Extracranial Vertebral Artery Pseudoaneurysm Presenting as Subarachnoid Hemorrhage

Stuart S. Kaplan, BA; Christopher S. Ogilvy, MD; Ramon Gonzalez, MD; Daryl Gress, MD; John Pile-Spellman, MD

**Background and Purpose:** True aneurysms of the extracranial vertebral artery are rare. The usual pathogenesis of aneurysms in this location is either penetrating or blunt trauma with resultant pseudoaneurysm formation. We report a postpartum patient with a presumed traumatic pseudoaneurysm of the extracranial vertebral artery presenting with subarachnoid hemorrhage.

**Case Description:** A 41-year-old woman had three episodes of neck stiffness 1 month after an uncomplicated vaginal delivery. The last episode, 3 days before admission, was accompanied by intense neck and head pain and paresthesias that extended into the left arm, thumb, and forefinger.

**Results:** Lumbar puncture showed subarachnoid hemorrhage. Angiography revealed a left vertebral artery dissection from C6-7 to C3 with pseudoaneurysm at C5-6. Computed tomography demonstrated impingement of the C6 root at the foramen by this lesion. The lesion was successfully treated by balloon occlusion of the vertebral artery.

**Conclusions:** We present a patient with an extracranial vertebral pseudoaneurysm with subarachnoid hemorrhage and cervical root impingement. To our knowledge, this is the first case of such a lesion presenting as subarachnoid hemorrhage. The lesion was successfully treated using endovascular techniques. (Stroke. 1993;24:1397-1399.)

**KEY WORDS** • embolization, therapeutic • subarachnoid hemorrhage • vertebral artery

Aneurysms of the extracranial vertebral arteries are rare, with blunt or penetrating trauma the usual cause.1-16 Their unusual occurrence is thought to be due in part to the relatively protected location of the vertebral artery coursing within the foramina transversaria of the cervical vertebrae. When lesions occur in the first and second portion of the vertebral artery, they are usually caused by penetrating trauma. In contrast, when pseudoaneurysms occur in the third portion of the vertebral artery, they are usually associated with blunt trauma or flexion-extension injuries of the neck. We describe a postpartum patient with a presumed traumatic pseudoaneurysm of the extracranial vertebral artery presenting with subarachnoid hemorrhage. Angiography revealed a dissection of the vertebral artery from the C6-7 level to the C3 level with a pseudoaneurysm located at C5-6 with impingement of the C6 nerve root at the neural foramen. This lesion was successfully treated with intravascular techniques of balloon occlusion of the vessel without complications. To our knowledge, the occurrence of subarachnoid hemorrhage in association with an extracranial vertebral pseudoaneurysm has not been previously reported. Details about the treatment of this lesion are discussed.

**Materials and Methods**

**Case Report**

A 41-year-old gravida 4, para 4 woman had three episodes of neck stiffness 1 month after an uncomplicated vaginal delivery. Each episode occurred suddenly. The first episode lasted 2 to 3 days and resolved spontaneously. It was not associated with headache. The second attack occurred approximately 5 days later and again resolved spontaneously during several days. This episode was associated with bilateral shoulder pain with radiation of pain down the left arm with low back pain. Four days before admission the patient had her third episode that was accompanied by intense headache, fever to 101°F and worsening neck stiffness. She also had paresthesias that extended into the left arm, thumb, and forefinger. Head computed tomography at another hospital showed no subarachnoid hemorrhage. Lumbar puncture showed 120,000 red blood cells/mm³ (in the fourth tube), 2000 white blood cells/mm³ (76% polys, 2% lymphs), glucose 15 mg/dL, and protein 128 mg/dL; serum glucose was 103 mg/dL. Neck and cerebral angiography demonstrated an abnormality at the C3-5 level of the left vertebral artery. The patient was transferred to our hospital for further evaluation and treatment.

**Results**

On initial examination, the patient was afebrile with a blood pressure of 160/84 and a heart rate of 84 beats per minute. Neurological examination was notable solely for nuchal rigidity. The rest of the neurological and general physical examination was normal. Cervical computed
tomography showed an abnormal left vertebral artery with the appearance of a filling defect with enhancement on the left (arrow) that encroaches on the left C5-6 neural foramen. We proceeded with balloon occlusion of the left vertebral artery to reduce the threat of hemorrhage from the pseudoaneurysm. The vertebral artery at C3-4 was obliterated using two detachable latex balloons. At C6-7 two additional detachable balloons were placed. The patient tolerated the vertebral occlusion without neurological deficit. A control angiogram showed normal filling of the contralateral vertebral artery and anterior spinal artery. The patient was neurologically unchanged. She was maintained on intravenous heparin with partial thromboplastin times maintained at twice the normal level. Subsequently, systemic anticoagulation was maintained with oral warfarin. She was discharged from the hospital 1 week after the embolization procedure.

Discussion

Aneurysms of the extracranial vertebral arteries are rare because of their deeply protected location. They are usually the result of penetrating or blunt trauma to the neck.1-16 The trauma needed to produce a vertebral pseudoaneurysm can be slight. Pseudoaneurysm formation has been reported following cervical dislocation,17 cervical fracture,18 chiropractic manipulation,19,20 motor vehicle accident,21 radon seed implantation,22 spinal surgery,23 subclavian vein catheterization,24 cervicodorsal sympathectomy,25 cardiac pacemaker placement,26 and head trauma.20 Nontraumatic aneurysms as a whole have been far less frequent. With regard to our patient, abnormal movements in the neck during her prior hospitalization and the forces associated with giving birth may have caused the artery to stretch unduly with resultant pseudoaneurysm formation and subarachnoid hemorrhage.

It is difficult to diagnose a vertebral aneurysm from clinical symptoms alone because the symptoms vary according to the location of the lesion. A patient can develop symptoms related to compression of surrounding structures or vertebralbasilar ischemic symptoms due to thrombosis and embolization. The signs and symptoms can include pain in the neck or occipital region, hearing difficulty, tinnitus, vertigo, nausea and vomiting, dysphagia, Horner’s syndrome, sensory disturbances of the upper or lower extremities, and gait disturbance. A large pseudoaneurysm with intraspinal or intracranial extension can lead to cervical spinal cord compression causing myelopathy27 or root compression producing a radiculopathy.16 In addition, brain-stem compression or lower cranial nerve compression can occur.27 To our knowledge, this is the first patient with an extracranial vertebral artery pseudoaneurysm presenting with subarachnoid hemorrhage confirmed by lumbar puncture. Her cerebrospinal fluid showed a low glucose for which we have no obvious explanation (all cultures showed no growth of organisms).

Direct surgical approach to vertebral pseudoaneurysms has resulted in a high incidence of mortality and morbidity. This is due to the artery’s anatomic location, extensive periarterial venous plexus, numerous sources of collateral blood flow, and the risk of dislodging emboli during manipulation.13,27-30 The surgical technique of repairing an injury to the first three parts of the vertebral artery has been outlined.15,31 Direct arterial ligation, aneurysm trapping, balloon embolization, and surgical revascularization have all been used and are reviewed elsewhere.23 Other techniques that have been described include direct vascular repair,23 aneurysmorrhaphy and direct closure,14 and surgical repair using catheters with balloons on the tips placed intraparatively to occlude flow during the repair.26 In some instances, the aneurysms have been left alone.17,19,20
Most vertebral artery pseudoaneurysms can be safely treated with percutaneous transcatheater embolization. Vertebral artery occlusion has been used with circulation to the basilar system maintained by the contralateral vertebral artery. The posterior inferior cerebellar artery (PICA) on the side of the injury must fill via the contralateral vertebral to avoid the possible development of a lateral medullary infarction. Test occlusion in an awake patient is an advantage of endovascular procedures. If occlusion is not tolerated, a bypass procedure combined with vertebral artery ligation may be considered.\(^\text{13}\) If occlusion is tolerated, systemic anticoagulation should be considered to avoid possible thromboembolic complications. Although balloons leak and collapse over time, they maintain their original volume long enough to allow for formation of well-organized thrombus.\(^\text{27,32}\)

Primary repair of a vertebral pseudoaneurysm should be reserved for unstable patients with active hemorrhage, large pseudoaneurysms that cannot be embozized, and in those instances when the contralateral vertebral artery is either hypoplastic, absent, or terminates in the PICA.\(^\text{20,21}\) Verbal artery ligation is well tolerated in most patients provided adequate collateral exists through the contralateral vertebral artery.\(^\text{20}\) However, the presence of a patent contralateral vertebral artery does not guarantee an adequate blood supply to the basilar system during surgical manipulation as the head may be sharply rotated and extended. This head position can lead to occlusion of the contralateral vertebral artery.\(^\text{33-35}\) For pseudoaneurysms of the vertebral artery, treatment should be considered early to avoid lesion enlargement, hemorrhage, or distal embolization of the thrombus.

References

Extracranial vertebral artery pseudoaneurysm presenting as subarachnoid hemorrhage.
S S Kaplan, C S Ogilvy, R Gonzalez, D Gress and J Pile-Spellman

Stroke. 1993;24:1397-1399
doi: 10.1161/01.STR.24.9.1397

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://stroke.ahajournals.org/content/24/9/1397

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Stroke can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Stroke is online at:
http://stroke.ahajournals.org//subscriptions/