

Minor Head Trauma in Children and Adolescents

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MHT

- ▶ An extraordinarily common problem
- ▶ Obvious sequelae are uncommon
- ▶ All it takes is one
- ▶ Recommendations characterized by
 - lack of standard definition
 - lack of prospective studies

MHT

- ▶ For the purposes of this lecture MHT will be considered to involve:
 - a relatively trivial mechanism of injury
 - a patient with a GCS of 15 on arrival to the ED
 - no evidence of skull fracture
 - May be retrograde/posttraumatic amnesia
 - ??? Brief LOC ???

MHT

- ▶ Key questions for the physician include:
 - What is the appropriate evaluation?
 - What radiographic studies are necessary?
 - What is the disposition of the patient?
 - When can the patient resume activity?
 - Are there sequelae?

MHT

- ▶ Radioimaging in the ED: the goal is to diagnose neurosurgical emergencies
 - Skull Films
 - CT Scanning

MHT: Cases

- ▶ A 6 month old boy with a chief complaint of fever, and by the way he hit his head against the coffee table.
 - PE remarkable for:
 - 1) left parietal swelling– no palpable fx
 - 2) normal neurological exam

MHT: Cases

- ▶ A 3 year old boy presents with forehead swelling after a fall sustained when he tripped; no LOC; vomited x one.
 - PE remarkable for
 - 1) An alert happy child
 - 2) A forehead contusion
 - 3) A normal neurological exam

MHT

- ▶ What is known (more or less)
 - Intracranial lesions (per CT scanning) are not rare in pediatric patients with MHT
 - A normal neurologic exam does not exclude an injury—especially in infants
 - The overwhelming majority of intracranial lesions in children with MHT are nonoperative

MHT

- ▶ Infants are different:
 - Both skull fractures and intracranial injuries are more common in patients less than 2 years old
 - Infants less than 12 months of age are probably exceptionally vulnerable to injury
 - Babies' bones break

MHT

- ▶ Skull X-Rays:
 - Intracranial injuries are associated with skull fractures
 - Skull fractures are usually associated with swelling
 - The parietal bone is the most common site of a skull fracture in infants
 - Whether skull films can be used as a screening tool is controversial

MHT

- ▶ Indications for CT scanning:
 - Any patient with altered mental status or an abnormal neurological exam
 - Patients less than 2 years of age with symptoms such as vomiting or irritability
 - Patients less than 2 years old with large scalp hematomas, especially non-frontal swelling
 - Infants less than 3 months—especially if a scalp hematoma is present

MHT

- ▶ Disposition: Patients with minor head trauma and a normal CT scan may be safely discharged— delayed bleeds are extremely rare
- ▶ What to do with patients with linear skull fractures?
- ▶ Remember it only takes one

MHT: Cases

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MHT: Cases

- ▶ A 17yo male presents because he needs a note to return to baseball; he had a concussion one week prior.
 - PE remarkable for:
 - 1) An alert oriented patient
 - 2) Normal neurological exam

MHT: Concussion

- ▶ “a clinical syndrome characterized by the immediate and transient post-traumatic impairment of neural function such as alteration of consciousness, disturbance of vision or equilibrium etc. due to brainstem involvement”

MHT: Concussion

- ▶ Results from acceleration-deceleration forces applied to a moving brain
- ▶ Shearing forces disrupt normal neurological elements
- ▶ Axonal injury, biochemical abnormalities, or microvascular injury may result

MHT: Concussion

- ▶ Prospectively Validated Signs and Symptoms:
 - Loss of Consciousness (less than 10%)
 - Amnesia (Retrograde---Posttraumatic)
 - Attention Deficit
 - Headache, Dizziness, Blurred Vision

MHT: Concussion

- ▶ Subjective findings:
 - Vacant Stare, Impaired Coordination
 - Emotional Lability, Sleep Disturbance
 - Lethargy, Behavioral Disturbance
 - Altered Sense of Taste or Smell

MHT: Concussion

- ▶ Grading the Severity of Injury:
 - There are over 25 published injury severity scales; many are "sport-specific"
 - Many rely on history of and duration of LOC and duration of Posttraumatic Amnesia
 - Current recommendations disregard these grading scales and divide concussion into simple and complex

MHT: Concussion

- ▶ Simple concussion: symptoms resolve in 7-10 days
- ▶ Complex concussion:
 - Symptoms persist
 - Symptoms may be specific
 - May include athletes with multiple concussion

MHT: Concussion

- ▶ Sequelae of Concussion:
 - There is evidence for neuropsychiatric deficits during the first week following mild concussive injury in some patients
 - After one week there is no consensus regarding time frame for full neurologic recovery: each patient is different
 - Risk of Second Impact Syndrome (SIS) ?

MHT: Concussion

- ▶ Second Impact Syndrome
 - Thought to occur when an athlete sustains a second head injury prior to recovery from an initial head injury, usually a mild concussion
 - Severe cerebral swelling occurs, which has been reported to be fatal
 - May be similar in pathology to "malignant brain edema" that is known to occur in children

MHT: Concussion

- ▶ Second Impact Syndrome (cont)
 - The pathology of malignant brain edema is thought to involve disordered cerebral autoregulation
 - Fear of SIS used to guide recommendations regarding the management of concussion
 - In fact the role of repeated concussion as a cause of SIS is questionable

MHT: Concussion

- ▶ Post (complex) concussion Syndrome
 - Clinically characterized by multiple physical and cognitive complaints
 - Etiology is controversial: physical damage vs emotional sequelae– also possible genetic vulnerability
 - Cannot be predicted in the immediate postconcussion period
 - New data suggests headache is associated with incomplete recovery

MHT: Concussion

- ▶ Sequelae of Multiple Concussions:
 - There is evidence that there is cumulative impairment from repeated mild head trauma, especially in cognitive function
 - Damage may be subtle and can involve deficits in verbal skills, memory processing, spatial relationships, and coordination
 - Do some patients have a predestined trauma reserve?

Concussion

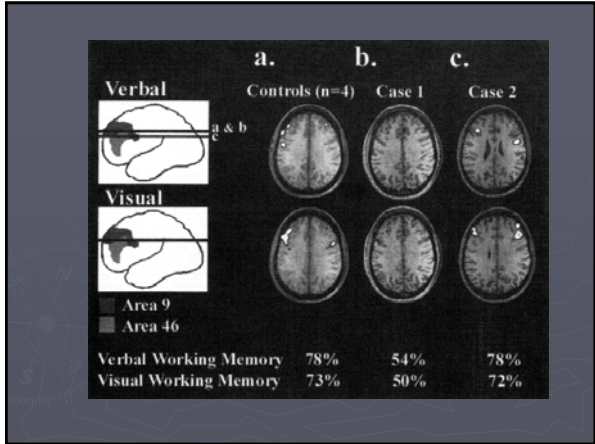
- ▶ Is the recovery from concussion age-dependent? Gender dependent?
- ▶ Recent data suggests that high school athletes recover more slowly from concussion than college students
- ▶ The brain is a constantly evolving organism

MHT: Concussion

- ▶ There is a growing trend toward neuropsychologic testing in the evaluation of concussion in athletes
 - There are many different types of exams: several are commercially available
 - Knowing a baseline is crucial
 - The primary goal is to prevent the return to competition before the brain has healed
 - More research is needed in this field, especially in children and adolescents

MHT: Concussion

- ▶ New Radiologic Modalities in Concussion
 - The CT scan is rarely a useful tool
 - Promising Modalities include
 - 1) Functional MRI
 - 2) Spect Scanning



MHT: Cases

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Current Guidelines

- ▶ Any player with signs or symptoms of a concussion should not be allowed return to the game or practice.
- ▶ Emphasis is on physical and cognitive rest until symptoms completely resolve; in simple concussions this will be in about a week.

Concussion: Return to Play

- ▶ Once asymptomatic patients advance through a graduated level of activity:
 - 1: light aerobic activity
 - 2: sport specific exercise
 - 3: noncontact training
 - 4: contact training

Concussion: complex

- ▶ There is no consensus on management
- ▶ Role of neuropsychiatric testing?
- ▶ Long-term sequela are probably patient specific

Concussion

- ▶ What happened to the 17 year old: He's done with contact sports
- ▶ There is no consensus on when to quit after repeated concussions

Concussion

- ▶ Advantage of new data: greater understanding of concussion.
- ▶ Disadvantages of new data:
 - Unnecessary sports restrictions
 - Pre-existing condition in young people?