Surgical Treatment of Aneurysms of the Vertebral Artery

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The frequency of the occurrence of aneurysms and arteriovenous malformations in the posterior fossa is still uncertain. The performance of vertebral angiography in the investigation of spontaneous subarachnoid haemorrhage, when bilateral carotid angiography failed to reveal the source of the bleeding, became routine in this and some other neurosurgical centres only in the last few years. The prevailing attitude has been that vertebral angiography is difficult to perform, potentially more dangerous and that few, if any, vascular anomalies in the posterior fossa are amenable to surgical treatment.

In theLiverpool series, there were 6 aneurysms of the tip of the basilar artery, 2 of the main stem (approximately at the level of the origin of the acoustic artery), 1 near the point of junction of the two vertebral arteries and 2 on the left vertebral artery. These 2 latter are the subject of this communication.

Despite the reports of Logue² (1958) and, more recently, that of Norlén³ (1960), no further publications on surgical treatment of aneurysms of the vertebral artery could be found in the available literature. This fact, and the apparent amenability of these aneurysms to surgical obliteration with permanent cure, prompted this report.

Case Reports

Case 1. No. 15530/62. Mrs. E.B., aged 42, had a subarachnoid haemorrhage in December 1954 but was not referred for investigations; subsequently she underwent thyroideectomy in January 1956. On Nov. 8, 1961 a sudden severe pain developed in the neck and back of the head followed by loss of consciousness for a few minutes. The blood pressure was 140/90 and lumbar puncture revealed bloodstained cerebrospinal fluid. There were no localising neurological signs. She had a further haemorrhage on Nov. 13, 1961, and on the following day bilateral carotid and right vertebral angiography was performed. No anomaly was found. Another severe haemorrhage occurred on Nov. 25, 1961 with loss of consciousness for several hours. Subsequently she was found to have papilloedema with multiple retinal haemorrhages.

Angiography. On Dec. 2, 1961 left vertebral angiography was performed. The roentgenograms showed the presence of a saccular aneurysm on the left vertebral artery (Fig. 1).

Operation. During the following 2 days, the patient improved and on Dec. 4, 1961 cerebellar craniectomy was performed and the arch of the atlas was removed. The operation was carried out under moderate hypothermia, controlled hypotension and infusion of hypertonic urea. A trilocular aneurysm was found on the left vertebral artery with the fundus pointing medially and adherent to the medulla. The neck of the aneurysm was just below the origin of the posterior inferior cerebellar artery, while one small arterial twig was incorporated in the aneurysmal sac. There was a solid thick blood clot lying on the surface of the vermis. With the blood pressure lowered to around 40 systolic, the aneurysm was dissected and clipped, incorporating the arterial twig, sparing the posterior inferior cerebellar artery. The blood clot was removed from the posterior fossa and the wound was closed.

Course. From the neurological point of view, her postoperative progress was uneventful. On the other hand, on the 2nd postoperative day, her right upper limb became swollen as a result of venous thrombosis following the urea drip. This resolved without sequela in 2 weeks. She was discharged home on Jan. 5, 1962, 4 weeks after the operation.

Three weeks later she was examined again in the Out-patient Department and was found to have no abnormal neurological signs, apart from some weakness of the left sternomastoid muscle. She was undertaking her full housewifely duties but was aware of slight unsteadiness of gait when she hurried.

Case 2. No. 15786/62. Mrs. N.P., aged 53, was admitted on Feb. 14, 1962. Her past history was irrelevant. On Feb. 13, 1962 a sudden pain developed at the back of her neck extending rapidly to the frontal area. This was associated with profuse

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vomiting. Lumbar puncture performed on the same day at a local hospital revealed heavily bloodstained cerebrospinal fluid. She was transferred to this Centre on the following day.

She had severe headache and stiffness of her neck. She was fully conscious and there was no abnormality in the cranial nerves. There was dysmetria of the left upper limb and there were increased reflexes in both left limbs with an extensor plantar response. Blood pressure was 160/90.

\textit{Angiography.} On Feb. 15, 1962 bilateral carotid and vertebral angiography was performed under general anaesthesia. Roentgenograms showed the presence of a saccular aneurysm on the left vertebral artery, the fundus pointing medially (Fig. 2).

\textit{Operation.} On Feb. 16, 1962, 3 days after the haemorrhagic incident, cerebellar exploration was performed under moderate hypothermia, controlled hypotension and infusion of hypertonic urea. The arch of the atlas also was removed. The cisterna magna was found to be filled by solid blood clot extending into the cerebellopontine angle and downwards over the cervical cord. The rootlets of the left spinal accessory nerve were divided as well as the first attachment of the dentate ligament and the clot was sucked away. The aneurysm was then fully exposed with its broad neck situated 3 mm. below the origin of the posterior inferior cerebellar artery. A large clip was placed across the sac a few millimetres distal to the neck. The clip, unfortunately, cut the friable sac which came away together with the clip. The resulting haemorrhage was easily controlled by a sucker as the blood pressure was only around 40 systolic. The remains of the aneurysm were picked with dissecting forceps and pulled gently, while a clip was applied across the neck flush with the wall of the artery. The blood pressure was now elevated and the clip held satisfactorily. The wound was closed.

\textit{Course.} Postoperative progress was uneventful. The patient was walking 3 weeks after the operation with a markedly ataxic gait and still had some ataxia of her left upper limb. Six weeks after operation she was discharged home and 4 weeks later she returned to her business as a floral arranger. She walked normally and her arm was no longer clumsy. Partial paralysis of the left sternomastoid muscle was the only neurological deficit.

\textbf{Comments}

(1) It is of interest that of the 3 vertebral aneurysms reported by Logue,\textsuperscript{2} 2 were on the left and 1 on the right vertebral artery. In both cases of Norlén\textsuperscript{3} the aneurysms were on the left and the 2 described here also were on the left vertebral artery (6:1).

(2) Both vertebral arteries must be shown up by vertebral angiography.

(3) In view of the finding of solid clots in the posterior fossa in both our patients, and in view of the frequent recurrence of subarachnoid haemorrhage (Case 1), one should strive at an early diagnosis, and early surgical exploration (Case 2).

(4) The hypothermia-hypotension technique of anaesthesia was most helpful during these operations. Infusion of hypertonic urea was also employed in our cases, as we were engaged in the investigation of a method combining these three aids to neurosurgical anaesthesia. Furthermore, the complete unfamiliarity with aneurysms in this situation prompted extreme caution in our approach. The infusion of urea is, however, not regarded as essential for operation on these aneurysms.

\textbf{FIG. 1}

\textbf{FIG. 2}