SURGEONS CHOICE™
MEDICAL CENTER

Health Notes

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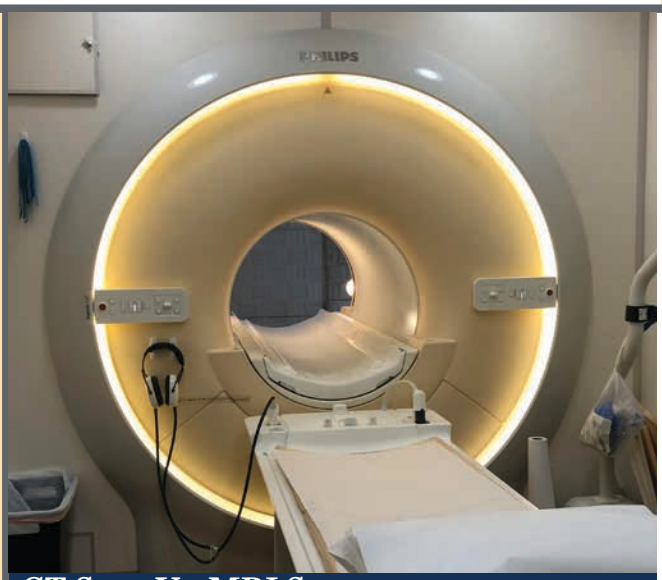

CT Scan Vs. MRI Scan: Safety and Effectiveness

Medical imaging exams are an essential step when diagnosing and treating disease. Computed Tomography (CT), also known as Computerized Axial Tomography (CAT) scans, and Magnetic Resonance Imaging (MRI) scans are two of the most common types of diagnostic imaging.

The information gained by CT and MRI scans has been directly linked to greater life expectancy and declining cancer death rates. These scans help surgeons detect and assess tumors, aneurysms, cysts, and other soft tissue conditions.

In some ways these imaging processes are very similar to one another. Both CT and MRI create cross sectional images of the interior of the body, but they accomplish this using very different methods.

A doctor must decide which imaging method is best on an individual patient basis. This could depend on the area of the body being imaged, the patient's health history, and the urgency in which the images are needed.

What is a CT Scan?

A CT scan uses x-rays, taken at multiple different angles, to produce a highly detailed cross-sectional image of an interior area of the body. These x-ray beams can see different levels of density and tissues within a solid organ, providing extremely precise information.

A computer then combines these images into a detailed, 3-dimensional picture of the inside of the body. This 3D view shows any abnormalities or tumors that might exist. Sometimes a doctor will use a contrast agent that can be injected with an IV or swallowed by the patient to create more contrast and detail in the images.

CT scans are often utilized when an image is needed of the head (brain and its vessels, eyes, inner ear, and sinuses), the chest (heart and lungs), the skeletal system (neck, shoulders, and spine), pelvis, hips, reproductive systems, bladder, and gastrointestinal tract.

Doctors frequently use CT scans to find tumor abnormalities and masses that might be cancer. They can also use these images to determine the stage of the cancer; if it has spread and if it is changing how your organs work. This information helps doctors find the right place for a biopsy, choose the best treatment plans, and plan radiation therapy.

With today's advancing technologies, CT scans have been modified to increase patient comfort and produce faster scan times, while still generating high resolution images.

What is an MRI Scan?

An MRI scan uses powerful magnetic fields and radio frequency (RF) pulses to produce detailed pictures of organs, soft tissues, bone and other internal body structures. What's unique about MRI imaging is that this process does not use ionizing radiation during the scan, unlike CT scans, X-rays and mammograms.

When an MRI machine is in use, it creates a magnetic field that lines up hydrogen atoms in the patient's body. Some of the atoms however, continue to spin in their normal fashion. When radio frequency waves are added, these atoms spin in the opposite direction. Once the RF waves are turned off these atoms return to their normal position, emitting energy. This energy sends signals to the computer which then uses mathematical formulas to convert the signals into images.

There are many different types of MRI, such as:

- abdominal MRI
- cervical MRI
- chest MRI
- cranial MRI
- heart MRI
- lumbar MRI
- pelvic MRI

Even though MRI machines produce extremely high-quality images, they are sometimes limited due to the time it takes to complete a scan, and because some patients are experience claustrophobia when inside the MRI.

Safety Comparison of CT and MRI Scans

Radiation

A significant difference between CT and MRI scans is that CT scans expose patients to ionizing radiation, while an MRI does not. The amount of radiation used during this test is higher than the amount used in an x-ray. Therefore, a CT scan slightly increases your risk of cancer.

There are a number of factors that determine the impact of the radiation from a CT scan:

- the dose of the radiation
- the frequency of exposure
- a patient's age
- a patient's gender
- the size of the patient
- the specific design of the scanner being used

The low level of radiation that a patient is exposed to during a CT scan is measured in units called millisieverts (mSv). According to the United States Nuclear Regulatory Committee, a person's average annual exposure from natural sources is 3.1msv. During a CT scan of the head, a patient is exposed to 2mSv; less than the yearly amount of natural exposure.2

This is acceptable because the human body can naturally repair this amount of radiation damage in one year.

However, a study by Smith-Bindman et al., concluded that radiation doses from commonly performed CT scans are higher and more variable than many think. This research estimated that approximately 1 in 270 women and 1 in 600 men who received a coronary angiography CT scan at age 40 will develop cancer from that CT scan. For patents who are in their 20's the risks approximately double, and for patients in their 60's, the risks were about 50% lower.3

In addition, women who are pregnant are advised against undergoing a CT scan. There is not a great deal of research surrounding pregnancies and CT scans, but radiation during pregnancy may increase the risk of birth defects.

Even though the radiation dose of a CT scan is so low and your risk of developing cancer due to the scan is so small, the American College of Radiology advises that no CT imaging be done unless there is a clear medical benefit.

Allergies

Before receiving both an MRI scan and a CT scan, it is very important that you inform your doctor of any allergies you may have. To obtain the clearest and most informative images, doctors sometimes add contrast in a scan. This can occur in two forms; drinking a glass of oral contrast or injecting contrast intravenously.

Oral contrast is a liquid that contains either barium or a substance called Gastrografin (diatrizoate meglumine and diatrizoate sodium liquid). Both are chemicals that help surgeons achieve a better image of your stomach and bowels.

The intravenous contrast dye is injected to highlight blood vessels, organs and other soft tissue structures. This is likely an iodine-based dye as well.

For patients who do experience an allergic reaction, most symptoms are mild and include a skin rash or itchiness. However, it is still best to inform your doctor of any allergies you may have as they could become life threatening.

Metal in the Body

MRIs rely on extremely strong magnets in their imaging process. Therefore, metal should never enter an MRI when it is in use, which can pose challenges to some patients.

Patients who have cardiac pacemakers or defibrillators can experience problems, because the MRI magnets can cause malfunctions in these battery-operated devices. In addition, some metal implants or orthopedic hardware that are metal are not compatible with MRI, particularly older types.

Patients who are unsure if they have metal fragments in their body, such as war shrapnel or metal working injuries, should have an x-ray prior to their MRI.

The following are some examples of things that are not safe or compatible with MRI scans:

- artificial metal heart valves
- artificial joints
- cochlear implants
- dentures/teeth with magnetic keepers
- implanted metal wires, rods, screws, or plates
- permanent cosmetics or tattoos
- surgical clips or staples.

Other side effects that patients may experience when undergoing a CT or MRI scan include:

- nausea
- pain from the needle at the site of the IV injection
- a headache that develops a few hours after the test is over
- low blood pressure
- Fainting or feeling lightheaded (this is rare)

CT and MRI Effectiveness

Many patients are interested in the ability of a CT or MRI scan in diagnosing cancer. However, in most cases cancer is definitively diagnosed by a tissue biopsy. CT and MRI scans can show tissue abnormalities that are likely tumors but it is not a definitive diagnostic tool for cancers.

The images produced by both CT and MRI scans can be used to determine the best site to do a biopsy to definitively diagnose cancer. Once cancer has been identified in a patient, these scans give the oncologist accurate information about the stage of the cancer and where it has spread in the body.

A circumstance where CT scans excel compared to MRI scans is when surgeons need to image the brain quickly. Most MRI machines cannot rapidly scan the brain to help determine the cause of a stroke. In fact, in any type of emergency situation MRI machines are not typically used.

CT scans can perform rapidly, usually completing a scan under 5 minutes, giving doctors useful information right when they need it. Therefore, CT scans are present in most emergency departments, and they are also the best at showing bone fractures, blood, and organ injuries. This is also the preferred test when imaging the lungs and the abdomen.

An MRI scan is usually reserved for non-emergency situations, since this type of scan can take anywhere from 15 minutes to 2 hours. When time is not an issue, an MRI will be used to scan the brain. MRIs are the best option when the surgeon is looking for cancer, causes of dementia, or neurological diseases. MRI is also the usually a surgeon's choice when imaging the spinal cord and nerves, and showing tendons and ligaments.

Images from both scans are highly effective in providing vital information during surgeries, specifically when surgeons are removing aneurysms and tumors. Information obtained from CT and MR scans provide surgeons with the precise location of these abnormalities, helping them navigate the area confidently.

While CT and MRI scans have the risk of minor side effects, they are generally considered completely painless and safe for all. Furthermore, these machines are at the forefront of imaging technology; offering patients the best imaging care options on the market. When considering a CT or MRI scan it is wise to ask questions, do your research, and trust in your doctor's recommendations, in order to have a positive imaging experience.

"CT Scan Vs. MRI Scan: Safety and Effectiveness." GE Healthcare, GE Healthcare (United States), 24 July 2018, www.gehealthcare.com/article/ct-scan-vs-mri-scan-safety-and-effectiveness.

In the Spotlight:

Surgeons Choice Medical Clinic WELCOMES Dr. Rakesh Ramakrishnan, M.D.

Dr. Rakesh Ramakrishnan is a fellowship trained Spine Surgeon. Dr. Ramakrishnan's goal is to provide compassionate care to help improve pain, mobility, and overall quality of life. He is trained in all aspects of spine care and will lead a multi-disciplinary, coordinated effort in the treatment of all spinal disorders. His adult practice focuses on the treatment of cervical (neck), thoracic and lumbar (low back) spine problems. His training includes degenerative, trauma, deformity, tumor, and infections of the spine.

His interests include minimally invasive techniques including Microdiscectomy, Minimally Invasive Lumbar and Cervical Fusion, Disc Replacement, Kyphoplasty and many more. His pediatric practice focuses on the treatment of adolescent scoliosis, trauma, and sports related neck and back injuries.

Please call
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to make an appointment.

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