Obliteration of Midline Vertebral Artery Aneurysm Via Basilar Craniectomy*

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LOGUE and others have emphasized the difficulties and hazards of a surgical approach to certain aneurysms of the upper vertebral and basilar regions. We are reporting what we believe to be the first successful attempt at ligation of an intracranial aneurysm of the vertebral artery by the anterior transcival approach.

Early in the 19th century, Cruveilhier first described and illustrated an aneurysm of the vertebrobasilar circulation. Krayerbühl was the first to demonstrate a vertebrobasilar aneurysm by positive contrast arteriography, using a retrograde subclavian injection technique. Dandy discussed his experience with the surgical treatment of three vertebrobasilar aneurysms. Schwartz is credited with the first case of a posterior fossa aneurysm diagnosed prior to surgery and successfully attacked by a direct surgical approach through the standard suboccipital craniectomy. Since then many patients have been operated upon for vertebrobasilar aneurysm and the results have been variable. Methods have included ligation of the neck of the aneurysm with or without excision of the aneurysm, trapping by ligation of efferent and afferent arteries supplying the aneurysm, reinforcement of the aneurysmal wall, or ligation of the proximal vertebral artery in its intracranial or extracranial position. Only suboccipital and subtemporal approaches have been used.

Since the development of the anterior approach for cervical discs there has been increased interest in attacking higher lesions through the anterior approach. Mullan, et al., did a subtotal removal of neoplasm anterior to the brain stem and upper cervical spinal cord by incising the posterior nasopharyngeal wall through the mouth. Stevenson, et al., described a transcival approach made by entering the upper retropharyngeal space through a right upper cervical, submandibular incision. Using this technique they have had encouraging results with lesions anterior to the brain stem and have suggested its possible application to midline vertebrobasilar aneurysms.

Case Report

Four days before admission on December 21, 1965, this 50-year-old woman had a sudden, severe, sharp fronto-occipital headache that spread rapidly to the back of the neck and down the spine. During the succeeding days the headache persisted and she felt she had lost control of balance. On admission to this hospital she was alert and still complaining of severe headache. The vital signs and neurological examination were normal except for a stiff neck, back pain upon flexing the leg with the knee extended, hyperactive deep tendon reflexes throughout, bilateral extensor toe response upon plantar stimulation, and mild ataxia of gait without lateralization. Lumbar spinal tap showed grossly bloody, xanthochromic cerebrospinal fluid (CSF).

X-ray Examination. On December 21, 1965, bilateral carotid arteriograms demonstrated no abnormality. Two days later, a right retrograde brachial arteriogram suggested an abnormal collection of contrast material close to the vertebrobasilar junction, but the overlapping vessels and petrous pyramids obscured the detail. On December 27, a right vertebral arteriogram by direct puncture (Fig. 1) demonstrated an aneurysm on the right side of the right vertebral artery between the clivus and brain stem. A submentovertical view of the vertebrobasilar arterial circulation (Fig. 2) demonstrated an ovoid berry aneurysm (15 × 8 mm) with the fundus directed frontally and the neck located inferiorly close to the midline as the right vertebral artery deviates to the left. A
Towne radiographic projection also clearly demonstrated the aneurysm.

On December 28, to determine the relation of internal to external size of the aneurysm, a prefontine and premedullary cistern x-ray contrast examination was carried out with 9 cc of Pantopaque introduced into the lumbar subarachnoid space. This showed that there was no significant intra- or extraneurysmal clot (Fig. 3).

First Operation. We decided to expose and ligate the aneurysm through the clivus. On January 4, 1966, the patient underwent general anesthesia; entubation was carried out through a tracheostomy. The patient was supine, and her head was hyperextended with the closed jaw rotated about 30° to the left, exposing the right upper cervical, submandibular region. The skin incision started over the symphysis mentis and extended down the midline to the level of the hyoid bone; it then curved laterally, posteriorly, and cephalad to terminate over the mastoid process. A secondary incision was extended laterally and downward from the lower lateral margin of the original incision to the sternocleidomastoid muscle. After separation of the carotid sheath and midline structures, exposure of the retropharyngeal space was carried out by transection of the following structures from below upward: the ascending pharyngeal artery, superior thyroidal artery, external laryngeal branch of the vagus nerve, branches of the ansa hypoglossi to the strap muscles, internal laryngeal branch of the vagus nerve, lingual artery, hypoglossal nerve, stylohyoid muscle, posterior belly of the digastric muscle, stylohyoid ligament, glossohyggeal nerve, stylopharyngeus muscle, and styloglossus muscle. The recurrent laryngeal, vagus, and spinal accessory nerves were preserved (Fig. 4).

Narrow Deaver and Richardson retractors were used to hold the right mandible up and the superior constrictor muscle of the pharynx forward and leftward. The superior constrictor muscle then was stripped from the rectus capitis anterior and longus capitus fascia and muscle overlying the inferior portion of the clivus up to the pharyngeal tubercle. The anterior arch of the C-1 vertebra was clearly seen and easily palpated as a landmark. The inferior edge of the clivus forming part of the foramen magnum could not be seen or felt because it lay buried at the tip of the odontoid process. The C-1 anterior arch and odontoid along with the longus capitis and rectus capitis anterior muscles obstructed the approach to the lower clivus. Once we reached this level, it was important to keep recalling the exact orientation of the head since unwarranted deviation laterally could have resulted in unnecessary damage to adjacent structures on both sides of the neck; these could include the jugular vein and its accompanying ninth through eleventh cranial nerves, the internal carotid artery, the eustachean tube, and the hypoglossal nerve as these structures enter the skull. A small towel clip on the drapes overlying the tip of the nose was essential as a guideline so that the orientation of the clivus could be conceptualized and not be confused by the rotation of the head to the left. The very adherent longus cervicis et capitis and rectus capitis anterior muscles as well as the anterior atlanto-occipital (anterior longitudinal) ligament were stripped from the anterior

Fig. 1. Lateral skull x-ray film during direct vertebral arteriogram. Subtraction technique used to delineate the right vertebral artery aneurysm. Arrow points to the anterior surface of the fundus of the aneurysm, just above the origin of the posterior inferior cerebellar artery at the junction of the vertebral artery with the neck of the aneurysm.