

Rubeosis iridis as a sign of underlying carotid stenosis

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Severe carotid stenosis may be associated with uncommon clinical symptoms. We report a case of ocular ischemic syndrome and subsequent rubeosis iridis due to a high-grade carotid stenosis. The patient recovered visual acuity and his normal iris coloring after carotid endarterectomy. Rubeosis iridis may be the only clinical sign associated with severe carotid stenosis, making it mandatory to rule out the presence of carotid narrowing when it is detected. Establishing an early diagnosis is essential to improve quality of life, prognosis, and patients' outcome. (*J Vasc Surg* 2012;56:1724-6.)

Severe carotid artery disease may occasionally present with uncommon clinical symptoms. Rubeosis iridis secondary to ocular ischemia may be the first and sole ocular manifestation leading to the diagnosis of carotid stenosis.^{1,2}

CASE REPORT

We present a 72-year-old male patient with previous medical reports of cigarette smoking, hypertension, stable ischemic heart disease, and type 2 diabetes. He was receiving oral antidiabetics, statins, β -blockers, a nitrate vasodilator, as well as antiplatelet therapy.

The patient was initially attended to at the emergency unit of our institution after developing sudden progressive left eye visual acuity loss with progressive ocular pain during the previous 4 days. The eye examination revealed prominent rubeosis iridis, characterized by numerous coarse and irregular vessels on the surface and stroma of the iris (Fig 1), impaired visual acuity (0.4; normal value = 1), increased intraocular pressure (IOP) of 35 mm Hg, grade II hypertensive retinopathy, and mild nonproliferative diabetic retinopathy. Because of the eye fundus examination findings and clinical presentation, an ocular ischemic syndrome secondary to carotid stenosis was suspected. A supra-aortic trunk ultrasound study was performed showing heterogeneous irregular plaque in the left internal carotid artery (ICA) leading to significant preocclusive stenosis, as well as a homogeneous plaque in the bifurcation of the right internal carotid artery with moderate stenosis. Further angiogram confirmed the diagnosis of carotid stenosis revealing a critical stenosis and ulcerated plaque at the base of the left ICA. Moreover, it showed a correct perfusion across the cavernous segment of the ICA and a poor collateral circulation between the

internal and external carotid arteries through the ophthalmic artery.

The patient was subjected to preoperative assessment of cerebral hemodynamic reserve that measures cerebral blood flow variations using vasodilating stimuli (different CO₂ concentrations) with a normal pattern. After 4 days, a left carotid endarterectomy was performed using a Pruitt-Inahara shunt and Dacron patch arterial closure. The plaque was, as suggested by angiogram, ulcerated and had severe hemorrhagic areas. The postoperative period was uneventful and the patient was discharged on the fourth day. Short-term follow-up confirmed an improvement of his visual acuity to 0.7 at 1 month after surgery as well as a marked reduction of rubeosis iridis 15 days after carotid revascularization (Fig 2). After 4 years, the patient remains asymptomatic without progression of the carotid artery disease. Annual color Doppler ultrasound shows long-term patency of the artery after carotid endarterectomy with stable stenosis of the right internal carotid. On the other hand, fundoscopic examinations have shown a progressive worsening of his nonproliferative diabetic retinopathy from mild to moderate.

DISCUSSION

Rubeosis iridis due to iris neovascularization can be the only clinical sign associated with severe stenosis of the carotid artery.^{3,4} This finding is often associated with ocular ischemic syndrome (OIS) due to impaired ocular arterial blood supply that causes generalized ocular ischemia. It is also associated with a poor prognosis as the ischemia affects both anterior and posterior eye chambers, inducing inflammation and/or increased IOP secondary to neovascular glaucoma. These are cardinal features of generalized chronic ocular hypoperfusion.⁴

Ocular ischemic syndrome occurs more frequently in patients with poor collateral circulation between internal and external carotid arteries or between both internal carotid arteries.⁵ It is more frequent in males over 50 years with underlying systemic arteriosclerosis and can be bilateral in up to 20% of cases.^{2-4,6} In patients with OIS, reduced retrobulbar blood flow is usually detected using a transorbital color Doppler imaging, and it is also possible to observe a retrograde flow in the ophthalmic artery, which is a highly specific indicator of ipsilateral high-grade ICA stenosis or occlusion. The flow reversal in the ophthalmic

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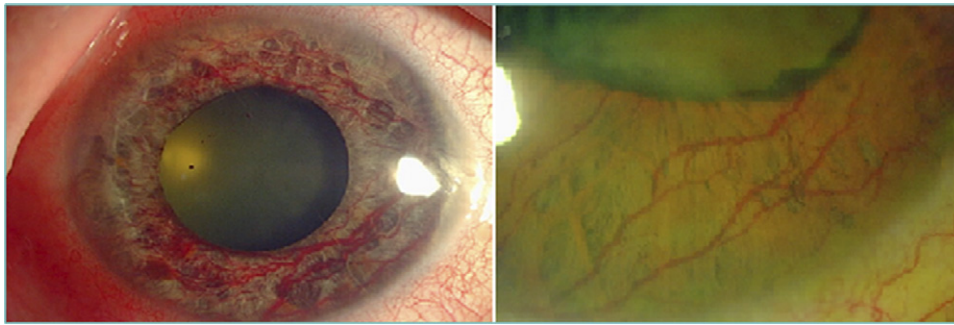


Fig 1. Eye examination showed prominent rubeosis iridis, characterized by numerous coarse and irregular vessels on the surface and stroma of the iris.

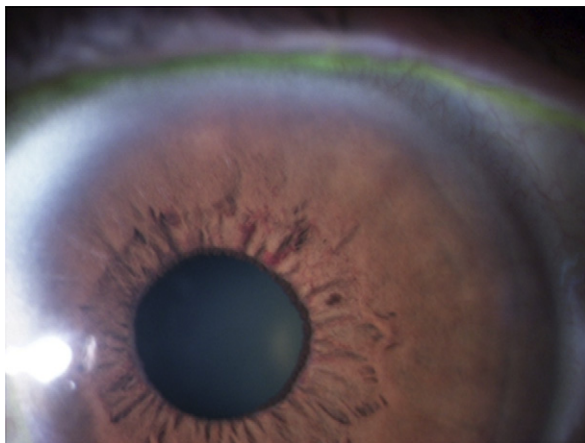


Fig 2. Postoperative image that showed an important decrease of rubeosis iridis with fewer vessels on the surface of iris.

artery produces a steal phenomenon from the ocular circulation to the low-pressure intracranial circuit, which leads to further worsening of ocular ischemia, generating more retrobulbar blood flow reduction.⁷⁻⁹

The most common symptom in patients with OIS due to carotid artery stenosis is diminished visual acuity, which is often associated with ocular pain secondary to the increase in intraocular pressure and ischemia.^{2,10} It is well known that carotid artery stenosis may lead to ipsilateral eye symptoms such as are observed in OIS. Those findings and symptoms may be the first clinical sign of underlying carotid artery disease.

Establishing an early diagnosis in patients with ocular pain and low visual acuity is mandatory. Differential diagnosis includes diabetic retinopathy, central retinal vein occlusion, and blood hyperviscosity syndromes. Low central retinal artery pressure defines OIS and occurs more commonly in patients with concurrent carotid artery stenosis, especially if systemic arteriosclerosis is also present. More infrequently, OIS may also be present in patients with giant cell arteritis, aortic arch syndrome, or Takayasu syndrome.^{2,3,11-13}

Color Doppler ultrasound of the supra-aortic arteries remains essential to confirm the diagnosis of carotid artery

disease. A transcranial ultrasound and color Doppler ultrasound of the ophthalmic artery, central retinal artery, and retrobulbar vessels add important information about the severity of the ischemia and the presence of an arterial shunt. Therefore, these findings could be used as a prognostic tool.¹⁴ Other imaging tests such as magnetic resonance angiography, arteriography, or computerized tomographic angiography may also be used, especially when surgical treatment is considered.^{7,9,10,15}

Carotid artery endarterectomy in OIS leads to an increase of blood flow and improves clinical findings and symptoms after normalization of IOP.^{5,16-20} However, the visual prognosis of these patients remains poor. This is likely due to having endured intraocular ischemia over prolonged periods of time (days), as well as the possible secondary complications from frequent comorbidities such as diabetes and hypertension. An important possible complication in the acute postoperative period following endarterectomy is a sudden rise in IOP that can require emergent ocular treatment. Medical treatment of increased IOP consists of ocular hypotensive agents that reduce aqueous outflow as topical beta-adrenergic blockers or alpha-agonists along with topical and/or oral carbonic anhydrase inhibitors. When the increased IOP is refractory to medical therapy surgery, as trabeculectomy, aqueous shunt implants or laser photocoagulation is often needed.

On the other hand, in patients with retrograde blood flow from the ophthalmic artery to low pressure intracranial vessels, a normalization of the blood flow in the ophthalmic artery following carotid endarterectomy has been reported.^{9,17}

In conclusion, the presence of rubeosis iridis can be considered as a hallmark of carotid artery disease that should be recognized as a sign of possible underlying carotid artery stenosis to lead to early diagnosis and improve the patient's outcome.^{2,20}

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