

CT vs. MRI:

Choosing the Right Imaging Modality for Your Patients



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Computed tomography (CT) and magnetic resonance imaging (MRI) are the two major cross-sectional imaging modalities used to diagnose and monitor a variety of medical conditions in all medical settings (Emergency Department, Inpatient, and Outpatient). One of the most common questions radiologists receive is “Which examination, CT or MRI, is the best for my patients and their specific medical condition/indication?”

Advantages and Limitations of CT

CT is considered the workhorse of radiology cross-sectional imaging, as it offers some significant advantages over MRI. It can be performed very quickly, sometimes less than one minute, versus 30–45 minutes for most MRIs. Given this, CT is better tolerated by patients, particularly those in significant pain or with an inability to remain still for long periods at a time. In addition, certain patients, such as those with specific medical devices or metallic foreign bodies, may not be able to undergo MRI, making CT the preferred option.

CT is also a relatively less expensive examination for patients and the medical system. The main drawback of CT is radiation exposure, although advanced software combined with patient care practices helps to minimize this exposure, and the imaging benefits far outweigh this negative in almost all circumstances.

Use of CT and MRI in the Emergency Department

In the emergency department, CT is usually the first-line examination when cross-sectional imaging is being considered for typical patient presentations, such as chest pain or abdominal pain. A notable exception would be pregnant patients with abdominal pain, where CT is avoided to limit radiation exposure to the developing fetus. Another case where MRI could be used in the ER is an MRCP (Magnetic Resonance Cholangiopancreatography) to evaluate the biliary tree in suspected choledocholithiasis, as some stones, particularly non-calcified ones, will show up better than they would on CT.

Contrast Considerations in CT Examinations

For the CT examinations, another question radiologists get is whether to use IV and/or oral contrast material. For most cases, IV contrast material is preferred as it better delineates lesions and disease processes. Contraindications would be for patients with an iodinated contrast allergy or severe renal insufficiency. If there is high clinical concern for a renal stone, this would be a case to order a non-contrast CT of the abdomen/pelvis. For nearly all other cases, IV contrast should be used.

Oral contrast is a different story. For most cases, water can be used as an oral contrast agent just prior to the CT scan, as it sufficiently distends the bowel for nearly all clinical indications. A specific oral contrast agent is typically used during CT Enterography exams to evaluate bowel disease, such as Crohn’s disease, or in cases where there is high clinical suspicion for bowel malignancy.

Comparing CT and MRI Resolution

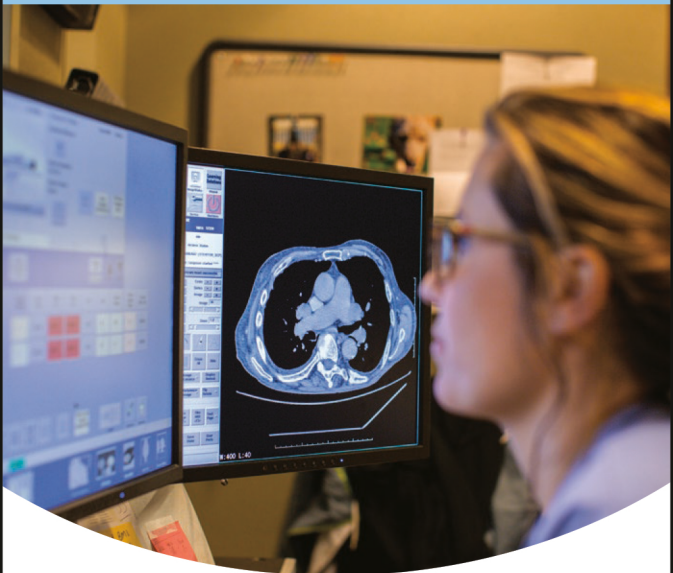
In general, CT has better spatial resolution, while MRI has better contrast resolution. Another way to think about it is that CT is often used for the initial detection of abnormalities, and then MRI is used as a problem-solving tool to help better evaluate the abnormalities or lesions that are encountered. For example, a patient could come into the ER with upper abdominal pain. They underwent a CT for the initial examination and were found to have an indeterminate liver lesion. MRI would then be used to further characterize this liver lesion as benign or malignant and make a specific diagnosis. The same approach applies to lesions discovered in the pancreas, spleen, kidneys, or adrenal glands.

CT and MRI in Cancer Imaging

For a known diagnosis of cancer, CT is typically used as the imaging modality for follow-up and to track various lesions. This is particularly the case for lung cancer, as MRI of the chest is not very useful for lung lesions. However, there are certain types of cancer, such as prostate, rectal, and cervical cancer, where MRI is more frequently used.

Conclusion

This overview outlines key considerations in determining when to order CT vs. MRI and the various ways in which both modalities are used. Both scans are highly important tools for diagnosing and monitoring disease. Radiologists remain an invaluable resource and partner in care and are always happy to discuss imaging strategies for specific patients and cases. In addition, Charlotte Radiology offers an online ordering guide for referring physicians at www.charlotteradiology.com/ordering-guide/ where you can verify the type of imaging exam to order for the medical reason or area of concern. The tool will provide the recommended exam, contrast guidance, contraindications, and CPT codes.



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