What is 3T MRI?

It would be impossible to explain how an MRI works in 25 words or less. An MRI examination utilizes several kinds of magnets, pulses of radio frequency (RF), and sophisticated and powerful computers. Images are generated based on the physics involving the excitation and relaxation of millions of spinning protons found in water molecules inside the human body.

The image taken with the MRI begins and ends with the computer. It directs all the activity of getting the image, sending it to gradient amplifiers and RF transmitters, turning them on and off to obtain the proper pulse sequence to the Magnet, passing the data through the RF amplifier to a data converter that digitizes the signal and back to the computer to be reconstructed into an image.

The first MRI was performed on a human being in 1977 and at that time it took almost five hours to produce the image. We now take the MRI for granted and assume that at some point, we most likely will need to have an MRI scan. An MRI examination is non-invasive and produces images without radiation exposure. Today we are able to produce images faster, with better detail, and using less injected contrast material. What makes this possible and is it all good news?

Therefore, if 1.5 T is the most commonly used and 3T is the newest approved, is the new approved 3T machine actually improved? It depends. The 3T is faster, meaning greater patient tolerance. As a result, there are fewer artifacts because of motion. It is particularly important when studying children, where a request to remain motionless may go unheeded unless they receive medication. So, another advantage may be less use of sedation.

The 3T MRI produces a higher spatial resolution and image contrast without injection of contrast edium, resulting in better visualization of anatomic structures. Subtle abnormalities can more easily be detected. The image can be so good that the radiologist may not require intravenous gadolinium or intra-articular contrast medium administration.

(Continued on Pg. 2)
**What is 3T? (Continued from Pg 1)**

Dr. Val Runge, who has 20 years experience in the field of radiology at Scott and White Hospital and Clinic at Texas A&M University, located in Temple Texas, believes that “Any Imaging that has to do with the brain is markedly superior with 3T.” In procedures such as contrast-enhanced MR angiography, it is normal to have a 20 second breath hold. Rather than decrease the breath hold time, Dr. Runge uses the time to improve the image. With 3T, there is improved spatial resolution and thinner slices are possible in less time than 1.5T systems.

The newer technology is accompanied by the necessity to learn new techniques specific to 3T. There is a learning curve for the users. There have been references to contrast differences in the tissues, and the increased field strength resulting in more artifacts if steps are not taken to compensate. Vendors, technologists and radiologists are working together to face these changes.

Safety concerns related to any MRI are increased with the 3T. Implants that are compatible with a 1.5 may be contraindicated with the 3T. Increasing the field strength by using stronger magnets may conflict with the FDA imposed limits, designed to prevent increases in the patient body temperature.

So, what is it about the 3T MRI that makes it worth having? It depends. While there are financial considerations for a radiology facility, the consensus seems to be that for neurological, musculoskeletal and cardiac images, your best choice is the 3T. It may reduce imaging time and/or improve resolution and contrast and give thinner slices. The use of less sedation and contrast medium may be additional advantages. The 1.5T and 3T imaging processes are different and require new learning, safety guidelines and experience. **1.5T is the mainstay, but 3T is definitely earning its place in MRI.**

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**MRI OF THE KNEE JOINT**

**Comparison of 1.5T and 3T Technology**

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**Ask Clinical Services Message Center**

**Q: How safe is an MRI?**

**A:** A contrast material called gadolinium may be used during MRI. Gadolinium-based contrast agents (GBCAs) may be contra-indicated for patients with kidney disease. It has been recommended by the Food & Drug Administration (FDA) and the American College of Radiology (ACR) that some patients be screened for kidney disease by the radiology center/provider. The FDA website [http://www.fda.gov/cder/drug/advisory/gadolinium_agents.htm](http://www.fda.gov/cder/drug/advisory/gadolinium_agents.htm) For the ACR website, link to [http://www.acr.org/SecondaryMainMenuCategories/quality_safety/MRSafety.aspx](http://www.acr.org/SecondaryMainMenuCategories/quality_safety/MRSafety.aspx) and you can then select the FDA documents as well as links for additional information.

**Q: Are there CEUs on contra-indications for Gadolinium-based contrast agents?**

**A:** Yes. An excellent source for CEUs is the International Center for Postgraduate Medical Education – link to [www.icpme.us](http://www.icpme.us). “Nephrogenic Systemic Fibrosis and Gadolinium-based Contrast agents – Etiology and Risk Reduction” is self-study and “Contrast induced Neuropathy & Chronic Kidney Disease” is offered as webinars. There is no charge for these two programs.

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The Current Connection and a directory of MRI/CT and EMG providers can be viewed at OCM’s website: [www.onecallmedical.com](http://www.onecallmedical.com)