SACCULAR ANEURYSMS OF THE POSTERIOR FOSSA*

RICHARD L. DESAUSSURE, M.D., SAMUEL E. HUNTER, M.D., AND JAMES T. ROBERTSON, M.D.

Departments of Neurological Surgery, Baptist Memorial Hospital and City of Memphis Hospitals, Memphis, Tennessee

(Received for publication June 18, 1957)

O ur interest in aneurysms of the posterior fossa has been stimulated recently by 2 cases in which the lesions were diagnosed and successfully treated by operation within a 6-month period. A review of the literature revealed only 2 other patients who had been successfully treated surgically. Both of these were operated upon without the aid of pre- or postoperative vertebral angiograms. A few additional cases have been reported to us in personal communications but the number of successfully treated aneurysms of the posterior fossa is still quite limited.

It has been estimated conservatively that at least one-sixth of intracranial aneurysms arise from the basilar-vertebral system and it is, therefore, our conviction that more of these would be diagnosed if they were searched for more diligently. Perhaps the feeling among neurosurgeons that little could be done for aneurysms of the posterior fossa even if they were diagnosed has been the factor deterring a more aggressive search for these aneurysms. It is our belief that vertebral angiography is reasonably safe and that it should be considered more frequently. Schultz has recently reported approximately 50 vertebral angiograms, all of which were done without complications.

Fulfilling Dandy's prediction, Schwartz, in 1948, reported the first successful direct surgical cure of a small sacculated arterial aneurysm in the posterior fossa. It arose from an abnormal artery in the left cerebellopontine angle and measured about 4 mm. in diameter. The patient had suffered several episodes of subarachnoid hemorrhage with subsequent cranial nerve signs. The aneurysm was trapped between two clips without residual signs.

Rizzoli and Hayes, in 1953, reported the second successful case. Their patient was admitted with subarachnoid hemorrhage without localizing signs and failed to respond to conservative therapy. Subsequently, bilateral occipital and temporal burr holes were placed; the findings were negative. Finally a ventriculogram suggested a lesion in the posterior fossa. The patient had dilated ventricles with a shift of the fourth ventricle to the right. An exploration of the posterior fossa demonstrated an aneurysm, 2 cm. by 1 cm. in size, arising from the left posterior inferior cerebellar artery just beneath and anterior to the left cerebellar tonsil. This was trapped and excised. During a stormy postoperative course the patient had bilateral ataxia of the

* Presented before the Harvey Cushing Society, Detroit, Michigan, April 26, 1957.
arms, weakness of both legs, and confusion, but he slowly improved. At the time of the report, 5 years after surgery, he was gainfully employed and his only residual sign was ataxia of the left arm.

In the cases reported here the diagnoses were made by percutaneous vertebral angiography and we believe they emphasize the necessity of complete cerebral angiography in cases of unexplained subarachnoid hemorrhage. The carotid angiograms were done with local anesthesia; however, for the vertebral angiograms general anesthesia was used. Angiography was carried out percutaneously using Hypaque Sodium, which we believe to be the medium of choice.16

CASE REPORTS

Case 1. #222492. K.G., a 48-year-old white male mechanic, was admitted to the Neurosurgical Service of the Baptist Memorial Hospital on July 18, 1956, complaining of severe headaches, stiffness of the neck, and photophobia. Eleven hours prior to admission he was awakened from sleep by severe occipital pain radiating into the parietotemporal region bilaterally. He also noted tingling dysesthesias, weakness of the left extremities and blurred vision of the left homonymous visual field. This persisted for about 15 minutes. Subsequently, he developed nausea, vomiting, stiffness of the neck, drowsiness, and mild disorientation. Previous history revealed that he had experienced intermittent headaches for about 6 months. For the past 10 years he had had bilateral Dupuytren’s contractures which seemed to be progressive.

Examination. The vital signs were normal. He was slightly confused. He had signs of meningeal irritation and examination of the optic fundi revealed bilateral subhyaloid hemorrhages. A lumbar puncture yielded grossly bloody spinal fluid under a pressure of 300 mm. of water. His bleeding and clotting times were within the limits of normal.

His condition remained stable and since he did not appear to be in critical condition, bilateral carotid arteriograms were done the following day. These were normal. Two days after admission right vertebral arteriography was performed. A saccular aneurysm arising from what was considered to be the right posterior inferior cerebellar artery was demonstrated.

1st Operation. On July 23, 1956, under general anesthesia, a right suboccipital craniectomy was performed. Exploration of the posterior fossa inferiorly revealed signs of subarachnoid hemorrhage. Dissection was then carried rostrally and a small mass of clotted blood was found beneath the arachnoid in the region of the 7th and 8th cranial nerves. An attempt to free up the arachnoid by gentle dissection was made but sudden brisk bleeding obscured the field. This was controlled by local pressure and Gelfoam. A silver clip was placed on a vessel presumed to be the anterior inferior cerebellar artery, which seemed to be entering the bleeding area. It was felt advisable to continue further operative manipulations and the wound was closed.

Postoperatively the patient had diplopia caused by paralysis of the right 6th nerve, a transient right peripheral facial paresis and deafness in the right ear. There were deviation of the uvula to the left, vertigo and ipsilateral ataxia. He was somewhat confused for a few days but rapidly recovered and was discharged 8 days postoperatively. The only deficit on discharge was vertigo on sudden motion and deafness on the right.
Saccular Aneurysms of Posterior Fossa

Fig. 1. Case 1. Right vertebral angiogram demonstrating aneurysm of posterior inferior cerebellar artery.

Readmission, Aug. 21, 1956. The patient stated that he had done quite well until 3 days previously when he suddenly felt hot, cold, became drowsy, nauseated, and had bilateral occipital pain.

Examination. His vital signs were essentially normal. There were signs of meningeal irritation and continued deafness on the right. A diagnosis of recurrent subarachnoid hemorrhage was made. On Aug. 22, 1956, right vertebral arteriography was repeated and again the aneurysm in the region of the posterior inferior cerebellar artery was demonstrated (Fig. 1).

2nd Operation. On Aug. 27, 1956, under general anesthesia, suboccipital craniectomy was again performed. There were signs of recent subarachnoid hemorrhage. The cerebellar hemisphere was elevated and the posterior inferior cerebellar artery was identified. The aneurysm arose from this tortuous vessel. It lay against the medulla beneath the rootlets of the 9th and 10th nerves, measured approximately 5 mm. in diameter, and was surrounded by adhesions. It was trapped between Olivecrona clips. Further exploration revealed no abnormality.

Postoperatively the patient had severe horizontal nystagmus, right facial paresis, deviation of the uvula to the left, brassy speech, dysphagia, vertigo, ipsilateral cerebellar ataxia and diplopia. He was again quite confused for a few days but then slowly improved. By the 6th day his condition seemed much better and right vertebral arteriography was repeated; this confirmed the absence of the lesion (Fig. 2).

At the time of discharge from the hospital on Oct. 10, 1956, his deficit consisted of mild ataxia, slightly brassy speech, 6th nerve weakness on the right, and nerve deafness on the right. When he was last examined in March 1957, he had mild diplopia on extreme right lateral gaze, deafness on the right, elevation of the uvula to the left, and very mild ataxia. He walked without difficulty and had had no further symptoms.
Case 2. #25061. C.N., a 33-year-old white farmer, was admitted to the medical service of the City of Memphis Hospitals on Jan. 17, 1957, in a state of agitated delirium. Relatives stated that 72 hours previously he awakened from sleep complaining of severe headaches, became nauseated, vomited and had stiffness of his neck. Twelve hours prior to admission he became very confused and disoriented.

Past history revealed that at the age of 6 he had suffered an injury to the left eye with a stick and subsequently the pupil became enlarged, with ptosis of the lid and impairment of movement. He had received a cerebral concussion and fracture of the right tibia in an automobile accident in 1941.

Examination. Temperature was 100°F., pulse rate 68, respiratory rate 24, and blood pressure 180/80. He was well developed, slightly dehydrated, and extremely restless. Neither pupil reacted to light. The left pupil was fixed and dilated and held in a neutral position. Corneal sensation was normal. His neck was slightly hyper-extended. Deep tendon reflexes were hyperactive. The remainder of the findings were normal except for bilateral ankle clonus. A lumbar puncture revealed grossly bloody spinal fluid under pressure in excess of 600 mm. of water. The supernatant fluid was found to be xanthochromic after centrifugation. Roentgenograms of the skull and chest were normal. Blood and urine were normal. Neurosurgical consultation was obtained 12 hours after admission. Bilateral carotid arteriograms were done and these were normal.

Course. A conservative regimen was instituted and the spinal fluid gradually cleared. On the morning of Jan. 28, 1957, he again became irrational and disoriented, and complained of pain in his head and neck. It was felt that he had suffered a recurrent subarachnoid hemorrhage. That afternoon right vertebral arteriography was performed and a saccular aneurysm arising from the right posterior inferior cerebellar artery was demonstrated (Fig. 3).
Operation. On Jan. 30, 1957, under general anesthesia, a right suboccipital craniectomy was performed. Exploration of the posterior fossa revealed evidence of recent subarachnoid hemorrhage. The cisterna magna was entered; the cerebellar hemisphere was retracted and a saccular aneurysm, measuring about 0.5 cm. by 1.5 cm., was successfully clipped.

Fig. 3. Case 2. Right vertebral angiogram demonstrating aneurysm of posterior inferior cerebellar artery.

Fig. 4. Case 2. Right vertebral angiogram demonstrating successful clipping of aneurysm.
cm., was exposed. It was being demonstrated to the staff on the medical service when it suddenly ruptured. The hemorrhage was controlled by direct finger tamponade and Arfonad-induced hypotension. The usual silver clips and Olivecrona clips were placed proximal and distal to trap the aneurysm. As a result of the bleeding which obscured the field several other vessels were inadvertently torn and bleeding from these vessels was controlled with silver clips.

The postoperative course was quite stormy, with fluctuations of sensorium and vital signs. He became quite confused and had evidence of an agitated psychosis. The right extremities were moderately ataxic. On Feb. 3, 1957, a lumbar puncture revealed bloody spinal fluid with xanthochromia. The pressure was 125 mm. of water. Pneumonitis of the right lower lobe complicated the immediate postoperative course but this finally cleared. By the 14th postoperative day the spinal fluid was clear and the patient's sensorium was normal. The ataxia progressively improved.

On Feb. 22, 1957, right vertebral arteriography was repeated and this demonstrated that the aneurysm had been successfully trapped (Fig. 4). The patient was discharged the following day with only a residual of mild ipsilateral ataxia.

When he was last examined on March 21, 1957, he was walking with crutches because of an incompletely healed fracture of his right tibia. He had no complaints but there was a very mild ataxia of the right lower extremity. There was no ataxia of his arms. However, this patient was quite nervous at the time of our examination, as he had been all his life, and it is possible that a very mild ataxia could have been masked by his nervousness. There was no change in his cranial nerve findings.

**DISCUSSION**

A review of the literature reveals only a few successful surgical attacks upon saccular arterial aneurysms of the posterior fossa.\(^5\)\(^6\)\(^11\) However, it has indicated the feasibility of this procedure. Successful attack of aneurysms of the posterior fossa is limited by accessibility. Uihlein and Hughes\(^14\) reported the surgical exploration of 14 basilar-vertebral aneurysms on which no definitive therapy could be rendered. Subsequently 8 of the 14 patients succumbed to ruptures. Treatment of aneurysms of the large vessels of the posterior fossa, such as the vertebral artery, will probably remain conservative as exemplified by Steelman,\(^12\) who relieved complaints of intolerable bruit and occipital headaches by re-enforcement of a vertebral aneurysm with muscle.

We were able to learn of several more aneurysms which had not been reported in the literature.\(^3\)\(^8\) Poppen has successfully attacked three aneurysms of the posterior inferior cerebellar and one aneurysm of the anterior inferior cerebellar artery. Bassett,\(^2\)\(^3\) discussed the embryological origin of aneurysms and mentioned that he had treated an aneurysm of the mid-portion of the left posterior inferior cerebellar artery successfully.

It is our feeling that vertebral arteriograms should be resorted to more frequently when subarachnoid bleeding cannot be accounted for by aneurysms of the carotid system. Surgical management of these lesions should be direct excision, trapping, or clipping when feasible. The role of various re-enforcement procedures remains to be seen. Ligation of the vertebral artery does not seem indicated. Although vertebral ligation has been accomplished, the experiences of Dandy\(^4\) and French and Haines\(^5\) furnish adequate
evidence of the danger involved. In addition Bakay and Sweet\(^1\) have shown that ligation of one vertebral artery does not reduce distal intravascular pressure providing both vertebral arteries are patent.

The risk involved with sacrifice of vessels of the posterior fossa must be weighed against the risk of recurrent subarachnoid hemorrhage. Occlusion of the posterior inferior cerebellar artery does not seem to have any serious sequelae. Lewis et al.\(^7\) in a follow-up of 20 clinically diagnosed cases of thrombosis of the posterior inferior cerebellar artery reported good results from 6 months to 12 years after the accident. There seemed to be only 2 cases of deaths which were caused directly by occlusion of the posterior inferior cerebellar artery. The experience with our 2 cases would lead us to believe the residual defects from clipping the posterior inferior cerebellar artery are quite minimal and it is our feeling that they are preferable to the risk of repeated subarachnoid hemorrhage.

In conclusion it is our feeling that vertebral arteriography should be resorted to more frequently and that a more aggressive approach should be made toward aneurysms in the posterior fossa.

REFERENCES