

TRAUMATIC BRAIN INJURY

Cerebral blood flow is linked to sports-related concussion outcomes

The rate of restoration of normal cerebral blood flow (CBF) correlates with cognitive and behavioural outcomes after sports-related concussion, a new report in *JAMA Neurology* reveals. In a study conducted in collegiate American footballers, Timothy Meier and colleagues found that incomplete resolution of CBF abnormalities by 1 month after concussion was associated with delayed return to play and more-severe initial mood symptoms. The results indicate that CBF could provide a prognostic biomarker for recovery after concussion.

“A reduction of CBF, known as hypoperfusion, has been consistently demonstrated in previous work in both animals and humans following more-severe forms of traumatic brain injury,” says Meier. “However, the timeframe for recovery of CBF following sports-related concussion had not really been investigated, especially immediately postinjury.”

The investigators recruited 44 male athletes from an American football team in the National Collegiate Athletic Association (NCAA) Division I. 17 of the participants sustained a concussion during play, and the remaining 27 were included in the study as healthy controls.

Follow-up assessments were scheduled for 1 day, 1 week and 1 month after concussion. At each visit, CBF was measured by means of arterial spin labelling MRI, and the participants also underwent neuropsychiatric and cognitive evaluations. Of the athletes with concussion, 13 completed all three of the assessments, and all 17 attended at least two of the three follow-up sessions. Assessment of concussion severity was based on behavioural scores at the first post-concussion visit, and outcomes were categorized as good or poor, depending the time taken to return to play (≤ 14 days and >14 days, respectively).

In the athletes with concussion, reduced CBF was observed in the right dorsal midinsular cortex (dmIC) and superior temporal sulcus during the first week after injury. In most cases, CBF in these regions had returned to normal levels by 1 month after concussion. In a subset of participants, however, CBF in the dmIC remained below pre-injury levels at 1 month, and the persistent CBF impairment was associated with poor return-to-play outcomes, as well as symptoms of anxiety and depression at the initial assessment.

“These data suggest that measurement of CBF has clinical potential for the management of concussed athletes,” concludes Meier. “As a next step, we are trying to initiate a large-scale programme in Albuquerque, New Mexico, in which all NCAA Division I athletes would be scanned at the start of the season, during any concussive events, and at the end of the season.” The researchers are also hoping to extend their studies to high-school athletes.

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Original article Meier, T. B. *et al.* Recovery of cerebral blood flow following sports-related concussion. *JAMA Neurol.* doi:10.1001/jamaneuro.2014.4778

Further reading Carman, A. J. *et al.* Mind the gaps—advancing research into short-term and long-term neuropsychological outcomes of youth sports-related concussions. *Nat. Rev. Neurol.* doi:10.1038/nrneuro.2015.30

