

MRI Review

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MRI is a complex and interesting tool in radiology that has radically changed the way we think about disease and its diagnosis over the last few decades. It is also the most complex radiology modality to truly understand. Many providers feel overwhelmed or sometimes confused with the plethora of available exams and the permutations those exams may take. Should I order contrast? Does this procedure need to be performed on a specific scanner? Are there limitations for my patient that may affect these decisions?

Many of these questions would require a longer discussion than is available, but I would like to address an issue that is sometimes overlooked. That is: Which scanner field strength is most appropriate for my patient?

Full field strength magnets are set by industry standard at 1.5 and 3.0T (Tesla). 1.5T magnets are by far more common and are considered the “work horse” of the industry. 3.0T magnets, largely because of their cost, are much less common. Field strength is just one factor which can affect the quality of the pictures that are produced. But it is a very important factor. In a nut shell, it is a primary determinant of how much “signal” you are going to get and therefore what your resolution is going to be.

This additional signal often means being able to visualize more subtle disease, sometimes allowing an earlier diagnosis. For instance, large Multiple Sclerosis brain

lesions are likely to be seen at any field strength. But studies have confirmed that smaller lesions are better seen at higher field strengths and more lesions overall are visible at 3.0T than 1.5T. This will allow earlier detection or progression of disease in some patients.

Imaging of joints, particularly the smaller joints, is very dependent on higher field strength. Small structures and their pathology, such as labral tears in the shoulder or rupture of Lisfranc’s ligament in the foot, are much better evaluated at higher field strengths.

Higher field strength magnets also have some limitations. Most notably, when large field of view images are needed. An example is MRI of the abdomen. Because of the very large field of view, an artifact may develop at the periphery on 3.0T scans. This artifact is much less at 1.5T, which is usually the optimal field strength for these studies. We are much better at limiting this artifact today than just a few years ago, so it is becoming less of a limitation all the time.

Another common point of confusion is when to give intravenous contrast. This is often a very complex question and frequently the answer is at least partly dependent on the clinical setting and what questions need to be answered by the exam.

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In a majority of MRI exams, IV contrast is not necessary. This is a different approach from CT, as MRI has greater tissue contrast inherently because of the physics of this modality. Therefore, IV contrast in MRI is only given when it would be helpful to answer a specific question. The most common indications would probably be to characterize masses in the brain or abdomen or for MR angiograms outside of the head.

For instance, it is easy to see Multiple Sclerosis plaques on a non-contrast exam. So just screening for this disease does not require contrast. But IV contrast enhancement in these lesions has been associated with active disease; therefore contrast is given intravenously if there is a concern for acute exacerbation. Another example would be MRI of the lumbar spine. Generally when evaluating for fractures or degenerative spondylosis, contrast is not indicated. If there is a concern for infection, contrast is sometimes given to better define areas of inflamma-

tion or abscess. In the setting of back pain after surgery, contrast is given to differentiate granulation tissue from a recurrent disc herniation. In musculoskeletal tumor imaging, contrast is given to evaluate extra-skeletal tumors routinely. But it is usually not helpful to evaluate tumors confined to the bone.

The field of Magnetic Resonance Imaging is still young and rapidly advancing. We are constantly learning of new and better ways to image the human body, which can make it very difficult to stay abreast of such changes and how to know the best test to order.

Most insurance companies will allow you to order a study with contrast at Radiologist's discretion. Further, we have several radiologists who specialize in and have years of experience with MRI. We are available and happy to consult on any particular case.

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