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Case Report

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Combined Trabeculectomy with Mitomycinc, Pars Plana Vitrectomy with Panretinal Photocoagulation, and Intravitreal and Intracameral Bevacizumab for Neovascular Glaucoma

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ABSTRACT

Purpose: To report the effectiveness of combined surgery for neovascular glaucoma.
Methods: Six eyes of six consecutive patients with neovascular glaucoma underwent the combined surgery: trabeculectomy with Mitomycin C, Pars Plana Vitrectomy (PPV), endolaserpanretinal photocoagulation, intravitreal and intracameral injection of bevacizumab.
Results: The intraocular pressure returned to normal range soon after operation. The neovascularization of iris regressed in a few days. Mild hyphema developed in three patients. All six patients had improved or stable visual acuity, and achieved normal intraocular pressure without antiglaucoma medications three months after operation.
Conclusions: This combined surgery may break the vicious cycle of neovascularglaucoma and preserve useful vision in these patients.

KEYWORDS: Neovascular glaucoma; Trabeculectomy; Mitomycin C; Pars plana vitrectomy; Endolaser photocoagulation; Intravitreal bevacizumab; Intracameral bevacizumab.

INTRODUCTION

Neovascular glaucoma (NVG) is a severe and rapidly progressive form of glaucoma associated with extensive retinal ischemia. Angiogenic factors, mainly Vascular Endothelial Growth Factor (VEGF), are released and result in Neovascularization of the iris (NVI) and the angle, and elevation of Intraocular pressure (IOP). The IOP elevation further reduces the ocular perfusion and aggravates retinal ischemia, which leads to a vicious cycle and a refractory glaucoma. Due to its rapid and devastating course, we suggest combined surgeries for NVG.

MATERIALS AND METHODS

A consecutive series of six eyes in six patients with uncontrollable NVG were enrolled. Informed consents were obtained for the off-label use of bevacizumab and the surgeries. All patients received the combined surgery including trabeculectomy with mitomycin C, pars plana vitrectomy (PPV), endolaser Panretinal photocoagulation (PRP), Intravitreal bevacizumab (IVB, 2.5 mg/0.1 ml), and Intracameral bevacizumab (ICB, 1 mg/0.04 ml)).

RESULTS

The outcome was illustrated in Table 1. In all six cases, the IOP returned to normal

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	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Age	80	63	55	36	62	63
Gender	Female	Female	Male	Female	Male	Male
Underlying disorder	CRVO	PDR	PDR + OIS	PDR	PDR	PDR
Previous ocular surgery	IVB*4	None	IVB*2, CC	None	PE+IOL	PRP, PE+IOL
At presentation						
Visual acuity	LP+	CF 30 cm	HM 10cm	HM	HM 50 cm	0.05
IOP (mmHg)	40	59	55	36	58	60
No. of medication	3	3	3	4	4	3
Neovascularization of iris	+	+	+	+	+	+
Hemorrhage Status of lens Postoperative bleeding	VH Brunescent Mild hyphema	Hyphema, VH Clear Mild hyphema	Hyphema, VH Nuclear cataract None	VH Clear None	Hyphema, VH PCIOL Mild hyphema	None PCIOL None
6 months after surgery						
Visual acuity	6/120	6/60	6/60	6/60	6/120	6/120
IOP (mmHg)	10	12	19	12	9	9
Recurrence	None	None	None	None	None	None

Recurrence indicates recurrence of neovascularization of iris and/or angle.
IOP: Intraocular pressure; CRVO: Central Retinal Vein Occlusion; PDR: Proliferative Diabetic Retinopathy; OIS: Ocular Ischemic Syndrome; IVB: intravitreous Injection of Bevacizumab; CC: Cyclocryotherapy; PE: Phacoemulsification; IOL: Intraocular lens; PRP: Panretinal photocoagulation; LP: Light Perception; CF: Counting Fingers; HM: Hand Motion; VH: Vitreous Hemorrhage.

Table 1: Patient characteristics and outcome.

range after surgery, and the NVI regressed completely in two weeks. All patients had improved or stable Visual Acuity (VA) for more than six months.

CASE REPORTS

Case 1

An 80-year-old woman was diagnosed with central retinal vein occlusion and had IVB four times. The VA was light perception. The IOP was 40 mm Hg with dorzolamide/timolol and brimonidine. Corneal edema, NVI, brunescent cataract, and Vitreous Hemorrhage (VH) were noted. She underwent phacoemulsification and the suggested combined surgery. Six months postoperatively, the best corrected VA of the left eye was 6/120, and the IOP was 10 mm Hg.

Case 2

A 63-year-old diabetic female had PDR, NVI, hyphema and VH. The IOP was 59 mm Hg and refractory to medication. The patient underwent combined surgery. The VA improved to 6/60 and IOP remained normal during the 4-year follow-up.

Case 3

A 55-year-old diabetic man was diagnosed as NVG and VH and had received Cyclocryotherapy (CCT) and IVB at another hospital but in vain. Combined surgery was carried out. Severe attenuation of retinal arteries and veins and whitening of the retina were noted. His ocular pain was resolved after the operation. Six months later, the IOP was 19 mm Hg and his VA improved to 6/60.

Case 4

A 36-year-old diabetic woman had NVG and VH in her right eye. The IOP was 36 mm Hg under full medication. The combined surgery was performed. The IOP was about 10 mm Hg during follow-up.

Case 5

A 62-year-old diabetic man had NVG in the right eye. The VA was HM at 50 cm. The IOP was 58 mm Hg with full medications. One week after operation, the NVI was completely resolved. At six-month's follow-up, his vision was 6/120, and IOP was 9 mm Hg with good bleb function.

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Case 6

A 63-year-old diabetic man was diagnosed with NVG in the right eye. The IOP was 60 mm Hg despite full medication. Gonioscopy revealed 360 degree peripheral anterior synechiae. One week after the combined surgery, the IOP decreased to 9 mm Hg and the NVI had resolved. The condition remained stable over a year of follow-up.

DISCUSSION

Medical treatment or separate procedure often leads to a disappointing visual result in NVG patients. This combined surgery provides prompt and adequate controlling of IOP.

NVG usually responds poorly to medication, and filtering procedure is mandatory. Failure rate of trabeculectomy alone is high in NVG eyes,[1] but decreases when adjunct with mitomycin C.[2]

PRP is important for ablation of the ischemic retina. When media opacity precludes complete PRP, more procedures are taken to make PRP possible, such as phacoemulsification for brunescent cataract (as in case 1), anterior chamber irrigation for hyphema (case 2, 3 and 5) or PPV for vitreous hemorrhage (in the first five cases).

PPV is indicated not only for clearance of the media opacity, but also of angiogenic factors. PPV eliminates the VEGF in the vitreous, and increases the clearance of VEGF that is produced afterward.[3-5]

The role of IVB in NVG has been verified,[6,7] but some reports suggested only for short term.[8,9] IVB is part of the surgery to reduce short-term complications. Increased level of VEGF is also noted in the aqueous humor,[10] and ICB is included in our surgery. In fact, with the existance of a filtering pathway, the drug might flow to the subconjunctival space, and subconjunctival bevacizumab has been suggested to reduce scar formation of the bleb.[11,12]

In conclusion, we suggest immediate combined surgery for NVG, which includes trabeculectomy with mitomycin C, PPV with endolaser PRP, IVB and ICB. This strategy has shown to be successful in controlling IOP and preserving useful vision.

CONFLICTS OF INTEREST

All authors certify that they have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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