

RSNA Statement on Traumatic Brain Injury (TBI) Imaging **Reviewed: 5/9/2024**

The Radiological Society of North America (RSNA) is committed to excellence in patient care through education and research.

- Traumatic brain injury (TBI) is one of the most common neurologic disorders. Leading causes of TBI in the general population include falls, motor vehicle accidents, assaults and sports-related injuries.
- Imaging plays an essential role in identifying TBI patients with intracranial injury. The goals of imaging include: (1) detecting injuries that may require immediate surgical or procedural intervention; (2) detecting injuries that may benefit from early medical therapy and/or vigilant neurologic supervision; and (3) determining the prognosis of patients to tailor rehabilitative therapy or help with family counseling and discharge planning.
- For patients presenting with moderate-to-severe TBI, non-contrast head CT is the first line of imaging in the acute phase, and can predict mortality and/or unfavorable outcomes in these patients. MRI may be indicated in acute TBI when the non-contrast head CT is normal and there are persistent unexplained neurological findings. In pediatric patients, imaging should *not* be routinely obtained to diagnose mild TBI.
- For patients presenting with acute TBI, non-contrast head CT remains the imaging of choice. Non-contrast CT has a high negative predictive value for excluding the need for neurosurgical intervention in patients with mild TBI. MRI has a higher sensitivity for detecting axonal injury among mild TBI patients; however, the routine use of brain MRI for the detection of injury in the setting of acute mild TBI is not supported at the present time. MRI may be indicated in particular instances when there are persistent neurological, cognitive, and behavioral symptoms, such as new-onset, progressive or worsening symptoms.
- Advanced neuroimaging techniques, including MRI diffusion tensor imaging, functional MRI, MR spectroscopy, perfusion imaging, PET/SPECT and magnetoencephalography, are the focus of ongoing research. Research is investigating whether these imaging techniques have any value in identifying further injury in TBI patients when conventional non-contrast head CT and MRI are normal, as well as for prognostication in patients with persistent symptoms. *However, at present, there is insufficient evidence supporting the routine clinical use of these advanced neuroimaging techniques for diagnosis and/or prognostication of TBI at the individual patient level.*
- To improve patient health and safety, appropriate precautions should always be taken to minimize radiation exposure through the use of the “As Low As Reasonably Achievable (ALARA)” principle.

RSNA is a strong advocate for quality, safety, equity and strict adherence to appropriateness criteria in medical imaging and radiation oncology. Through its peer-reviewed journals, education programs and annual scientific assembly, RSNA continually informs radiologists, medical physicists, radiation oncologists and other radiology professionals of the latest technologies and research developments designed to optimize dose and improve patient safety.