

**Commentary on:**

*Sport-Related Structural Brain Injury: 3 Cases of Subdural Hemorrhage in American High School Football*

by Yengo-Kahn et al. *World Neurosurg* 106:1055.e5-1055.e11, 2017.

## On Protecting Young People's Brains

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In "Sport-Related Structural Brain Injury: 3 Cases of Subdural Hemorrhage in American High School Football,"<sup>1</sup> the group from Vanderbilt's Sports Concussion Center and Department of Neurological Surgery report 3 cases of subdural hemorrhage in high school football athletes treated at their institution, occurring in 1 athletic season. The authors acknowledge their series to be atypical, due to the rarity of such injuries. Two of 3 cases had prior concussion within the same season, both requiring surgery. None of the students returned to sports, and all had some residual deficits, the most severe in a near vegetative state. The outcomes are consistent with published data, and their references are supportive and consistent with their results.

The paper supports the need for further reporting and study of sport-related structural injury, as well as the need for further education of parents, athletes, coaches, trainers, first responders, and medical personnel. The authors reported their lack of access to records regarding earlier concussions and decision making in the medical provider's clearance to play.

So why put this in **WORLD NEUROSURGERY**? Most of the world's youth don't play American football, nor would neurosurgeons in many countries deal with American style football players at all.

Head injury in American football has taken hold of the public's attention, from those occurring in professionals in the National Football League to college players in the National Collegiate Athletic Association and high school, middle school, and Pop Warner leagues for younger players. A severe head injury in a motor collision is often not reported by the media, yet a severe head injury occurring during a football game will almost certainly

make the local, if not regional or even national, news and Internet. This is not the forum to explain why this is true, but for our readership, neurosurgeons, to understand and take advantage of this peculiarity.

The attention, interest, and willingness of organized football groups to work with neurosurgeons to help understand, educate, and prevent injury to the brain provide a unique opportunity.

The results of what we learn about head injury from football, ranging from concussion to structural brain injury, will hopefully be extrapolated to not only other sports but also traumatic brain injuries of all etiologies for the benefit of patients around the world.

The 3 components to understanding, treating, and preventing sport-related injury are education, research, and advocacy. The ThinkFirst National Injury Prevention Foundation, founded by organized neurosurgery, uses programs modeled around this concept.<sup>2</sup> Education begins with youth, prospective athletes, and parents becoming aware of the risks of head injury in football, as well as other organized sports, allowing them to make decisions in advance as to whether to allow a child to play or at what age to begin. It also includes making athletes and parents aware of the signs and symptoms of concussion and more severe brain injuries, the need to stop playing, and when to seek medical attention.

More extensive education extends to coaches, teachers, trainers, first responders, doctors, and other health personnel. There must be a culture shift within sports, especially youth sports, to put the safety of the athlete above the completion or outcome of a sporting event.

**Key words**

- Football
- Structural brain injury
- Subdural hemorrhage
- Traumatic brain injury

**Abbreviations and Acronyms**

**TBI:** Traumatic brain injury

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Coaches, teachers, trainers, and school and sports personnel need to not only recognize concussion and more serious head injuries but also change their training programs to minimize repetitive contact to the head; change rules to help prevent head injuries, such as head-to-head contact; and eliminate types of plays that increase risk of injury such as kickoff returns. Recognition of the spectrum of mild to severe head injury, as well as spine injury, must be taught to coaches, trainers, and first responders.

Programs such as the National Football League's Play Smart, Play Safe initiative; the National Collegiate Athletic Association's Stop Sports Injuries; and the Centers for Disease Control's Heads Up Concussion Toolkit are examples of this type of education component. Changing practice patterns, eliminating tackling in young players' programs, rule changes to prevent violent head-to-head contact, recognition of injuries and early treatment, and delaying return to play will hopefully result in less long-term neurologic effects and perhaps decrease the rare yet serious types of sport-related structural brain injuries under discussion.

Research can range from case reports, retrospective reviews, and prospective studies regarding prevention efforts, reporting of injuries, incidence, diagnosis, treatment, outcome, and long-term effects. Studies are needed to show the efficacy of rule changes, equipment development, neuropsychologic testing relevance, brain imaging markers, blood markers for brain injury, return-to-play criteria, and the significance of autopsy findings, as in the ever-popular media reporting on chronic traumatic encephalopathy.

Advocacy on behalf of athletes occurs at many levels, from the organizations controlling the events to players' unions; government agencies at the local, state, national, and international levels; and attorney groups on behalf of injured clients. Physicians and their medical organizations, in this case neurosurgery, must engage in advocacy on behalf of athletes suffering traumatic brain injury (TBI), as well as protecting those not injured. This is especially true for younger athletes, who do not have the benefit of representation that professional and even collegiate athletes enjoy, and one can question their ability to truly comprehend the consequences of such injuries when deciding whether to play football or any other organized sport.

There is something ethically disturbing about TBI occurring in a leisure activity, such as a sport, that can have lifelong consequences, even death, compared with a similar injury from a motor vehicle collision or other non-sports-related injury.

The principles in studying prevention, recognition, and treatment of TBI in sports can be extended to other sports-related injuries including spine, cardiac, vascular, and heatstroke. The principles of prevention of head injury can also extend throughout the age spectrum to injuries in infants, youth, and teens; workplace injuries; and senior falls. Developing a culture of safety, broadening targeted training, informational outreach, and minimization of unsafe behaviors are general principles that can be applied to all traumatic injuries.

In our paper under discussion, 3 cases of structural brain injury in 1 season were treated in 1 institution. Is this an oddity, or are such injuries underreported? Registry participation could possibly give us the answer. Head injury registry participation needs to be encouraged, and the existence and mechanism of reporting should be promulgated among physicians treating sports-related injuries. Requirements to report sports-related injuries could be mandated through legislative efforts at the state and federal levels, and immunity to medical malpractice could be given to physicians following specialty accepted guidelines on TBI and concussion.

Our state and national neurosurgery organizations would need to take up these challenges. There needs to be less impediment to access records, as was potentially the case in this paper, where the medical records on earlier concussions and what findings and decisions went into the decision to allow return to play. Such information may be critical in understanding the role of second impact syndrome and more severe structural brain injuries.

The authors are to be congratulated on their report and its help in the effort to increase registry participation and highlight the need for further study of sport-related brain injury, incidence, treatment, and outcomes.

As neurosurgeons, dedicated to treating diseases of the nervous system, we have experienced all too often the permanent destruction that TBI can leave on our patients and their families. We must take the lead in preventing these injuries, which is preferable to even the best treatments available once they occur.

## REFERENCES

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