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## CASE REPORT

## Trauma

# Acute large-vessel occlusion masquerading as traumatic injury

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**Abstract**

A patient presented to an urban level 1 trauma center/accredited thrombectomy-capable stroke center for evaluation of suspected traumatic injury and was quickly determined to have symptoms suspicious for acute stroke that included dense hemiparesis with preserved mental status. He received a thrombectomy with an eventual return to neurologic baseline and discharge to acute inpatient rehabilitation 14 days after presentation.

**KEYWORDS**

critical care, emergency medicine, neurology, thrombectomy, trauma

## 1 | INTRODUCTION

An 87-year-old man with an initially unknown past medical history presented as a prehospital trauma alert to a busy, urban level 1 trauma center for concern of fall with altered level of consciousness. On arrival, the patient was found to have lateralizing symptoms with relatively preserved mental status, and an in-hospital stroke alert was activated. There is a paucity of literature that addresses the potential for trauma patients to be concomitantly or retroactively diagnosed with acute ischemic stroke. Prioritizing time-sensitive workup and treatment for both conditions simultaneously requires collaboration and a combination of elements of systematic trauma and stroke alert processes. This patient had contraindications to systemic tissue plasminogen activator therapy. However, they were a candidate for thrombectomy because of an acute proximal M1 segment occlusion in the left middle cerebral artery diagnosed by CT during the initial evaluation as well as significant deficits likely related to the same occlusion.

## 2 | CASE REPORT

Before presentation, emergency medical services (EMS) had responded to a call placed by the patient's family, who had reportedly

seen him return home, park his vehicle, exit the vehicle and immediately fall to the ground, get up, and then fall again. As per the family's report, the patient had an abrasion to the right forehead and temple area that was apparently present as he exited the vehicle before his falls, but he was found with no other obvious injuries. Because of his visible injuries, a prehospital Glasgow Coma Score (GCS) of 10 (E4V2M4) with lateralizing deficits, and a normal fingerstick glucose, the patient was made a prehospital trauma alert.

Based on the prehospital notification, a level 2 trauma (intermediate level) was activated, and the trauma team consisting of representatives of trauma surgery, emergency medicine, and ancillary services was assembled and waiting when the patient arrived. The patient had an intact primary trauma survey. There were no other obvious injuries besides a right forehead 2-cm linear laceration. However, the patient's presentation was concerning for a flaccid right upper extremity, withdraw to pain on the left, and an associated expressive aphasia. The patient's consciousness was relatively preserved. Because of these findings, specifically the preservation of mental status in the setting of significant unilateral deficits and aphasia, which is atypical for traumatic brain injury or spinal cord injury, a stroke alert was activated because of the suspicion that cerebrovascular accident (CVA), rather than traumatic brain injury (TBI), best explained his mental status. The patient's fingerstick glucose in the emergency department was normal.

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He also had a negative focused assessment with sonography in trauma (FAST) study performed at bedside.

With the assembled emergency department, trauma, and now neurology teams at bedside, the patient was expeditiously moved to the CT scanner and received comprehensive imaging, including a head CT without contrast; CT angiography of the head and neck; and CT scans of the chest, abdomen, and pelvis with contrast. Preliminary reads of the head CT without contrast as well as the CT scans of the chest, abdomen, and pelvis were not concerning for acute hemorrhage or injury. However, the CT angiography of the head and neck was concerning for thrombus and embolus of the left carotid bifurcation, extending into the proximal internal and external carotid arteries with occlusion of the proximal left external carotid artery and high-grade stenosis of the proximal left internal carotid artery. In addition, the CT angiography found an occlusion of the M1 segment of the left middle cerebral artery with minimal distal reconstitution.

As the patient's presentation was now explained by ischemic stroke caused by a large-vessel occlusion without evidence of associated significant traumatic injury, the trauma service signed off the case, deferring further management to emergency medicine and stroke neurology. At this point, the patient's National Institutes of Health stroke score was 19, with deficits in level of consciousness, motor strength, articulation, and extinction. The patient had an unknown prehospital modified Rankin score, although presumed to be low (0 or 1) as the patient was independently driving a motor vehicle just before presentation. The patient's past medical history was expanded to include hypertension after a thorough review of available external records. In addition, the last known normal time was unknown, and there was no family at bedside to corroborate the prehospital clinical history, full past medical history, medications, or any baseline neurologic deficits. For this reason as well as the external evidence of minor closed head injury, thrombolysis was deferred because of the lack of pertinent information to stratify the risk of hemorrhagic conversion. However, because of the presumed acute nature of the patient's condition as well as the evident large-vessel occlusion on CT angiography, he was considered to be a viable thrombectomy candidate. As an accredited thrombectomy-capable stroke center (an intermediate level between primary and comprehensive stroke centers), interventional radiology is available 24 hours a day to perform mechanical thrombectomy. Consequently, the patient was rapidly transferred to the interventional radiology suite, where he underwent successful suction thrombectomy with subsequent Thrombolysis in Cerebral Infarction 3 flow established.

He was eventually discharged to an acute inpatient rehabilitation facility on day 14 of his in-patient stay.

### 3 | WHY AN EMERGENCY PHYSICIAN SHOULD BE AWARE OF THIS

A review of the medical literature revealed scant sources dedicated to discussing the issue of acute ischemic stroke leading to traumatic injury. It is unclear why there is a deficit of knowledge on this subject.

This may be due to it being an uncommon condition or perhaps because it is a challenging diagnosis for emergency physicians to make. An evaluation of the majority of the relevant existing literature—primarily 3 articles that include 2 single-center, retrospective chart analyses and a case report—reveals that, even among those clinicians intentionally seeking to explore this diagnosis more fully in both real time and via literature/chart review, the diagnosis is difficult to make and difficult to elucidate from the existing information. Furthermore, if a patient is identified as suffering from a CVA that itself functioned as the causative etiology for the traumatic injury, there is frequently a delay in correctly identifying stroke as the reason for the patient's injuries, sometimes by several days.

For example, in a study from 1996,<sup>1</sup> Finelli and Lee sought to characterize the incidence of acute stroke leading to motor vehicle accidents at a single center in Connecticut. Of 2844 ischemic strokes admitted to the center, only 4 were identified with a motor vehicle accident, with an overall incidence of 0.1%. Furthermore, in the same study, in only 1 of the 4 cases was the correct cause and effect (stroke leading to motor vehicle accident) suspected at the time of initial evaluation. In another study from 2018,<sup>2</sup> a retrospective study of 192 trauma patients admitted to a single-center emergency department between September 2012 and November 2015, the authors found that 11 of these patients, or 5.7% of the cohort, were eventually also diagnosed with acute ischemic stroke. Importantly, none of the patients were diagnosed with stroke on initial presentation to the emergency department, although 4 had neurologic deficits present on initial examination. A neurology consultation was not obtained in the emergency department for any of these patients during initial triage, and the median time to acute ischemic stroke diagnosis was 2 days.

This delay was not the case with our patient. As an overview regarding stroke care and prehospital emergency medicine services, EMS are trained to use prehospital stroke severity assessment tools to appropriately categorize patients as suffering from a potentially occlusive stroke that could benefit from either thrombolysis or thrombectomy at appropriate centers. These assessment tools are incorporated into both local and national guidelines. In the case of the Cincinnati Prehospital Stroke Scale, the most widely disseminated tool and the tool used by our local EMS agency, the 4-point scoring system is used to rule out CVA. A recent meta-analysis<sup>3</sup> demonstrated a sensitivity of 82% and a specificity of 57% when used by EMS, akin to other validated scoring systems. The 2018 American Heart Association/American Stroke Association guidelines<sup>4</sup> recommend that patients with a positive stroke screen or strong suspicion of stroke should be transferred to the nearest facility capable of thrombolysis. In the case of our patient, the prehospital assessment noted the patient to have a GCS of 10 as well as withdrawing to pain on the left side only with a normal finger-stick glucose. Because the deficits were coupled with a potential traumatic history, in this case a fall in the setting of driving, a prehospital trauma alert was called instead of a stroke alert although EMS considered CVA as a secondary diagnosis.

Current Advanced Trauma Life Support guidelines incorporate both a primary and secondary survey to rule out significant traumatic injury. The primary survey emphasizes evaluation of a patient's neurologic

status as part of the disability subevaluation. In turn, the GCS, which is validated to predict mortality in trauma patients suffering from acute brain injury,<sup>5</sup> is used by many clinicians as a shorthand for neurologic function during the primary survey and the necessity for certain interventions based on concern for decompensation, including endotracheal intubation (“A GCS less than 8, intubate”).

It is important to note that trauma, as a predisposing etiology, is an independent risk factor for stroke in general. A retrospective cohort study from 2013<sup>6</sup> that evaluated 1,173,353 trauma patients, including 436,630 with TBI, found an association between TBI and ischemic stroke, with this relationship persisting through secondary analysis even after accounting for multiple known risk factors including hypertension. Although the absolute risk for ischemic stroke in patients with TBI versus those without TBI in this study was small, it conforms to an understanding that injuries to the cerebral vasculature, particularly blunt trauma or injuries leading to cerebral or vertebral artery dissection, can lead to ischemic stroke and to worse functional and cognitive outcomes.

Physicians should be conscious to not allow diagnostic momentum that is generated by following an established evaluation pathway to lead to premature closure. Recognition of the classic clinical syndrome of hemiparesis and aphasia in an undifferentiated patient is diagnostically easier than a patient believed to be suffering from head or spine trauma.

In this case, the lack of depressed mental status was a helpful clue and indicative of how this case can serve future emergency physicians. Rather than proceeding in series, by ruling out traumatic injury and then returning to the CT scanner to evaluate for large-vessel occlusion, the treating physicians used this important diagnostic clue, coupled with a normal fingerstick glucose and lateralizing features, to proceed in parallel to expedite the correct diagnosis and treatment. Their quick consultation to neurology proved instrumental in ultimately getting the patient the morbidity-altering intervention required. Although not every center possesses resources equivalent to our dual level 1 trauma center and thrombectomy-capable stroke center, if available the assistance of multiple consultants at the same time is helpful in managing these diagnoses. Load the boat, so to speak, and understand that a correctly identified large-vessel occlusion initially obscured by a traumatic history is worth the inevitable extra people in the trauma or resuscitation bay.

## 4 | CONCLUSION

We suggest that emergency and trauma clinicians caring for patients who are injured should pay attention for significant unilateral symptoms with a relatively preserved level of consciousness as potential clues to acute stroke as a cause of the patient’s injury.

## CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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