

Study: Fast MRI can diagnose TBI without radiation

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Young children can accurately be tested for traumatic brain injury (TBI) without exposure to radiation by using a fast MRI instead of a CT scan, a new study found.

Unlike a conventional MRI that requires a child to be motionless and often sedated, a fast MRI requires neither. Instead, it uses brief sequences to capture images.

Researchers from the University of Colorado School of Medicine set out to see if the fast MRI would be as accurate in capturing traumatic brain injury as the gold standard CT scan. They reported their findings in “Feasibility and Accuracy of Fast MRI vs CT for Traumatic Brain Injury in Young Children” (Lindberg DM, et al. *Pediatrics*. Sept. 18, 2019, <https://pediatrics.aappublications.org/content/early/2019/09/17/peds.2019-0419>).

Subjects included children under age 6 who underwent both a CT scan and a fast MRI within 24 hours of each other so the child’s condition would not have changed significantly.

Researchers completed the fast MRI in 223 of 225 patients. Fast MRI imaging took a median time of about six minutes, while CT took just under a minute. The median time between tests was four hours.

CT scans found TBI in 111 patients, while the fast MRI detected 103 of those. The fast MRI missed six cases of isolated, linear, non-depressed skull fractures and two cases of isolated subarachnoid hemorrhage. It had a sensitivity of 93%, just short of the bar of above 95%, which the authors initially set to be considered useful.

“Although the sensitivity of fast MRI did not meet our pre-specified threshold, we feel that the benefit of avoiding radiation exposure outweighs the concern for missed injury,” authors wrote. “No dose of radiation is completely safe and median radiation exposure from head CT for children <5 years old is ~ 2.6 mSV (millisievert), equivalent to several months of background radiation.”

They also noted the types of injuries that were missed are rarely treated. In addition, the fast MRI found five cases of TBI the CT did not — three subdural hematomas, two parenchymal contusions and one subarachnoid hemorrhage (one child had two of these injuries).

“These results suggest that fast MRI is a reasonable alternative to CT with the potential to eliminate ionizing radiation exposure for thousands of children each year,” authors wrote. “The ability to complete imaging in ~ 6 minutes, without the need for anesthesia or sedation, suggests that fast MRI is appropriate even in acute settings where patient throughput is a priority.”

However, they cautioned that even with fast MRI, physicians should use imaging only when it is indicated. They also noted they used newer model scanners and that their patients were stable.

To ease into use, they recommended considering fast MRI as an alternative to repeating a CT scan for children who need more imaging.

Authors of a [related commentary](#) said the findings “suggest great promise for fast MRI,” but noted the limitation of using clinically stable children.

They said “the remaining real-world challenge will be using fast MRI to identify clinically important TBIs among children who most need neuroimaging. This study is an important first step that should prompt additional well-designed and more generalizable future research using fast MRI for acutely head-injured children.”

Resources

- ["Centers for Disease Control and Prevention Guideline on the Diagnosis and Management of Mild Traumatic Brain Injury Among Children"](#)
- [CDC resources including key mild TBI recommendations, a checklist on diagnosis and management, patient discharge instructions and recovery tips](#)
- ["Identification of children at very low risk of clinically-important brain injuries after head trauma: a prospective cohort study" from the Pediatric Emergency Care Applied Research Network](#)
- [Information for parents from HealthyChildren.org on head injuries](#)
- [Pediatrics in Review article "Pediatric Head Trauma: A Review and Update"](#)

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