



# The Doctor Is In

By Dr. David Hill

## Heading for Trouble

**H**ead injury is a leading cause of morbidity and mortality in childhood, a fact that will not surprise any parent. In fact, there are over 1.5 million documented head injuries each year in the United States causing around 300,000 pediatric hospitalizations. It's also no surprise to learn boys are more than twice as likely as girls to sustain a head injury. Motor vehicle accidents cause the most head injuries, followed by falls. Football is the most dangerous sport for heads, but soccer, baseball, lacrosse, basketball, and even volleyball pose substantial risks as well. Chess, anyone?

### What's a head injury?

This would seem obvious, but the American Association of Neurologic Surgeons calls traumatic brain injury (TBI), "a blow or jolt to the head or penetrating head injury that disrupts the normal function of the brain." Injuries occur most often by rapid acceleration of the head (being hit with a baseball), rapid deceleration of the head (falling off the bed), and shearing forces (being spun around in a car accident). Often multiple forces are involved.

### What's in the head anyway?

To understand head injuries, it helps to know how different parts get damaged. The scalp is full of blood vessels and bleeds like crazy with cuts, but the bleeding is usually easily controlled by applying pressure. Between the scalp and the skull is a loose layer called the *galea*, which can accumulate a large volume of blood. Next is a tough layer of tissue over the skull called *periosteum*. Bleeding between the periosteum and the skull often forms a firm bruise or "goose egg."

Next is the bone of the skull itself, actually several interlocking plates of bone that meet at sutures (which look like zippers). Under the skull is another tough layer of tissue called the *dura*, and the space in between is called the *epidural* space. Epidural bleeding is potentially quite dangerous. Epidural bleeds may not be immediately obvious, with the patient feeling fine for minutes or hours before developing a severe headache and then losing consciousness.

The space under the *dura* (*subdural*) is filled with *cerebrospinal fluid* (CSF) and flimsy, spidery tissue called the *arachnoid*. This is separated from the brain by the *subarachnoid space*, also filled with CSF. Bleeding in any of these spaces may progress more slowly but often requires close monitoring and neurosurgical intervention.

### How can you tell when there's been a skull fracture?

Injuries to the bones of the skull can be subtle, but evaluating them is critical. The

most common type of fracture is in a straight line (linear). Fortunately linear fractures are also least dangerous. You'll often find an overlying bruise, and sometimes you can feel a "step-off" as you run your hand over the head. Any skull fracture deserves a CT scan to look for underlying brain injury. When there's no other injury, patients over age two with linear fractures can often be observed with pain medicine alone. Children under two should still be evaluated by a neurosurgeon.

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More severe trauma can push the bone inward, causing a depressed skull fracture. These fractures always require a neurosurgeon's attention, and depending on how deep the depression is, patients often need surgery. Because of the risk for seizures we often treat with anticonvulsant medicines.

The bones at the base of the skull can also break (basilar skull fracture), which can be quite dangerous. Bruising under the eyes ("black" or "raccoon" eyes" or behind the ear ("Battle's sign") may indicate a basilar fracture, as may clear or bloody nasal drainage (that's not snot, it's CSF). These injuries always require the attention of a neurosurgeon.

### Can you just damage the brain?

Rapid movement can injure nerve cells all over the brain (diffuse axonal injury or DIA). This type of damage can occur without a fracture or bleed. It may lead to increased pressure inside the skull, which can be very dangerous if not treated.

### What's a concussion?

A concussion is an alteration in mental status due to head trauma when there's no clear

physical injury to the brain. Concussion symptoms are "self-limited," meaning they go away eventually, although repeated or severe concussions can cause long-term or permanent impairment. Victims may lose consciousness, but they don't have to. Physical complaints include headache, dizziness, nausea, vomiting, and light sensitivity. Patients may be confused, depressed, or irritable. Concussion victims may find it hard to concentrate and they may experience temporary amnesia. Symptoms may last months (post-concussion syndrome). Children who have had a concussion should not return to sports until they have been cleared by a physician, usually when they can tolerate exercise again without having any symptoms. Repeated concussions can be very dangerous, especially if they occur in rapid succession.

### My child bumped his head. What should I do?

It depends in part on how old your child is. Children under age two years are especially susceptible to serious head injuries, so we have a lower threshold to check them out. It also depends on what happened. Any child who loses consciousness should be evaluated immediately; don't hesitate to call EMS if he/she doesn't wake up in seconds. Falls from greater than three feet are more dangerous than from lower heights. Children with recent head injuries are at greater risk from repeated trauma.

Children may vomit once or twice immediately after an injury, but repeated or prolonged vomiting is concerning. A "goose egg" on the forehead is rarely a sign of serious injury, but a lump on the side of the head can be a sign of a skull fracture. Any blood or clear fluid draining from the nose or ears deserves immediate attention. Seizures, bad headaches, or altered behavior are all alarming signs. If you are at all concerned, call your child's doctor.

### How can I prevent head injuries?

Head injury prevention goes back to common sense. Infants should never be left unattended on a bed or other surface. Children should always be appropriately restrained in cars. They should wear helmets for any activity (biking, football, horseback riding) where injuries are likely. They should obey the diving rules wherever they swim. Children will always be at some risk, but if we use our heads, there's plenty we can do to protect theirs.

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