



Intra-vitreous gas injection and supine positioning for hypotony post-intrascleral intraocular lens fixation

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ABSTRACT

Purpose: This study aimed to report a case of intravitreal gas injection in the supine position for hypotony after intrascleral intraocular lens (IOL) fixation in a patient with Vogt-Koyanagi-Harada (VKH) disease.

Observations: A 72-year-old Japanese female patient presented with blurred vision in her right eye. Both eyes exhibited a sunset glow fundus due to VKH disease. The right IOL was dislocated; therefore, IOL fixation was performed. The patient's hypotony and choroidal effusion persisted postoperatively and her intraocular pressure (IOP) remained 2–4 mmHg despite the performance of two steroid courses. C3F8 (perfluoro pane gas) was injected into the vitreous cavity on postoperative day 35. The patient was instructed to assume a supine position on the third day after injection. At 6 days post-injection, her IOP began to rise; her IOP remained within the normal range until 1 year later.

Conclusions and Importance: This is the first report of successful intravitreal gas injection in a supinated patient with VKH disease to treat postoperative hypotony.

1. Introduction

Uveitis, such as Vogt-Koyanagi-Harada (VKH) disease, can cause hypotony in the chronic stage.¹ Hypotony is induced when the ciliary body fails to produce aqueous humor.² The complications of hypotony include visual loss by maculopathy.³ Ocular surgery can also lead to hypotony by choroidal effusion due to inflammation.⁴ Therefore, ocular surgery with uveitis has been associated with a higher risk of hypotony.

When postoperative hypotony persists, viscoelastic substances or gas may be injected into the anterior chamber.⁵ In cases that are refractory to this treatment, silicone oil may be injected into the vitreous cavity. Silicone oil injections are effective against hypotony maculopathy, but the visual prognosis is limited.^{6,7} Gas injection into the vitreous cavity to fill the vitreous space is also effective against hypotony after ocular surgery.⁸ Silicone or gas injections could fill the vitreous cavity with oil or expansive gas. However, postoperative hypotony is caused by decreased ciliary body secretions due to choroidal effusion.⁴ Therefore, we hypothesized that administering a gas injection in the supine position to press the ciliary body and decrease choroidal effusion was viable.

To the best of our knowledge, this was the first case report concerning the effective management of postoperative hypotony of a patient with VKH disease by providing an intravitreal gas injection in the

supine position.

2. Case report

A 72-year-old Japanese female patient presented with blurred right-eye vision in 2019. Her best-corrected visual acuity (BCVA) was 0.6 in the right eye and light perception in the left eye. Both eyes exhibited a sunset glow fundus because of end-stage VKH disease.

She first came to our clinic in 2001 with branch retinal artery occlusion in her right eye, and since that time, she had been presenting with a sunset glow fundus that seemed to be caused by VKH disease. She had never noticed any symptoms of vision loss or headaches before. As the anterior chamber inflammation persisted after cataract surgery in 2013, the intraocular pressure (IOP) decreased, and the left eye developed phthisis bulbi. In the right eye, inflammation in the anterior chamber was observed for approximately 3 months after cataract surgery in 2014, but was controlled with 0.1% fluorometholone drops. No immunosuppressive drugs were used, but only steroid eye drops, and no recent inflammatory findings were observed.

In 2019, she presented with blurred vision in her right eye. The right IOL, which had been originally fixed intracapsularly, was dislocated with a bag complex (Fig. 1). Since the anterior capsule hung over the

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pupil, her visual acuity decreased. Therefore, pars plana vitrectomy (PPV) and IOL fixation surgery using the Y-fixation technique⁹ were performed. The PPV was performed using a 25-gauge system. The fixation wound was made with a 25-gauge Viance and haptics of the IOL were pulled out with 27-gauge MAX GRIP and fixed to the sclera.

On postoperative day 1, she demonstrated right eye hypotony. We detected no apparent aqueous humor leakage on postoperative slit-lamp bio-microscopy. Gonioscopy showed a corner angle separation, but there was no suspicion of ciliary body dissection. Despite two courses of steroid pulse therapy, her IOP remained 2–4 mmHg, and choroidal effusion and hypotony maculopathy persisted for >3 weeks postoperatively.

We injected 1 mL of 50% C3F8 into the vitreous cavity on postoperative day 35. Gas bubbles came out of the anterior chamber and, therefore, the final gas injection volume was ~0.5 mL. The injected gas occupied 30% of the vitreous cavity, and her IOP was 3 mmHg immediately post-injection.

After the injection, the patient remained in a prone position. The amount of gas and the IOP did not increase. Therefore, the patient was placed in the supine position to press the ciliary body 3 days after the injection. A few hours after placing the patient in that position, her visual acuity improved. At 6 days after the injection, her IOP increased to 6 mmHg, and the choroidal effusion and hypotony maculopathy disappeared (Fig. 2). At 3 months post-injection, her BCVA was 0.4 in the right eye, and the IOP was maintained at 8 mmHg.

Her IOP remained within the normal range until 1 year later.

3. Discussion

This patient's clinical course emphasizes several critical clinical issues. Postoperative hypotony occurs in patients with VKH disease, and intravitreal gas injection in the supine position was an effective treatment. Aqueous humor is produced by the ciliary epithelium¹⁰; however, its production decreases in the presence of choroidal effusion secondary to surgical trauma, ocular inflammation, or ciliary body atrophy.^{1,11,12} In this case, the patient's postoperative choroidal effusion caused a pathological decrease in the patient's aqueous humor.

Her left eye anterior chamber inflammation persisted for several years postoperatively, causing hypotony. The left eye developed phthisis bulbi, and we expected the patient to develop postoperative hypotony in her right eye, which persisted for 35 days after surgery.

Gas or silicone oil was injected into the vitreous cavity to improve hypotony. In general, injection of gas or silicone oil provides an extended mechanical tamponade of the retina. Upon occupying the space, they reduce choroidal effusion,⁸ thereby increasing aqueous humor production.¹³ De Smet et al. showed that injection of gas into the vitreous space reduced ciliary edema.⁷ Despite its temporary effect, gas injection helps maintain the IOP if the choroidal effusion resolves and aqueous production resumes.¹⁴

De Smet et al. also reported that injected silicone oil was more effective than gas for treating hypotony.⁷ IOP reportedly increased by approximately 67% after gas injections and by >90% after silicone oil injections. Morse et al. reported that silicone oil injections increased the IOP by 80% and visual acuity by 60%.¹⁵ Therefore, they concluded that silicone oil injections prevented phthisis; however, improvements in visual acuity were limited. Based on this, silicone oil injections were not the first choice for this case. Weinberger et al. reported injecting 0.7–1.0 cc of C3F8 gas into the vitreous cavity for hypotony after cataract surgery.⁸ Unlike the previous report, we used a small gas volume, and the post-injection IOP remained low. Consequently, the choroidal effusion did not decrease.

Placing the patient in the supine position was another crucial feature of this case. The patient's visual symptoms improved within hours after supination. The pressure exerted against the ciliary body by the case—due to its buoyancy—was likely the reason for the improved choroidal effusion. Accordingly, even 30% of the gas volume would have been effective in a supinated patient. Gozawa reported that the supine position has a higher gas contact rate in the superior and inferior anterior retina beyond the equator compared with the supine position.¹⁶ The average amount of gas in Gozawa et al.'s report was 60%, while in our work it was only 30%. However, based on the magnetic resonance imaging findings in the aforementioned report, even 30% gas was sufficient to cover the ciliary body in the supine position. Therefore, we speculated that this amount of gas was effective.

Hoerauf and Helbig documented the effectiveness of gas injections after placing their patient in the supine position for hypotony maculopathy caused by ciliary body dissection after trauma.^{17,18} These previous reports have reported no complications, such as pupillary block, anterior chamber shallowing, or IOL dislocation.

To the best of our knowledge, this was the first reported case, in which intravitreal gas injection was used with the patient in the supine position to treat postoperative hypotony of VKH disease. Future studies should monitor patients' IOP and progress over a longer follow-up period. As this is a case report, future studies should also seek to determine the reproducibility of these effects in other patients.

4. Conclusions

Intravitreal gas injection and supine positioning were effective in treating postoperative hypotony in a patient with VKH disease.

Research ethics

We further confirm that any aspect of the work covered in this manuscript that has involved human patients has been conducted with the ethical approval of all relevant bodies and that such approvals are acknowledged within the manuscript.

IRB approval was obtained (required for studies and series of 3 or

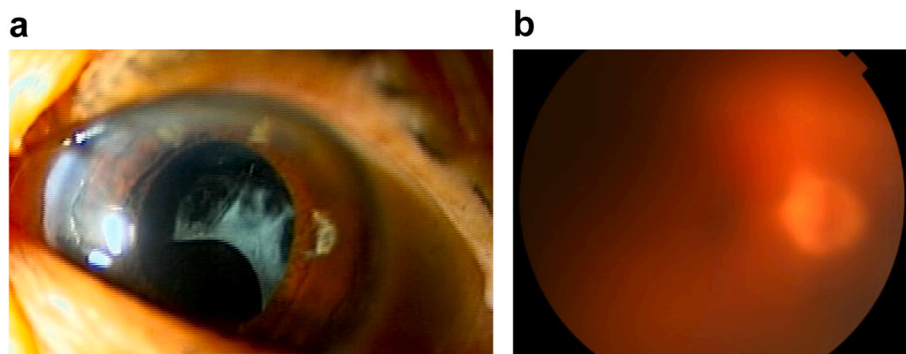


Fig. 1. a) The IOL and anterior capsule of the right eye hanging over the pupil. b) A sunset glow fundus was observed within the right eye. IOL, intraocular lens.

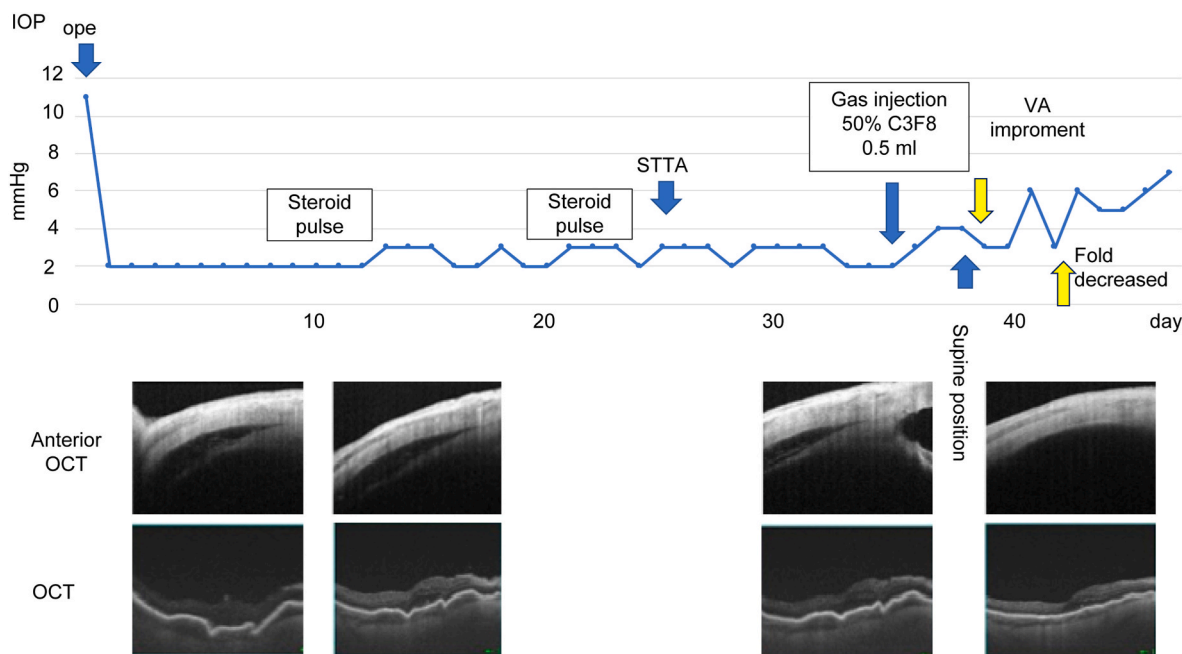


Fig. 2. On postoperative day 1, hypotony maculopathy and choroidal effusion were noted in the right eye. Despite two courses of steroid pulse therapy, the patient’s IOP remained low (i.e., 2–4 mmHg). Choroidal effusion and hypotony maculopathy persisted for >3 weeks postoperatively. C3F8 was injected into the vitreous cavity on postoperative day 35, and 3 days later the patient was placed in a supine position. The patient’s visual acuity improved hours after the injection. At 6 days after the injection, the patient’s IOP increased to 6 mmHg, and the choroidal effusion and hypotony maculopathy disappeared. IOP, intraocular pressure.

more cases).

Written consent to publish potentially identifying information, such as details or the case and photographs, was obtained from the patient(s) or their legal guardian(s).

Intellectual property

We confirm that we have given due consideration to the protection of intellectual property associated with this work and that there are no impediments to publication, including the timing of publication, with respect to intellectual property. In so doing we confirm that we have followed the regulations of our institutions concerning intellectual property.

Patient consent

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Authorship

All authors attest that they meet the current ICMJE criteria for authorship.

Declaration of competing interest

None.

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References

1. Pederson JE. Ocular hypotony. *Trans Ophthalmol Soc U K.* 1986;105(2):220–226.
2. Sen AHN, Drye LT, Goldstein DA, et al. Hypotony in patients with uveitis: the multicenter uveitis steroid treatment (MUST) trial. *Ocul Immunol Inflamm.* 2012;20(2):104–112.
3. Fannin LA, Schiffman JC, Budenz DL. Risk factors for hypotony maculopathy. *Ophthalmology.* 2003;110(6):1185–1191.
4. Toris CB, Pederson JE. Aqueous humor dynamics in experimental iridocyclitis. *Invest Ophthalmol Vis Sci.* 1987;28(3):477–481.
5. Daniele S, Schepens CL. Can chronic bulbar hypotony be responsible for uveal effusion? Report of two cases. *Ophthalmic Surg.* 1989;20(12):872–875.
6. Dayani PN, Chow J, Stinnett SS, Jaffe GJ. Pars plana vitrectomy, fluocinolone acetonide implantation, and silicone oil infusion for the treatment of chronic, refractory uveitic hypotony. *Am J Ophthalmol.* 2011;152(5):849–856.
7. de Smet MD, Gunning F, Feenstra R. The surgical management of chronic hypotony due to uveitis. *Eye.* 2005;19(1):60–64.
8. Weinberger D, Stiebel H, Lusky M, Hodish I, Yassur Y. Intravitreal gas injection for hypotony after cataract surgery. *J Cataract Refract Surg.* 1998;24(11):1490–1492.
9. Ohta T, Tshida H, Murakami A. Simplified and safe method of sutureless intrascleral posterior chamber intraocular lens fixation: Y-fixation technique. *J Cataract Refract Surg.* 2014;40(1):2–7.
10. Pederson JE, Green K. Solute permeability of the normal and prostaglandin-stimulated ciliary epithelium and the effect of ultrafiltration on active transportation. *Exp Eye Res.* 1975;21(6):569–580.
11. Tran VT, Mermoud A, Herbort CP. Appraisal and management of ocular hypotony and glaucoma associated with uveitis. *Int Ophthalmol Clin.* 2000;40(2):175–203.
12. Inazumi K, Gentile RC, Lee KY, et al. Ultrasound biomicroscopic diagnosis of cyclitic membranes. *Am J Ophthalmol.* 2001;131(4):446–450.
13. Gotzaridis SV, Portaliou DM, Mela VA, Xanthopoulos P, Kymionis GD. Anterior chamber sulfur hexafluoride (SF6) injection for the management of postsurgery hypotony in glaucoma patients. *J Glaucoma.* 2018;27(5):476–479.
14. Yu EN, Paredes I, Foster CS. Surgery for hypotony in patients with juvenile idiopathic arthritis-associated uveitis. *Ocul Immunol Inflamm.* 2007;15(1):11–17.
15. Morse LS, McCuen 2nd BW. The use of silicone oil in uveitis and hypotony. *Retina.* 1991;11(4):399–404.
16. Gozawa M, Kanamoto M, Ishida S, et al. Evaluation of intraocular gas using magnetic resonance imaging after pars plana vitrectomy with gas tamponade for rhegmatogenous retinal detachment [sci rep:1521]. *Sci Rep.* 2020;10(1):1521.
17. Hoerauf H, Roeder J, Laqua H. Treatment of traumatic cyclodialysis with vitrectomy, cryotherapy, and gas endotamponade. *J Cataract Refract Surg.* 1999;25(9):1299–1301.
18. Helbig H, Foerster MH. Management of hypotonous cyclodialysis with pars plana vitrectomy, gas tamponade, and cryotherapy. *Ophthalmic Surg Laser.* 1996;27(3):188–191.