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# Intracameral viscoelastic treatment for hypotony after glaucoma incisional surgery

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## Abstract:

We report on a minimally invasive treatment of symptomatic hypotony after glaucoma surgery. Hypotony after incisional glaucoma surgery can have severe visual consequences. Refractory symptomatic hypotony often requires surgical intervention to prevent further vision loss. The clinical records of four patients in this interventional case series with symptomatic hypotony and choroidal detachments after incisional glaucoma surgery between 2013 and 2014 were reviewed. Observations were made as the cases progressed. Visual obscuration secondary to refractory hypotony was treated with an intracameral injection of high-molecular-weight ocular viscoelastic devices (HMWOVD). Postinjection, mean intraocular pressure improved from a baseline of 3.6 mm Hg to 24.0, 15.5, and 9 mm Hg at 1 day, 1 month, and 6 months' post-intervention, respectively. The mean visual acuity after injection improved from 20/274 to 20/83 at 6 months. Choroidal detachments resolved within 1 week in all patients. Intracameral HMWOVD for the treatment of symptomatic hypotony post-incisional glaucoma surgery is minimally invasive, avoided reoperation, and led to quick visual recovery.

## Keywords:

Case series, glaucoma, hypotony, intraocular pressure, viscoelastic

## Introduction

Hypotony, intraocular pressure (IOP) below 5 mmHg, is not uncommon after incisional glaucoma surgery. The prevalence ranges from 15% to 32.7% after trabeculectomy with mitomycin (MMC) and 12%–89% after aqueous shunts.<sup>[1]</sup> Chronic hypotony, self-irreversible after 4 weeks, is associated with accelerated cataract formation, choroidal detachments (CDs), hypotony maculopathy, expulsive, and delayed suprachoroidal hemorrhages.<sup>[1-3]</sup> Surgical revision to reverse the glaucoma surgery and limit outflow may become necessary in hypotony patients with compromised vision.

High-molecular-weight ocular viscoelastic devices (HMWOVD) have the side effect of transient increase in IOP.<sup>[4-6]</sup> Herein, we report

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a series of four patients with symptomatic hypotony after incisional glaucoma surgery where we describe the use of intracameral HMWOVD as a minimally invasive treatment.

## Case Reports

### Case 1

After trabeculectomy with MMC, an 82-year-old female developed hypotony with decreased visual acuity (VA) from 20/40 to 20/80 and symptomatic peripheral visual field defects due to large CD. The large CD completely resolved on postoperative day (PD) 97 when intracameral HMWOVD was performed. Postinjection (PI) VA and IOP improved with complete CD resolution on PI day 1.

### Case 2

An 81-year-old male underwent Ahmed glaucoma tube shunt with suture ligation. Hypotony on PD 1 led to worsening VA

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from 20/40 to counting fingers and the development of large CD. The patient was symptomatic until HMWOVD was performed on PD 7. VA and IOP improved and the CD completely resolved by PI day 7.

### Case 3

After a Baerveldt tube shunt insertion with lumen stenting and suture ligation, an 86-year-old female developed hypotony with worsening VA from 20/25 to 20/70 and large CD [Figure 1a] which persisted for 6 weeks. On PD 133, intracameral HMWOVD was injected with complete resolution of the CD on PI day 1 [Figure 1b].

### Case 4

A 90-year-old male developed hypotony after an Ahmed tube shunt insertion to the left eye with worsening VA to the hand motions on PD 3. HMWOVD was injected on PD 5, with complete resolution of CD on PI day 1.

Table 1 summarizes the patient characteristics, and the VA and IOP at various time points PI. All eyes on PI day one had IOP >10 mmHg. At week 1, one eye had hypotony (5 mmHg) but did not have a recurrent CD. At final follow-up 6 months later, two eyes had hypotony (5 mmHg) but did not have a recurrent CD either. VA was stable or improved with the resolution of CD in all subjects.

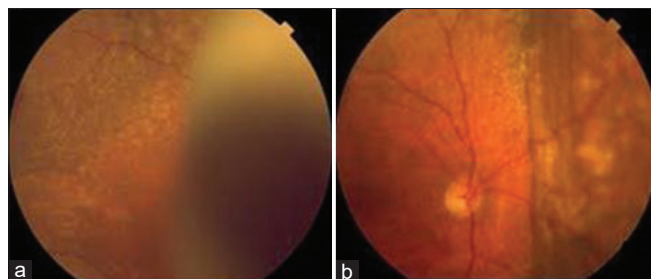


Figure 1: Fundus imaging of choroidal detachment (a) and its resolution (b)

Intracameral HMWOVD was performed after patients' failed conservative management with topical steroids and cycloplegia. All eyes received standard medical therapy which included topical steroids and cycloplegia when the clinician suspected that intraocular inflammation might have been contributing to the hypotony. The doses used were commensurate with the inflammation and did not include an increasing dosing regimen of topical steroids. Written informed consent was obtained. The patients were prepped with betadine for sterile intraocular surgery and were given tetracaine 0.5% and lidocaine 2% gel for topical anesthesia. A 15° side port blade was used to perform a paracentesis temporally. HMWOVD was injected into the anterior chamber to achieve about a 50% fill. Healon 5 (cases 1 and 3) and Healon GV (cases 2 and 4) (sodium hyaluronate 2.3% and 1.4%, respectively, Abbott Medical Optics, Santa Ana, CA) were used. Topical antibiotics were given postoperatively for 1 week.

## Discussion

Hypotony due to overfiltration can be associated with maculopathy and CD leading to serious visual consequences.<sup>[7]</sup> Prevention measures include tight suturing of a trabeculectomy scleral flap with subsequent laser suture lysis and stenting and ligating sutures for tube shunts.<sup>[8]</sup> Such measures reduce the likelihood of hypotony but do not eliminate it. The treatment of hypotony can be challenging and often requires surgery to reverse the overfiltration by resuturing the trabeculectomy scleral flap, or in the case of tube shunts tying off, restenting, or even shunt removal.<sup>[7,8]</sup> In this series, intracameral HMWOVD successfully improved symptomatic hypotony and avoided incisional surgical revision.

In this case series, we found the complete resolution of CD immediately after intracameral injection. VA improved in all cases with an overall mean

Table 1: Patient characteristics, intraocular pressure, and visual acuity

Case	Surgery	Baseline VA <sup>a</sup>	Hypotony onset (days)	Time from hypotony to OVD injection (days)	OVD	Pre-OVD injection		Day 1		Week 1		Final		Total (months)
						VA <sup>b</sup>	IOP <sup>b</sup> (mmHg)	VA	IOP (mmHg)	VA	IOP (mmHg)	VA	IOP (mmHg)	
1	Trab	20/40	7	90	Healon 5	20/80	6	20/40	42	20/40	5	20/40	5	6
2	Tube	20/40	1	6	Healon GV	CF	2.6	20/60	24	20/80	17	20/60	12	6
3	Tube	20/25	47	86	Healon 5	20/70	4.8	20/50	18	20/50	6	20/100	5	6
4	Tube	LP	3	2	Healon GV	HM	1	HM	12	CF	10	20/200	13	6
Mean		20/142	15	46		20/386	3.6	20/148	24	20/150	9.5	20/83	9	6

<sup>a</sup>The mean of two VA before incisional surgery, <sup>b</sup>Mean VA and IOP after incisional surgery and before OVD injection. CF=Counting fingers, IOP=Intraocular pressure, VA=Visual acuity, OVD=Ocular viscoelastic device, Trab=Trabeculectomy with mitomycin C, Tube=Glaucoma tube shunt, HM=Hand motion, LP=Light perception

Snellen VA of 20/83 at the final visit. All eyes had an immediate IOP increase on PI day 1, and all eyes except one had a resolution of hypotony by PI week 1 and final visit. Altangerel *et al.* found that IOP and VA improved within 2 weeks after performing a similar intervention using only Healon 5. Nonetheless, their endpoint IOP at 4–6 weeks was lower ( $6.50 \pm 2.24$  mmHg), and improvements in VA were small yet significant.<sup>[9]</sup> In our series, we monitored the resolution of CD with B scan ultrasound and fundus imaging up to 6 months. Intraoperative and PI complications did not occur and a return to the operating room for revision of the original procedure was avoided in all eyes. No eyes required repeated intracameral HMWOVD injection or had a recurrence of symptomatic hypotony.

We used Healon 5 ( $4 \times 10^6$  Daltons,  $7 \times 10^6$  mPas) and Healon GV ( $5 \times 10^6$  Daltons,  $2 \times 10^6$  mPas) with the first having higher viscosity but lower molecular weight.<sup>[4]</sup> Viscoelastic devices have been proposed to block the trabecular meshwork, close ciliary body detachment,<sup>[10]</sup> and interrupt the cycle of hypotony and choroidal effusion.<sup>[10,11]</sup> HMWOVD may also increase the viscosity of the aqueous humor and slow the rate of filtration through a tube shunt or a sclerotomy. Among our patients, the eyes receiving Healon GV had an earlier intervention and seemed to have a more sustained elevation in IOP. We believe that the immediate rise in IOP noted with the use of intracameral HMWOVD contributed to the interruption of hypotony that lead to CD and hypotony maculopathy. In addition, in the eyes with repeat hypotony at PI week 1 or later, none had developed visual deteriorations with the low IOP. We recommend the injection of intracameral HMWOVD when VA worsens and/or there are persistent CD or worsening detachments that may affect VA or threaten retinal adhesions. Other HMWOVD with differing viscosities and molecular weights can be investigated in a larger series to study the optimal HMWOVD and amount needed to treat hypotony in this setting.

## Conclusion

In our patients, intracameral HMWOVD for symptomatic hypotony and CD after incisional glaucoma surgery

improved IOP and VA. It was an effective and minimally invasive rescue technique.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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## Conflicts of interest

The authors declare that there are no conflicts of interests of this paper.

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