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Serous Choroidal Detachment and Retinopathy With Ipsilateral Carotid Cavernous Fistula

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Abstract

Purpose: To describe a choroidal detachment resulting from an indirect carotid-cavernous fistula. **Methods:** An observational case report was evaluated, and a literature review was performed. **Results:** A 97-year-old woman presented with unilateral dilated episcleral vessels. A posterior segment examination showed serous choroidal detachments in all 4 quadrants with associated retinal hemorrhages. A subsequent cerebral angiogram showed a Barrow type D carotid-cavernous fistula. The patient was observed, and the serous choroidal detachments slowly improved. **Conclusions:** In a patient with a choroidal detachment of unclear etiology, it is important to consider carotid-cavernous fistula in the differential diagnosis.

Keywords

carotid disease, choroidal detachment, vitreous hemorrhage

Introduction

Serous choroidal detachments arise secondarily to the accumulation of serous fluid in the suprachoroidal space after disruption of the normal physiologic ocular pressure gradients and flow dynamics. The differential diagnosis for serous choroidal detachments is broad, and they can occur as a sequela of numerous mechanical, inflammatory, vascular, toxic, and malignant processes.

Carotid-cavernous fistulas are arteriovenous fistulas between the carotid arterial system and cavernous sinus. Indirect carotid-cavernous fistulas are low-flow with an indolent course that occur spontaneously, in particular in the setting of carotid disease from vascular risk factors such as hypertension, diabetes, and atherosclerosis.[1] This type of fistula can cause increased venous pressure in the orbital veins and lead to venous stasis of the choriocapillaris, resulting in choroidal vascular morphologic alterations.

Here, we describe a case of a patient with unilateral retinopathy and serous choroidal detachments associated with an indirect carotid-cavernous fistula with a subsequent vitreous hemorrhage and review the available literature on serous choroidal detachments as a sequela of carotid-cavernous fistulas.

Case Report

A 97-year-old woman presented with 2 weeks of decreased vision in the right eye. On ophthalmic examination, her best-corrected visual acuity (BCVA) was counting fingers at 2 feet OD and 20/40 OS. The intraocular pressure (IOP) measurements were normal in both eyes. An anterior segment examination showed dilated episcleral vessels in the right eye and a normal anterior segment in the left eye. A posterior segment examination of the right eye showed serous choroidal detachments in all 4 quadrants with scattered retinal hemorrhages (Figure 1). B-scan ultrasonography confirmed the presence of unilateral serous choroidal detachments (Figure 2).

Given the concern for a carotid-cavernous fistula, the patient had urgent neuroimaging with a magnetic resonance angiogram suggestive of a right-sided carotid-cavernous fistula. A diagnostic cerebral angiogram was performed showing a Barrow type D right cavernous fistula with meningeal feeders from the bilateral internal and external carotid arteries (Figure 3).

After consultation with the patient's neurosurgical team, the decision was made for conservative management of the fistula given her age and minimal ophthalmic symptoms. Over the next 4 months, the serous choroidal detachments improved. However, 6 months after her initial presentation the patient developed a vitreous hemorrhage for which she has declined surgical intervention and is being monitored without further sequelae. Since then, her BCVA stabilized at 20/80 OD.

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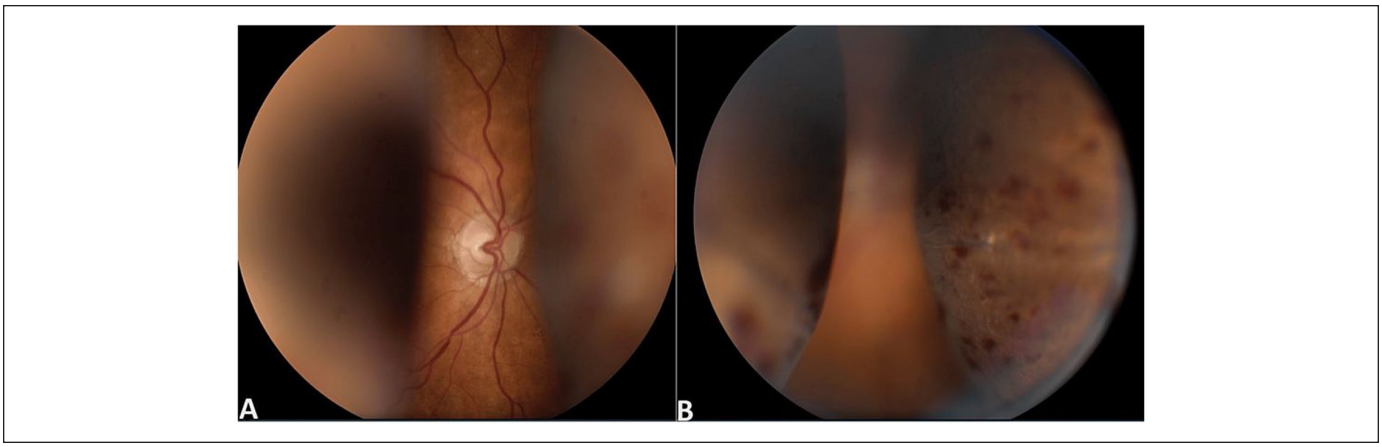

Figure 1. Fundus photograph shows (A) mild vitreous hemorrhage, attenuated vessels, and choroidal detachments in all 4 quadrants with scattered retinal hemorrhages. (B) The view of the fundus is obstructed due to the choroidal detachment.

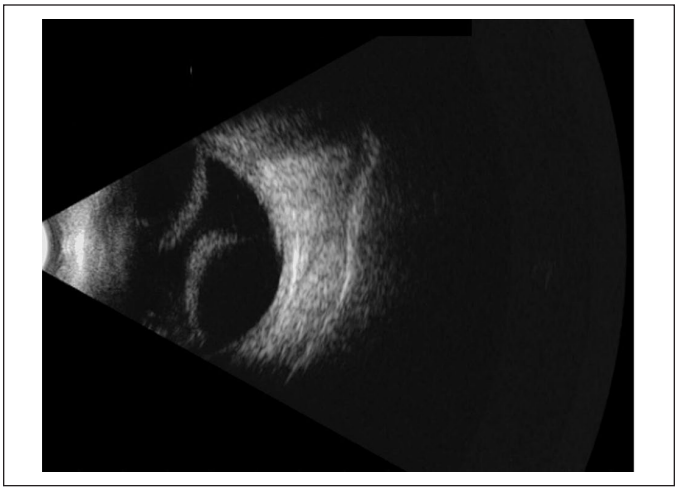

Figure 2. B-scan ultrasound shows a choroidal detachment in the right eye.

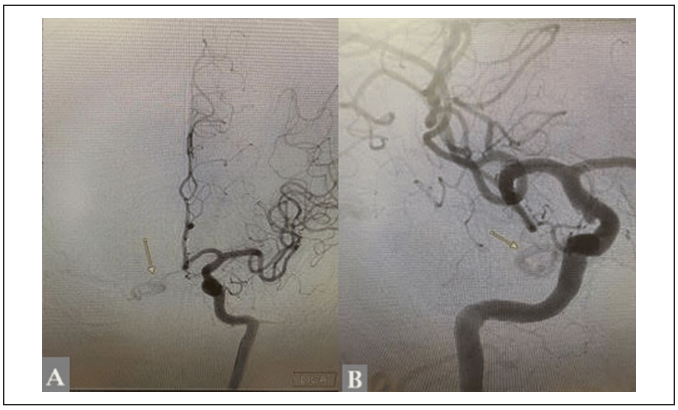

Figure 3. Cerebral arteriogram shows (A) the right cavernous sinus via small meningeal branches of the cavernous right internal carotid artery. (B) Early filling of the right cavernous sinus with fistulous connection via small branches of the distal internal maxillary artery.

Table 1. Patient Characteristics.

Characteristic	Value
Mean age (y) ± SD	67.32 ± 10.49
Sex (%)	
Male	55
Female	45
Range of observed BCVA	CF to 20/20
Mean IOP in affected eye (mm Hg) ± SD	22.55 ± 7.67
Most common biomicroscopy finding (%)	
Conjunctival congestion/injection/red eye (%)	22.45
Laterality (%)	
Right eye	65.0
Left eye	30.0
Both eyes	5.0

Abbreviations: BCVA, best-corrected visual acuity; CF, counting fingers; IOP, intraocular pressure.

Conclusions

Carotid-cavernous fistulas are abnormal communications between the carotid arterial system and the cavernous sinus. Indirect idiopathic carotid-cavernous fistulas are typically low-flow and follow a more indolent course than direct fistulas.[2] Ophthalmic manifestations result from venous stasis impeding drainage into the cavernous sinus, leading to choroidal circulation congestion and in some cases increased episcleral venous pressure. Management of indirect low-flow carotid-cavernous fistulas is dependent on symptom severity given their low risk for intracerebral hemorrhage.[3] Endovascular treatment of indirect low-flow carotid-cavernous fistulas is effective but carries an increased risk for procedural complications.[4]

Serous choroidal detachments are a rare complication of carotid-cavernous fistulas. Table 1 shows the characteristics of patients with choroidal detachment secondary to carotid-cavernous fistulas. The mean age of patients with this presentation was 67.32 years, with men affected in 55% of cases. The most common presenting BCVA was 20/20; however, the range of acuities

included counting fingers to 20/20. To our knowledge, additional reported symptoms and examination findings include conjunctival/scleral injection/congestion, elevated IOP, diplopia, proptosis, headache, serous retinal detachment (RD), retinal hemorrhage, disc edema, and chemosis.[5–16] Delayed vitreous hemorrhage in patients with serous choroidal detachments associated with carotid-cavernous fistulas has not been previously reported.

In the previous literature, several cases of carotid-cavernous fistula were found in patients with vision changes using various imaging modalities. Todorova et al[12] described 2 cases of angle closure resulting from annular choroidal effusions in patients with carotid-cavernous fistulas seen on ultrasound biomicroscopy. Mazzeo et al[14] described 4 patients with serous choroidal detachments and hypothesized low-flow carotid-cavernous fistula as the cause; however, only 1 patient had direct evidence of a fistula on imaging. Klein et al[15] reported 2 cases of serous RD, including 1 with a choroidal detachment, in patients with clinically or neuroimaging-confirmed carotid-cavernous fistulas. Delayed choroidal filling was seen on fluorescein angiography in both cases.

Multimodal imaging in patients with carotid-cavernous fistula without clear serous choroidal detachments also offers insight into the underlying pathophysiologic process. Del Mar Schilt-Catafal et al[17] found augmented vessel density in the superficial capillary plexus, deep capillary plexus, and choriocapillaris that normalized after embolization in a patient with an indirect carotid-cavernous fistula. In a series of 19 patients with carotid-cavernous fistula, Inam et al[18] found increased choroidal thickness on enhanced-depth imaging optical coherence tomography in patients with anterior carotid-cavernous fistula compared with posterior draining fistulas and controls. Kumbhat et al[9] described a patient with decreased vision in whom computed tomography of the head revealed an enlarged superior ophthalmic vein, leading to the diagnosis of choroidal effusion and carotid-cavernous fistula. Furthermore, Touitou et al[19] presented a case of a hyperemic eye in which magnetic resonance imaging of the brain proved useful in revealing a choroidal detachment and diagnosing a carotid-cavernous fistula.

For patients with indirect carotid-cavernous fistulas and choroidal detachment, treatment can result in the resolution of the serous choroidal detachment; however, transient worsening of the choroidal detachment after embolization or spontaneous resolution of indirect carotid-cavernous fistula has been reported.[14–16,20] After a discussion with neurosurgery and given our patient's age and the low mortality risk related to the indirect carotid-cavernous fistula, the decision was made to observe, with the choroidal detachment slowly resolving over time.

To conclude, carotid-cavernous fistula can result in choroidal detachments secondary to venous stasis and decreased arterial perfusion. Conservative management and embolization have both been shown to be associated with the improvement of choroidal detachments. In the setting of an indirect low-flow fistula, management predominantly depends on symptom severity given the relatively low risk for mortality. In cases of carotid-cavernous fistula without clear choroidal detachment, ultrasound biomicroscopy may help identify anterior choroidal detachments, which can lead to forward rotation of the ciliary body and angle closure.

This case highlights the importance of considering a diagnosis of carotid-cavernous fistula in patients presenting with choroidal detachment of unclear etiology, especially in the setting of anterior segment venous changes.

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Ethical Approval

The collection and evaluation of all protected patient health information were performed in an ethical manner. This study conformed to the Declaration of Helsinki and the US Health Insurance Portability and Accountability Act of 1996.

Statement of Informed Consent

The patient consented to publication of the clinical history, findings, and images. The patient understands that her name and initials will not be published and that due efforts will be made to conceal her identity but that anonymity cannot be guaranteed. This report does not contain personal information that could lead to the identification of the patient.

Declaration of Conflicting Interests

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References

1. Prasad SN, Singh AP, Kanaujia V, Singh V, Phadke RV, Sharma K. Dural carotid-cavernous fistulas: our experience with endovascular management. *Egypt J Radiol Nucl Med*. 2021;52:155. doi:10.1186/s43055-021-00534-w
2. Barrow DL, Spector RH, Landman JA, Tindall SC, Tindall GT. Classification and treatment of spontaneous carotid-cavernous sinus fistulas. *J Neurosurg*. 1985;62(2):248-256. doi:10.3171/jns.1985.62.2.0248
3. Rossmann T, Veldeman M, Oulasvirta E, et al. Long-term treatment outcomes and natural course of low-grade intracranial dural arteriovenous fistulas. *Neurosurg Focus*. 2024;56(3):E2. doi:10.3171/2024.1.FOCUS23767
4. Schartz D, Rahmani R, Gunthri A, et al. Observation versus intervention for Borden type I intracranial dural arteriovenous fistula: a pooled analysis of 469 patients. *Interv Neuroradiol*. 2024;30(2):175-182. doi:10.1177/15910199221127070
5. Berk AT, Ada E, Kir E, Saatci AO. Choroidal detachment associated with direct spontaneous carotid-cavernous sinus fistula. *Ophthalmologica*. 1997;211(1):53-55. doi:10.1159/000310875

6. Harbison JW, Guerry D, Wiesinger H. Dural arteriovenous fistula and spontaneous choroidal detachment: new cause of an old disease. *Br J Ophthalmol*. 1978;62(7):483-490. doi:10.1136/bjo.62.7.483
7. Jadhav S, Padmalakshmi K, Bhende M. Red eye and choroidal detachment in an older woman. *JAMA Ophthalmol*. 2023;141:687-688. doi:10.1001/jamaophthalmol.2023.1513
8. Jorgensen JS, Guthoff R. Ophthalmoscopic findings in spontaneous carotid cavernous fistula: an analysis of 20 patients. *Graefes Arch Clin Exp Ophthalmol*. 1988;226(1):34-36. doi:10.1007/BF02172714
9. Kumbhat S, LeBlang SD, Falcone S. CT-revealed choroidal effusions as a sign of carotid cavernous fistula. *AJNR Am J Neuroradiol*. 2000;21(4):779-780.
10. Sheng J, Lally DR, Shah CP. Choroidal effusions secondary to carotid cavernous fistula. *Ophthalmol Retina*. 2017;1:226. doi:10.1016/j.oret.2016.11.009
11. Choi HY, Newman NJ, Biousse V, Hill DC, Costarides AP. Serous retinal detachment following carotid-cavernous fistula. *Br J Ophthalmol*. 2006;90:1440. doi:10.1136/bjo.2006.098723
12. Todorova MG, Palmowski-Wolfe AM, Messerli J, Meyer P. Choroidal effusion: an important hallmark in carotid-cavernous fistula. Report on 2 cases. *Invest Ophthalmol Vis Sci*. 2009;50:4040-4040.
13. Fiore PM, Latina MA, Shingleton BJ, Rizzo JF, Ebert E, Bellows AR. The dural shunt syndrome I. Management of glaucoma. *Ophthalmology*. 1990;97(1):56-62. doi:10.1016/s0161-6420(90)32641-6
14. Mazzeo V, Galli G, Signori D, Perri P. Spontaneous choroidal detachment and "red-eyed shunt syndrome": two clinical entities with the same cause? *Int Ophthalmol*. 1985;8:129-138. doi:10.1007/BF00136489
15. Klein R, Meyers SM, Smith JL, Myers FL, Roth H, Becker B. Abnormal choroidal circulation association with arteriovenous fistula in the cavernous sinus area. *Arch Ophthalmol*. 1978;96(8):1370-1373. doi:10.1001/archopht.1978.03910060124005
16. Thinda S, Melson MR, Kuchtey RW. Worsening angle closure glaucoma and choroidal detachments subsequent to closure of a carotid cavernous fistula. *BMC Ophthalmol*. 2012;12:28. doi:10.1186/1471-2415-12-28
17. Del Mar Schilt-Catafal M, Pastor-Escartín F, Martínez-Piñero A, Neira-Ibáñez P, Manfreda-Domínguez L, Duch-Samper AM. Carotid cavernous sinus fistula findings in optical coherence tomography angiography before and after percutaneous embolization. *Retin Cases Brief Rep*. 2023;17(4):478-481. doi:10.1097/ICB.0000000000001224
18. Inam O, Arat YO, Yavas GF, Arat A. Retinal and choroidal optical coherence tomography findings of carotid cavernous fistula. *Am J Ophthalmol*. 2019;206:264-273. doi:10.1016/j.ajo.2019.06.010
19. Touitou V, Shor N, Mainguy A, Touhami S. When the retina reflects the brain: an unusual presentation of a carotid-cavernous fistula. *J Neuroophthalmol*. 2023;43(4):e197-e198. doi:10.1097/WNO.0000000000001443
20. Rey A, Castillo L, Dyrda A, Maseras X, Jürgens I. Subfoveal choroidal thickness changes in carotid cavernous fistula following spontaneous resolution. *BMC Ophthalmol*. 2016;16:63. doi:10.1186/s12886-016-0240-2