

Best Practice guidelines
Brain and Spine

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The following discussion is the second in a series to guide clinicians in selecting the most appropriate diagnostic test for their patients. It is designed to help understand the advantages and limitations of specific tests and to help the clinician formulate cost-effective imaging strategies. This article focuses on imaging of the brain and spine.

In general, in the setting of acute trauma to the skull or face, CT is the preferred imaging modality over MRI and X-ray. MRI can reveal brain edema and bleeding, but CT is superior to MRI at depicting acute facial or skull fractures. CT is excellent at demonstrating acute hemorrhage within the brain, ventricles and subarachnoid or subdural space as well. While x-rays might depict fractures, they do not depict the intracranial structures adequately.

CT is also preferred for evaluation of the paranasal sinuses and temporal bones in adults. CT has excellent spatial resolution and well suited for sinus evaluation. Radiation dose can be diminished while still demonstrating anatomy well. Despite the relatively low dose of CT, plain X-rays have a role in the pediatric population. Most often, a solitary Water's view or limited sinus series reveal enough diagnostic information.

CT is also the preferred initial imaging modality for acute onset, high suspicion, headache (worst headache of your life, "thunderclap" headache or similar). While blood can be seen on MRI, CT is cheaper, faster and more readily available.

In the setting of acute stroke, the choice is not CT or MRI, it is probably CT plus or minus MRI. CT is preferred in the hyperacute setting as it can exclude brain parenchymal hemorrhage, help stratify patients into treatment groups and is a very rapid test. However, MRI is helpful in complete evaluation of the ischemic stroke. It is more accurate than CT in delineating the extent of involvement and may ultimately be required for additional workup in the acute/subacute setting.

While CT is best for trauma, sinus disease, acute headache and initial evaluation of stroke, MRI is probably the best first-line imaging for most other diagnostic scenarios. It is a more expensive test, but CT is often "non-diagnostic" in these other situations and MRI is required for further workup anyway, making MRI alone most cost-effective. Further, MRI does not expose the patient to x-ray radiation.

In acute cervical spine trauma, the choice between X-ray or CT as initial evaluation should be clinically driven. If there is low to moderate suspicion, X-rays are probably most useful and cost-effective. CT of the C-spine is recommended in high suspicion cases. If C1 through T1 is not demonstrated on standard X-ray series, CT probably is of value, too.

In the lumbar spine, CT has little role in the acute trauma patient. CT of the lumbar spine creates high radiation exposure to the patient. And, there is little information not seen on standard X-ray series. MRI is reserved for further workup as needed.

