Introduction

Concussion: pathophysiology and sequelae

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In 2002 the Centers for Disease Control and Prevention (CDC) report to Congress stated that concussion, or mild traumatic brain injury (TBI), is an important public health problem in the US. In this report the authors documented that this problem is frequently referred to as the “silent epidemic” because the complications from TBI such as changes affecting thinking, sensation, language, or emotions may not be readily apparent.² Recently the CDC reported in a national surveillance study that each year US emergency departments treat an estimated 1.7 million people who have sustained a TBI. Furthermore, 173,285 sports- and recreation-related TBIs, including concussions, occur yearly among children and adolescents, from birth to 19 years of age.¹

The current concussion incidence statistics reported above have been found to be significantly underreported. This underreporting of concussion may result from a lack of publicly available information, a lack of valid and objective diagnostic tools, and accepted social norms, especially those involved in a wide range of contact/collision sport participation.

The December 2012 issue of *Neurosurgical Focus* provides broad coverage of many topics concerning concussion, including prospective clinical, neuropsychological, and radiological concussion evaluation; macroscopic cerebral saturation/cerebral blood flow topics; microscopic neural injury; metabolic changes; electrophysiological measurements; biomechanical parameters of helmeted collisions; and current legislative initiatives. This issue begins with a groundbreaking prospective study of sport concussion documented in a 4-part series of articles by Echlin et al. This unique study examines independent physician-observed and physician-diagnosed concus-

sions. The participants are examined before and after the season as well as after injury, utilizing both neuropsychological (Sport Concussion Assessment Tool-2 [SCAT2] and Immediate Post-Concussion Assessment and Cognitive Test [ImPACT]) and radiological (MR spectroscopy and diffusion tensor imaging) objective parameters. The results are given an insightful perspective concerning the social and cultural origin of concussion in the editorial written by the principal investigator. This series involves contributions from multiple academic institutions including Harvard University, University of Montreal, Western University of Canada, University of British Columbia, and Indiana University.

Dashnaw et al. provide an excellent overview of this topic, examining the forces behind the primary phase of injury in mild TBI as well as the immediate and delayed cellular events responsible for the secondary phase of injury leading to neuronal dysfunction and possible cell death. Advanced neuroimaging techniques are also discussed concerning the detection of both structural and functional abnormalities associated with concussion. The potential long-term effects of repetitive mild TBI are addressed, particularly chronic traumatic encephalopathy. Zuckerman et al. provide an excellent literature review, which indicates that reliable incidence and prevalence data related to structural brain injuries in sports-related concussion cannot be offered at present. These authors conclude that a prospective registry collecting incidence, management, and follow-up data after structural brain injuries in the setting of sports-related concussion would be of great benefit to the neurosurgical community and to those suffering from sports-related concussion.

Gosselin et al. provide a study concerning event-related potentials, the objective of which was to understand brain functioning during the performance of a working memory task by patients who have sustained a mild TBI mostly due to motor-vehicle accident or sports concussion. This study also aimed to better understand the association between brain functioning (as measured by event-related potentials), behavioral performance on the working memory task, postconcussion symptoms, type of injury (sports concussion vs other types), and delay after the injury. De Beaumont et al. complement the study of Gosselin et al. with a review of the current literature concerning persistent and cumulative alterations of both

cognitive and motor function following sports concussions detected by some of the newest, most sophisticated brain investigation techniques. Tormenti et al. provide the results of an interesting magnetoencephalographic pilot study. In this study the authors demonstrate a novel task protocol and then assess magnetoencephalographic virtual recordings obtained during task performance as a diagnostic tool for concussion.

Forbes et al. provide novel, important information that helps to quantify the relative insignificance of helmeted collisions and the use of biomechanical parameters in prediction of concussion risk. Tomei et al. evaluate and compare the concussion legislation for 50 states and the District of Columbia. Evaluation parameters included are stipulations of concussion education, criteria for removal from play, requirements for evaluation and return to play after concussion, and qualification of individuals required to evaluate students.

This volume should prove insightful and informative to many specialists, primary care physicians, and health practitioners who care for patients with concussion. (<http://thejns.org/doi/abs/10.3171/2012.10.FOCUS12357>)

Disclosure

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2. National Center for Injury Prevention and Control: **Report to Congress on Mild Traumatic Brain Injury in the United States: Steps to Prevent a Serious Public Health Problem**. Atlanta: Centers for Disease Control and Prevention, 2003 (<http://www.cdc.gov/ncipc/pub-res/mtbi/mtbireport.pdf>) [Accessed October 26, 2012]

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