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Background / Objectives

- Neuroinflammation plays a significant role in the pathogenesis of chronic traumatic encephalopathy¹
- Recent studies suggest that repeated concussions may increase risk for multiple sclerosis^{2,3}.
- Possible mechanisms include disruption of blood-brain barrier leading to exposure of CNS antigens to the peripheral immune system⁴.
- We describe four adolescent males who were diagnosed with multiple sclerosis and were former football players.

Methods

- Retrospective chart review of four pediatric patients with history of participation in football who were diagnosed with multiple sclerosis.
- Demographic information, medical histories, neuroimaging features, and neuropsychological testing results were reviewed.

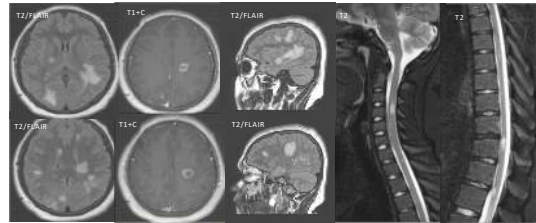
Results

- Four adolescent males who played football were diagnosed with relapsing-remitting multiple sclerosis at ages 14, 15, 16, and 17.
- Three out of the four individuals had a documented history of concussion and diagnoses of post-concussive syndrome.
- Sensory, vision, balance, and gait abnormalities were common presenting symptoms.
- Preceding history of football training or competition was a salient feature of the cases (diagnosis of multiple sclerosis occurred in months of June, September, October, November, possibly overlapping with football season).
- The patients all had a high burden of white matter lesions, and in some cases, had multiple enhancing lesions that appeared similar in age.
- Neuropsychological testing or screening results were available for three of four individuals. Commonly identified areas of weakness included processing speed, memory, visual-motor integration, and attention. All three who were tested were receiving formal educational accommodations through a 504 Plan.

Results

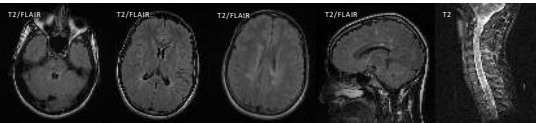
Patient 1:

A 14-year-old male presented with ascending weakness, paresthesias, and left facial droop. He had participated in a football camp 3 weeks prior (played defensive tackle). He had no documented history of concussion. LP was unsuccessfully attempted; neuropsychological testing was not completed. MRI sequences shown below.



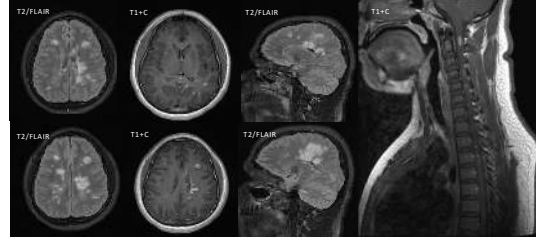
Patient 2:

A 16-year-old male with history of viral meningitis at age 11 and history of multiple concussions (played quarterback), who experienced headache, nausea, poor concentration, and double vision after a concussion. CT head was abnormal, prompting MRI (shown below). CSF analysis showed WBC 12 per mm³ (97% lymphocytes), RBC 1 per mm³, 9 oligoclonal bands, IgG index 1.4. Full neuropsychological evaluation showed impairments in processing speed, complex attention, and relative weaknesses in visual memory and math calculation with full scale IQ of 97.



Patient 3:

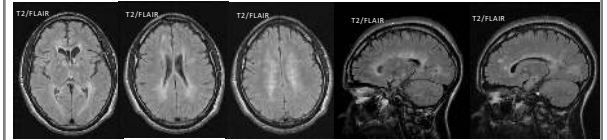
A 15-year-old male experienced a concussion (played running back) followed by headache and blurry vision. The following day, he developed left foot numbness and unsteady gait. CT head was abnormal, leading to MRI (shown below). CSF studies showed WBC 50 per mm³, RBC not available, positive oligoclonal bands, IgG index 1.65. Full neuropsychological evaluation demonstrated impairment in processing speed, memory, reading comprehension, simple and complex attention, visual-motor integration, fine-motor dexterity with the dominant hand, and verbal fluency with a full scale IQ of 83.



Results

Patient 4:

A 17-year-old male with history of multiple concussions (played as safety) developed balance problems, slurred speech, and right hand tremor. Persistent symptoms prompted MRI (shown below). CSF with WBC 4 per mm³, RBC 0 per mm³, 11 oligoclonal bands, IgG index 0.87. Brief neuropsychological screening battery identified poor visual-motor integration, visual perception, verbal learning and memory, processing speed, simple and complex attention, and bilateral fine-motor dexterity.



Conclusions / Discussion

- This case series provides examples of pediatric football players and subsequent development of multiple sclerosis.
- Prior and repeated concussions was a common theme within these cases.
- Presenting neurological symptoms and diagnosis of multiple sclerosis often occurred in the football pre-season or season.
- These patients had a relatively high burden of white matter disease and demonstrated neuropsychological deficits. Notably, all who were tested were receiving formal academic accommodations through a 504 Plan.
- This case series is limited by its retrospective nature and selection bias.
- Future directions include prospective, case-controlled studies investigating if there is a causal relationship between concussive events and risk of developing multiple sclerosis.

Disclosures

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