**Comparison chart**[***</> Embed this chart***](http://www.diffen.com/difference/CT_Scan_vs_MRI)

|  | **CT Scan** | **MRI** |
| --- | --- | --- |
| **Cost** | CT Scan costs range from $1,200 to $3,200; they usually cost less than MRIs (about half the price of MRI). | MRI costs range from $1200 to $4000 (with contrast); which is usually more than CT scans and X-rays, and most examining methods. |
| **Time taken for complete scan** | Usually completed within 5 minutes. Actual scan time usually less than 30 seconds. Therefore, CT is less sensitive to patient movement than MRI. | Scan typically runs for about 30 minutes. |
| **Radiation exposure** | The effective radiation dose from CT ranges from 2 to 10 mSv, which is about the same as the average person receives from background radiation in 3 to 5 years. Usually, CT is not recommended for pregnant women or children unless absolutely necessary. | None. MRI machines control/limit energy deposition in patients. |
| **Ability to change the imaging plane without moving the patient** | With capability of MDCT, isotropic imaging is possible. After helical scan with Multiplanar Reformation function, an operator can construct any plane. | MRI machines can produce images in any plane. Plus, 3D isotropic imaging also can also produce Multiplanar Reformation. |
| **Effects on the body** | Despite being small, CT can pose the risk of irradiation. Painless, noninvasive. | No biological hazards have been reported with the use of the MRI. |
| **Details of bony structures** | Provides good details about bony structures | Less detailed compared to X-ray |
| **Details of soft tissues** | A major advantage of CT is that it is able to image bone, soft tissue and blood vessels all at the same time. | Much higher soft tissue detail as compare to CT scan. |
| **Scope of application** | CT can outline bone inside the body very accurately. | MRI is more versatile than the X-Ray and is used to examine a large variety of medical conditions. |
| **Application** | Suited for bone injuries, Lung and Chest imaging, cancer detection. Widely used on Emergency Room patients. | Suited for Soft tissue evaluation, e.g. ligament and tendon injury, spinal cord injury, brain tumors etc. |
| **Acronym for** | Computed (Axial) Tomography | Magnetic Resonance Imaging |
| **Principle used for imaging** | Uses X-rays for imaging | Uses large external field, RF pulse and 3 different gradient fields |
| **Principle** | X-ray attenuation is detected by detector & DAS system, followed by math. model (back projection model) to calculate the value of pixelism that becomes a image. | Body tissues that contain hydrogen atoms (e.g. in water) are made to emit a radio signal which are detected by the scanner. Search for "magnetic resonance" for physics details. |
| **History** | The first commercially viable CT scanner was invented by Sir Godfrey Hounsfield in Hayes, United Kingdom. First patient's brain-scan was done on 1 October 1971. | First commercial MRI was available in 1981, with significant increase in MRI resolution and choice of imaging sequences over time. |
| **Image specifics** | Good soft tissue differentiation especially with intravenous contrast. Higher imaging resolution and less motion artifact due to fast imaging speed. | Demonstrates subtle differences between different kinds of soft tissues. |
| **Limitation for Scanning patients** | Patients with metal implants can get CT scan. A person who is very large (e.g. over 450 lb) may not fit into the opening of a conventional CT scanner or may be over the weight limit for the moving table. | Patients with Cardiac Pacemakers, tattoos and metal implants are contraindicated due to possible injury to patient or image distortion (artifact). Patient over 350 lb may be over table's weight limit. Any ferromagnetic object may cause trauma/burn. |
| **Intravenous Contrast Agent** | Non-ionic iodinated agents covalently bind the iodine and have fewer side effects. Allergic reaction is rare but more common than MRI contrast. Risk of contrast induced nephropathy (especially in renal insufficiency (GFR<60), diabetes & dehydration). | Very rare allergic reaction. Risk of nephrogenic systemic fibrosis with free Gadolinium in the blood and severe renal failure. It is contraindicated in patients with GFR under 60 and especially under 30 ml/min. |
| **Comfort level for patient** | Seldom creates claustrophobia | Often creates claustrophobia in susceptible patients. |

**Advantages of MRI over CAT Scan**

* A CAT scan uses X rays to build up a picture. MRI uses a [magnetic field](http://www.diffen.com/difference/Electric_Field_vs_Magnetic_Field) to do the same and has no known side effects related to radiation exposure.
* MRI gives higher detail in soft tissues.
* One of the greatest advantages of MRI is the ability to change the contrast of the images. Small changes in radio waves and magnetic fields can completely change the contrast of the image. Different contrast settings will highlight different types of tissue.
* Another advantage of MRI is the ability to change the imaging plane without moving the patient. Most MRI machines can produce images in any plane.
* Contrast agents are also used in MRI but they are not made of iodine. There are fewer documented cases of reactions to MRI contrast and it is considered to be safer [than](http://www.diffen.com/difference/Than_vs_Then) X-ray dyes.
* For purposes of [tumor](http://www.diffen.com/difference/Cancer_vs_Tumor) detection and identification, MRI is generally superior. However, CT usually is more widely available, faster, much less expensive, and may be less likely to require the person to be sedated or anesthetized.
* CT may be enhanced by use of contrast agents containing elements of a higher atomic number (iodine, barium) than the surrounding flesh. Contrast agents for MRI are those which have paramagnetic properties. One example is gadolinium. Iodine use may be associated with allergic reactions.

**Advantages of CT Scan over MRI**

* CT is very good for imaging bone structures.
* Some patients who have received certain types of surgical clips, metallic fragments, cardiac monitors or pacemakers cannot receive an MRI.
* The time taken for total testing is shorter than taken by MRI.
* MRI cannot be done on patients who are claustrophobic as the patient has to remain inside the noisy machine for about 20-45 minutes.
* CT scan is cheaper than an MRI. A CT scan costs $1,200 to $3,200 while an MRI can cost up to $4,000.