CASE REPORTS AND TECHNICAL NOTES

INTRACRANIAL AND CERVICAL TRAP LIGATION OF THE CAROTID ARTERY COMPLICATED BY BLINDNESS OF THE HOMOLATERAL EYE

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Since the ophthalmic artery usually arises from the internal carotid artery in the region of the cavernous sinus, it might be expected that occlusion of the internal carotid proximal and distal to this point would result regularly in thrombosis within the ophthalmic artery followed by blindness of the homolateral eye. That this does not occur has been cited as clinical proof of the rich anastomosis between the ophthalmic artery and orbital branches of the external carotid artery. In only 1 of Dandy's cases of "trap" ligation of the internal carotid artery intracrani ally and in the cervical region was there any diminution of visual acuity in the homolateral eye following operation. In this case the internal carotid was clamped intracrani ally first and then ligated in the neck after insertion of a piece of muscle within the lumen of the internal carotid to produce thrombosis. After operation there was almost complete blindness of the homolateral eye and after 2 years visual acuity was limited to light perception.

Birley, in 1928, quotes Siegrest who collected 997 cases from the literature in 1900 in which the carotid artery had been ligated for a variety of pathological conditions. In 8 cases there was some degree of homolateral blindness, but in 6 of these sepsis, thrombosis, or embolism was apparently responsible. No other instance of blindness from any type of carotid ligation in the neck or combined with intracranial ligation has been reported to our knowledge.

Adson reported 4 cases in which he ligated the internal, external and common carotid arteries in the neck prior to intracranial ligation of the internal carotid artery on the cerebral side of the cavernous sinus. In addition, in 3 of these cases the ophthalmic artery also was occluded by silver clips followed by a resection of the ophthalmic and periorbital veins. In none of these cases did visual disturbance occur. Adson explained this on the basis of the abundant collateral circulation of the ophthalmic artery.

Another case, cited by Singleton, also indicates an uninterrupted supply of blood to the eye via the ophthalmic artery after multiple ligations of the carotid vessels. This patient had a right internal carotid-cavernous sinus fistula with pulsating exophthalmos. After ligation of the right common, internal, and external carotid arteries in the neck and of the internal carotid intracranially, the fistula persisted. It was assumed that the blood passing through the fistula must have been back flow through the ophthalmic artery from anastomoses with the internal maxillary and facial branches of the external carotid vessel of the opposite, or left, side. The left external carotid was therefore ligated with immediate cessation of the bruit on the right. The bruit subsequently appeared on the left side and later responded to retrograde injection of sclerosing solutions into the orbital veins. In spite of these multiple ligations, the vision in the right eye was not impaired but steadily improved.

Standard textbooks of human anatomy (Cunningham, Gray, Jackson) describe numerous anastomoses between the ophthalmic artery and branches of the external carotid artery in the orbit as well as free anastomosis between terminal branches of the external carotid arteries of the two sides across the midline. Elschnig was the first to demonstrate this anastomosis between branches of the external carotid and ophthalmic arteries. He injected fluid into one external carotid or internal maxillary artery of cadavers under a pressure of 60 mm. of water

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after ligating the internal carotid and found that the injection fluid flowed from the cut end of the homolateral ophthalmic artery and filled the vessels of both orbits and both sides of the face. He concluded there was free communication therefore between the ocular branches of the external carotid arteries of both sides.

Walsh and King extended these investigations by injection experiments on 5 "recent" cadavers. In all of these they performed the "trap" operation; that is, ligating the internal carotid artery intracranially and in the neck. They then made the following observations:

1. Methylene blue injected into the common carotid artery appeared from the cut end of the homolateral ophthalmic artery.
2. X-ray studies after injection of colloidal thorium dioxide in the common carotid demonstrated a rich circulation of the homolateral orbit.
3. Vermillion paint injected into the common carotid was demonstrated entering the trapped portion of the internal carotid via the ophthalmic artery.
4. Histological sections made after injection of India ink into the common carotid showed ink particles in the central retinal artery.
5. After bilateral ligation of the internal carotids in the neck and intracranially, 200 cc. of barium sulphate were injected into one common carotid. This filled both ophthalmic and the trapped segments of both internal carotid arteries.

On the basis of these experiments and a review of Dandy’s clinical material, Walsh and King conclude: "a large collateral exists between the external carotid and the ophthalmic artery of the same side and there is sufficient cross circulation so that the ophthalmic artery of the contralateral side may be filled from the external carotid artery."

**CASE REPORT**

Because of this evidence from the literature that vision in the homolateral eye ordinarily remains unimpaired after ligation of the carotid artery and the general clinical impression that collateral circulation to the eye is always adequate after "trapping" procedures, it seemed wise to report briefly a recent experience to the contrary. The following case is that of a young colored female with a demonstrable aneurysm intracranially who developed complete blindness of the homolateral eye following a "trap" ligation of the carotid artery.

M.W., Duke Hosp. #C9987, a 26-year-old colored, married female, was first seen on June 16, 1947 in the Eye Clinic because of pain in the left eye and drooping of the left upper eyelid. She stated that 8 months previously sudden pain had developed in her throat which then moved to her neck and head and settled behind her left eye. It lasted for 1 week. She was then well until 1 month previously when she had a recurrence of the same type of pain, this time accompanied by ptosis of the left upper lid, slight diminution of visual acuity on the left, and an inability to move the left eyeball. No history of hypertension or other systemic disease was elicited. Hospital admission was arranged.