

BrainLine Talks With Dr. James Kelly

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Video Link: <http://www.brainline.org/content/multimedia.php?id=727>

Areas of the Brain Affected by Concussion

Dr. James Kelly: The parts of the brain that are most commonly affected in traumatic brain injury are the frontal and temporal lobes. And part of the reason for that is because they're up against bone. And it's fairly rigid and rough bone. The other reason is that when the head rotates because the neck is positioned posteriorly to the skull. If you really look at where the neck attaches, the front of the head moves greater distances than the rest of the head. And so under those circumstances, the frontal and temporal lobes, as if appendages are out there moving greater distances than the core of the sphere if you will of the rest of the brain.

As a result of that torturing effect, there's more damage to the frontal and temporal lobes. The frontal lobes influence personality, planning, initiating, organizing, the kind of things that are high level cognitive functions and personality features largely. The temporal lobes are involved primarily in language functions and certain language functions. And so if certain parts of the temporal lobes are damaged, then memory functions either for verbal memory in the left hemisphere and non-verbal visual memory in the right hemisphere can be adversely effected and injured even permanently if the injury is severe enough. While other areas of the brain can be relatively spared.

It's interesting. A contra-coup injury ... I should explain ... is very different than a coup injury. A coup injury means the French word blow. And so it's as if you were to think of a baseball bat hitting my head. And so the injury would be immediately underneath where that blow occurred. That's the coup injury. In the human experience, it's that scenario. Contra-coup means opposite to blow.

And so the common human experience is a fall on the back. And the head is moving but then suddenly stops. So it's not something hitting the head. It's something the head hits. An infinite mass, let's say this floor. And the suddenly stops, but the brain keeps going. And so at least part of the damage that occurs in the front lobe after the back of my head hits the floor is because of a vacuum effect in the closed container of the head.

So there's a shift of the brain tissue towards the back of the head that's instantaneous and a decompression injury in the front. And so what we see is a very slow leaking of hemorrhage in the tissue of the frontal lobes when the injury was really at the back of the head. And yet, if people fall on their faces from some distance, it turns out that the facial bones themselves fracture and there's some positions called air bag effect by the face which gives and tends to protect from contra-coup injury happening in the back of the head. Although, it can certainly happen. And so the common human experience of contra-coup injury happens on either side if you land on one side or the front if you land on the back of your head. The face oddly enough tends to be protected.

Aging and a history of multiple concussions is now a major concern in certain sports in particular. And some people have started to write about that. There are people who are in one camp thinking that there may be a dementia like syndrome not unlike boxers get, dementia pugilistic, that occurs from football with repeated concussions over a long career. And there are others who say, no. That's not possible. Those people were predisposed to that kind of condition anyway. And that condition does occur in the general population at some level.

So the jury's still out on that. There is some evidence that predisposition in a genetic sense ... and we can look for that particular marker of genetic predisposition and any injury to the brain leads to a worse outcome. And perhaps even earlier onset of Alzheimer's like changes in that genetic subset of us. But even then we don't know why. And we don't know if there is truly a different way of handling that or a protective approach that we should be using.

I hear from patients all the time that they are different, that they know they're not the same patient they were before. The people that know them best, spouses and family members, will say the same thing. And it's no longer the same John or the same Jane. And the change is really the person's ability to do the high level interaction, the ability to engage in a fluid sense, the core part of that person that allowed for the relationship to develop that they're in. If that's damaged, then the relationship is damaged. That the family is damaged under the circumstances. So the brain itself, which is the core part of our person in all ways, if injured changes the person. And thus, the relationships, family, work, other outside interests. That's all part of who we are.

Pre-existing personality really does set the tone for patterns of recovery and likelihood of extent of recovery and so forth. And so the more we have access to who that person was before an injury occurs, the better we are at looking at the difference from that to a later post-injury person. The other thing that happens commonly is that the pre-existing personality characteristics after traumatic brain injury are usually exaggerated. It's as if the post-injury person has become a caricature of his pre-existing personality. So that the salient features are now even more salient. So if this person was a real pain in the neck beforehand, man are they hard to handle now. And so those sorts of things we know about pre-existing personality and other neurological features that then are a part of the formula that we use to predict and to understand better who that person is afterwards.