Splitting of the optic nerve by a carotid-ophthalmic artery aneurysm

Case report

ROBERT A. BEATTY, M.D.

Department of Neurosurgery, University of Illinois College of Medicine, Chicago, Illinois

A patient with splitting of the optic nerve by a carotid-ophthalmic artery aneurysm is presented. Possible explanations for this previously unreported configuration are discussed.

KEY WORDS • carotid-ophthalmic aneurysm • optic nerve

CAROTID-OPHTHALMIC artery aneurysms, when small, usually project upward, but as they enlarge, there is a tendency for the sac to extend medially, probably because of the restraint provided by the overlying optic nerve. A patient is described in whom a giant carotid-ophthalmic aneurysm was pointing directly upward, splitting the optic nerve. The possible explanations of this unique configuration are discussed.

Case Report

This 66-year-old right-handed woman presented on February 28, 1985, with an episode of headache, dysphasia, and clumsiness of the right arm. There was no alteration of her level of consciousness. The medical history revealed that 11 years earlier another surgeon had wrapped a left middle cerebral artery aneurysm but had left untreated a left carotid-ophthalmic aneurysm measuring 2 cm in diameter. Visual fields, tested by an ophthalmologist in December, 1983, were normal.

Examination. Only mild expressive dysphasia was noted on examination. Visual fields were full to confrontation. The patient had bilateral presbyopia compatible with her age.

A computerized tomography (CT) scan initially showed a calcified mass 4 cm in diameter surrounded by edema and evidence of leakage of blood along the anterolateral margin (Fig. 1 left). A repeat CT scan 1 week later showed some resolution of the blood. A cerebral angiogram showed the neck of an aneurysm pointing directly upward (Fig. 1 right). The cerebrospinal fluid was clear and colorless, and under a pressure of 90 mm H2O.

Operation. At surgery, a giant left carotid-ophthalmic aneurysm was resected piecemeal until fresh bleeding was encountered near the neck. It was apparent that the neck of the aneurysm passed through the left optic nerve, splitting the nerve in about equal portions over a length of 5 to 7 mm (Fig. 2). The nerve did not appear to be particularly thinned or elevated. There was evidence of recent bleeding anterolateral to the aneurysm. In order to ligate the neck of this aneurysm, the lateral half of the optic nerve was sacrificed.

Postoperative Course. Postoperatively, the patient could perceive only light with the left eye. There were no other neurological deficits.

Discussion

Although other authors have alluded to actual division or disruption of the optic nerve by carotid-ophthalmic aneurysms, the present case seems to be unique. Thurel, et al., have classified these aneurysms according to the direction in which they point: those pointing lateral to the optic nerve, those pointing medially under the optic nerve, those pointing medially and above the optic nerve, and those large aneurysms occupying the whole region which are designated as "global." As noted by Drake, et al., the restraint by the optic nerve usually determines the direction in which the aneurysm points. In their experience this was usually medially.
Splitting of optic nerve by carotid-ophthalmic aneurysm

In the present case there are several explanations for the aneurysm having penetrated the optic nerve. Longitudinal splitting of the optic nerve has been described as an incidental postmortem finding in several cases. Snead\(^7\)\(^9\) described an optic nerve split in two parts, each 6 mm in length and each with its own connective tissue sheath. The temporal fascicle was 2.5 mm thick and the nasal fascicle was 4 mm thick. Although possible, it seems highly unlikely that such a convenient anomaly existed in our case.

Actual penetration of the optic nerve by the aneurysm is a more probable explanation. However, one would expect to have seen some deficit in visual acuity or visual field with such a giant aneurysm; indeed, Ferguson and Drake\(^3\), in a large series of carotid-ophthalmic aneurysms, found visual symptoms in 87% of patients with aneurysms larger than 2.5 cm. In addition, one could expect to have seen some elevation, displacement, or thinning of the optic nerve caused by the fundus of the aneurysm.

The most likely explanation is that the aneurysm arose from a vessel already penetrating the optic nerve. Dawson\(^1\) has described prechiasmal branches of the ophthalmic arteries which pass backward from the region of the optic foramina toward the chiasm. As they loop along the medial border of the optic nerves these branches send minute twigs into the parenchyma of the optic nerves. A recent study has shown that cranial nerves are penetrated by arteries more frequently than was previously suspected; for example, this phenomenon was found in 40% of the third cranial nerves examined.\(^5\) Slade and Weekley\(^6\) described a patient with an anterior communicating artery aneurysm who incidentally had an anomalous artery which arose from the internal carotid artery, passed through the optic nerve, and ended in the frontal pole. The artery produced a 5-mm long diastasis in the optic nerve. No visual symptoms were described. In view of the lack of visual symptoms or distortion of the optic nerve, this mechanism seems a likely explanation in the present case.

Acknowledgment

I am indebted to Mr. William Schwarz, medical artist at the University of Illinois College of Medicine, for his kind assistance.
References


Manuscript received March 5, 1986.

*Address reprint requests to:* Robert A. Beatty, M.D., 333 Chestnut Street, Hinsdale, Illinois 60521.