

Pediatric Concussion: Mild Head Injury ?

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OBJECTIVES

- Describe the Definition and Classification of Cerebral Concussion
- Review the Epidemiology of Pediatric Concussion
- Discuss the Assessment and Management of Children Diagnosed with Concussion
- Discuss Issues Related to Sports-Related Concussion

Cerebral Concussion

- Concussion was previously described as a reversible neurologic disturbance with no evidence of pathology.
- Ommaya and Gennarelli modified the definition of Concussive Brain Injury now believed to be a result of centrifugal strains that result in a graded set of syndromes with progressive disturbance of the level and content of consciousness

Cerebral Concussion in Children

- Posttraumatic disturbances seen in children after mild head injuries include confusion without amnesia; confusion with amnesia of variable duration; classical loss of consciousness.
- Concussion includes diffuse axonal injury as one extreme of the spectrum.

Classification Of Concussion

- Mild/Grade I: No LOC. Positive Confusion and Disorientation. 5-15 minutes of Amnesia.
- Moderate/Grade II: No LOC to 1-5 minutes of LOC; 15-30 minutes of Amnesia.
- Severe/Grade III: Greater than 5 minutes of LOC; Greater than 1 hour of Amnesia

Epidemiology of Pediatric Concussion

- Accurate incidence difficult to assess since many patients with minor head injuries do not seek medical attention.
- Incidence of TBI is about 180 per 100,000 children per year
- Mild TBI accounts for 90% of total Pediatric Head injuries presenting to ED.
- Incidence between Boys: Girls is 1.8:1.0. Incidence in Boys increase after age 5

Epidemiology of Pediatric Concussion

- Durkin et al (Neurosurgery (1998) 42(2) 300-310)
 - Pediatric Evaluation for Neurological Trauma (1983-1992)
 - 155 incidents per 100000 population per year
 - Minor head Injuries accounted for 76% neurological Injuries
 - Boys were affected more than girls at all ages and the disparity widened with age.
 - 1-4 year olds had the lowest rates with steady increase thereafter.

Epidemiology of Pediatric Concussion

- Birth to Age 4 with highest incidence of Child Abuse and Falls resulting in TBI.
- Above Age 4, Motor vehicle accident major culprit for TBI.
- Sports-Related Concussion highest incidence in High School-age males.

Pathophysiology of Concussion

- Evidence of Axonal Disruption (Grades I-III) with possible progression to axonal injury
- Transient Torsion with malfunction of the RAS as it projects from brainstem to cerebral hemispheres.
- Small contusion and brain swelling and hemorrhagic necrosis

Assessment and Management of Pediatric Concussion

- Patient History:
 - Mechanism and Severity of Injury.
 - Past medical history.
- Clinical Signs and Symptoms.
- Radiographic Studies.
- Laboratory Studies.

Assessment and Management of Pediatric Concussion

- Glasgow Coma Scale Score with mild TBI (GCS13-15)
- Glasgow Coma Scale Score for Children
 - Eye opening (1-4) i.e None, To pain, To sound, Spontaneous
 - Verbalization(1-5) i.e None, restless, irritable, cries but consolable, Appropriate for age
 - Motor (1-6) Same as Adult except (6) is Spontaneous movement

Assessment and Management of Pediatric Concussion

- Postconcussive Syndrome in Children may be associated with a single episode of emesis after the injury followed by a prolonged period of intractable emesis. In Adults, these same symptoms are more ominous. Pediatric patients still need imaging.

Assessment and Management of Pediatric Concussion

- Impact Seizures : No intracranial lesions or risk of Epilepsy when presents in Children. CT should be done to r/o pathology
- Pediatric Concussion Syndrome
 - Young children with appearance of recovery followed by pallor, diaphoresis and diminished responsiveness

Assessment and Management of Pediatric Concussion

- Posttraumatic Symptoms
 - Acute Symptoms of Headaches/memory problems and fatigue (Rest)
 - Behavioral changes and Adjustment Problems (improves in 1-3 months)
 - Social Problems such as Employment and family problems (Neuropsych testing)

Assessment and Management of Pediatric Concussion

- Postconcussion Syndrome can occur immediately or after a days or weeks and LOC is not necessary for this syndrome to occur.
 - Headache/Dizziness/Photophobia
 - Anxiety, Depression, Fatigue
 - Insomnia, Drowsiness
 - Nausea, vomiting
 - Concentration and memory problems

Concussion in Athletes

- Annual incidence with risk of Minor Head Injuries in General Population 0.1%
- Varsity Football Study (Gerberich et al(1983) Am J Public Health) had incidence of concussion of 20% . Second and third time Concussion was as high as 14% and 3% respectively

Concussion in Athletes

- Annual incidence with risk of Minor Head Injuries in Sports as National Athletic Injury Reporting .
 - Football 6%
 - Ice Hockey 3.7%
 - Wrestling 2.5%
 - Basketball 2.2%
 - Lacrosse 1.9%
 - Soccer 1.6%

Incidence of Concussion in High School Football Players of Ohio and Pennsylvania *J Child Neurology (2001)*

- 450 football players surveyed.
- 233 (52%) responded to the survey.
- 110/233 (47% of respondents) had concussions.
- 81/233 (35% of respondents) had multiple concussions
- Grade I (88%), Grade II (10%) and Grade III (2.4%)

Concussion in Athletes and Return to Sports

- Cantu et al (1995)
 - Grade I Injury: After 1st Episode out 1 week if no sx's; 2nd Episode out 2 weeks and 3rd Episode Terminate Season with possible return next season.
 - Grade II: 1st episode out 1 week, 2nd episode out 1 month consider termination and 3rd episode terminate season and return next season.
 - Grade III: 1st episode out 1 month and 2nd episode terminate season with return the following season

Concussion in Athletes: Returning to Sports

- Team Physician should refer patient with potential medical problem to independent physician.
- Independent Physician should evaluate and determine risk and convey risk to Athlete
- Athlete and family should make informed decision.

Hospitalization for Sports Related Concussions in US Children aged 5-18 years from 2000-2004 *Br J Sports Med(2008)*

- 755 non-fatal pediatric sports-related concussion hospitalization
- Over 80% received no procedures
- 1.1 day average hospital stay
- Non-teaching hospitals more likely to admit patients.

Topics Discussed

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References

- Marion MW Traumatic Brain Injury (Thieme Press).
- McClone DG et Al Pediatric Neurosurgery 4th Edition. (W.B saunders Company)