

The Dynamics of a Closed Head Injury

Source: Produced by Vicky Youcha and Brian King

Video Link: <http://www.brainline.org/content/multimedia.php?id=3512>

Dr. Jeffrey Barth: The dynamics of closed head injury, which is what we're talking about today, is that the brain is either subjected to a direct insult, which is called a blunt injury, or is a shaking or a, what we refer to as an acceleration deceleration injury. Most of the injuries you see in sports and that sort of thing are the acceleration variety. And, what happens there is the brain is shaken. If it's shaken violently, it can hit areas of the skull and create swelling and bleeding in the brain.

But, the kind of injuries we're discussing are mild head injuries or concussions. And, they usually just involve that shaking of the brain where there is a bioelectrical discharge of energy and there's a physiological process. It involves the use of glucose in the brain and things happening, actually at the cellular level of the brain. When a brain cell is shaken, it discharges its sodium and potassium and that is replaced by calcium which is, actually, very good for you bones but not very good for your brain. And it can cause death of the brain cell which is referred to as apoptosis.

So, your brain, when it's injured, those cells try to get back to normal and they try to bring the sodium and potassium back into the cell and expel the calcium. That requires energy which is essentially in the form of glucose. And you have glucose in the brain and it uses that glucose to make this change. Unfortunately, you begin to run out of glucose. And, after a mild head injury, your brain is slightly swollen and doesn't allow as much blood to get into the brain and bring you that energy source. So, all the sudden, it stops working toward repairing the cells. So, you slow down in that process. And, that can take anywhere from a few hours to five or ten days to get back to normal physiological function at those brain cell levels.

So, also, as part of this injury, there are various dynamics going on with this shaking injury that we talked about or the acceleration deceleration injury. And, that can involve either a linear injury or rotational injury. The linear injury is one that's best described as sort of a piston action. And that would be if a, let's say we're talking about boxing, if you were hit directly in the nose with a punch, that would move the head back in one plane and the brain would go from front to back and might, in fact, bounce off of the skull. A rotational injury is one where the brain turns inside of the skull. So, you can imagine with an acceleration deceleration injury, like being hit by a boxer and being hit on the jaw, the head turning, eventually the head stops but the brain keeps turning inside of the skull. So, you get this rotational type injury. That can happen front to back as well when the head moves in this direction. So, automobile accident, for example, where you move forward and stop the brain is rotating inside of the skull.