

## What are CT scans and MRIs? <sup>[1]</sup>

Dear Alice,

What is the difference between CT and MRI? And what does with or without dye mean?

### **Answer**

Dear Reader,

Clear and painless are frequently used adjectives for these tests, which produce *clear* high-resolution images of an area of the body through non-surgical and generally *painless* means. These two methods of diagnostic testing are conducted by placing the body in a somewhat large machine and then using computers to compile pictures of the desired areas. Although the tests achieve similar results through comparable means, there are some significant differences. For example, a computerized tomography (CT) scan uses x-rays to scan the body and develop images, only takes a few minutes, and is typically cheaper. Magnetic resonance imaging (MRI) scans, on the other hand, use radio waves, may last anywhere from fifteen minutes to an hour, and produce clearer pictures.

If a body scan is clinically indicated, a health care provider may recommend one or the other based on what's being assessed. CT scans are able to provide excellent information about anatomical features and tissue density, allowing for the detection and identification of malignant and benign tumors. They can also detect calcium deposits, cysts, and abscesses. MRIs are most commonly used to examine the central nervous system (the brain and spinal cord) and also help detect tumors, along with signs of strokes, degenerative diseases, inflammation, infection, and other abnormalities in organs and soft tissues of the body. Additionally, a functional MRI of the brain, known as an fMRI, may be administered to assess blood flow in critical regions of the brain.

In a CT scan, the patient lies on a table that slides into a scanning machine. Inside, an x-ray beam rotates around the body while detectors measure how much of the x-rays pass through the tissues and organs, indicating density. A computer then creates many images called slices based on this information. Slices can be studied individually, or placed together to form a three-dimensional model of the area of the body being studied. A dye, often referred to as contrast, is sometimes given to highlight a desired area. In a CT scan, the contrast agent blocks x-rays and typically shows up as white in images to help produce a more distinct picture of blood vessels,

intestines, and other parts of the body. A health care provider may ask the patient to drink the dye or will inject the dye through a person's veins or rectum. If injected, they may feel some warmth in the body upon injection. The ingestion of this dye may cause slight nausea or an allergic reaction, such as a rash or itchiness, but such symptoms are rare and closely monitored. In many cases, no dye is needed.

CT scanning carries with it some risks due to the use of x-rays, which exposes individuals to ionizing radiation. Studies show that prolonged exposure to high doses of ionizing radiation may cause cancer or the deformity of cells, and that the risk of developing a cancer due to radiation increases with frequency of tests. However, exposure to lower amounts of ionizing radiation hasn't been linked to future harm. Newer CT scan machines are faster and use less radiation. Therefore, this risk is thought to be small and less than that of going untested for serious conditions. Despite the most recent developments in CT scan technology, pregnant people are advised to avoid abdominal CT scans because of potential harm to the fetus.

A bit newer than CT scans, the MRI was first used in the late 1980s. In an MRI, a patient also lies on a table which slides into a machine. Radio waves and strong magnets briefly create a magnetic field that pulls at the water molecules in an individual's body. This information is relayed to a computer which creates slices (similar to a CT scan). In addition to the contrast dyes, small coils are also sometimes placed around the area being assessed to help send and receive the radio waves and improve MRI image quality. The MRI is usually painless, although a patient may feel some warming around the area being examined due to the electromagnetic radiation of the radio waves. There are no known health risks associated with the test, although people with pacemakers, aneurysm clips, or other implants that contain magnetic materials (such as an intrauterine device, commonly called an IUD) are generally advised not to undergo MRI scans. Relatedly, any metal found on or in a person's body must be removed in order to be scanned.

Gadolinium, the most commonly used MRI contrast agent, may be injected into a person's vein using an intravenous injection, and helps to brighten the details found in a MRI image by altering the magnetic properties of body tissues. Gadolinium seldom causes allergic reactions. There have been concerns that it may have an adverse impact on the brain, but this has been disputed — recent studies don't find gadolinium to be associated with any harmful effects in the general population. However, people are screened before undergoing MRI testing, and complications or risks specific to an individual are taken into account so that providers may adjust the procedure accordingly. For example, health care providers recommend that people who are pregnant or have kidney disease use a non-gadolinium contrast agent. This is because, for people with kidney disease or on dialysis, gadolinium has been linked to a rare condition called nephrogenic systemic fibrosis.

For both the MRI and CT scan, some people may become anxious when inside the scanner. If a patient experiences claustrophobia, has difficulty lying still, or is otherwise uncomfortable with the test, they may be given a mild sedative. However, while not necessarily fun to undergo, these test methodologies provide detailed pictures of body areas that used to be inaccessible. Previously, exploratory or invasive surgery may have been required to find the same results that MRIs or CT scans can provide today in a fraction of the time with much less stress to the body! If one of these tests is recommended by a health care provider, you may consider speaking with them to discuss any additional questions or concerns.

Alice!

Category:

[General Health](#) [2]

[Body Maintenance](#) [3]

[Immunizations, Screenings, & Tests](#) [4]

## Related questions

[PET scan](#) [5]

[Taking care of someone sick](#) [6]

[Is cellular phone radiation harmful?](#) [7]

## Resources

[Medical Services \(Morningside\)](#) [8]

[Medical Services \(CUIMC\)](#) [9]

Published date:

Oct 25, 1996

Last reviewed on:

Jan 17, 2020

## Footer menu

- ▼ [Contact Alice!](#)
  - [Content Use](#)
  - [Media Inquiries](#)
  - [Comments & Corrections](#)
- ▼ [Syndication & Licensing](#)
  - [Licensing Q&As](#)
  - [Get Alice! on Your Website](#)
  - [Full Site Syndication](#)
  - [Link to Go Ask Alice!](#)

**Go Ask Alice! is not an emergency or instant response service.**

If you are in an urgent situation, please visit our Emergency page to view a list of 24 hour support services and hotlines.

---

**Source URL:** <https://goaskalice.columbia.edu/answered-questions/what-are-ct-scans-and-mris-0>

**Links**

- [1] <https://goaskalice.columbia.edu/answered-questions/what-are-ct-scans-and-mris-0>
- [2] <https://goaskalice.columbia.edu/category/general-health>
- [3] <https://goaskalice.columbia.edu/category/body-maintenance>
- [4] <https://goaskalice.columbia.edu/category/immunizations-screenings-tests>
- [5] <https://goaskalice.columbia.edu/answered-questions/pet-scan-1>
- [6] <https://goaskalice.columbia.edu/answered-questions/taking-care-someone-sick>
- [7] <https://goaskalice.columbia.edu/answered-questions/cellular-phone-radiation-harmful-0>
- [8] <https://goaskalice.columbia.edu/resource/medical-services-morningside>
- [9] <https://goaskalice.columbia.edu/resource/medical-services-cuimc>