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Neovascular Glaucoma Following Central Retinal Artery Occlusion and Carotid Stenting: A Case Report on Surgical Timing and Dual Antiplatelet Therapy Considerations

Rohun R. Gupta

ABSTRACT

INTRODUCTION AND IMPORTANCE

Neovascular glaucoma (NVG) following central retinal artery occlusion (CRAO) in patients requiring dual antiplatelet therapy (DAPT) after carotid stenting presents a complex clinical challenge. The timing of glaucoma surgery must balance hemorrhagic risks from antiplatelet therapy against the urgent need for intraocular pressure control. This case highlights critical decision-making considerations in managing NVG when surgical intervention is complicated by recent vascular procedures requiring ongoing anticoagulation.

CASE PRESENTATION

A 33-year-old male with proliferative diabetic retinopathy developed CRAO secondary to 80–90% right internal carotid artery stenosis. Following emergent carotid stenting and initiation of DAPT (aspirin and ticagrelor), he developed refractory NVG in the affected eye. Despite maximal medical therapy including topical glaucoma medications and intravitreal anti-VEGF injections, intraocular pressure remained elevated (24–42 mmHg) over six months. Progressive visual deterioration occurred from counting fingers at 6 feet to hand motions, with cup-to-disc ratio progression from 0.6 to 0.9, ultimately resulting in ciliary body shutdown.

CLINICAL DISCUSSION

This case demonstrates the limitations of conservative management in NVG when surgical intervention is contraindicated due to bleeding risks. The Law et al. study showing 31.8% hemorrhagic complication rates in patients continuing anticoagulation during glaucoma surgery informed the decision to delay intervention. However, the progressive optic nerve damage highlights the need for earlier multidisciplinary consultation to explore antiplatelet bridging strategies or modified surgical approaches with lower bleeding risks.

CONCLUSION

NVG in patients on DAPT following carotid stenting requires individualized multidisciplinary management. While conservative therapy may be initially appropriate given bleeding risks, the refractory nature of NVG to medical management alone necessitates early surgical planning. Future cases may benefit from coordinated antiplatelet modification protocols and consideration of cyclophotocoagulation as a lower-risk surgical option.

Keywords: Neovascular glaucoma, Central retinal artery occlusion, Carotid artery stenosis, Dual antiplatelet therapy, Glaucoma surgery timing

Introduction

Neovascular glaucoma (NVG) represents one of the most challenging forms of secondary glaucoma, characterized

by fibrovascular proliferation in the anterior chamber angle leading to elevated intraocular pressure and progressive vision loss.¹ The condition typically results from retinal ischemia, which triggers vascular endothelial growth factor (VEGF) release and subsequent anterior segment neovascularization.² While proliferative diabetic retinopathy and ischemic central retinal vein occlusion are the most common causes, central retinal artery occlusion (CRAO) represents an important etiology due to its strong association with carotid artery disease.³

The management of NVG becomes particularly complex when it occurs following carotid intervention requiring dual antiplatelet therapy (DAPT). Carotid artery stenting necessitates antiplatelet therapy to prevent stent thrombosis, yet glaucoma surgery in anticoagulated patients carries significantly increased hemorrhagic risks.⁴ This case report presents a challenging clinical scenario that illustrates the difficult balance between thrombotic and hemorrhagic risks in managing NVG following carotid stenting.

Methods

This case report was prepared in accordance with the SCARE 2025 guidelines.⁵ Written informed consent was obtained from the patient for publication of this case report and any accompanying images. Institutional review board approval was not required for this single case report as per institutional guidelines. The clinical workup included comprehensive ophthalmic examinations with intraocular pressure measurements, visual acuity assessment, anterior and posterior segment evaluation, and optical coherence tomography of the optic nerve. The patient was followed over a six-month period with regular monitoring of clinical parameters and response to medical therapy (Table 1).

Case Presentation

A 33-year-old male with a medical history significant for proliferative diabetic retinopathy in both eyes status post panretinal photocoagulation and bilateral pseudophakia presented for urgent glaucoma evaluation. The patient had been hospitalized with acute onset of painless monocular vision loss in the right eye. Comprehensive vascular imaging revealed severe (80–90%) stenosis of the right internal carotid artery with poor Circle of Willis collaterals. The patient underwent emergent carotid artery stenting and was placed on DAPT consisting of aspirin and ticagrelor.

Following the vascular intervention, ophthalmologic evaluation revealed CRAO with subsequent development of NVG in the right eye. The patient received

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Table 1 | Summarizes the clinical course over the six-month follow-up period

| Time Point | Visual Acuity OD | IOP OD (mmHg) | Cup-to-Disc Ratio OD | Interventions |
|----------------------|------------------|---------------|----------------------|--------------------------|
| Initial presentation | CF 6 feet | 28 | 0.6 | Maximal medical therapy |
| 4 days | CF 6 feet | 39–42 | 0.6 | Continue medical therapy |
| 1 month | CF 3 feet | 30–37 | 0.6 | Anti-VEGF injection |
| 2 months | HM | 24–37 | 0.7 | Continue therapy |
| 3-4 months | HM | 24–38 | 0.8 | Continue therapy |
| 5-6 months | CF face | 33–40 | 0.9 | Continue therapy |
| Final visit | HM | 7 | 0.9 | Ciliary body shutdown |

CF: Counting fingers; HM: Hand motions; IOP: Intraocular pressure; OD: Right eye

an intravitreal anti-VEGF injection three days prior to our evaluation and was started on maximal medical glaucoma therapy including latanoprost, dorzolamide-timolol combination, brimonidine, and oral acetazolamide.

Clinical Timeline and Examination Findings

Initial examination revealed visual acuity of counting fingers at 6 feet in the right eye with markedly elevated intraocular pressure of 28 mmHg despite maximal medical therapy. The anterior segment demonstrated 360-degree neovascularization of the iris with a slowly responsive pupil. Posterior segment examination showed neovascularization of the optic disc with a cup-to-disc ratio of 0.6, severely attenuated retinal vessels, and evidence of previous panretinal photocoagulation. The left eye maintained 20/25 vision with normal intraocular pressure of 11 mmHg.

The fluorescein angiography demonstrates the characteristic vascular changes associated with central retinal artery occlusion and subsequent ischemic retinopathy. The image reveals extensive areas of capillary non-perfusion, particularly in the peripheral retina, with marked arteriovenous transit delays consistent with compromised retinal circulation. The central retinal vessels show attenuated caliber and delayed filling patterns typical of CRAO. Areas of retinal ischemia are evident as hypofluorescent zones where capillary dropout has occurred. The optic disc demonstrates hyperfluorescence consistent with neovascularization of the disc (NVD), which correlates with the clinical findings of proliferative changes secondary to retinal ischemia. These angiographic findings provide objective documentation of the extensive retinal ischemia that served as the driving force for VEGF-mediated anterior segment neovascularization and subsequent development of neovascular glaucoma. The scale bar

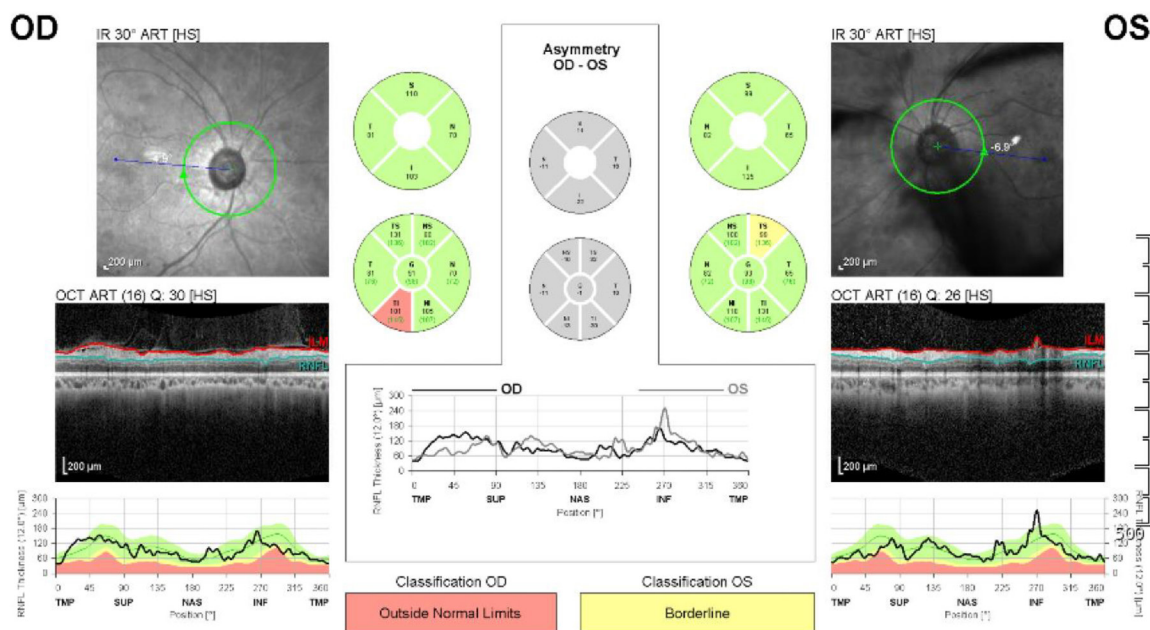


Fig 1 | Optical coherence tomography retinal nerve fiber layer (OCT RNFL) analysis
 The OCT analysis demonstrates significant asymmetry between the right eye (OD) and left eye (OS). Inferior thinning of the right eye is demonstrated at this baseline OCT-N. The infrared fundus images show the optic disc appearance with significant cupping in the right eye.

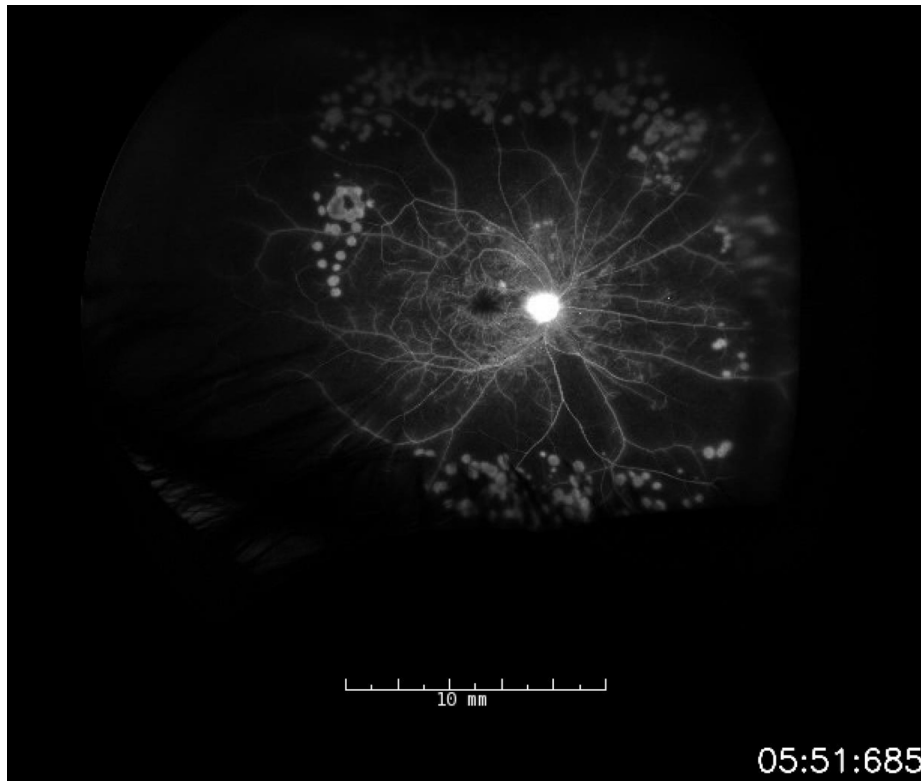


Fig 2 | Fluorescein angiography of the right eye

indicates the field of view, demonstrating the widespread nature of the ischemic changes throughout the posterior pole and mid-peripheral retina.

Surgical Considerations and Multidisciplinary Consultation

Multiple surgical options were considered for this patient, including Ahmed glaucoma valve implantation, trabeculectomy with mitomycin C, and cyclophotocoagulation. However, the recent carotid stenting (within one month) and ongoing DAPT requirement created significant concerns regarding hemorrhagic complications. Consultation with cardiology and vascular surgery teams confirmed that discontinuation of DAPT within the first month post-stenting would pose unacceptable thrombotic risks.

The possibility of antiplatelet bridging with shorter-acting agents was discussed but deemed inappropriate given the high-risk nature of the recent carotid intervention and poor collateral circulation. Cyclophotocoagulation was considered as a potentially lower-risk option due to its non-incisional nature, but concerns about unpredictable pressure control and potential for inflammation in an already compromised eye led to continued conservative management.

Discussion

Pathophysiology and Clinical Significance

This case exemplifies the complex pathophysiological cascade from systemic vascular disease to devastating

ocular complications. The patient's underlying diabetes with proliferative diabetic retinopathy created baseline retinal ischemia and VEGF upregulation.¹ The subsequent CRAO, caused by severe carotid stenosis, provided an additional ischemic stimulus that triggered anterior segment neovascularization. The relationship between CRAO and carotid disease is well-established, with ipsilateral carotid stenosis present in approximately 50% of CRAO patients.⁶

The OCT analysis (Figure 1) provides objective documentation of the severe glaucomatous damage that occurred during the clinical course. The marked asymmetry between eyes, with the right eye showing "Outside Normal Limits" RNFL thickness while the left eye remained "Borderline," demonstrates the rapid progression of optic nerve damage in the setting of uncontrolled intraocular pressure. The RNFL thickness maps clearly illustrate the diffuse nature of the damage, with particular involvement of the superior and inferior quadrants typical of glaucomatous optic neuropathy.

Antiplatelet Therapy and Surgical Risk Assessment

The decision-making process in this case was significantly influenced by the landmark study by Law et al., which demonstrated that patients on anticoagulation or antiplatelet therapy had significantly higher hemorrhagic complication rates during glaucoma surgery compared to controls (10.1% vs 3.7%, $P = 0.002$).⁴ More concerning, patients who continued anticoagulation during surgery had the highest complication rate at

31.8%. While our patient was on DAPT rather than full anticoagulation, the combination of aspirin and ticagrelor still posed substantial bleeding risks (Figure 2).

Recent literature has provided additional insights into perioperative antithrombotic management in ophthalmic surgery. The 2024 American Academy of Ophthalmology Preferred Practice Pattern emphasizes individualized risk assessment and multidisciplinary consultation for patients requiring ongoing anticoagulation.⁷ For patients with recent carotid stenting, the risk of stent thrombosis must be carefully weighed against the urgency of ophthalmic intervention.

Surgical Options and Risk-Benefit Analysis

Contemporary surgical approaches for NVG include traditional filtering procedures, glaucoma drainage devices, and cyclodestructive procedures. Recent comparative studies have examined outcomes of different approaches in NVG patients. A 2023 multicenter study comparing Ahmed glaucoma valve implantation with cyclophotocoagulation in NVG found comparable pressure control (mean final IOP 17.2 vs 18.1 mmHg) but different complication profiles.⁸ The drainage device group had higher rates of early hypotony and hyphema (complications particularly concerning in anticoagulated patients), while the cyclophotocoagulation group required more repeat procedures.

The 2024 update to glaucoma surgical guidelines suggests that cyclophotocoagulation may be preferred in high bleeding-risk patients due to its non-incisional nature, though success rates may be more variable.⁹ In retrospect, earlier consideration of cyclophotocoagulation might have been appropriate in this case, particularly given the progressive nature of the disease and ultimate poor visual outcome.

Anti-VEGF Therapy Limitations

While intravitreal anti-VEGF therapy has become an important adjunct in NVG management, this case demonstrates its limitations as monotherapy. Anti-VEGF agents can provide temporary regression of neovascularization but do not address the underlying mechanical obstruction of aqueous outflow.¹⁰ The effects are typically temporary, with neovascularization recurring within weeks to months if definitive intervention is not performed. More aggressive anti-VEGF protocols with monthly injections might have provided better bridging therapy in this case.¹¹⁻¹³

Learning Points and Clinical Implications

This case provides several important learning points for managing similar complex scenarios. First, the strong association between CRAO and carotid disease necessitates prompt vascular evaluation, but subsequent interventions create additional challenges for ophthalmic management. Second, while conservative management may be initially appropriate given bleeding risks, the refractory nature of NVG to medical therapy alone requires early surgical planning and multidisciplinary coordination.¹⁴⁻¹⁶

Third, the progressive deterioration observed in this patient (visual acuity decline from counting fingers to hand motions, cup-to-disc ratio progression from 0.6 to 0.9) underscores the urgent nature of NVG and the limitations of prolonged conservative management. The OCT findings (Figure 1) provide objective evidence of this progression, showing severe RNFL thinning that correlates with the clinical deterioration. The eventual development of ciliary body shutdown, while providing symptomatic pressure relief, represents end-stage disease with minimal potential for visual recovery.^{17,18}

Future Directions and Recommendations

Based on this experience, we recommend several strategies for managing similar cases. Early multidisciplinary consultation involving ophthalmology, cardiology, and vascular surgery should be initiated to develop coordinated management plans. Consideration should be given to cyclophotocoagulation as a potentially lower-risk surgical option in patients with high bleeding risk. More aggressive anti-VEGF protocols may provide better bridging therapy while surgical options are being evaluated.

Additionally, development of institutional protocols for perioperative antiplatelet management in urgent ophthalmic cases could improve outcomes. Such protocols might include criteria for temporary antiplatelet modification, alternative surgical approaches for high-risk patients, and standardized monitoring procedures.

Conclusion

This case illustrates the challenging clinical scenario of managing NVG in patients requiring ongoing DAPT following carotid stenting. While the initial decision to pursue conservative management was reasonable given the bleeding risks, the progressive visual deterioration and optic nerve damage demonstrate the limitations of this approach. The case emphasizes the importance of early multidisciplinary consultation, consideration of alternative surgical approaches with lower bleeding risks, and the need for individualized patient care in complex medical scenarios.

The poor visual outcome in this case, while disappointing, provides valuable insights for managing similar patients in the future. The OCT analysis clearly documents the extent of glaucomatous damage that occurred during the period of conservative management, reinforcing the urgent nature of this condition. Key takeaways include the need for earlier surgical intervention when medically feasible, the potential role of cyclophotocoagulation in high bleeding-risk patients, and the importance of coordinated care between multiple subspecialties. These lessons may help improve outcomes for future patients with similar complex presentations at the intersection of ophthalmology and vascular medicine.

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