HEALTH BASICS

Imaging and radiology

Imaging uses technologies such as X-rays, ultrasound, CT, and MRI to examine the inside of the body.

WHAT IT IS
Technology for viewing structures and activity inside the body

WHERE IT COMES UP
Diagnosis, treatment planning, procedures, screening, and follow-up

WHY IT MATTERS
Helps guide decisions without always needing surgery

WHAT IT IS NOT
Not a disease or diagnosis

WHO TO ASK
Referring clinician, radiology service, or imaging technologist

HOW IT IS CHECKED
Image acquisition, specialist interpretation, and a written report

Overview

Medical imaging creates pictures or measurements of the inside of your body. Radiology is the medical field that uses these images to help investigate health concerns, guide procedures, plan treatment, or monitor changes over time.

Imaging is not a disease or a diagnosis. An image provides information that must be considered alongside your symptoms, medical history, physical examination, and other test results.

A radiologist is a doctor trained to interpret medical images. A radiographer or imaging technologist operates imaging equipment and helps position and prepare you. Some radiologists also perform image-guided procedures, such as taking a tissue sample or opening a narrowed blood vessel. This is called interventional radiology.

Common types of imaging include:

The best test depends on the body area, the question being asked, how quickly an answer is needed, and your individual safety needs.

- X-ray: Uses a small amount of ionizing radiation, which has enough energy to affect cells

- CT scan: Uses multiple X-ray measurements and a computer to create detailed cross-sectional images
- Ultrasound: Uses high-frequency sound waves to create moving images
- MRI: Uses a strong magnet, radio waves, and a computer to produce detailed images
- Nuclear medicine: Uses a small amount of radioactive material, called a tracer, to show body function
- Fluoroscopy: Uses continuous or repeated X-rays to show movement or guide a procedure

How it works

Each imaging method collects information differently.

X-rays pass through the body. Dense materials, such as bone, block more X-rays and usually appear lighter on the image. Air-filled areas, such as the lungs, block less and appear darker.

CT uses X-rays taken from many angles. A computer combines them into thin "slices" of the body. CT is often useful when detailed images are needed quickly.

Ultrasound sends sound waves into the body through a handheld probe. The returning echoes create an image. Ultrasound can show movement, blood flow, pregnancy, and many soft tissues. Image quality can be affected by the body area, bowel gas, body size, and the operator's access to the area.

MRI measures signals from tissues while you are inside a strong magnetic field. It can provide detailed views of the brain, spinal cord, joints, organs, and soft tissues. MRI does not use ionizing radiation, but its magnetic field requires careful safety checks.

Nuclear medicine starts with a tracer that is swallowed, inhaled, or injected. A scanner detects energy released by the tracer. These tests can show how an organ or tissue is working, rather than only what it looks like.

Some examinations use a contrast agent to make particular tissues, blood vessels, or organs easier to see. Iodine-based contrast is commonly used with CT and some X-ray studies. Gadolinium-based contrast may be used with MRI. Ultrasound contrast agents are used for selected examinations.

After the test, a radiologist reviews the images and prepares a report. The report usually describes the findings, gives an overall interpretation, and may suggest another test or comparison with earlier images.

Why it matters for your health

Imaging can help answer a focused health question. For example, it may show a broken bone, bleeding, a blocked blood vessel, inflammation, a growth, or changes in an organ. It can also help clinicians choose where to take a biopsy or how to perform a procedure safely.

Some imaging is used for screening. Screening looks for certain conditions before symptoms appear. Whether screening is suitable depends on factors such as age, medical history, and personal risk. A screening image can identify something that needs more testing, but it does not always provide a final diagnosis.

Follow-up imaging can show whether a finding is stable, improving, or changing. Comparing new images with older ones is often important. Having previous images available may also reduce unnecessary repeat examinations.

The possible benefit of an imaging test should be balanced against its limits and risks. X-ray, CT, fluoroscopy, and nuclear medicine use ionizing radiation. The dose differs by examination. When these tests are medically needed, the expected benefit may outweigh the radiation risk. Ultrasound and MRI do not use ionizing radiation, although they have other safety considerations.

An imaging result can also be uncertain. A normal scan does not exclude every condition, and an abnormal-looking area may turn out not to be harmful. The meaning of a result comes from the full clinical context, not the image alone.

What can go wrong

Imaging can produce a false-negative result , meaning a condition is present but is not seen. It can also produce a false-positive result , meaning an image looks abnormal even though the suspected condition is absent.

An incidental finding is something unexpected that is unrelated to the original reason for the scan. Some incidental findings need follow-up, while others are harmless. Further testing can sometimes create worry or lead to procedures that do not provide a clear benefit.

Ionizing radiation can damage cells. The added risk from an individual examination is generally considered in relation to the medical benefit, but unnecessary repeat exposure should be avoided. Children and younger people require particular attention because their tissues are more sensitive and they have more years ahead for radiation effects to develop.

Contrast agents can cause allergic-like reactions. Kidney function may affect decisions about some iodine- or gadolinium-based agents. Contrast can also leak from a vein into nearby

tissue, called extravasation , causing pain and swelling. Serious complications are not expected in most people, but safety checks are important.

MRI's powerful magnet can move certain metal objects, interfere with some implanted devices, or heat some materials. Noise and the enclosed scanner may also be difficult for people with hearing concerns, pain, or claustrophobia.

Movement can blur images. Eating, drinking, or taking medicines against the preparation instructions may affect some tests. Occasionally, an examination must be repeated or a different type of imaging is needed.

Breathing difficulty, swelling of the face or throat, collapse, or rapidly worsening symptoms during or soon after contrast require emergency medical attention. After contrast injected into a vein, severe or increasing pain, marked swelling, numbness, blistering, or skin colour change around the injection site needs urgent assessment.

Mild soreness at an injection site or questions about a written report can usually be handled through routine follow-up with the radiology service or referring clinician.

What you can do

Before an imaging test, ask what question the test is intended to answer and how the result may change your care. You can also ask whether the examination uses radiation or contrast and whether another type of test could answer the same question.

Tell the imaging team if you:

These details do not automatically prevent imaging. They help the team choose suitable equipment, preparation, contrast, or monitoring.

Follow the test-specific instructions about food, drink, medicines, clothing, and arrival time. Do not stop prescribed medicines unless the service responsible for your test gives you clear instructions.

Keep a record of where and when previous imaging was performed. If possible, make sure earlier images are available for comparison. Ask when and how you should receive the result. If the expected time passes, contact the referring service rather than assuming that no news means a normal result.

When reviewing a report, useful questions include:

- Are pregnant, could be pregnant, or are breastfeeding
- Have had a previous reaction to a contrast agent

- Have kidney disease or recent kidney test results
- Have a pacemaker, implanted pump, surgical clips, metal fragments, or another implant
- Have difficulty lying flat, keeping still, or being in enclosed spaces
- Need support with hearing, communication, mobility, pain, or anxiety
- What is the main finding?
- Does it explain the reason for the test?
- Is follow-up imaging or another test recommended?
- When should that follow-up happen?
- Were there any incidental findings?

Common questions

Does radiation remain in my body after an X-ray or CT scan?

No. X-rays pass through the body and do not make you radioactive. Nuclear medicine is different because it uses a radioactive tracer. The tracer loses its activity over time and leaves the body according to the specific material used.

Is MRI always safer because it has no radiation?

Not always. MRI avoids ionizing radiation, but it may not answer every medical question and can take longer than CT. Metal, implanted devices, severe claustrophobia, or difficulty staying still may also affect whether MRI is appropriate.

Does every scan need contrast?

No. Contrast is used only when it may add useful information. The choice depends on the body area, the question being investigated, and your health history.

Does "no acute findings" mean everything is normal?

Not necessarily. It usually means the radiologist did not see a new problem needing immediate attention. The rest of the report may still describe long-standing changes, incidental findings, or limits of the examination.

Who explains the result?

The radiologist writes the report, but the clinician who requested the examination usually explains how it fits with your other health information. Some radiology services also provide results directly through patient portals.

Can I decline an imaging test?

You can ask about its purpose, benefits, risks, alternatives, and what may happen without it. In an emergency, decisions may need to be made quickly, but you should still receive an explanation whenever circumstances allow.

Sources

- U.S. Food and Drug Administration - Medical X-ray Imaging
- U.S. Food and Drug Administration - MRI (Magnetic Resonance Imaging)
- American College of Radiology - ACR Manual on Contrast Media
- RadiologyInfo.org, American College of Radiology and Radiological Society of North America - Radiation Dose in X-ray and CT Exams
- RadiologyInfo.org, American College of Radiology and Radiological Society of North America - Contrast Materials
- International Atomic Energy Agency - Radiation Protection of Patients