Thrombosis of the Vertebral Artery from Hyperextension Injury to the Neck

Case Report

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TEMPORARY and permanent occlusion of the vertebral artery by rotation or hyperextension of the neck has been reported in association with chiropractic manipulations, head trauma, the application of tong traction, and voluntary movement. Many of the cases ended fatally, with thrombosis demonstrated at autopsy extending from some point in the cervical vertebral artery to involve the posterior-inferior cerebellar and basilar arteries. In some patients who survived, this pathology was suspected on the basis of the development of a Wallenberg's syndrome following the injury. In most instances the diagnosis has been made at autopsy.

We could find no reports similar to our present case in which bilateral traumatic vertebral artery occlusion was demonstrated in the living patient by arteriography and no instance in which endarterectomy was performed. The present case also demonstrates a unique injury of the cervical spine which apparently predisposed the patient to delayed posttraumatic vertebral artery occlusion.

Report

A 40-year-old Negro cab driver was involved in an automobile accident on May 8, 1965. After the injury he was confused and disoriented, but there was no definite history of unconsciousness.

Examination. When admitted to Philadelphia General Hospital, the patient was able to move all extremities in response to pain, but demonstrated a fluctuating level of consciousness. A laceration along the anterior rim of the mandible was sutured. The blood pressure was 140/70 mm Hg on admission, pulse 80 and regular, and respirations 15 per min. Episodes of conjugate deviation of the eyes to the right were noted sporadically. The deep tendon reflexes were equal and symmetric throughout, although there was a left extensor plantar response. Marked neck stiffness was noted on admission, and a lumbar puncture demonstrated bloody spinal fluid under normal pressure.

During the ensuing hours the patient's level of consciousness improved somewhat and he was able to converse and follow commands. X-rays of the skull and cervical spine were initially reported as normal except for congenital fusion of the bodies at C-4 and C-5. Further review of these x-rays (Fig. 1) revealed an anterior widening of the C3-4 and C5-6 disc spaces. Also, a thin rim of bone continuous with the anterior margin of the C-5 body was elevated away

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Fig. 1. X-ray of lateral cervical spine. The C-4, C-5, bodies are congenitally fused. The intervertebral disc spaces between C3-4, C5-6 are disproportionately widened anteriorly (distraction). A thin segment of bone is separated from an irregular anterior-inferior surface of the body of C-5 (arrow).
from its lower border, which also demonstrated a slightly irregular, poorly defined margin. In the frontal projection of the cervical spine there was slight widening on the left side between the articular pillars of C-5 and C-6.

The patient continued to improve, and on the following morning he was less confused without significant changes in the neurological examination. Because of thick secretions in the oropharynx and tracheobronchial tree, a catheter was passed through his nose for aspiration. During the aspiration, he coughed quite vigorously and lifted his chest from the bed allowing his head to fall back. He suddenly became apneic. When spontaneous respirations did not return, a tracheostomy was performed, after which more secretions were aspirated and assisted respiration begun. He required only a few minutes of assisted respiration before spontaneous breathing developed. Following this episode, ptosis of the right eyelid, miosis of the right pupil, and anhydrosis limited to the right side of the face were noted. Hypertension and tachycardia developed, but vital signs stabilized over the next few hours, although the patient became less alert. His response to pain became sluggish, and he demonstrated little or no comprehension of speech even though his eyes were open.

A right common carotid angiogram (Fig. 2) showed no midline shift nor evidence of either intracerebral or subdural hematoma. Retrograde filling of the basilar artery occurred down to the level of the basivertebral junction through a large right posterior communicating trunk, with no evidence of washout from vertebral flow. A retrograde right brachial angiogram revealed a small right vertebral artery which arose normally from the subclavian and was completely occluded at the level of the C2-3 intervertebral disc space (Fig. 3 left). A left retrograde brachial angiogram demonstrated a large left vertebral artery that was completely occluded 2½ cm from its origin (Fig. 3 right). At the level of C-2, the left vertebral artery refilled via muscular collateral branches from a large ascending cervical branch of the thyrocervical trunk. There was no flow cephalically in the reformed vertebral trunk; however, retrograde flow occurred down to the level of C-4.

Operation. The patient was taken immediately to the operating room. The left vertebral artery was approached anterolaterally, and a gross blush discoloration could be seen on its surface just as it entered the foramen transversarium of C-6. A linear incision was made in the vertebral artery and some currant jelly-like acute clot was removed, without backflow. A small Fogarty catheter was passed up the vertebral artery, then withdrawal with the balloon expanded, and further clotted material was evacuated followed by only moderate backflow. The operation failed to alter the patient's clinical condition; he died approximately 9 hours after surgery.

Postmortem Examination. The laceration and soft tissue injury in the region of the mouth and jaw were noted. The cervical spine when hyperextended showed distraction of the disc spaces (that is, separation of the vertebral bodies with rupture of the anterior longitudinal ligament) at C3-4 and C5-6. There was no evidence of fracture of the vertebral bodies, lamina or their articulations. The left vertebral artery was patent

Fig. 2. Lateral right carotid angiogram. Mid arterial phase demonstrating persistent retrograde filling of entire basilar artery (arrow) via the posterior communicating trunk.

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from its origin on the left subclavian artery to the point where it entered the cervical spine at C-6. A bluish discoloration extended around the vessel for a distance of approximately 1 cm. This artery was completely occluded with fresh thrombus which extended into the posterior-inferior cerebellar arteries and completely involved the basilar artery to its bifurcation. The posterior and inferior portions of the cerebellum were softened, the softening extending medially to involve the entire central and inferior portion of the cerebellum. The pons and the medulla were not definitely softened, indicating that perhaps the basilar artery occlusion was more recent than that involving the posterior-inferior cerebellar arteries. The angiographic demonstration of active retrograde flow down the basilar artery from the carotid system would indicate this. The cerebral cortex was swollen, with diffuse areas of cortical contusion.

Serial transverse sections of the left vertebral artery at its point of entry into the foramen transversarium (the site of the surface contusion) demonstrated extensive hemorrhagic dissection up the media of the artery (Fig. 4).

**Discussion**

The pathophysiology of this occlusion is apparently similar to cases described previously. Carpenter's case demonstrated thrombosis of the left vertebral artery as it entered the foramen transversarium at C-6. Apparently, with extreme hyperextension of the neck, the artery is stretched across the bony fulcrum with sufficient force to disrupt the vessel wall and initiate the dissection.

The minimal anterior widening of the two intervertebral disc spaces and the separation of the thin rim of cortex from the inferior margin of C-5 apparently represent the distraction of the disc spaces with rupture of the anterior longitudinal ligament demonstrated at post mortem examination. Since
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The syndrome of traumatic occlusion of the cervical vertebral artery should be suspected when cerebellar and brain stem signs follow a hyperextension injury to the neck. The recognition of distraction of the cervical vertebrae on x-ray following trauma indicate the need for immediate cervical traction to mobilize the instability incident to a tear of the anterior longitudinal ligament. Failure to recognize and treat this lesion could result in delayed vertebral thrombosis and death. If surgical revascularization is to be of value, it would be in those cases where the local occlusion is treated surgically before dissection or propagating thrombosis develops. The extent of the occlusion can be determined angiographically by identifying the level of reconstitution of the vessel through muscular collaterals.

Summary

A case of dissecting medial hematoma of the vertebral artery secondary to hyperextension of the neck and stretching of the artery over the bony foramen transversarium of C-6 has been described. Early recognition of the cervical spine injury and the importance of prompt prophylactic cervical traction have been emphasized. When signs of progressive vertebral artery thrombosis are evident, emergency confirmation by angiography followed by surgical relief in appropriate cases, must be seriously considered.

References


