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Point/Counterpoint

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Football Participation and Chronic Traumatic Encephalopathy

CASE SCENARIO

A 13-year-old male athlete presents to the clinic with his parents for a preparticipation physical examination. The athlete has participated in soccer, baseball, and track in the past but is very interested in joining the football team this year. His parents are hesitant for him to participate in football because they have heard about a brain injury in football players called chronic traumatic encephalopathy (CTE). They would like your advice regarding whether their child should avoid football due to the risk of developing CTE. The athlete is an above-average student and aspires to go to college and become an engineer. He has no significant medical or surgical history. Specifically, he has never sustained a previous brain injury. He does not take any medications. He does not have a history of psychiatric disorder or learning disability. He denies smoking, drinking alcohol, or taking illicit drugs. His family history is significant for migraine headaches in his mother and maternal grandmother.

Dr Scott Laker will argue that the benefits of participating in football outweigh the risks of developing CTE and would counsel the patient to participate in football if they so desire. Dr Christine Griess will argue that collision sports, especially American football, increase the chances of CTE and would counsel the patient not to participate.

Scott R. Laker, MD, Responds

All physiatrists who care for youth athletes should be prepared to have this conversation, and all sports medicine providers should be well versed on the topic of safety in youth tackle football. I would recommend if one is not current on this literature base or uncomfortable with the vagaries of this clinical situation that a referral to a sports medicine specialist be made. This family is seeking advice about chronic traumatic encephalopathy (CTE) as it relates to youth tackle football. It is important to clarify that this family is asking for a preparticipation physical, where the standard for disqualification would be the clear and present danger of injury or death due to participation. I feel that this standard for disqualification goes above and beyond the current understanding of CTE and places the provider who chooses to disqualify an athlete from participation in football due to the risk of CTE in an untenable and unsupportable position. In addition, the provider should ask themselves, "Am I willing to de facto disqualify every youth athlete I see from participating in football, even if the family supports participation?"

The preparticipation physical evaluation involves a thorough history and physical examination, recommendations for necessary follow-up testing, and determination of the safety for participation. From an ethical standpoint, the physician performing the preparticipation physical evaluation is duty bound to provide impartial information so that the athlete and their parents can make an informed consent to participate (ie, autonomy) and to support the health of this athlete (ie, beneficence) [1]. The final decision regarding participation on the football team will largely be up to the parents rather than the child. I would clarify that I do not have a personal stance on his participation and would support their decision to participate, not participate, or to defer the decision until the athlete is older and more information is available. Although the American Academy of Pediatrics recommends vigorous discouragement of participation in youth boxing, it has no similar policy statement for football [2]. I would give the family examples of situations in which I would recommend disqualification from participation in football (eg, atlantoaxial instability, multilevel Klippel—Feil anomalies, etc).

The major symptoms associated with CTE include cognitive decline, behavioral abnormalities, and mood changes. These symptoms cover a wide spectrum of

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severity, are nonspecific, and are associated with other diseases, not all of which are associated with head trauma. CTE has been identified in deceased athletes who participated in soccer, ice hockey, boxing, and martial arts; military personnel; and victims of domestic abuse [3]. It is more accurate to describe CTE as a disease associated with exposures to repetitive head trauma rather than a football disease.

Pathologically, CTE involves the abnormal deposition of tau-protein and amyloid plaques in specific regions of the brain. The pattern of this deposition is specific to CTE and distinct from other tau-opathies. In addition, the disease itself is distinct from other neurodegenerative diseases like Alzheimer disease or Parkinson disease. A consensus panel published a set of diagnostic criteria for CTE [4]. It is still a disease that is confirmed on autopsy, and prediction of its presence in living individuals is not currently possible.

The current literature supports a theory of repetitive brain trauma, including concussive and subconcussive blows, as the leading risk factor for the development of CTE. Much of the current research is focused on identifying the disease accurately in living individuals.

Unfortunately, we do not know which athletes are at greatest risk and cannot stratify athletes into risk pools for participation. Perhaps most importantly, we do not know the "threshold" of trauma a human brain can tolerate without exhibiting long-term effects. Clearly, the majority of retired professional athletes exposed to repetitive brain trauma live long, full, healthy lives. However, we know that some athletes are suffering from a poorly understood form of dementia that we associate with similar exposures to those who remain asymptomatic.

The available literature suggests that CTE is not a disease that stems from involvement in youth football. When confirmed, it is found in former professional and collegiate American football players, boxers, and martial artists. There are no current studies available for the long-term neurocognitive health of youth football participants. For the purposes of this family discussion, we will make the assumption that we are talking participating in football through high school but not beyond. As such, the most relevant data are those published by Deshpande et al [5]. This cohort study reviewed nearly 2700 male athletes (834 played football and 1858 did not) in the graduating high school class of 1957 and evaluated their cognitive function and emotional status at 65 years of age. The authors found no cognitive or depressive differences in athletes who participated in high school football compared with those who did not participate. Secondary outcomes, like heavy alcohol use, anger and hostility indices, and cognitive scores at age 72 years, were also similar.

A more complete understanding of CTE will require longitudinal studies of individuals with and without exposure to repetitive head trauma, with and without neurocognitive complaints, and with close attribution of other contributors (eg, alcohol, drug use, psychiatric diagnoses) [3]. In addition, there is an inherent selection bias for the athletes who have donated their brains to the study of this disease. We may be finding CTE in artificially greater percentages of studied brains, as athletes without symptoms may be less likely to donate their brains for study.

In this case, the child has no previous medical history of concussion or concussion-modifying factors (eg, psychiatric disorders, learning disability, etc). Other than his age of $<$18 years [6], I feel that the participation in football for this child is safe, given our current understanding of CTE, and would not advocate against his participation. I would recommend that the family spend some time discussing this decision among themselves and with their son. It is not medically reasonable to disqualify him based on the available literature and the current standard for disqualification. In addition, disqualification is not defensible in this scenario, given the athlete has no clear risk of injury or sudden death and that the sport is considered safe for participation [7].

References

1. Herring SA, Kibler WB, Putukian M. Team Physician Consensus Statement: 2013 update. Med Sci Sports Exerc 2013;45:1618-1622.
2. Council on Sports Medicine and Fitness. Tackling in youth football. Pediatrics 2015;136:e1419-1430.
3. Asken BM, Sullan MJ, DeKosky ST, Jaffee MS, Bauer RM. Research gaps and controversies in chronic traumatic encephalopathy: A review. JAMA Neurol 2017;74:1255-1262.
4. McKee AC, Cairns NJ, Dickson DW, et al. The first NINDS/NIBIB consensus meeting to define neuropathological criteria for the diagnosis of chronic traumatic encephalopathy. Acta Neuropathol 2016;131:75-86.
5. Deshpande SK, Hasegawa RB, Rabinowitz AR, et al. Association of playing high school football with cognition and mental health later in life. JAMA Neurol 2017;74:909-918.
6. McCrory P, Meeuwisse W, Dvorak J, et al. Consensus statement on concussion in sport—the 5(th) international conference on concussion in sport held in Berlin, October 2016. Br J Sports Med 2017;51:838-847.
7. Mitten MJ. When is disqualification from sports justified? Medical judgment vs patients' rights. Phys Sportsmed 1996;24:75-78.

Christine Greiss, DO, Responds

Lately, it is not unusual to see the words football and chronic traumatic encephalopathy (CTE) in the same sentence; both are individually and simultaneously hot topics. The main issue here is whether this child's participation in football ultimately increases his chances of developing CTE.

CTE is a neurodegenerative tauopathy characterized by the deposition of hyperphosphorylated tau (p-tau) protein