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Article

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Karthikeyan Y.R., Sanjeev Chopra, Somnath Sharma, Devendra Purohit
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Post traumatic vertebro basilar dissection: case report and review of literature

Karthikeyan Y.R., Sanjeev Chopra, Somnath Sharma, Devendra Purohit

Department of Neurosurgery, SMS Medical College, Jaipur, INDIA

Abstract: Posterior circulation territory stroke following mild head injury is a known entity although rarely seen. Numerous case reports appear in literature from time to time highlighting this complication. Blunt trauma to the head and neck possibly causes injury to the vertebrobasilar system in the form of angiorrhexis, subintimal, intramural and perivascular hemorrhage which causes secondary narrowing of the injured vessel. These processes can be complicated by progressive thrombosis & vascular occlusion. Here we are reporting a case of post traumatic vertebra-basilar dissection causing bilateral cerebellar and brainstem infarct.

Key words: vertebral artery dissection, post traumatic, head injury, posterior fossa infarct

Introduction

Blunt cerebro vascular injury (BCVI) encompasses a spectrum of disease processes due to damage of the vertebral and carotid arteries. In the current era of trauma epidemic with increasing number of high velocity motor vehicle accidents, these injuries become more relevant. They may present immediately or in a delayed fashion. High index of suspicion and thorough screening is of utmost importance. Here we report one such case with the review of literature.

Case summary

A 50 year old gentleman presented to us with a history of high speed motor vehicle accident. On examination the patient was unconscious, intubated, had no respiratory effort and no motor response to pain. No obvious external injury was seen except for lacerated wound over the forehead. Pupils were bilaterally pinpoint and not reacting to light. NCCT brain showed large acute infarcts involving bilateral cerebellar hemispheres, medulla, pons and mid brain (Figure 1). Focal acute infarcts were also seen in the left thalamus and left medial temporal lobe. CT cervical spine showed fracture of the clivus and the occipital bone in the midline extending upto the groove for the vertebral artery bilaterally. Fracture of left transverse process of C2 vertebra was also noted. CECT chest and

abdomen was unremarkable. In view of the suspected vascular injury, a four vessel carotid angiography was contemplated. There was no enhancement in V3 and V4 segment of left vertebral artery and almost the entire length of basilar artery sparing its tip suggestive of complete occlusion with a likely possibility of post traumatic dissection.V1 and V2 segments were of normal caliber with no evidence of filling defect suggestive of thrombosis (Figure 2 and Figure 4). Lt vertebral artery was seen to arise from the aortic arch. Right vertebral artery was of normal caliber (Figure 3). Both the common carotids and bilateral internal and external carotids were of normal caliber. The patient was managed conservatively but he succumbed to his condition within 24 hours of admission.

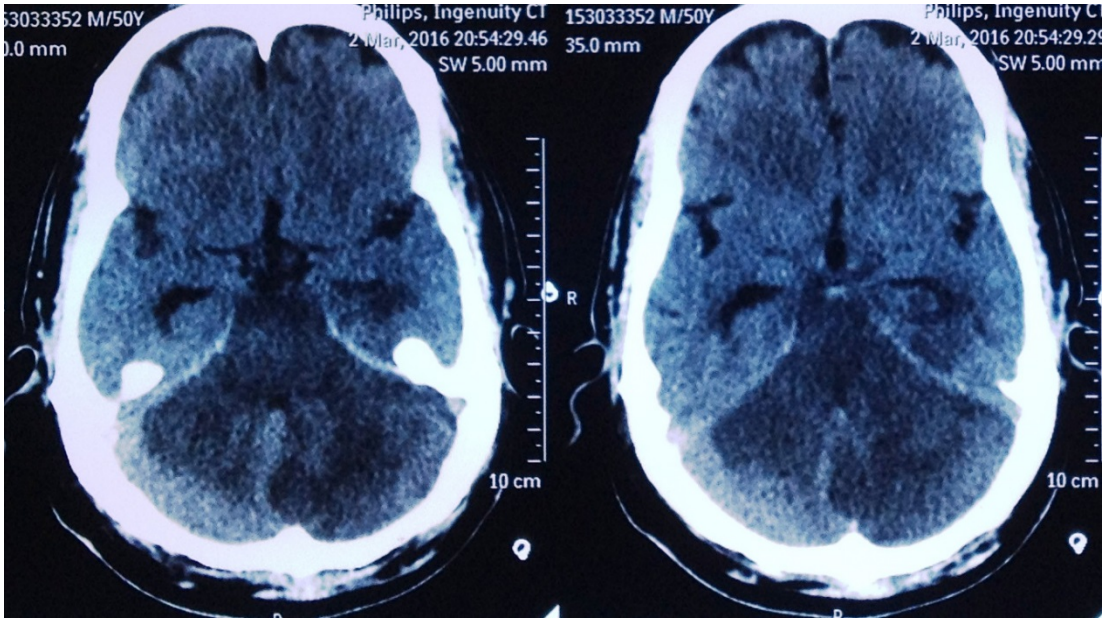

Figure 1 - Computed tomography brain showing large acute infarcts involving bilateral cerebellar hemispheres and brain stem

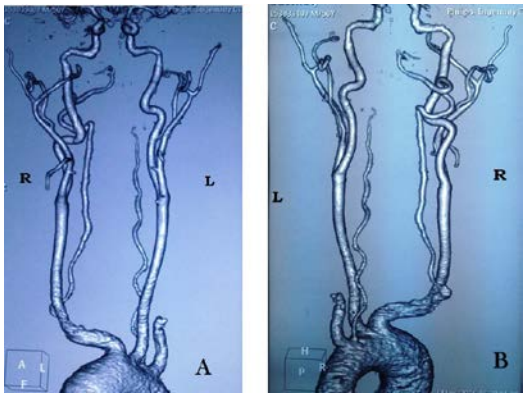

Figure 2

A: CT angiography brain showing no enhancement in V3 and V4 segment of left vertebral artery and almost the entire length of basilar artery.normal right vertebral artery

B: Anomalous origin of left vertebral artery from the aortic arch

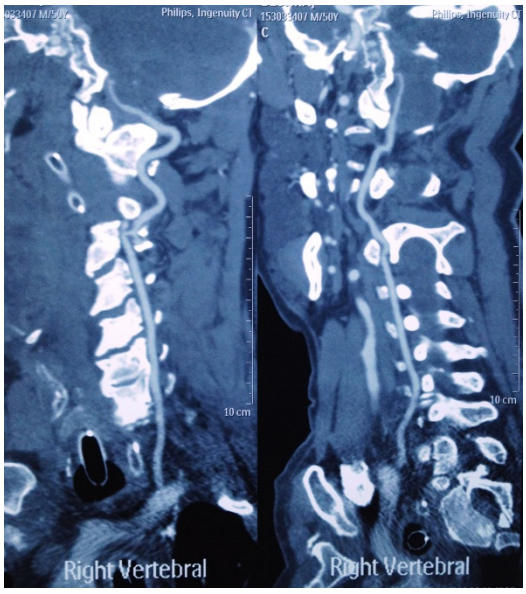

Figure 3 - Normal right vertebral artery

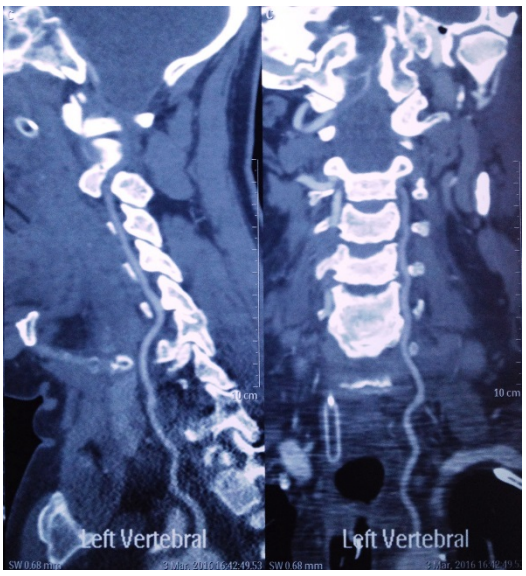

Figure 4 - Absent flow in V3,V4 segment of left vertebral artery

Discussion

Blunt cerebro vascular injury (BCVI) encompasses a spectrum of disease processes due to damage of the vertebral and carotid arteries. The reported frequency is between 0.5% and 1.55% of all cases of blunt trauma. The common causes of BCVI include motor vehicle collision followed by a fall from height. Extensive skull base fracture, cervical fracture, cervical soft tissue hematoma and facial fracture are common high risk factors for BCVI. Of great clinical significance is that BCVI can occur even after a minor impact such as cervical traction, contact sports and chiropractic manipulation.

Neck vessel injury is probably an under diagnosed complication of head or cervical spine trauma. A high index of suspicion followed by early recognition of these

complications is absolutely essential to prevent poor outcomes. The commonest site of vertebral artery dissection seems to occur at C1-C2. (1) Most common fracture patterns described are subluxations, upper C1 to C3 body fractures and transverse foramen fractures, while spinous process fractures of the lower cervical spine are rarely reported. (5) In our patient we found fracture of the left transverse process of C2 vertebra.

Predisposing conditions include infections, fibromuscular dysplasia, hereditary connective tissue diseases, hyperhomocysteinemia and migraine. Dissections are commonly sub-intimal and cause stenosis (48%) or occlusion (35%). Sub-adventitial dissections form pseudo aneurysms (17%), which can rupture intracranially causing sub-arachnoid hemorrhage. (3)

Posterior fossa infarcts following trauma are often a result of vascular dissections, vertebrobasilar spasm, embolization or systemic hypoperfusion. Posterior inferior cerebellar artery (PICA) territory is the commonest territory involved followed by superior cerebellar infarcts. (6)

The mechanism of injury in patients with blunt trauma is not entirely clear. Hyperextension and rotation, direct blows to the neck, intraoral trauma and basilar or other skull fractures have been suggested as possible mechanisms. In a patient with polytrauma, it is often difficult to ascertain the exact mechanism of injury. It seems likely that stretching and twisting of the vessels or impalement against the transverse processes of the vertebral bodies or a fractured bony fragment may result in these injuries. No definite evidence exists to support these hypotheses. Whether a local deficiency in elastic fibers or other structural abnormalities may account for the frequent location of blunt injuries in the ICA has not been established. (2) In our case the mechanism of injury is most likely to be due to a combination of hyperextension, rotation and direct trauma to the neck secondary to high speed motor vehicle accident.

Although penetrating injury to the cervical vessels is usually readily suspected, blunt injuries may be elusive. Their relative infrequency (3% to 10% of cervical arterial injuries) and their common association with other injuries especially closed head trauma, render their diagnosis more difficult. Symptoms of extracranial vertebral dissections may occur at any time from minutes to days after trauma. In some cases the delay may be extended up to six weeks which may confound the diagnosis. Delayed onset of detectable neurologic deficits characteristically leads to delay in diagnosis. (2)

The Denver Screening criteria provide a screening protocol for BCVI based on injury mechanisms, injury patterns and symptoms (Table I). This protocol can identify trauma patients at risk for BCVI with a sensitivity of 97% and a specificity of 42%. (5)

TABLE I

Denver Screening Criteria for BCVI
• Signs/symptoms of BCVI
o Arterial hemorrhage
o Cervical bruit
o Expanding cervical hematoma
• Focal neurologic deficit
o Neurologic examination incongruous with head CT scan findings
o Stroke on secondary CT scan
• Risk factors for BCVI
o High-energy impact with:
o LeForte II or III fracture
o Cervical-spine fracture patterns:
o subluxation, fractures extending Into the transverse foramen
o fractures of C1-C3
o Basilar skull fracture with carotid canal involvement
o Petrous bone fracture
o Diffuse axonal injury with GCS score <6
o Near hanging with anoxic brain injury

The most common aortic arch branching pattern includes three main branches namely brachiocephalic, left common carotid and left subclavian. Other branching patterns are formed due to the increased or decreased number of branches and their formation. In some cases, there are two aortic branches. The first branch includes the common trunk of right subclavian, right common carotid and the left common carotid arteries. The second branch is related to the left subclavian artery. This aortic arch branching pattern is called Bovine aortic arch. Some variations of the aortic arch branches are rare such as the presence of retroesophageal right subclavian artery as the last branch of the aortic arch. In a study in 2006 by Nayak et al on 62 human cadavers in India, 94% of the patients had a normal aortic branching pattern and 4.8% of them had a common origin for the carotid arteries. Doubled trunk branching and the right subclavian branching from aortic arch were observed in 1.6% of cases. In their study, the left vertebral artery branching from the aortic arch was reported in 1.6% of cases. (1) In our patient the left vertebral artery was seen to arise from the aortic arch. Though an incidental and rare finding on angiography, it possibly may have played a role in the etiopathogenesis of the injury due to abnormal long course of the vessel predisposing it traction injury and consequent dissection.

Here we are reporting a rare case of BCVI which presented with isolated posterior fossa infarct which was associated with an anomalous origin of the left vertebral artery. BCVI is a rare but well-documented clinical entity with a wide spectrum of clinical features. In the current era of trauma epidemic with high velocity trauma the incidence of BCVI

and its complications are expected to be on the rise. High index of suspicion in appropriate clinical situations is the key to early diagnosis and prompt management to improve clinical outcome.

Correspondence
Dr. Devendra Purohit
Professor Neurosurgery
Department Of Neurosurgery
SMS Medical College, Jaipur
Mail: devendrapurohit@rediffmail.com
Contact: +91 9829190335

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