Who Is Most Likely to Have Seizures After a Traumatic Brain Injury?

About 2.5 million Americans experience a traumatic brain injury (TBI) each year. TBI is lasting brain damage from a head trauma such as a fall or a car accident, and it can be mild, moderate, or severe. Some people experience seizures—sudden bursts of electrical activity in the brain that can cause occasional jerky body movements or reduced levels of consciousness—after a TBI. These seizures can happen any time, from hours to months or years after the injury. In a recent NIDILRR-funded study, researchers looked at factors that could put people at a higher risk for seizures during the first two years after a TBI. They wanted to see if people who had other conditions before their TBI were more likely to experience seizures after their TBI. They also wanted to find out if receiving surgical treatment for TBI-related complications could affect seizure risk.

Researchers from TBI Model System Centers in Indiana, New York, Pennsylvania, and Virginia analyzed data from 2,136 adults with TBI who were enrolled across 16 TBI Model Systems (TBIMS) centers. All of the participants had a moderate or severe TBI, were at least 16 years old, and received treatment in the hospital within three days of the injury. The researchers used information collected from hospital records to find out how many of these participants developed seizures while they were in the hospital. They also interviewed the participants one year and two years after the TBI and asked them if they had had a seizure during the previous year.

The researchers looked at several factors they thought could affect seizure risk. They reviewed each participant’s personal and medical history before the TBI, such as whether or not the participant had a previous TBI; any mental health conditions; or other issues that might affect their ability to learn, remember, and concentrate. The researchers also asked the participants whether or not they had been incarcerated before their injury. In addition, the researchers also considered injury-related factors like the severity of the TBI; the extent of brain bruising (contusions); and whether or not the participant had received surgery to open the skull bone, either temporarily to access the brain (craniotomy) or more permanently (craniectomy) to relieve brain swelling.

The researchers found that about 9% of the participants had at least one seizure while they were in the hospital recovering from their TBI. During the two-year follow-up period, about 10% of the participants in the total sample had a seizure. The majority of these participants experienced their seizures after discharge from the hospital setting. About 82% of the participants who had a seizure during the first year post-injury did not have one while they were in the hospital for their TBI.
The researchers also found that several pre-TBI factors were related to seizure risk. The participants who had pre-existing health conditions affecting their ability to learn, remember, or concentrate, such as learning disabilities or emotional disorders, were more likely to have seizures in the hospital than those without these conditions. During the follow-up period, the participants who had mental health conditions before their TBI, or who had been incarcerated before their TBI, were also more likely to have seizures. However, having more than one moderate-to-severe TBI did not affect seizure risk.

In addition, the researchers found that participants who had craniotomies or craniectomies were much more likely to have seizures than those who did not, both in the hospital and at follow-up. The participants with more extensive brain bruising were also more likely to have a seizure in the hospital. TBI severity, by itself, did not differently affect seizure risk among individuals who all sustained a significant TBI.

The researchers found that all of this information helped them to reasonably predict who might be at risk for seizure at one or two years after a TBI. The authors noted that predicting who will develop seizures after TBI can help target prevention efforts to those people at the greatest risk. Seizures may develop soon after the injury, or they may have a more delayed onset. In this study, those participants who had mental health conditions before their TBI had a higher risk of seizures in the first two years after TBI. Individuals with mental health conditions may take medications, like antidepressants, that could increase seizure risk. The participants who had been incarcerated were also more likely to develop seizures. These individuals may also have undiagnosed mental health conditions or cognitive or behavioral disorders that may make them more susceptible to seizures.

According to the authors, those participants who had brain surgeries after their TBI had a higher risk of seizures. Although brain operations such as craniotomies and craniectomies may be life-saving and necessary for healing, they can also increase seizure risk. The authors noted that patients who receive these surgeries may benefit from increased monitoring and may also benefit from taking medications to prevent seizures. Future research may be useful in identifying other factors that put people at risk for developing seizures, such as genetic differences.

To Learn More

The Model Systems Knowledge Translation Center (MSKTC) offers an extensive collection of factsheets, educational modules, and InfoComics on TBI and its impact, including a factsheet on seizures after TBI: http://www.msktc.org/tbi/factsheets/Seizures-After-Traumatic-Brain-Injury

Study co-author Amy Wagner, PhD, talks with Brainline.org about seizures and how and why they develop after TBI: http://www.brainline.org/content/multimedia.php?id=7863
To Learn More About this Study

Anne C. Ritter, Amy K. Wagner, et al. (2016) Prognostic models for predicting posttraumatic seizures during acute hospitalization, and at 1 and 2 years following traumatic brain injury. Epilepsia, 57(9), 1502-1014. This article is available from the NARIC collection under Accession Number J74088.

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