

Guest Editorial

Emerging Data in Pediatric Traumatic Brain Injury

This issue is dedicated to work in children with traumatic brain injury (TBI), with a primary focus on neuroimaging. These papers provide a sampling of structural and functional imaging techniques and applications ranging across the spectrum of TBI severity. As this technology applied to pediatric TBI is still relatively new, more questions may be raised than answered, perhaps most true in the mildest of injuries.

These articles add to a growing literature showing anatomic and functional changes associated with childhood concussion. This information should shape follow-up research questions and inform provider-patient conversations. Babcock et al. show the utility of diffusion weighted imaging (DTI) for identifying abnormalities early after concussion, most likely reflecting edema. Westfall, Tlustos, and Risen and their colleagues capitalized on the power of functional MRI to demonstrate alterations in brain activation after TBI, seemingly demonstrating that compensatory mechanisms used by children with a history of mild to moderate TBI to achieve similar task performance of uninjured controls involves more brain activation and different regions. This drives home the point that the behavioral assessments that are currently the gold standard for return to play decision-making do not sufficiently represent brain function. Further work is needed to understand whether these functional changes persist indefinitely or resolve with time and whether these alterations are risk factors for short or longer term outcomes of re-injury and poor recovery from subsequent injuries.

Behavioral measures that are more sensitive to the effects of mild TBI are needed for eventual clinical use. Sambasivan and colleagues report on motor measures which discriminate between children cleared to return to play after concussion and uninjured children. Candidate behavioral measures like these will need to be studied with sensitive neuroimaging to better understand pathoanatomic correlates.

While these sensitive imaging measures stand to reshape the understanding of clinical recovery after a mild injury, they may also increase our understanding of varying outcomes across the spectrum of severity of TBI. As highlighted by Max et al., there has been variability in findings of the association of “macroscopic” lesions with specific outcomes. Reasons for this may be multifactorial and include the lack of identification of important but less obvious injuries to the brain, which may come from greater refinement in how image quantification is done.

Moving forward, an important role of neuroimaging will also be to understand how rehabilitative efforts affect the identified structural and functional changes. Kaldoja et al. report on a computer-based cognitive intervention for children with mild TBI or epilepsy. Pairing such interventions with functional MRI may yield better understanding of the mechanism of benefit.

Although new studies as presented in this special issue provide us with additional information to share with families, we have little in our evidence-based clinical toolbox to provide specific guidance to an individual child. Fortunately this problem has risen to the level of public awareness, and as these articles show, our future toolbox likely will include even more neuroimaging findings.

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