo.org) or radiotracers (http://www.radiologyinfo.org) to help diagnose and assess medical conditions.

Radiotracers are molecules linked to, or "labeled" with, a small amount of radioactive material. They accumulate in tumors or regions of inflammation. They can also bind to specific proteins in the body. The most common radiotracer is F-18 fluorodeoxyglucose (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 detect disease before it may be seen on other imaging tests. FDG is just one of many radiotracers in use or in development.

You will usually receive the radiotracer in an injection. Or you may swallow it or inhale it as a gas, depending on the exam. It accumulates in the area under examination. A special camera detects gamma ray emissions from the radiotracer. The camera and a computer produce pictures and supply 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.

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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 (https://www.radiologyinfo.org/en/info/cholecystitis)
- pain or fever following surgery on the gallbladder (https://www.radiologyinfo.org/en/info/gallstones) or the upper gastrointestinal tract
- biliary atresia (http://www.radiologyinfo.org) 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 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.

Leave jewelry and accessories at home or remove them prior to the exam. These 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?

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 (http://www.radiologyinfo.org) 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.

How is the procedure performed?

Doctors perform nuclear medicine exams on outpatients and hospitalized patients.

You will lie on an exam table. If necessary, a nurse or technologist will insert an intravenous (IV) (http://www.radiologyinfo.org)

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catheter into a vein in your hand or arm.

For most exams, you will receive an injection of the radiotracer. Or, you may swallow it or inhale it as a gas.

Pediatric patients receive a smaller dose of radiotracer.

When imaging begins, the camera or scanner will take a series of images. The camera may rotate around you or stay in one position. You may need to change positions in between images. While the camera is taking pictures, you will need to remain still for brief periods. In some cases, the camera may move very close to your body. This is necessary to obtain the best quality images. Tell the technologist if you have a fear of closed spaces before your exam begins.

After the technologist takes an initial series of images, they may give you a medication that causes your gallbladder to empty. As your gallbladder empties, the technologist will take more images.

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

If you have an intravenous (IV) line for the procedure, your technologist will usually remove it. The technologist will leave it in place if you are to have 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. Reports of significant discomfort or side effects are rare.

You will feel a slight pin prick when the technologist inserts the needle into your vein for the intravenous line. You may feel a cold sensation moving up your arm during the radiotracer injection. Generally, there are no other side effects.

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.

If you receive medication to empty your gallbladder, you may have slight abdominal discomfort or nausea. This should pass within a few minutes. Although imaging may take place over 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 after the test. Drink plenty of water to help flush the 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 exams provide unique information that is often unattainable using other imaging procedures. This information may include details on the function and anatomy of body structures.

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- Nuclear medicine supplies 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 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.
- Women should always tell their doctor and radiology technologist if there is any possibility that they are pregnant, or they are breastfeeding. *See the Radiation Safety (https://www.radiologyinfo.org/en/info/safety-radiation) 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 area of interest. Plus, 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. The functional information they yield is often unobtainable using other imaging techniques.

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