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The New Medical Technologies

Introduction

In the past ٢٠ – ٣٠ years a huge and significant steps happening in our world starting with the new technologies been entered our lives starting with rise of the new generations of the computers and the internet, cell phones reaching to this present time with all facilities are available and become a basic part from our daily activities and cannot be ,

With these significant changes we are now having different life style than before more depending on the technology.

Along with these huge steps and specifically in the medical segment also the technology had a huge foot print in the sector and due to that new equipment been delivered and new technologies been discovered to support the doctors in helping him to have a better diagnosis with a short time using these new technologies.

The new medical equipment that been delivered in the past period changes a lot and also let the doctors to explore the reasons for many diseases that was not known before and also this changes the procedure of a lot of medical treatments in the new world.

In this research we are going to demonstrate the some of these most update medical system and how it works and differences between these systems and their effect in our bodies and diagnoses.

The systems we are going to talk about is the CT scans (Computed Tomography) and the MRI (Magnetic resonance imaging) and the PET scan (Positron Emission Tomography) and last the PET/CT which is a combine of PET and CT scans)

١- How it Works

We will start with a brief on each equipment principle of work to understand more on the differences that will be showed later

PET Scan

- A PET scan is a type of imaging that uses nuclear medicine. This type of scan measures important body functions so doctors can see if the organs and tissues in the body are functioning properly. This includes blood flow, oxygen use and sugar metabolism.

  Doctors use PET scans to detect cancer, determine blood flow to the heart and evaluate brain abnormalities. It is performed on an outpatient basis and usually takes about ٣٠ minutes. The process of a PET scan involves a dose of radiotracer, which is injected, swallowed or inhaled by the patient. Once the radiotracer works its way through the body, the patient is moved into a scanner. The patient will be given a CAT scan first, and then a PET scans, according to the Radiology Info website.

CAT Scan

- The CAT scan is a test that doctors use to diagnose and treat medical conditions. The CAT scan x-rays a patient's body to produce images that allow doctors to see internal organs, bones, soft tissue and blood vessels.

  CAT scans are used for a variety of reasons. Some doctors prefer using this method to diagnose different forms of cancer, vascular diseases and spinal problems. During a CAT scan, x-ray beams and electronic x-ray detectors rotate around the person, measuring the amount of radiation that is absorbed throughout the body. A computer processes these images as the examination tables moves to get a cross-section x-ray of the entire body. The scan takes about ٣٠ minutes.

MRI

- An MRI uses a magnetic field, radio frequency pulses and a computer to produce detailed pictures of organs, bones and any internal body structure, which allows doctors to determine if there are diseases in the body.

  An MRI is often used to evaluate organs, blood vessels and breasts to diagnose and monitor tumors, heart problems, diseases and breast cancer. The test does not use ionizing radiation, but it instead uses radio waves that redirect the axes of spinning protons. During the exam, the patient is placed on an exam table with small devices around the body that will send and receive the radio waves. Sometimes a contrast material will be used in the exam through an IV. A series of images will be taken during the exam, which lasts about ١٥ to ٤٥ minutes depending on what the exam is for.


٢-Procedures and Applications

Some people looking at the title of this article would think of small furry animals, but anyone who has any experience with cancer knows better. CAT (CT or C-T) scans, MRI and PET scans are all used to provide information about possible tumors and metastasis (spread) of cancer. Since proper staging of cancer is important in planning the best treatment, imaging methods such as these are important in getting the best cancer care. But the terminology can be confusing, and often it's difficult to tell the difference between them, or the reasons for using each. Here's a guide to help sort it all out.

C-T (CAT) Scans - CT stands for computed or computerized tomography. This is essentially a series of X-rays in "slices" through the body, which are then analyzed by a computer, and an image constructed from the data. It can show the precise location of a tumor, its shape, and whether it is solid or hollow. Although it can give clues as to whether or not a tumor is cancerous, only a biopsy can tell for sure.

Procedure - Usually before the test, a contrast medium is given, either as a drink or through a vein or port. When it's time, the person being tested lies down on a special table while the scanner is rotated around them. This usually takes around ١٥-٢٠ minutes, although it can be shorter or longer depending upon how much of the body is being scanned.

Drawbacks - A CT scan is not reliable in helping to find tumors that are less than ٢ cm. in size. Additionally, some find the contrast drink unpalatable. (Tip: There are several different contrast substances that can be used, and sometimes this problem can be helped by switching.)

MRI (Magnetic Resonance Imaging) Scans - MRI scans use magnets rather than X-rays to produce the image. The strength of the magnetic field causes the atoms of the body to respond, and the emissions are detected by the scanner, which are analyzed, and an image is produced. In many tissues, the image and detail are clearer with an MRI than a CT scan.

Procedure - The person to be tested lies on a table, which slides into the opening of a narrow cylinder. Loud noises are heard during the scan, which lasts approximately ٣٠ minutes, although this, again, depends on the size of the area being scanned.

Drawbacks - For some tissues, a MRI image is not as clear as that of a CT. It is more difficult to differentiate inflammation and scar tissue from tumors on a MRI image. Also, it generally cannot be used on anyone who has metal implants in their body. People who have a difficult time in close places sometimes have a hard time coping with the MRI. The MRI is also more expensive than the CT.

About MRI

MRI is a completely different animal! Unlike CT it uses magnets and radio waves to create the images. No x-rays are used in an MRI scanner.

The patient lies on a couch that looks very similar the ones used for CT. They are then placed in a very long cylinder and asked to remain perfectly still. The machine will produce a lot of noise and examinations typically run about ٣٠ minutes.

The cylinder that you are lying in is actually a very large magnet. The computer will send radio waves through your body and collect the signal that is emitted from the hydrogen atoms in your cells. This information is collected by an antenna and fed into a sophisticated computer that produces the images. These images look similar to a CAT scan but they have much higher detail in the soft tissues. Unfortunately, MRI does not do a very good job with bones.

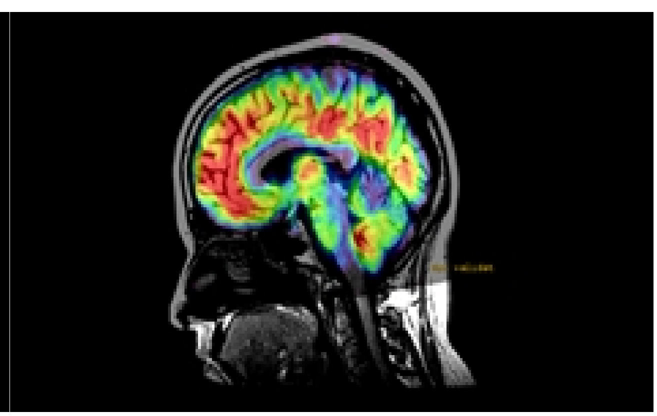
One of the great advantages of MRI is the ability to change the contrast of the images. Small changes in the radio waves and the magnetic fields can completely change the contrast of the image. Different contrast settings will highlight different types of tissue.

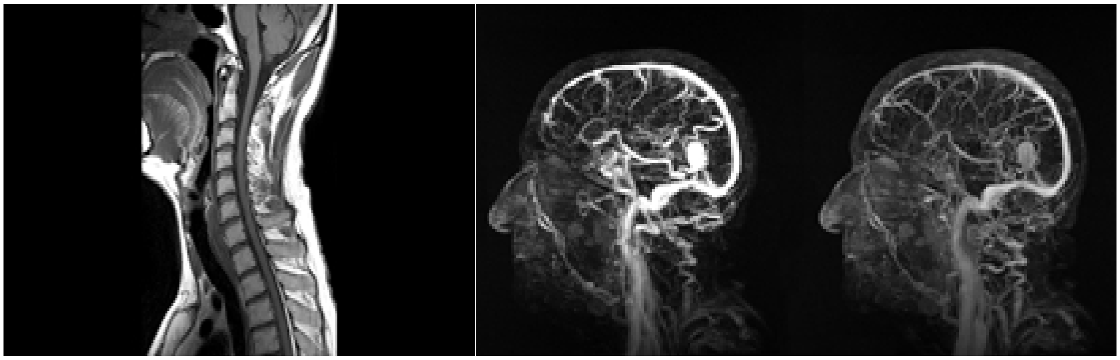
Another advantage of MRI is the ability to change the imaging plane without moving the patient. If you look at the images to the left you should notice that they look very different. The top two images are what we call axial images. This is what you would see if you cut the patient in half and looked at them from the top. The image on the bottom is a coronal image. This slices the patient from front to back. Most MRI machines can produce images in any plane. CT can not do this.

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 x-ray dye. Once again, you should discuss contrast agents with your physician before you arrive for the examination

.

Below is an MRI images





PET (Positron Emission Tomography) Scans - This technology uses radioactive positrons (positively charged particles) to detect differences in metabolic and chemical activity in the body. An area with increased activity will show on a colored image. Notice that this is a distinct difference from other kinds of imaging - whereas CT and MRI scans look at **structures** in the body, a PET scan looks at **function**. Since cancer cells tend to divide more rapidly than other cells, they will generally show as having more metabolic activity. PETs can pick up very small areas of activity - much smaller than either of the above methods. They are also very good at differentiating scar tissue, which has very little metabolic activity.

Procedure - The person to be scanned lies on a table, which moves through a ring-shaped scanner. After a few minutes, a radioisotope called a tracer is inhaled or injected into a vein. (This substance will clear from the body rapidly as it has a short "half-life".) The scan then continues with the tracer active. The entire procedure can take anywhere from ٣٠ minutes to two hours, depending upon the size of the body part being scanned.

Drawbacks - Frankly, the main drawbacks to PET scans are accessibility and expense. Until recently, PET was mainly used as a research tool. It is very expensive (often above $٣٠٠٠ per scan) and many areas do not yet have access to them. Even when PETs are available, insurance does not always cover them. Among other problems with PET: ١) that the image is not as clear as with CT scans and MRI, so sometimes localizing the exact place of the increased activity can be a problem ٢) it takes more training to learn to read them well ٣) since inflammation shows as "hot" on a PET scan, if there is a lot of inflammation present it can obscure other activity on the scan and ٤) it tends to work better for higher grade tumors and metastasis, as well-differentiated tumors have less metabolic activity (they are usually growing more slowly).

Still, the prospects for PET scans being able to find cancer that goes undetected by other technologies is exciting, and the use of PETs will probably grow quite rapidly. At this point, many people are having success getting approval for PETs if their doctors submit a request as a necessary procedure.

The PET/CT Combo Scans! - A PET/CT scan is actually a combination of two scans: a computed tomography (CT) scan and a positron emission tomography (PET) scan. The combination of procedures can help detect conditions that may not show up on a standard X-ray,or on a CT or PET scan alone. While a CT scan shows detailed anatomical structure, a PET scan gives the healthcare team information on organ function and metabolism. PET/CT scans are often used to get information about various types of cancer, but there are growing clinical applications in cardiology and other fields.

During the PET/CT scan, the patient lies on a table and the part of the body that is to be scanned is positioned in the middle of a ring-shaped scanner. It generally takes less than ٣٠ minutes to perform the scan. The patient will be given a radioactive tracer as part of the exam.

Because a patient will be exposed to radioactive material during a PET/CT scan, a female patient must notify her physician, the radiologist and the radiology technologist if she is pregnant, if there is a possibility she is pregnant or if she is breastfeeding before undergoing the procedure. The exact amount of radiation exposure depends on many factors. Patients should discuss this with the radiologist and their healthcare team for more details. In addition, they should let their medical team know if they are allergic to any foods or drugs before beginning the procedure.

About PET/CT

Positron emission tomography (PET) and computerized tomography (CT) are both state-of-the-art imaging tools that allow physicians to pinpoint the location of cancer within the body before making treatment recommendations. The highly sensitive PET scan images the biology of disorders at the molecular level, while the CT scan provides a detailed picture of the body's internal anatomy. The PET/CT scan combines the strengths of these two well-established imaging modalities into a single scan.

A CT scan is able to detect and localize changes in the body structure or anatomy, such as the size, shape and exact location of an abnormal growth, a sizeable tumor or a musculoskeletal injury.

A PET scan is very different from an ultrasound, X-ray, MRI, or CT scan. A PET scan allows the physician to distinguish between living and dead tissue or between benign and malignant disorders. Since a PET scan images the biology of disorders at the molecular level, it can help the physician detect abnormalities in cellular activity at a very early stage, generally before anatomic changes are visible.

Alone, each imaging test has particular benefits and limitations but by combining these two state-of the-art technologies, physicians can more accurately diagnose, localize and monitor cancer, as well as heart disease and certain brain disorders.

PET/CT Utilization

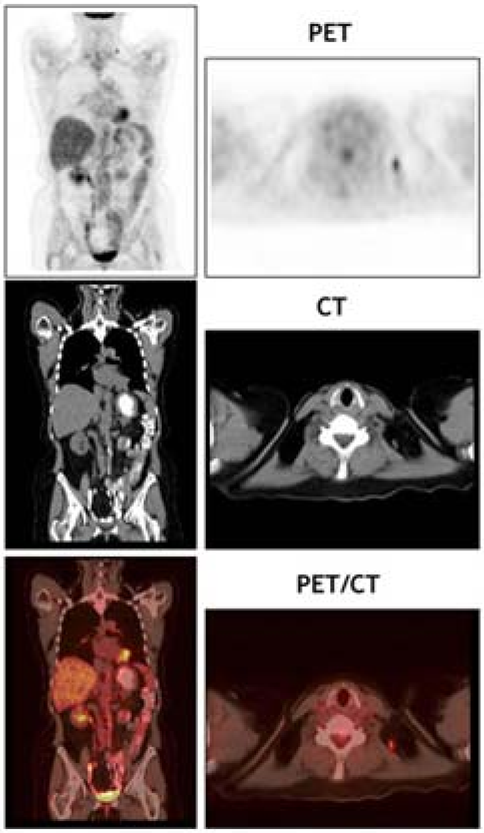
The majority of PET/CT scans are performed for oncologic applications. Physicians utilize PET/CT scans for diagnosing, staging and evaluating treatments for their cancer patients.

A PET scan helps the physician distinguish between living and dead tissue or between benign and malignant disorders. PET imaging provides the physician with additional information about cellular activity which guides the characterization of a questionable abnormality as malignant or benign.

A PET/CT scan can show the extent of disease. For patients whose cancer is newly diagnosed, it is important to determine if the cancer has spread to other parts of the body so that appropriate treatment can be started. A PET scan images the entire body in a single examination, and aids the physician in detecting the primary site(s) as well as any metastases. Painful, costly and invasive surgery, such as thoracotomy, may no longer be necessary for diagnosis.

A PET/CT scan can also help physicians monitor the treatment of disease. For example, chemotherapy leads to changes in cellular activity that is observable by PET/CT long before structural changes can be measured. This gives physicians an alternative technique to evaluate treatments earlier, perhaps even leading to modifications in treatment, before an evaluation would normally be made using other imaging technologies.

After treatment is complete, a PET/CT scan allows the physician to investigate suspected recurrence of cancer, revealing tumors that might otherwise be obscured by scar tissue resulting from surgery and radiation therapy.



Whole-body PET/CT scan of metastatic disease showing PET, CT and combined PET/CT images.

A PET/CT scan puts time on your side. The earlier the diagnosis and the more accurate the assessment of the extent of disease, the better the chance for successful treatment.

Visualizing Disease

When disease strikes, the biochemistry of cells and tissue changes. In cancer, for example, cells begin to grow at a much faster rate. In one continuous whole-body scan, PET/CT captures images of changes in the body's metabolism caused by actively growing cancer cells and provides a detailed picture of the body's internal anatomy that reveals the size, shape and exact location of the abnormal cancerous growths.

The PET/CT scan begins with injection of a glucose-based radiopharmaceutical which travels through the body, eventually collecting in the organs and tissues targeted for examination.

The patient lies flat on a table that moves incrementally through the PET/CT scanner. The CT portion of the exam sends X-rays through the body which are then measured by detectors in the CT scanner. A computer algorithm then processes those measurements to produce images of the body's internal structures.

The PET scanner has cameras that detect the gamma rays emitted from the patient, and turns those into electrical signals. These are processed by a computer to generate the images. The table moves slowly through the scanner and many sets of PET and CT images are produced.

The CT and PET images are assembled by the computer into a ٣-D image of the patient's body. If an area is cancerous, the signals will be stronger there than in surrounding tissue, since more of the radiopharmaceutical will be absorbed in those areas. Each imaging modality can be viewed independently of the other without compromise, or used in concert for complementary functional and anatomic diagnosis. PET/CT is a highly sensitive procedure that aids in the detection of small cancerous tumors and subtle changes in the brain and heart. This enables physicians to identify and treat these diseases earlier and more accurately.

Images below shows the differences between the PET , CT and PET/CT

PET CT PET/CT

Application

In clinical practice, MRI is used to distinguish pathologic tissue (such as a brain tumor) from normal tissue. One advantage of an MRI scan is that it is harmless to the patient. It uses strong magnetic fields and non-ionizing radiation in the radio frequency range. Compare this to CT scans and traditional X-rays which involve doses of ionizing radiation and may increase the risk of malignancy, especially in a fetus.

While CT provides good spatial resolution (the ability to distinguish two structures an arbitrarily small distance from each other as separate), MRI provides comparable resolution with far better contrast resolution (the ability to distinguish the differences between two arbitrarily similar but not identical tissues). The basis of this ability is the complex library of pulse sequences that the modern medical MRI scanner includes, each of which is optimized to provide image contrast based on the chemical sensitivity of MRI.

For example, with particular values of the echo time (TE) and the repetition time (TR), which are basic parameters of image acquisition, a sequence will take on the property of T٢-weighting. On a T٢-weighted scan, fat-, water- and fluid-containing tissues are bright (most modern T٢ sequences are actually fast T٢ sequences). Damaged tissue tends to develop edema, which makes a T٢-weighted sequence sensitive for pathology, and generally able to distinguish pathologic tissue from normal tissue. With the addition of an additional radio frequency pulse and additional manipulation of the magnetic gradients, a T٢-weighted sequence can be converted to a FLAIR sequence, in which free water is now dark, but edematous tissues remain bright. This sequence in particular is currently the most sensitive way to evaluate the brain for demyelinating diseases, such as multiple sclerosis.

The typical MRI examination consists of ٥-٢٠ sequences, each of which are chosen to provide a particular type of information about the subject tissues. This information is then synthesized by the interpreting physician.

Comparison chart

	CT Scan	MRI
Cost	CT Scan costs less expensive (about half the price of MRI).	MRI costs more expensive and most examining methods.
Time taken for complete scan	Usually completed within ٥ minutes. Actual scan time usually less than ٣٠ seconds. Therefore, CT is less sensitive to patient movement than MRI.	Scan typically runs for about ٣٠ minutes.
Radiation exposure	The effective radiation dose from CT ranges from ٢ to ١٠ mSv, which is about the same as the average person receives from background radiation in ٣ to ٥ years. Usually, CT is not recommended for pregnant women or children unless absolutely necessary.	None. MRI machines control/limit energy deposition in patients.

	CT Scan	MRI
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, ٣D 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 ٣ 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 ١ October ١٩٧١.	First commercial MRI was available in ١٩٨١, with significant increase in MRI resolution and choice of imaging sequences over time.
Image specifics	Good soft tissue differentiation especially with intravenous	Demonstrates subtle differences between different kinds of soft

	CT Scan	MRI
	contrast. Higher imaging resolution and less motion artifact due to fast imaging speed.	tissues.
Limitation for Scanning patients	Patients with metal implants can get CT scan. A person who is very large (e.g. over ٤٥٠ 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 ٣٥٠ 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<٦٠), 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 ٦٠ and especially under ٣٠ ml/min.

٣-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 ٢٠-٤٥ minutes.
- CT scan is cheaper than an MRI. A CT scan costs $١,٢٠٠ to $٣,٢٠٠ while an MRI

MRI vs CT

A computed tomography (CT) scanner uses X-rays, a type of ionizing radiation, to acquire its images, making it a good tool for examining tissue composed of elements of a relatively higher atomic number than the tissue surrounding them, such as bone and calcifications (calcium based) within the body (carbon based flesh), or of structures (vessels, bowel). MRI, on the other hand, uses non-ionizing radio frequency (RF) signals to acquire its images and is best suited for non-calcified tissue.

CT may be enhanced by use of contrast agents containing elements of a higher atomic number than the surrounding flesh (iodine, barium). Contrast agents for MRI are those which have paramagnetic properties. One example is gadolinium.

Both CT and MRI scanners can generate multiple two-dimensional cross-sections (slices) of tissue and three-dimensional reconstructions. Unlike CT, which uses only X-ray attenuation to generate image contrast, MRI has a long list of properties that may be used to generate image contrast. By variation of scanning parameters, tissue contrast can be altered and enhanced in various ways to detect different features. (See Application below.)

MRI can generate cross-sectional images in any plane (including oblique planes). CT was limited to acquiring images in the axial (or near axial) plane in the past. The scans used to be called Computed Axial Tomography scans (CAT scans). However, the development of multi-detector CT scanners with near-isotropic resolution, allows the CT scanner to produce data that can be retrospectively reconstructed in any plane with minimal loss of image quality.

For purposes of 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.

Contrast enhancement

Both T١-weighted and T٢-weighted images are acquired for most medical examinations; However they do not always adequately show the anatomy or pathology. The first option is to use a more sophisticated image acquisition technique such as fat suppression or chemical-shift imaging.[٧] The other is to administer a contrast agent to delineate areas of interest.

A contrast agent may be as simple as water, taken orally, for imaging the stomach and small bowel although substances with specific magnetic properties may be used. Most commonly, a paramagnetic contrast agent (usually a gadolinium compound[٩]) is given. Gadolinium-enhanced tissues and fluids appear extremely bright on T١-weighted images. This provides high sensitivity for detection of vascular tissues (e.g. tumors) and permits assessment of brain perfusion (e.g. in stroke). There have been concerns raised recently regarding the toxicity of gadolinium-based contrast agents and their impact on persons with impaired kidney function. Special actions may be taken, such as hemodialysis following a contrast MRI scan for renally-impaired patients.

More recently, superparamagnetic contrast agents (e.g. iron oxide nanoparticles[١٠][١١]) have become available. These agents appear very dark on T٢*-weighted images and may be used for liver imaging - normal liver tissue retains the agent, but abnormal areas (e.g. scars, tumors) do not. They can also be taken orally, to improve visualisation of the gastrointestinal tract, and to prevent water in the gastrointestinal tract from obscuring other organs (e.g. pancreas).

Diamagnetic agents such as barium sulfate have been studied for potential use in the gastrointestinal tract, but are less frequently used.

Frequently asked questions

Question: My child is hearing impaired. Which study is right for him?

Answer: You need to discuss this with the neurologist that is seeing your child. CT scans are great for looking at the bones and can be very useful in diagnosing inner ear malformations that could be contributing to the deafness. MRI scans are used for looking at soft tissue. This might be appropriate if your doctor suspects a brain lesion. Either way, make sure that the prescribing doctor answers all of your questions before you leave the office.

***Question*:** Is MRI dangerous?

***Answer*:** Not usually.....There are some people that should not have an MRI. Top of the list are folks that have cochlear implants or pacemakers. People with metal fragments in their eyes or aneurysm clips implanted in their brain should also avoid MRI examinations. The strong magnetic fields can dislodge metal objects that are in the body. Even worse they can overload implanted electronic devices and render them useless. Always tell your physician and the technologist if you have implanted medical devices before you enter the magnet suite.

Question: Are the pictures on your web page normal?

Answer: No they are not. All of these patients were very ill at the time the images were obtained.

Question: Why did the technologist make me remove my eye make up before the (MRI) scan?

Answer: Eye shadows often contain small metal particles than can interfere with the study. Sometimes they can heat up and cause eye irritation.

Question: If I'm unconscious in an emergency room and they order an MRI, will they know I have an implant?

Answer: Emergency departments and MRI facilities often rely on relatives to provide this information when you are unable to communicate. The problem arises when a patient presents with a loss of consciousness and family is not present. If you are in a hospital that has not seen you before and the external portion of your implant has been removed prior to arrival in MRI there may be a problem. As you know, a CI is almost impossible to see once the processor is disconnected.

MRI is very common for patients that present with seizure activity, spinal trauma, and unexplained loss of consciousness that does not appear to be stroke induced. Sometimes they get a CT scan first which shows the implant but sometimes they do not. If you are concerned about this possibility, you should wear a medic alert tag or bracelet.

Cat Scan, PET Scan, SPECT Scan, MRI: What Creatures Are These?

Terry Doire, RN, Yahoo Contributor Network

Dec ٢٢, ٢٠٠٩ "Share your voice on Yahoo websites. Start Here."

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Over the years, I have had my share of CAT scans ordered in the emergency department for my three teenage boys and husband. Sitting in the emergency department, it is important to be informed of what each type of scan is being ordered for your family member. These scans are all diagnostic tools that non-invasively look inside the body. They are medical tests that help physicians to diagnose and treat medical conditions.

CAT scanning, sometimes called CT scan (Computed Axial Tomography), combines special x-ray equipment with sophisticated computers to produce multiple images or pictures of the inside of the body. The cross-sectional images of the area being scanned can then be examined on a computer monitor or be printed. CT scans of internal organs, bones, soft tissues and blood vessels can provide more details than a regular x-ray exam.

MRI (Magnetic Resonance Imaging) uses a magnetic field from super-cooled magnets to distinguish more accurately between healthy and diseased tissues. A MRI provides much greater contrast between the different soft tissues of the body than the CT scan. Using magnetic and radio waves, means no exposure to radiation. An MRI provides clear pictures of the body parts that are surrounded by bone tissue, so the MRI is very useful for examining the brain and spinal cord. A CT scan can only show pictures horizontally, while the MRI can scan from almost every angle with more detail.

Positron Emission Tomography (PET) scan provides images on the function of a tissue rather than a static image like any x-ray. PET scan helps physicians locate the presence of any cancers or infections anywhere in the body. During the PET scan, glucose is injected into the body and taken up by cancer cells. The PET scan can detect any spread of cancer in the body. The amount of radiation exposure is minimal and the radioactive glucose is rapidly excreted from the body.

Finally, a Single Photon Emission Computerized Tomography (SPECT) scan, analyzes the function of your internal organs. It is a type of nuclear imaging test that uses a radioactive substance and a special camera to show pictures of your organs. A SPECT scan produces ٣-D images that show how your organs work. The scan is used primarily to view how blood flows through arteries and veins of organs such the heart and brain.

There are a variety of machines and techniques that can create pictures of the structures and activities inside your body. The technology, or type of scan, will depend upon your symptoms and the part of your body being examined.

SOURCE:
American Academy of Orthopaedic Surgeons
http://orthoinfo.aaos.org/topic.cfm?topic=A٠٠١٨٨