Case Reports and Technical Note
Arteriovenous Fistula: A Complication of Vertebral Angiography
Report of a Case

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An unusual complication of percutaneous vertebral angiography, namely a traumatic arteriovenous fistula between the vertebral artery and the vertebral venous plexus, recently was observed in 1 of our patients. A search of the literature revealed no previously reported case of this entity.

Report of Case
The patient, a 67-year-old white woman, was seen for the first time at the clinic in August 1961, with the chief complaint of pain for 3 weeks in the right arm, shoulder, and neck. The patient stated that she had been in fairly good health until 8 weeks prior to her admission here, when, because of an episode of vertigo and diplopia, she was hospitalized elsewhere. All tests performed at that time, including bilateral carotid and right vertebral angiography, gave negative results (Fig. 1). Her symptoms improved gradually, and she was released from the hospital after 2 weeks.

Three weeks thereafter the patient noted pain in the neck, which came on gradually and subsequently spread to the right shoulder and arm. It was constant, sharp, and boring in character, and was accentuated by motion of the neck or right upper extremity. It gradually increased in severity and was followed by rapidly progressive weakness of the right upper extremity.

Physical findings were not remarkable except for spasm of the cervical paraspinal muscles on the right, and minus-4 motor weakness of the right scapular, deltoid, biceps, and brachioradialis muscles, with associated loss of the appropriate deep tendon reflexes. There was an area of hyperesthesia overlying the right shoulder and upper (C5) arm. One examiner noted a continuous bruit in the neck; it was loudest 2 inches below the right ear.

It was thought that compression of the right 5th cervical nerve root, secondary to either a herniated disk or hypertrophic spurring, could explain the complaints. To investigate these possibilities, Pantopaque myelography was performed, and an extradural defect was noted on the right, extending from C5 to C6. The cause and nature of this defect were not readily apparent.

A cervical hemilaminectomy with exploration of the 5th and 6th cervical interspaces revealed no evidence of underlying pathology of the disks, but abnormal vessels were found compressing the right 5th and 6th cervical roots. The diagnosis of arteriovenous fistula then was made, and the significance of the bruit that had been detected previously was appreciated belatedly.

Two days later a right subclavian angiogram was made which revealed an arteriovenous fistula involving the vertebral artery and the vertebral venous plexus on the right, with drainage by way of the deep cervical and vertebral veins into the right subclavian vein. The fistula was at the level of the previous puncture of the vertebral artery, and the part of the artery above this level did not fill (Fig. 2).

Following this, the right vertebral artery was ligated proximal to the fistula, and the patient noted considerable improvement in the amount of pain in the right arm. The bruit persisted, however, though it was not quite as loud as it had been preoperatively; therefore, a left subclavian angiogram was obtained, and retrograde filling of the right vertebral artery down to the level of the fistula was demonstrated (Fig. 3).

Extracranial ligation of the right vertebral artery at the level of C1 was performed.

Postoperatively the bruit was still present, though considerably diminished in intensity. It was obvious that other vessels were involved, but no further treatment was contemplated, as the patient’s pain, weakness, and paresthesia had improved considerably following the second procedure.

Comment
A review of the literature failed to reveal any previously reported cases of arteriovenous fistula involving...
involving the vertebral artery and vertebral venous plexus secondary to percutaneous vertebral angiography. This is rather surprising, considering the close proximity of the vertebral artery and the veins as they pass cranialward through the vertebral foramina of the cervical transverse processes. When one considers that the venous plexus lies just anterior to the artery, one might reasonably expect to encounter a number of traumatic arteriovenous fistulas secondary to percutaneous puncture of the vertebral artery. Sugar and associates\(^5\) commented on the possibilities of this complication in their excellent article concerning the use of vertebral angiography. They stated that, although the theoretic possibility of traumatic arteriovenous fistula existed, they had not observed such a complication. They postulated that in the presence of a normal coagulative mechanism, and with the use of a sharp needle, the holes in the vessels would close quickly (especially since the direction of the puncture into the artery was with the flow of blood, which favored automatic closure of the defect by pressure from within the vessel).

In 1945, Heifetz\(^2\) reviewed the literature regarding arteriovenous fistulas of the vertebral artery and vertebral venous plexus. He found that "close to a hundred cases" had been reported previously. Almost all of these cases could be related directly to a stab or gun-shot wound. None followed angiography. In 1946, Elkin and Harris,\(^1\) reviewing their experiences, reported 10 cases, all secondary to

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Fig. 2. Right subclavian angiogram demonstrates arteriovenous fistula at site of previous puncture of vertebral artery. Note numerous venous channels.

Fig. 3. Left subclavian angiogram following ligation of right vertebral artery at its origin. Medium flows down right vertebral artery in a retrograde direction to fistulous communication.
trauma. Most of the wounds were caused by a small fragment of highly explosive shell during the second world war. They stated that this injury was rare because of the protected position of these vessels as they course through the neck.

The complications that have been reported following cutaneous vertebral angiography are varied. Extravasation of media, hematoma, sensitivity to iodine, and injury of the brachial plexus are among the more common. On occasion, dysfunction of the occipital lobe as evidenced by an organic mental syndrome and bilateral or unilateral visual-field defects, blindness, or optic aphasia; dysarthria; dysphagia; dysphasia; the Brown-Séquard syndrome; and cervical osteomyelitis have been noted.

Summary

Percutaneous vertebral angiography is not without some risk. One complication of this procedure, not previously reported, is the development of a traumatic arteriovenous fistula involving the vertebral artery and vertebral venous plexus.

References