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Case report

Gonioscopy-assisted goniosynechialysis with fibrovascular membrane dissection for advanced neovascular glaucoma: A case report

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ABSTRACT

We report a case of a 26-year-old woman with poorly controlled type 2 diabetes who developed neovascular glaucoma in the left eye, with an intraocular pressure of 80 mmHg and nearly 360° synechial angle closure. When medical therapy and intravitreal conbercept failed to control the pressure, gonioscopy-assisted goniosynechialysis and fibrovascular membrane dissection were performed. During 12 months of follow-up, intraocular pressure remained between 13.0 and 18.9 mmHg without intraocular pressure-lowering medication, more than 180° of the anterior chamber angle remained open, and no recurrent neovascularization was observed.

1. Introduction

Neovascular glaucoma (NVG) is a severe secondary glaucoma associated with retinal ischemia. Increased expression of vascular endothelial growth factor (VEGF) induces neovascularization of the iris and anterior chamber angle, followed by fibrovascular membrane formation, trabecular meshwork (TM) obstruction, and peripheral anterior synechiae (PAS), ultimately causing refractory intraocular pressure (IOP) elevation.[1–4] Anti-VEGF therapy and panretinal photocoagulation can suppress the angiogenic drive; however, once extensive synechial angle closure has developed, IOP often remains uncontrolled and surgical intervention is required.[1,5–8]

Trabeculectomy, glaucoma drainage devices, and cyclophotocoagulation are commonly used in advanced NVG, but hemorrhage, postoperative fibrosis, hypotony, and other complications may limit long-term outcomes.[9–14] An angle-based approach that reopens the synechially closed angle and selectively dissects fibrovascular membrane from the TM may offer a means of restoring conventional aqueous outflow. However, such an approach remains exploratory and should not currently be considered a routine first-line treatment for advanced NVG.

Here, we report a case of advanced NVG secondary to diabetic retinopathy in a 26-year-old woman with an IOP of up to 80 mmHg (1 mmHg = 0.133 kPa) and nearly 360° synechial angle closure. Because medical therapy and intravitreal conbercept failed to achieve sustained pressure control, gonioscopy-assisted goniosynechialysis and fibrovascular membrane dissection (GAGMD) was performed 10 days after anti-VEGF treatment. During 12 months of follow-up, IOP remained controlled, more than 180° of the anterior chamber angle remained open, and no recurrent neovascularization was observed. This case suggests that anti-VEGF pretreatment may create a therapeutic window for direct angle reconstruction in carefully selected eyes with advanced NVG.[15]

2. Case description

A 26-year-old woman with a 12-year history of poorly controlled type 2 diabetes presented with a 3-week history of decreased vision in the left eye, ocular distension, headache, and nausea. Her glycated hemoglobin level was 9.9%, and the highest recorded IOP in the left eye was 80 mmHg. At presentation to our hospital, visual acuity was “finger counting” in the left eye and 0.08 in the right eye, with corresponding IOPs of 49 mmHg and 12 mmHg, respectively. Slit-lamp examination of the left eye revealed prominent neovascularization of the iris, a fixed dilated pupil, and ectropion uveae. Gonioscopy demonstrated 360° PAS. Although visualization of the left fundus was partially obscured by lens opacity, fundus examination revealed bilateral vitreous hemorrhage, retinal hemorrhages and exudates, fibrovascular proliferation, and macular edema. These findings were consistent with proliferative diabetic retinopathy and supported the diagnosis of NVG secondary to diabetic retinal ischemia.

The patient was treated with four topical IOP-lowering agents (timolol, brimonidine, dorzolamide, and travoprost), anterior chamber paracentesis, and intravenous mannitol. Nevertheless, IOP repeatedly exceeded 50 mmHg. After an intravitreal injection of conbercept (0.5 mg/0.05 mL), the IOP transiently decreased to approximately 35 mmHg and the neovascularization of the iris partially regressed. Within 24 hours, however, the IOP rose again to above 40 mmHg. Go-

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nioscopy showed complete synechial angle closure, while the fixed dilated pupil and ectropion uveae suggested traction from a fibrovascular membrane (Fig. 1A). Ultrasound biomicroscopy confirmed circumferential angle closure (Fig. 1C).

Because the IOP remained uncontrolled after anti-VEGF therapy, GAGMD was performed 10 days after the conbercept injection. Following standard corneal incisions, intracameral carbachol was administered to induce miosis, and an ophthalmic viscosurgical device was used to deepen and stabilize the anterior chamber. Intraoperative gonioscopy revealed circumferential synechial angle closure caused by a fibrovascular membrane. Viscodissection was first used to mobilize the peripheral iris, after which the adherent iris was sharply separated from the TM with a trabeculotomy knife and the opening was enlarged by lateral sweeping. The TM-adherent membrane was elevated and peeled with a trabeculotomy knife and a Tanito hook, and the dissected tissue was removed with 25-gauge retinal forceps. Continuous gonioscopic irrigation-aspiration and repeated reinjection of the ophthalmic viscosurgical device were used to maintain anterior chamber stability and visualization during minor bleeding. The procedure was performed sequentially by quadrant rather than through continuous circumferential dissection from a fixed view. The surgeon repositioned among the nasal, superior, and temporal sides of the patient, with corresponding adjustments of the patient's head position, microscope viewing axis, gonioscope, and instrument approach to obtain a stable view of the target angle. Treatment was limited to areas with adequate visualization and safe instrument access. Residual membrane fragments were then removed, followed by inspection of the exposed TM and adjacent angle structures (Fig. 2; **Supplementary Video).**

Postoperatively, visual acuity remained at "finger counting". No IOP-lowering medication was required during follow-up. IOP was 13.0 mmHg on day 1, 18.9 mmHg at 2 months, 16.0 mmHg at 6 months, and 17.0 mmHg at 12 months. No clinically significant hyphema, corneal edema, inflammatory reaction, hypotony, or other procedure-related adverse events were observed during the postoperative follow-up. At the 12-month follow-up, both gonioscopy and ultrasound biomicroscopy showed that more than 180° of the anterior chamber angle remained anatomically open, with focal residual PAS and no recurrent neovascularization (Fig. 1B and 1D).

3. Discussion

NVG is an aggressive secondary glaucoma in which retinal ischemia induces neovascularization and fibrovascular proliferation over the iris and anterior chamber angle. As the membrane contracts, progressive PAS and synechial angle closure obstruct the conventional aqueous outflow pathway. In advanced disease, medical therapy and anti-VEGF treatment may induce regression of active neovascularization but are often insufficient to reverse the mechanical obstruction or achieve sustained IOP control.[1–8] Trabeculectomy, glaucoma drainage devices, and cyclophotocoagulation remain established options, although hemorrhage, postoperative fibrosis, hypotony, and other complications may compromise outcomes in eyes with active ischemia.[9–14]

In the present case, intravitreal conbercept produced partial regression of iris neovascularization, but the IOP rapidly rose to above 40 mmHg. Gonioscopy and ultrasound biomicroscopy demonstrated nearly circumferential synechial angle closure, while the fixed dilated pupil and ectropion uveae suggested traction from a fibrovascular membrane. These findings indicated that the persistent pressure elevation was primarily related to structural obstruction of the angle rather than ongoing neovascular activity alone. Accordingly, treatment was directed toward separating the PAS and removing the membrane covering the TM.

Angle-reconstruction procedures are well established for several forms of angle-closure glaucoma, but their use in NVG has been limited

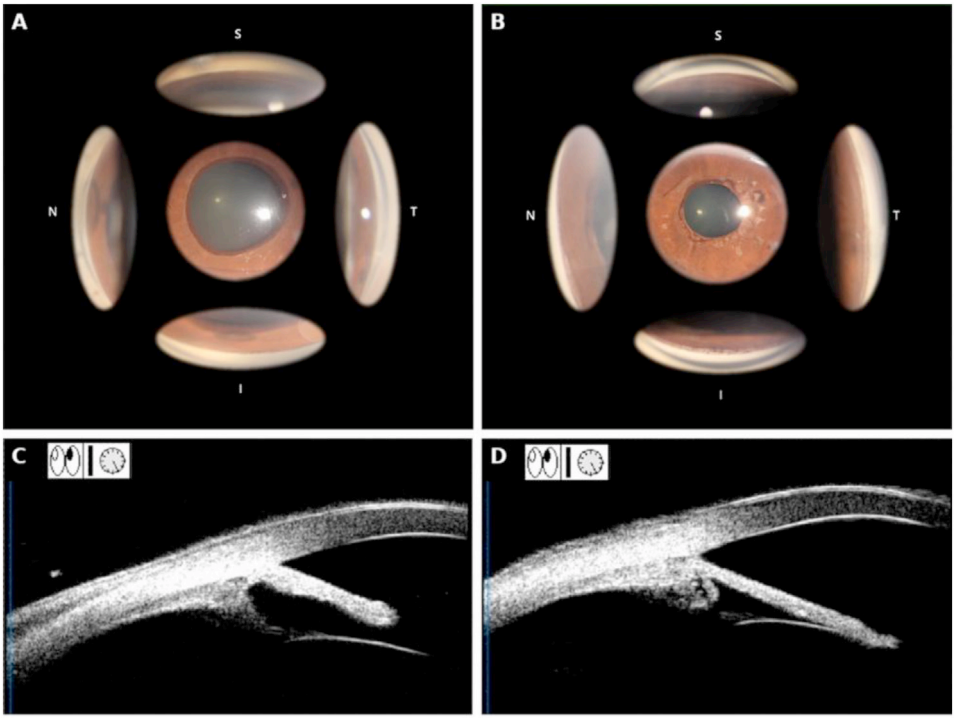


Fig. 1. Gonioscopic and ultrasound biomicroscopic findings of the anterior chamber angle before and after gonioscopy-assisted goniosynechialysis and fibrovascular membrane dissection (GAGMD). (A) Preoperative 360° gonioscopic view after partial regression of angle neovascularization, showing complete synechial angle closure, a fixed dilated pupil, and ectropion uveae caused by fibrovascular traction. (B) Gonioscopy at 12 months after surgery, showing focal residual peripheral anterior synechiae, reopening of more than 180° of the anterior chamber angle. (C) Preoperative ultrasound biomicroscopy, showing circumferential angle closure. (D) Postoperative ultrasound biomicroscopy, showing reopening of the anterior chamber angle extending clockwise from the inferotemporal region toward the nasal quadrant.

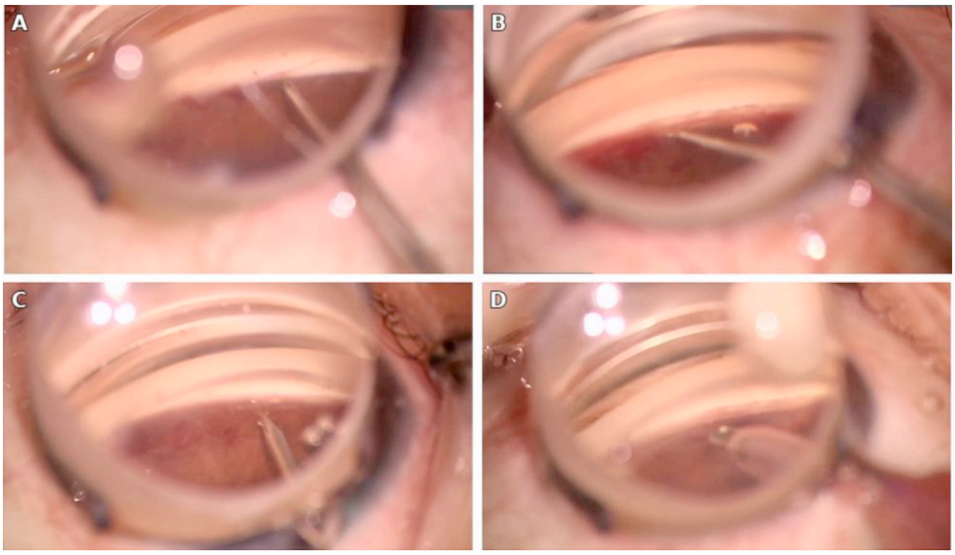


Fig. 2. Intraoperative steps of GAGMD. (A) Initial gonioscopic assessment and blunt goniosynechialysis. (B) Sharp goniosynechialysis with dissection and peeling of the fibrovascular membrane. (C) Removal of the dissected fibrovascular tissue with 25-gauge retinal forceps. (D) Irrigation-aspiration to remove residual membrane fragments and clear the anterior chamber.

by dense adhesions, intraoperative bleeding, and concern regarding irreversible TM injury. Published experience with direct gonioscopic reconstruction of the angle and removal of fibrovascular tissue in advanced NVG remains very limited. A previous report described extraction of anterior chamber fibrovascular tissue, but did not specifically assess gonioscopy-assisted reconstruction of nearly 360° synechial closure.[16] Against this limited evidence base, the present case is clinically noteworthy because it documents a gonioscopy-assisted strategy combining goniosynechialysis with targeted fibrovascular membrane dissection after anti-VEGF pretreatment. The potential contribution of this approach lies in attempting to restore the conventional aqueous outflow pathway rather than bypassing or destroying it. However, this observation should be regarded as preliminary technical and clinical evidence rather than proof of superiority over established procedures.

Anti-VEGF pretreatment may provide an important therapeutic window for GAGMD by reducing neovascular activity and tissue vascularity, although intraoperative bleeding may still occur.[6,15,17] Adequate regression of iris and angle neovascularization is therefore important before surgery. Limited bleeding may be managed with viscoelastic reinjection and irrigation-aspiration to maintain visualization; however, if bleeding obscures the angle and a clear gonioscopic view cannot be restored, further angle reconstruction should be discontinued.

Gonioscopic visualization and instrument access also impose technical limitations. The procedure is performed sequentially by quadrant, requiring frequent adjustment of the surgeon's position, patient head position, microscope viewing axis, gonioscope, and instrument approach as needed. Treatment should be limited to areas with adequate visualization and safe instrument access, and the substantial learning curve may limit reproducibility.

In the present case, at 12 months, more than half of the angle remained anatomically open. Throughout follow-up, IOP remained between 13.0 and 18.9 mmHg without IOP-lowering medication, suggesting that at least part of the conventional outflow system retained functional capacity. No clinically significant hyphema, corneal edema, inflammatory reaction, hypotony, or other procedure-related adverse events were observed during the 12-month follow-up.

GAGMD adopts an ab interno, angle-based, tissue-sparing strategy that is conceptually aligned with the principles of minimally invasive glaucoma surgery, aiming to restore conventional aqueous outflow while minimizing disruption of ocular tissues. In selected eyes, successful IOP control may provide a therapeutic window for treatment of the underlying retinal ischemic disease and potentially defer more invasive glaucoma surgery or cyclodestructive treatment. However, given its technical demands and limited evidence, GAGMD remains an exploratory approach for advanced NVG. Nevertheless, angle reconstruction does not eliminate the underlying ischemic drive; coordinated postoperative management, including anti-inflammatory therapy, appropriate miotic therapy, repeated anti-VEGF injections, and timely panretinal photocoagulation, remains essential to reduce the risks of recurrent neovascularization, reformation of PAS, and subsequent angle reclosure.

Several questions remain regarding the role of this procedure in advanced NVG. Because published reports of this specific treatment strategy are scarce, the optimal timing after anti-VEGF treatment, the extent and chronicity of PAS compatible with successful reopening, and the degree of preserved TM function required for sustained pressure control remain uncertain. Candidate selection should therefore be cautious, particularly in eyes with longstanding angle closure or severe structural damage.

This report is limited by its single-case design, 12-month follow-up, persistent poor visual acuity, and residual PAS. The durability of the reopened angle and the comparative safety and efficacy of GAGMD relative to established glaucoma procedures cannot be determined. Given its technical demands, potential complications, and limited evidence, GAGMD should not currently be considered a routine first-line treatment for advanced NVG, but rather an exploratory option for carefully selected patients. The present case provides preliminary evidence of technical feasibility and sustained IOP control over 12 months, but does not establish general effectiveness or superiority over existing treatments. Larger prospective studies with longer follow-up are required to define its indications, safety profile, and long-term effectiveness.

Authors' contributions

Jin Y: Writing-original draft, Visualization. Zhang Y: Writing-original draft, Visualization. Sun ZX: Investigation. Cheng GW: Supervision, Writing-review & editing. All authors reviewed the manuscript.

Patient's consent

Written informed consent has been obtained from the patient for the publication of this case report.

Declaration of generative AI and AI-assisted technologies use

The authors declare that no generative AI or AI-assisted technologies were used in the preparation of this manuscript.

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Conflict of interest disclosure

None.

Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.cmsj.2026.09.003.

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