ARTERIOGRAPHIC DEMONSTRATION OF COLLATERAL CIRCULATION THROUGH OPHTHALMIC ARTERY IN INTERNAL CAROTID ARTERY THROMBOSIS

REPORT OF TWO CASES

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Thrombosis of the internal carotid artery has gained considerable attention in recent years and is a diagnosis made with increasing frequency. An associated loss of vision in the homolateral eye was observed by Kussmaul,\(^6\) Penzoldt,\(^7\) Guthrie and Mayou,\(^2\) Hunt,\(^3\) King and Langworthy,\(^8\) and many others. The explanation usually accepted for this phenomenon has been inadequacy of blood flow through the ophthalmic artery to the retina because of the proximal thrombosis. Walsh and King\(^9\) felt that homolateral blindness and optic atrophy invariably occurred with spontaneous internal carotid thrombosis. Johnson and Walker,\(^4\) however, found optic atrophy and blindness in only 11 of 107 cases they reviewed. More recently Walsh and Smith\(^10\) have extended their observations on ocular complications of internal carotid thrombosis. This failure of blindness to occur in the homolateral eye has also intrigued observers, but the ingenious and excellent work of Elschnig,\(^1\) repeated and extended by Walsh and King\(^9\) themselves, had already suggested the explanation of this phenomenon by virtue of their experimental demonstration, on cadavers, of free collateral circulation between the external carotid and ophthalmic arteries.

Another striking thing about internal carotid thrombosis has been the occasional absence of neurological signs or evidence of massive infarction, even after arteriography has demonstrated complete obstruction of flow of dye into the internal carotid vessel in the neck.

Recent experience with 2 cases has brought to light the fact that in cases of internal carotid thrombosis demonstrable by arteriography, collateral circulation through the ophthalmic artery may be visualized, thereby corroborating the experimental work of Elschnig and Walsh and King in vivo. In addition, this collateral circulation not only explains the failure of blindness to occur in the homolateral eye but the richness of this circulation may be adequate to fill the intracranial branches of the internal carotid artery and, therefore, may account for the paucity of neurological symptoms in some of these cases.

CASE REPORTS

Case 1. V.A. Hospital, #96805. V. B., a 50-year-old male, was admitted Mar. 31, 1953 with a chief complaint of "blackout spells." He had been in perfectly good health until 5 months previously when, on a Sunday afternoon drive, he suddenly noticed transient weakness of his right hand. Ten minutes later this happened again, and on the following day he had persistent weakness in that hand. There were no headaches, dizziness, or numbness in the hand associated with the weakness. There was no disturbance of speech. The patient was able to move his arm with normal strength but found that he was unable to extend his fingers in that hand. He had not returned to work since that time. On the day following his first episode, he was examined by his family doctor, who found his B.P. was 240 systolic. He was told that he had had a "shock" and was placed on a diet. He was advised to exercise his hand with a
small rubber ball. The weakness in his hand gradually subsided, and 1 month later he was feeling perfectly well and was able to go deer-hunting without difficulty.

Three and a half months before admission, the patient noticed his right arm had begun to shake and his legs felt weak. He was able to grab a bedpost with both hands but slipped to the floor and was unable to get up for 10 minutes. He was perfectly conscious but unable to talk during this period. The shaking in the right arm did not spread but gradually subsided. After this he was able to get up and talk without difficulty. He denied headache, nausea, vomiting, loss of weight, or other associated symptoms.

**Examination.** B.P. was 150/92, pulse rate 76, respiratory rate 20, and temperature was normal. He was a florid-faced, middle-aged male, who was a little given to "wisecracking." There was a slight left exophoria. The pupils were equal and reacted normally. Both disks showed blurring of superior margins with full veins but there were preserved physiological cups and no definite elevation of the disk margins. The visual fields were full. Vision was normal in each eye. Facial sensation was normal. There was a slight right facial weakness. Hearing was normal. The patient could name common articles readily. He was able to demonstrate the use of common objects but he had difficulty in performing motor acts on command, especially if they were at all complicated. For example, he was unable to do the heel-to-knee test until it had been done passively for him. He believed the present month to be March when in reality it was April. He had the day of the week correct, however. He demonstrated no spatial disorientation. The right hand was a little less strong than the left. Reciprocating movements on the right side were slower than on the left. Strength and tone in the legs were normal. Sensation was intact, including stereognosis and figure-writing on the fingers. The right arm reflexes were increased over the left.

Roentgenograms of the chest were normal except for multiple calcifications, possibly old histoplasmosis. Those of the skull showed very slight pineal displacement toward the left in the AP film. Hematological and urinary analyses were normal. NPN and fasting blood sugars were normal.

**Arteriography.** On Apr. 9, 1953 Dr. G. F. Hoessly performed percutaneous arteriography on the left side under pentothal anesthesia. The dye entered the external carotid artery despite numerous attempts to fill the internal carotid artery by replacing the needle lower and lower in the common carotid artery. The films revealed that in tracing the branches of the external carotid artery, an excellent demonstration of communication with the ophthalmic artery (Schurr) was seen. The dye entered the intracranial portion of the internal carotid via the ophthalmic artery and, thereby, its branches were filled (Figs. 1 and 2).

**Course.** He suffered no untoward symptoms following the procedure. There was no change in his neurological findings or in the vision of the left eye, and he was discharged Apr. 22, 1953.

Final diagnosis was thrombosis of the internal carotid artery, left, secondary to arteriosclerosis.

**Comment.** This case of complete thrombosis of the internal carotid artery in its cervical portion demonstrates: (1) extraordinary lack of neurological signs and symptoms; (2) failure of blindness to occur in the homolateral eye; (3) that arteriography may reveal collateral circulation about a thrombosis of the internal carotid through the ophthalmic artery back into the intracranial portion of the internal carotid artery and its branches.

**Case 2.** V. A. Hospital #30999. C. O., a 61-year-old man, was admitted for the first time on Oct. 19, 1953. He was totally aphasic and the history was partially obtained by indirect methods. He was conscious and alert and able to shake his head "yes" or "no," but was totally unable to speak. He denied any pain prior to the present episode. He denied headache, dizziness, or visual symptoms. He was a chef at another hospital and had been hospitalized there for 6 weeks for right hemiplegia, which according to the patient had not improved. He had had no previous serious illness.

**Examination.** There was a Grade 3 to Grade 4 harsh aortic systolic murmur. The liver was enlarged one finger below the right costal margin; it was non-tender and had a sharp edge.