With our method, a small opening large enough to pass a polyethylene tube 2.5 mm in a diameter was placed in the wall of the cervical internal carotid artery. Through this tube, tightly rolled gelfoam, with gold film as an x-ray marker, was injected in saline solution until no blood flowed back from the internal carotid artery. In both cases, the occlusion of the fistula and the intact ipsilateral cerebral blood supply were ascertained by postoperative radiography.

Discussion to 58.

Eiichi TANI, Masaru TAKAHASHI and Hajime HANDA
Department of Neurosurgery, Kyoto University Medical School

Two patients with carotid cavernous fistula were treated by trapping a muscle embolization in the internal carotid artery. One case was traumatic; another had no history of head injury, and her carotid cavernous fistula increased in size with frequent digital carotid compression. Bilateral carotid and vertebral angiography, including cross-compression study, gave evidence of anomalous circulation from the unilateral internal carotid artery to the cavernous sinus.

The internal carotid artery was clipped proximal to the posterior communicating artery. Subsequently, the common, internal, and external carotids were clamped. A strip of muscle, clipped in its either end, was introduced through the external carotid into the common carotid. After the external carotid was clamped proximal to the incision, clamps on the common and internal carotids were opened momentarily. Roentgenograms showed the muscle embolus in the cavernous carotid segment. The internal and external carotids were divided, and the common carotid was ligated. The trapping and the muscle embolization in the internal carotid has relieved immediately the symptoms of carotid cavernous fistula without producing any complications. The follow-up studies, 5 and 6 months after the surgery, show lasting relief from carotid cavernous fistula.

59. A Case of Bilateral Carotid-Cavernous Fistula Treated Successfully by Bilateral Carotid Ligation

Ken'ichi YAMAGA, Bun'ichiro NAGAO, Hajime IWA, Norio ONO and Tsutomu TANABE
Surgical Clinic, Osaka Prefectural Hospital

Masatsugu KOBATAKE
2nd Dept. of Surgery, Nara Medical University

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Collateral pathways develop when a unilateral carotid artery is ligated for therapeutic purpose. Thyroid artery, persistent primitive artery (trigeminal or hypoglossal artery), extracranial anastomosis of vertebral and external carotid artery as well as the Willis circulus will serve as the pathways.

On the other hand, it has been recognized that many disturbances will occur after ligature of bilateral carotid arteries, because of insufficiency of blood supply to the whole brain tissue even when such collaterals have been established. Successful bilateral ligation has been reported only by Penzholz, Arnulf, Pardal and Aschan & Hugosson.

The present report concerns a rare case to which the bilateral ligation was applied with success for carotid-cavernous fistulas.

**Case Report**

A 17-year-old boy sustained a head injury (Type 1—Araki’s classification) in Feb. 1966.

Right palpebral swelling gradually developed with hemicrania, pulse-synchronous ocular pain, dilated vein of eye-lid, exophthalmos and bruit. In October the carotid angiogram revealed bilateral carotid-cavernous fistula at the level of C4 with retrograde flow into superior ophthalmic veins (Figs. 1, 2 & 3).
Operation (9, Jan. 1967): Ligation of the right common carotid was performed, spending 78 hrs, in the use of the Crutchfield's clamp. After the operation, the above-mentioned symptoms subsided. No ophthalmologic abnormality was noted.

However, similar symptoms developed on the contralateral side one month after the operation. Headache could be removed by compression of the left common carotid. Vertigo usually developed having been compressed for 20 minutes when he was free from headache. The Matas test was applied daily (3 times a day, 30 min. each time) for fifteen days.

Subsequently, a vertebral angiogram was carried out in conjugation with the Matas test showed filling of anterior and middle cerebral arteries in both hemispheres.

Re-operation (6, Mar. 1967): Left common carotid artery was ligated slowly spending 10 days by the Crutchfield technique. After the second operation, the patient became well. Disturbances were found scarcely on speech, motility and in electroencephalogram.

Discharged on 1, May 1967. He has come back to his business one month after his discharge. A retrograde brachial angiogram, took 5 months after his discharge, revealed well developed collateral vessels of the circle of Willis (basilar

Fig. 3. The left carotid angiogram. A similar fistula and venous shadow is revealed.

Fig. 4. A retrograde brachial angiogram, a half year after the second operation. Retrograde filling to the carotid area via circle of Willis from vertebral artery is revealed.
artery → posterior communicating artery → internal carotid artery) (Fig. 4).

References


60. Cranio-cervical Injury as a Factor inducing Symptoms of “Intermittent Vertebral Artery Compression”

Tsuneo OHNO, Kyo Zui Ko, Toshimoto ARAI, Kazuyuki YANAGIBASHI and Shinya MANAKA
Department of Neurosurgery, Kanto-Rosai Hospital

Chikao NAGASHIMA
Department of Neurosurgery, Moro Hospital

In 1961 and 193, S. R. Powers et al. reported a new syndrome consisting of vertigo, syncope, tinnitus, and deafness as “Intermittent Vertebral Artery Compression”, which might be due to an intermittent obstruction of the subclavian and/or vertebral artery due to the anterior scalenus muscle and deep cervical fascia with anomalous origin of the vertebral artery. In majority of cases reported by Powers and others, there was no antecedent history of trauma or bony injury to the neck or chest.

We had ten patients of this syndrome and eight patients were treated surgically. All of them except one arteriosclerosis had had no symptom before cranio-cervical injury. We are impressed with spontaneous “nystagmus” including positional and positioning nystagmus as the most important neurological sign in these cases. It is interesting that postoperative complete disappearance of the subjective symptoms is not necessarily accompanied by a corresponding improvement in oto-neurological examinations including nystagmus.

From our experiences, it may be concluded as follows.

Each of our patients has maybe had the phenomenon of intermittent vertebral artery compression without any clinical symptom before trauma. A trauma to the head or cervical spine produced some central vestibular dysfunction in brain stem,