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Case Report

Central Retinal Artery Occlusion: A Rare Complication of Carotid Artery Stenting

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ABSTRACT

Carotid artery stenting (CAS) has become a promising alternative to carotid endarterectomy in the management of atherosclerotic carotid artery disease. A 68-year-old woman with diabetes and hypertension presented with an ischemic infarct in the right precentral gyrus. The patient was diagnosed with carotid stenosis, and she underwent CAS. Severe postoperative complications in the form of decreased visual acuity and visual field defect arose, and she was eventually diagnosed with central retinal artery occlusion, resulting in a near-total loss of unilateral vision. CAS reduces carotid plaques; however, it can lead to significant shedding of carotid plaques, followed by retinal artery embolism and ultimately serious loss of vision. This complication is of paramount importance, and it requires ample consideration from the interventionist before CAS. Ophthalmic evaluation is vital following CAS, and it is imperative that patients be informed of the risk of permanent vision loss. We herewith emphasize preoperative visual assessment in patients undergoing carotid revascularization who have risk factors for ocular sequelae. ***(Iranian Heart Journal 2021; 22(4): 159-163)***

KEYWORDS: Retinal artery, Vision loss, Carotid stenting, Cherry-red spot

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Carotid artery stenting (CAS) has become a promising alternative in the management of carotid artery atherosclerotic disease. The complications of the procedure include the risk of embolization, which usually involves the cerebral hemisphere and rarely the central or branch retinal arteries. We herein present a rare complication of carotid angioplasty, namely central retinal artery occlusion (CRAO), which is an ophthalmologic emergency and could be severe enough to cause complete vision loss.

Case Report

A 68-year-old woman with diabetes and hypertension presented with left hemiparesis of more than 12 hours' duration. The patient was diagnosed with an acute cerebrovascular accident, and magnetic resonance imaging (MRI-Brain) confirmed an acute non-hemorrhagic infarct in the right precentral

gyrus (Fig. 1 B). She had prior ischemic heart disease and abdominal aortic occlusion in 2014, for which coronary angioplasty and abdominal aortic stenting were done, respectively. The patient was on regular antiplatelet therapy. As she presented beyond the window period for thrombolysis, she was managed medically and stabilized. Computed tomography (CT) angiography of the cranial vessels was done later, and it showed a plaque at the bifurcation of both common carotid arteries with extension into the proximal internal carotid arteries (ICAs) bilaterally and the right-sided proximal external carotid artery (Fig. 1 A). The patient was then referred for carotid angiography. It showed 95% stenosis in the right-sided ICA and 90% stenosis in the left-sided ICA with distal plaques in the common carotid arteries bilaterally and 70% stenosis in the right-sided external carotid artery (Fig. 1 C & Fig. 1 D). After discussion with the consulting physician and counseling the patient's relatives, CAS was planned in view of the patient's history of ischemic heart disease and abdominal aortic stenting, which could increase her surgical risk. Aspirin (150 mg) and clopidogrel (75 mg) were administered daily for 5 days before the procedure. Intraoperatively, heparin was administered intravenously at a bolus dose of 5000 U (100 U/kg) immediately after femoral artery puncture. CAS was performed under local anesthesia with a 3.5/8 F Judkins right catheter (Cordis Corp, Johnson & Johnson) to cannulate the right-sided ICA under temporary pacemaker support. A 6 mm distal protection device (spider FX; EV-3, USA) was deployed, and the lesion was dilated with a 3.75×20 mm non-compliant balloon (NC TREK, Abbott) at 10 atm, followed by the deployment of an 8×6×40 mm EV3 Protégé (Medtronic, USA) self-expandable stent, resulting in the establishment of good flow (Fig. 1 E). The patient was monitored in the intensive care unit after the procedure. Twenty-four hours following the procedure, however, she complained of decreased vision in the right eye. A funduscopic examination showed a cherry-red spot and general attenuation of the retinal arteries, suggestive of CRAO (Fig. 1 E). An urgent repeat CT brain was done to rule out a new infarct, and it showed no new infarcts. The patient was started on measures to reduce the intraocular pressure with acetazolamide. Although she exhibited mild improvements in hemiparesis, there was no satisfactory improvement in her visual acuity. She was discharged on aspirin, clopidogrel, and statins, in conjunction with other supportive measures. A 3-month follow-up showed recovery of visual acuity to 50% of normal, and the left-sided ICA was asymptomatic. The patient was, therefore, kept on medical management.

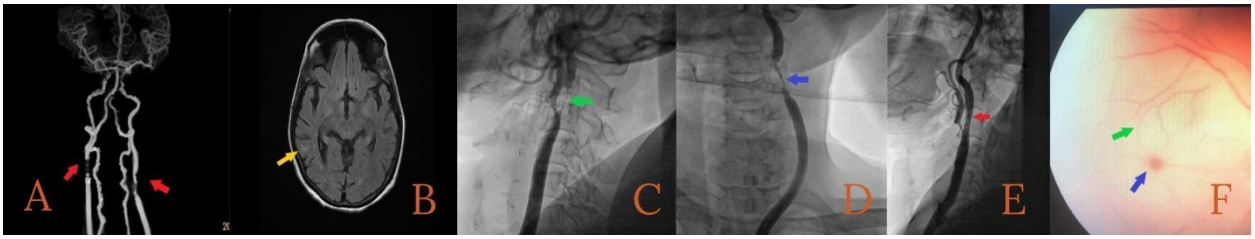

Figure 1. The computed tomography angiography shows a plaque in both common carotid arteries extending into the internal carotid artery on both sides, causing significant stenosis (A). The diffusion-weighted magnetic resonance imaging shows an acute infarct in the right precentral gyrus (B). Conventional angiography shows significant internal carotid stenosis in the right and left-sided internal carotid arteries, respectively (C and D). Good flow is noted in the right carotid artery after stenting (E). A cherry-red spot and attenuation of the retinal arteries, suggestive of central retinal artery occlusion, can be seen here (F).

DISCUSSION

The clinical benefits of CAS and carotid endarterectomy have been demonstrated in several large randomized controlled trials in high-risk patients (SAPPHIRE), average-risk patients (CREST), [2] symptomatic patients (ICSS), [3] and asymptomatic patients (ACT-1). [4] The 2017 guidelines of the European Society of Cardiology (ESC) [5] endorse CAS in symptomatic patients with average to high-risk anatomical features or medical comorbidities for carotid endarterectomy, with a documented procedural death/stroke rate of less than 6%. CAS should be preferably performed within 14 days of symptom onset. In asymptomatic patients who have average or high risks for carotid endarterectomy with 60% to 99% stenosis in the presence of clinical or imaging characteristics that may be associated with a higher chance of the recurrence of ipsilateral stroke, CAS is considered, provided that the perioperative risk is less than 3% and the patient's life expectancy is more than 5 years.

With the increased utilization of CAS, it is important to know the expected complications and their incidence rates. Complication rates range from 0.9% to 9.3% based on the experience of different centers. [6] Among the various complications, major embolic events are serious with long-term implications. CRAO is a relatively rare but vision-threatening thromboembolic phenomenon that can occur following angioplasty. Sudden painless vision loss occurring within 24 hours of stenting is highly suggestive of CRAO. The potential mechanisms of this dreaded complication are discussed here. The ophthalmic artery arises from ICA stenosis, and any significant ICA stenosis may cause insufficient blood supply to the inner retina. Similarly, during carotid angioplasty, debris in the ICA may be flushed to the retinal artery during the placement of the balloon, the carotid stent, and the embolic protection device (EPDs). Further, sometimes there can be anastomosis between the ophthalmic artery and the external carotid artery. The ophthalmic artery through its extra-orbital branches can have extensive anastomoses with the ICA, and these anastomoses may cause retinal embolization during ballooning or the placement of stents or distal protection devices. In the last few years, a few cases of ocular hypertension syndrome have been documented following CAS. [7-9] Although neovascular glaucoma is encountered more commonly before the reperfusion of the carotid artery secondary to ocular ischemic syndrome, sudden painless loss of vision following CAS should always alert the cardiologist of ocular hypertension syndrome apart from embolic/thromboembolic causes, which remains the most common cause of blindness following CAS. Neovascularization of the iris due to ocular ischemia causes both inadequate production and resorption of the aqueous humor. Neovascularization causes adhesion between the iris and the cornea, leading to the closure of the anterior chamber angle. What may follow is insufficient aqueous resorption and ultimately elevated intraocular pressure. After CAS, resorptive capacity remains the same; nonetheless, sudden improvements in the ocular circulation lead to increased humor production, which significantly increases the ocular pressure. Though ocular hypertension syndrome manifests itself usually several days to weeks following reperfusion, an acute presentation has also been documented. Embolization despite the use of EPDs has been reported in various studies. Vos et al [10] reported the occurrence of retinal embolization in 6/118 patients (4%) undergoing CAS with EPDs, of whom 2 (1.7%) were symptomatic. Wilentz et al [2] reported retinal emboli in 5/33 patients (15%) who underwent the stenting

procedure with the aid of distal EPDs. [11] The current management of CRAO includes the use of acute and chronic measures such as lowering intraocular pressure, enhanced retinal oxygenation, and ocular massage. Nevertheless, chronic treatments aim to decrease platelet adhesiveness with therapies such as aspirin, dipyridamole, and sulfinpyrazone with a view to preventing the dislodgment of further emboli and thrombus formation. For all the recent advances, no therapy has been conclusively demonstrated to be efficacious. [12] The most widely studied treatment recently is thrombolysis with tissue plasminogen activators. [13] Still, results are mixed, with trials reporting conflicting findings concerning the success of treatment. With respect to thrombolysis, guidelines advocate that it be performed within 6 hours of the onset of thrombolysis. However, patients are more often than not aware of the onset of symptoms unless gross visual field defects occur. In our case, the delayed awareness of symptom onset precluded urgent thrombolysis, highlighting the underrecognized but threatening complication of CRAO. As such, careful vigilance with objective visual field analysis should be considered in all patients following CAS.

Summary

Patients presenting with symptomatic carotid artery disease may need to undergo revascularization therapy via either CAS or endarterectomy based on their clinical profile. CRAO is a rare complication seen in patients undergoing CAS; hence, all patients should receive comprehensive explanations before the procedure regarding its risks because of the poor visual prognosis. It should be kept in mind that whenever patients develop visual symptoms post CAS, it should be considered an ocular emergency that requires quick assessment and treatment. We also wish to underscore the significance of preoperative visual assessment in patients undergoing carotid revascularization who have risk factors for ocular sequelae.

Declaration of Conflict of Interest

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Informed Consent

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