TEST

Radionuclide cisternogram

A radionuclide cisternogram tracks a radioactive tracer through the fluid around your brain and spinal cord.

WHAT IT MEASURES
Movement of cerebrospinal fluid around the brain and spine

SAMPLE
None; images follow tracer injection into spinal fluid

FASTING NEEDED?
Usually no; sometimes if sedation is planned

HOW LONG IT TAKES
Several imaging visits over 24-48 hours

RESULTS IN
Same day to several days; varies by laboratory and service

USED FOR
Diagnosing cerebrospinal fluid leaks or abnormal fluid circulation

MAIN LIMITATION
Intermittent leaks may be inactive and missed during imaging

Overview

A radionuclide cisternogram is an imaging test that follows the movement of cerebrospinal fluid, or CSF. This clear fluid surrounds and cushions your brain and spinal cord.

A small amount of radioactive tracer is injected into the CSF through a lumbar puncture, also called a spinal tap. A special camera then detects the tracer as it moves around your spine and brain.

Images are usually taken several times, often over one or two days. This allows the imaging team to look for fluid escaping from its expected pathway or moving in an unusual pattern.

This is a specialized test rather than a routine scan. CT or MRI tests are now often used first because they provide more detailed pictures of anatomy. A radionuclide cisternogram may still be useful when a leak is intermittent or when the care team needs to observe CSF movement over an extended period.

Why the test is ordered

The test may be ordered to investigate a suspected CSF leak. A leak can allow fluid to drain from the nose or ear or escape around the spine.

It may also be used to study abnormal CSF circulation. In the past, radionuclide cisternography was used more often when assessing hydrocephalus, which is a buildup of CSF in the brain. Its role for this purpose is now limited because other imaging tests usually provide more useful information.

The test may help answer questions such as:

A laboratory test called beta-2 transferrin may be used when clear fluid is draining from the nose or ear. It can help confirm that the fluid is CSF, but it cannot show where the leak is located.

- Whether CSF appears to be leaking
- Whether fluid reaches expected areas at the expected times
- Whether movement is delayed or obstructed
- Whether further, more targeted imaging is needed

Who should have the test

A radionuclide cisternogram may be considered if your symptoms, examination, fluid testing, or earlier scans suggest a CSF leak or circulation problem.

It is not automatically the best test for every suspected leak. The choice may depend on whether the suspected leak is in the skull or spine, whether it happens continuously, and what previous CT or MRI scans have shown.

Tell the imaging team if you:

These details mainly affect whether the lumbar puncture and radiation exposure are appropriate. Do not stop prescribed medicines unless the team arranging the test gives you specific instructions.

- Are or could be pregnant
- Are breastfeeding
- Take blood thinners or medicines that affect platelets
- Have a bleeding disorder or low platelet count
- Have had spinal surgery or a difficult lumbar puncture

- Have an infection, fever, or skin infection near the lower back
- Have previously reacted to a radiopharmaceutical

How to prepare

Most people do not need to fast. You may usually eat and drink normally unless sedation is planned or your imaging department gives different instructions.

You may be encouraged to drink fluids before or after the test. Follow the instructions from your imaging department because protocols differ.

Wear comfortable clothing and leave jewelry or removable metal items at home if requested. You may need to change into a gown.

Bring an up-to-date list of your medicines. The team needs to know about anticoagulants, such as medicines used to prevent blood clots, because these can increase bleeding risk during a lumbar puncture. The timing of any medicine changes must be decided individually.

Plan for several sets of images. You may be allowed to leave between them, but you must return at the stated times. If you receive a sedative, arrange for someone to take you home.

What happens during the test

You will usually lie on your side or stomach for the lumbar puncture. The skin over your lower back is cleaned, and a local anesthetic is used to numb the area.

A thin needle is placed between the bones in your lower spine and into the fluid-filled space around the spinal nerves. A small amount of radioactive tracer is then injected. The tracer is not the same as the iodine-based contrast commonly used for CT scans.

After the needle is removed, a dressing is placed over the site. You may be asked to remain in a particular position for a short time.

A gamma camera takes pictures by detecting radiation from the tracer. The camera does not produce the radiation and does not touch you, although it may be positioned close to your body.

The timing varies by protocol. Images may begin within the first few hours and continue later that day, the next day, or occasionally longer. Each imaging session may take approximately 30 to 60 minutes. You need to keep as still as possible.

For a suspected leak from the nose, small absorbent pads may sometimes be placed inside the nasal passages. These can be checked for tracer, although this technique is not required for

every test.

Understanding your results

A radiologist or nuclear medicine specialist reviews where the tracer appears and how quickly it travels.

There is no single numerical reference range. Expected timing and appearance vary with the imaging protocol, your anatomy, age, previous surgery, and the clinical question.

A report may describe:

An abnormal pattern does not identify the cause by itself. The result is interpreted alongside your symptoms, examination, fluid tests, and other imaging.

- Tracer following the expected pathway around the spine and brain
- Tracer appearing outside the expected CSF space
- Delayed movement toward the upper surface of the brain
- Tracer entering the brain's fluid-filled chambers
- An incomplete study because the tracer did not enter the CSF correctly

What affects the results

The most important issue is whether a leak is active while images are being taken. A slow or intermittent leak may not release enough tracer to be detected.

The lumbar puncture also matters. If some tracer is injected outside the intended CSF space, it may remain near the injection site and fail to travel normally. This can make the study difficult or impossible to interpret.

Other influences include:

Most foods, coffee, exercise, and medicines do not directly change tracer movement. Blood thinners like warfarin or apixaban affect the safety of the lumbar puncture rather than the image itself. Pregnancy and breastfeeding mainly affect decisions about radiation exposure and aftercare.

- Movement during imaging, which can blur the pictures
- Previous brain or spinal surgery, which can alter CSF pathways
- Obstruction or unusually slow CSF circulation

- Image timing and body position
- Tracer contamination on skin, clothing, or nasal collection pads
- A recent lumbar puncture, which can create a temporary puncture-site leak

Accuracy and limitations

A radionuclide cisternogram can observe CSF movement over a longer period than many other tests. However, it produces less detailed anatomical images than CT or MRI.

The test can miss a leak if it is very slow, intermittent, or inactive during imaging. It may show that tracer has escaped without locating the exact opening. Published results differ because studies have used different techniques and included different types of leaks, so one accuracy figure does not apply to every situation.

A result may wrongly appear positive if tracer contaminates the skin or a collection pad. Leakage caused by the lumbar puncture itself can also complicate interpretation.

A different test may be more useful in some situations. CT cisternography can show bone and pinpoint some active skull-base leaks. MR cisternography can provide detailed soft-tissue images, sometimes without an injection into the spinal fluid. Dynamic CT myelography or digital subtraction myelography may be used for certain fast spinal leaks or abnormal connections between CSF and veins.

A normal radionuclide cisternogram does not always rule out a leak. If suspicion remains, the care team may recommend repeat or different imaging.

Risks and complications

The lumbar puncture can cause temporary soreness or bruising in the lower back. Some people develop a headache that is worse when sitting or standing and improves when lying down.

Bleeding, infection, or nerve irritation is uncommon. Serious complications are rare when the procedure is appropriately planned.

The tracer exposes you to a small amount of ionizing radiation. It gradually leaves the CSF, enters the bloodstream, and is removed from the body, mainly in urine. Your imaging department may advise extra fluids and regular urination afterward.

Contact the service promptly for a severe or persistent headache, repeated vomiting, fever, increasing redness or drainage at the puncture site, or worsening back pain.

Seek emergency help for new leg weakness, loss of bladder or bowel control, confusion, a seizure, severe difficulty waking, or trouble breathing.

What happens next

You can usually return home after the required images unless another procedure or sedation requires observation. Follow instructions about activity, fluids, bathing, and care of the puncture site.

Routine follow-up involves discussing the report with the clinician who ordered the test. A normal result may end the investigation, but further testing may be needed if symptoms and other findings still suggest a leak.

An abnormal result may lead to more detailed imaging to locate the problem. Treatment decisions are not based on the cisternogram alone.

Common questions

Can I drink coffee before the test?

Usually, yes. Coffee does not normally affect tracer movement. Follow different instructions if you are fasting for sedation or another procedure.

Does the time of day matter?

The starting time matters mainly because several images must be taken at planned intervals. Expect to return later the same day or on following days.

Can I exercise beforehand?

Ordinary activity does not usually change the result. Avoid unusually strenuous exercise if the imaging department asks you to, and follow its activity instructions after the lumbar puncture.

Will the injection hurt?

The local anesthetic may sting briefly. You may feel pressure during the lumbar puncture, but sharp or radiating pain should be reported immediately.

Am I radioactive afterward?

A small amount of radiation remains temporarily while the tracer leaves your body. The department will tell you whether you need short-term precautions around pregnant people or young children.

Can I drive home?

You may be able to drive if you received only local anesthetic and feel well. Do not drive after sedation, or if headache, dizziness, or local instructions make driving unsafe.

Sources

- American College of Radiology. ACR Appropriateness Criteria: Cerebrospinal Fluid Leak
- American College of Radiology, American Society of Neuroradiology, and Society for Pediatric Radiology. Practice Parameter for the Performance of Myelography and Cisternography
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- Kranz PG, Gray L, Amrhein TJ. Decubitus CT myelography for fast-flow spinal CSF leaks. AJNR American Journal of Neuroradiology . 2019;40(4):754-756.