

Neurosurgical injuries sustained during the April 2011 tornado outbreak in Alabama

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Neurosurgeons from the University of Alabama at Birmingham (UAB) Medical Center recount their experiences in treating patients with head and spine injuries during the epic April 2011 tornado disaster. The authors focus on injuries sustained on April 27th of that year. Details on these cases and a discussion on the necessity of disaster preparedness are found in "Neurosurgical injuries resulting from the 2011 tornados in Alabama: the experience at the University of Alabama at Birmingham Medical Center. Clinical article," by Joseph H. Miller, M.D., and colleagues, published today online, ahead of print, in the *Journal of Neurosurgery*.

April 2011 was the most turbulent tornado month on record in the US: 758 tornados were identified and 360 people were killed. On April 27th of that year, 206 tornados swept through the southeastern states. Sixty-two tornados struck in Alabama alone, killing 248 people. Two of the Alabama tornados were ranked EF5, the highest tornado rank on the Enhanced Fujita Scale. The [Tuscaloosa](#)-Birmingham EF-4 tornado, which affected the primary catchment area of the UAB Medical Center, resulted in approximately 1500 injuries and more than 60 fatalities.

The authors reviewed the records of 27 [patients](#) who were directly injured by tornados that occurred on April 27, 2011, and were referred to the Division of Neurosurgery at the UAB Medical Center. This facility is the largest Level I [trauma center](#) in Alabama. According to Dr. Miller and colleagues, 26 patients were seen within 36 hours following the tornado disaster; the other patient was seen 6 days later. Adult

patients of all ages were treated; 48 percent of them were women. Twenty-three of the patients had sustained injuries to the spine and [spinal cord](#), and four patients had received intracranial injuries. Two of the 27 patients suffered from both types of injury.

There were few injuries involving the head and brain. Most neurosurgical injuries were spinal, and most of these were limited to the thoracic and lumbar regions. When asked, the senior author, Mark N. Hadley, M.D., provided a possible explanation for the discrepancy between cranial and spine injuries: "These storms were of incredible force and intensity; high circulating winds and remarkable barometric pressure alterations, completely unpredictable. Victims were often displaced 100 yards from where they were seeking shelter, or were crushed under fallen structures. Forces of this type may have immediately ruined victims if they suffered primary head or cervical spinal impact injuries; the thoracic and lumbar spinal columns were perhaps better able to withstand these remarkable forces when thrown against the side of a barn (for example) or a tree or a remaining lamppost. Additionally, locating injured citizens was easy enough if they were visible. Many were buried beneath debris and fallen, collapsed structures. Localization and extrication took hours in most cases, a time frame not favorable for victims with severe primary cranial or cervical spinal cord injuries."

Interestingly, the authors mention that following the tornados, the Children's Hospital in Birmingham saw injuries in children that differed from those found in [adult patients](#) at the UAB Medical Center, despite the fact that adults and children were found in the same locations. Children who required neurosurgery presented with a far greater number of traumatic brain injuries than spinal injuries (11 vs. 1).

Dr. Miller and colleagues describe the extent of the tornado victims' head and [spine injuries](#), the neurosurgical treatments that were

performed, and the patients' outcomes. A year's worth of follow-up data was available for all but four patients. Twenty-two of the 27 patients who received neurosurgical treatment at UAB Medical Center completely recovered from their neurological injuries by the time they were discharged by the hospital. The authors also list the other—often numerous—injuries sustained by each patient on that day and the few (only two) postoperative complications that arose in this group of neurosurgical patients. One patient with multiple injuries died.

The authors discuss some of the mechanisms of [injury](#) that occurred during the storms, address the meteorological events that led to the tornado's ferocity, and discuss the importance of having a disaster plan to face unexpected catastrophic events such as the epic April 27, 2011 tornado outbreak.

More information: Miller JH, Zywicke HA, Fleming JB, Griessenaure CJ, Whisenhunt TR, Okor MO, Harrigan MR, Pritchard PR, Hadley MN. Neurosurgical injuries resulting from the 2011 tornados in Alabama: the experience at the University of Alabama at Birmingham Medical Center. Clinical article. Journal of Neurosurgery, published online, ahead of print, April 23, 2013; [DOI: 10.3171/10.3171/2013.3.JNS121656](#)

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