

Dr. Jeffrey Bazarian Talks About His Research With the Military

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Dr. Jeffrey Bazarian: I've been involved with DVBIC, the Defense and Veterans Brain Injury Center, trying to develop some guidelines for how to treat mild Traumatic Brain Injury, and also for how to diagnosis it from the field. And I think that DVBIC and the military are really leading the way in that regard, especially with the mild Traumatic Brain Injury, with the milder forms of TBI. There's no civilian organization that has guidelines for how to treat the various symptoms that come up after someone has a concussion. There's no civilian organization that has specific guidelines for how a blow to the head should then lead to some diagnosis of mild TBI in a really systematic way. So I've been really impressed by the amount of effort that has gone into to producing both of these.

I've also been involved with the Institute of Medicine in a committee to try to determine what the long-term health effects of Traumatic Brain Injury are or would be. So if you have a soldier who is hit and has a concussion or a more severe Traumatic Brain Injury, what kind of problems that may crop up in the future could reasonably be ascribed to the initial brain injury.

This conflict in Iraq and Afghanistan has really accelerated the pace of research. The Department of Defense has dispersed quite a bit of funds for research in TBI and Post-Traumatic Stress Disorder and I think that we've gotten a long way in the last five years in terms of diagnosis and in treatment. There's several clinical trials that are about to be started related to TBI. And there's several new diagnostic modalities. One of them is an eye tracker, an eye tracking device that's supposed to be a biomarker of a brain injury after a concussion. The serum markers, a field device that could be used to put someone's blood on it to see whether they've had some brain injury and all of this has really been as a result of these two conflicts.

So most of the Traumatic Brain Injuries that are occurring in Iraq and Afghanistan involve, at least in part, a blast, not solely a blast, but at least in part, some blast from a bomb. And what we've found, or I shouldn't say we, because it's really the researchers that have been involved in the military in Iraq, is that these blast-related injuries behave in special ways. So, for example, patients who, or soldiers who get knocked out from a blast may actually be okay for an hour or two and then start to develop symptoms in a delayed fashion. Where we've found in the civilian world that doesn't happen. People who get hit in the head in a car accident start to develop symptoms pretty soon after the brain injury, within minutes, vomiting and headache. So the symptoms seem to be a little delayed after a blast.

After a blast, it also looks like the brain swells up a lot more than it does after non-blast mechanisms. Soldiers who have had mild or moderate and severe TBI have a lot, a lot of brain

swelling, much more than a similar severity of brain injury by a non-blast mechanism in the civilian world and this is what's led to neurosurgeons being really aggressive about craniectomies, removing a part of the skull immediately and allowing the brain to swell through that whole skull. An interesting finding was there have been many, many cases of blast-related mild Traumatic Brain Injury where a CAT Scan has been done, and has been absolutely negative, no blood at all. Now, in the civilian world, as I told you before, about 5 to 7% of mild Traumatic Brain Injury will have some kind of bleeding on it, but in these blast-related brain injuries, in very few, like zero, that's a very different type of injury. And it maybe because there's more swelling and less bleeding with a blast injury than there is with non-blasts. So it's a very different animal, I think.

After a neurosurgeon performs a craniectomy, and I'm an emergency physician, not a neurosurgeon, but my understanding is that the brain does swell out through the opening that's made in the skull, and that actually helps relieve the pressure inside the skull so that the brain isn't forced through the base of the skull. If the brain is forced through the base of skull, then the patient's heartbeat and breathing will stop, and they die. So this prevents them from dying but as the brain swells out, it does press against the edges of the skull and sometimes that's a problem, at least for the brain around the edges of the skull. The skull is almost always discarded and I'm told because it's usually contaminated from the initial blast and the brain is covered with a protective covering so that it doesn't get infected. Then after the swelling goes down, which is often weeks to months later, that defect in the skull is repaired.

There's a lot of interest in trying to sort out the interplay between the symptoms of a concussion and the symptoms of Post-Traumatic Stress Disorder. It seems like they potentiate each other, they interact somehow. And this is very different than civilian life. Because in civilian life, Post-Traumatic Stress Disorder is rarely seen as a complication of a concussion. It's rare. But it's very common after military TBI. And so we're trying to figure out what the interplay is. I think the leading hypothesis is that the mild brain injury that occurs probably exacerbates or interacts with the stress, the combat stress that soldiers undergo. And the symptoms are much worse than if either one of them was there alone.

In a way, it's hard to think about these things because a soldier may have one or two isolated brain injuries, but it may be consistently and continuously exposed to stress. So that stress is there all the time, all the time. And then interject a brain injury in there. And you could see how they would interact. So there's lots of interplay, a lot of work being done in this area. From my way of thinking, this underscores the need to really have an objective way to know whether someone has had a brain injury. When we know that for sure, then it will really help us understand what the contribution of stress, Post-Traumatic Stress Disorder is to the outcome after these events. But until we have a good way of nailing down whether there's brain injury, yes or no, we have to rely on the symptoms, which are kind of not exact ways to know what's happening in the brain.