Dynamic Chiropractic

DIAGNOSIS & DIAGNOSTIC EQUIP

Stroke and the Motor-Vehicle Accident: Clinical Safeguards

Troy Freiheit, DC | DIGITAL EXCLUSIVE

Stroke is a rare, but very serious outcome of motor-vehicle accidents. This article focuses on the incidence, signs and symptoms of possible stroke predictors that may be observed in practice when caring for patients involved in an MVA, including a review of clinical safeguards.

Stroke syndrome is defined as a condition caused by sudden onset of an acute vascular lesion due to hemorrhage, embolism, thrombosis or rupturing aneurysm. The result may be headache, neck pain, hemiplegia, hemiparesis, vertigo, numbness, aphasia, dysarthria, drop attacks and even death.[1-2] Traumatic stroke syndrome is the result of a preceding incident.

In relation to motor-vehicle accidents, (MVA), these preceding incidents may be defined as penetrating injuries and blunt-force trauma to vascular anatomy directly and/ or indirectly.[3] Penetrating (straightforward) injuries can occur as a result of a motor-vehicle collision; however, such injuries are more likely associated with workplace and home vascular accidents, warfare and assault variations, including sharp, penetrating injuries and gunshot wounds (GSW).

Blunt-force trauma (non-straightforward), which is common in motor-vehicle collision injuries, can occur with or without actual impact of the patient's body against a surface. Traumatic vascular injuries comprise both penetrating and blunt-force injuries.[3]

Steve Allen was a famous entertainer who hosted "The Tonight Show," among other notable accomplishments. He perished in 2000 as a result of a minor automobile collision that resulted in a penetrating traumatic vascular injury. A delay of symptoms involving traumatic vascular injuries is not uncommon.[4]

Blunt-force trauma injuries are more frequently seen in chiropractic practice, as opposed to penetrating injuries. Blunt-force trauma to the cranium is categorized as traumatic intracranial hemorrhages (TIH). Depending upon the location of the traumatic bleed, TIH results in traumatic intracerebral hemorrhage (coup and contrecoup contusions), traumatic subarachnoid hemorrhage, acute subdural hematoma and acute epidural hematoma.

Traumatic brain injury (TBI), ranging from concussion to coma, can result from head trauma.[3,5-6] Non-contrast CT is the preferred imaging modality method to identify suspected TIH injuries.[5]

Traumatic intracranial hemorrhages should be a consideration when the patient has been rendered unconscious or there has been a direct impact of the skull against a hard object. However, even when there has only been minor impact damage to the vehicle, a TIH can occur. Head impact against a side window, windshield, steering wheel, dashboard, flying objects within the vehicle or impact even with a co-traveler have resulted in TIH injuries.

Frequent symptoms associated with TIH include headache, vomiting, vertigo, confusion, deteriorating levels of consciousness and nuchal rigidity.[5-6] The patient with TIH will often have a coexisting vertebral artery injury (VAI).[9]

Simon writes that physicians treating MVA patients should not automatically assign symptoms of confusion and drowsiness to TBI, but should also be on the lookout for other signs of a traumatic intracranial hemorrhage.[12]

Blunt-force trauma to the cervical spine may result in a spinal subarachnoid hemorrhage (SSAH), spinal subdural hematoma (SSH), spinal epidural hematoma (sEDHs), vertebral artery injury (VAI), vertebral basal injury (VBI), and blunt carotid injury (BAI).[3,7] Croft identifies reports Indicating that VAI is more common than originally thought owing to increased awareness of the injury and improved diagnostic abilities through advanced imaging.[8-9] These injuries oftentimes go undetected, largely due to

the compensatory nature of the contralateral vertebral artery; and thus remain asymptomatic initially.[3]

Traumatic VAIs are often devastating and have a reported stroke rate of 24% and mortality rate of 8%.[12] Motor-vehicle accidents are the primary cause of traumatic VAI.[9]

Trauma is the most common etiology of the development of immediate VBI.[10] Parbhoo, et al., demonstrated that 25% of individuals involved in a high-velocity flexion-distraction mechanism of injury (MOI), with or without rotational force, developed evidence of the VBI on MRI.[10]

It is important to understand the patient's position at the time of impact to ascertain if a VBI injury is likely. A head-on collision could produce this type of MOI. Trauma by way of cervical acceleration deceleration (CAD) injuries, even when minor, to the cervical spine is a common cause of vertebral artery injury.[11]

Hyperextension with rotation can cause traction of the mostly fixed vertebral artery and is a frequent

cause of VAI.[12] The VAI injury occurs in the vicinity of C1-2 and C6 due to the artery's attachment to the skull base and cervical spine, respectively.[11]

Typical VBI signs and symptoms, similar to some CAD injuries, include headache, neck pain, dizziness, diplopia, dysarthria, diminished pupillary light reflex, nystagmus, blurred vision, epistaxis, nausea and impaired sensation to the face.[10,12-13] A deviated tongue on protrusion noted on CN 12 testing may indicate a vertebral basilar compromise.[10] The patient may initially have no symptoms or even just neck pain.[10,15]

Most commonly, VBI symptoms occur within the first 24 hours following the injury.[15] However, neurological symptoms may not develop for up to 90 days post VBI injury in some cases.[15] Although highly unlikely, stroke can occur up to 12 weeks after the initial advanced imaging evidence of arterial dissection is obtained.[14]

Blunt carotid artery injury (BCI) following motor-vehicle trauma can predispose the patient to carotid artery compromise, with some symptoms that mimic those typically found in a whiplash patient. The mortality rate associated with BCI injury is 44.5%.

Stroke rate is higher with BCI than TAI, and BCI has a higher mortality rate.[9] Most affected are drivers who are belted with lap and shoulder restraints. The restraining devices are commonly considered to be the primary injury source. Headaches, ataxia, visual loss, hemiparesis, Horner syndrome, neck swelling, focal tenderness, and epistaxis are the most common BCI symptoms. Bruit is observed infrequently.

An observed seat belt contusion, the “seat belt sign,” even if minor, should alert the examiner to the possibility of BCI.[3,9] Immediate CT scanning or MRI is the preferred imaging method to evaluate BCI.[16-17]

Practitioner and Patient Safeguards

The most important safeguard measure is to be aware of the signs, symptoms and the patient's historical account of the collision factors. Stroke, a rare but possible sequela of cranial and cervical spine blunt-force trauma, should be a differential diagnosis whenever evaluating a patient involved in a motor-vehicle collision.

References

1. Stroke Syndrome. *Dorlands Illustrated Medical Dictionary, 26th Edition*. Philadelphia: WB Saunders Company: p. 1298.
2. Glasgow K, et al. *Aspects of Manipulative Therapy.* Melbourne: Churchill Livingstone, 1985: pp. 168-169.
3. Evans R. *Neurology and Trauma*. Oxford University Press, Inc, 2006: pp. 167-176.
4. Allen S. Wikipedia: https://en.m.wikipedia.org/wiki/Steve_Allen.
5. Evans R, *Op Cit*: pp.156-164.
6. Reitan R, Wilson D. *Traumatic Brain Injury*. Tuscon, AZ: Neuropsychological Press, 1986: pp. 27-38.

7. Rumboldt Z. *Clinical Imaging of Spinal Trauma, A Case Based Approach*. Cambridge, UK: Cambridge University Press, 2018: pp. 79-87.
8. Foreman S, Croft C. *Whiplash Injuries: The Cervical Acceleration/Deceleration Syndrome, 3rd Edition*. Philadelphia: Lippincott Williams & Wilkins, 2002: pp. 353.
9. deSousa, R. Crocker, M, et al. Blunt traumatic vertebral artery injury: a clinical review. *Euro Spine J*, September 2011;20(9):1405-1416.
10. Chids J, et al. Screening for vertebral basilar insufficiency in patients with neck pain: manual therapy decision-making in the presence of uncertainty. *JOSPT*, May 2005;35(5).
11. Evans R, *Op Cit*: pp. 170-172.
12. Simon L, Nassar A, Mohseni M. *Vertebral Artery Injury*. Treasure Island, FLA: StatPearls Publishing, January 2024.
13. Glasgow EF, et al, *Op Cit*: pp. 166-169.
14. Brown S. "The 'Chiropractic Stroke': It Does Exist and We Must Do More to Prevent It." *Dynamic Chiropractic*, December 2019.
15. Rumboldt Z, *Op Cit*: p. 87.
16. Nordoff L. *Motor Vehicle Collision Injuries*. Sudbury, MA: Jones and Bartlett Publishers, 2005: p. 170.
17. Rumboldt Z, *Op Cit*: p. 87.

APRIL 2024