

A case involving an Ahmed™ glaucoma valve transferred from the vitreous into the anterior chamber of the eye with a silicone oil tamponade for the treatment of neovascular glaucoma

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Purpose: To report the short-term efficacy and safety of the transfer of an Ahmed™ glaucoma valve (AGV™) tube from the vitreous into the anterior chamber, in a patient with neovascular glaucoma who had undergone pars plana AGV™ implantation and ultimately needed a silicone oil tamponade.

Case: A 41-year-old male with proliferative diabetic retinopathy in both eyes was referred to us for treatment in December 2009. Although the patient previously underwent several surgeries, he ultimately lost vision in his right eye. His left eye suffered from neovascular glaucoma after undergoing a pars plana vitrectomy for tractional retinal detachment. After several vitreous and glaucoma surgeries, the patient underwent implantation of a pars plana AGV™. Postoperatively, although his intraocular pressure was stabilized at approximately 10 mmHg, he had repeated vitreous hemorrhage and hyphema without improvement. He ultimately underwent PPV with a silicone oil tamponade and at the same time, the AGV™ tube was pulled out from the vitreous and inserted into the anterior chamber in order to avoid complications caused by the silicone oil.

Results: At 19 months postoperative, the patient's intraocular pressure had stabilized at 10 mmHg with no recurrence of vitreous hemorrhage and hyphema. Eventually, he lost vision in his left eye because of cerebral hemorrhage.

Conclusion: The findings show that insertion of a pars plana AGV™ tube into the anterior chamber in a patient undergoing a silicone oil tamponade is both effective and safe in the short-term.

Keyword: tube implantation, glaucoma surgery, tube transfer, pars plana, proliferative diabetic retinopathy, intraocular pressure

Introduction

Although tube-based surgeries for the treatment of glaucoma are prevalent in Europe and America, they have only recently been approved for use in Japan. The results of a questionnaire survey conducted by the American Academy of Ophthalmology revealed that the number of surgeons opting to perform trabeculectomy is apt to reduce, while the number of surgeons opting to perform tube implantation is apt to increase. The recent "Tube versus Trabeculectomy study," a comparative, randomized, multicenter study of tube implantation into the anterior chamber versus trabeculectomy conducted in the United States, showed that patients who underwent tube implantation obtained better intraocular pressure (IOP) control and suffered overwhelmingly fewer complications.¹ Thus, it is expected that the number of surgeons opting to perform the tube implantation procedure will greatly increase in the future.

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Pars plana implantation, also referred to as the “fourth generation of implant tube–based surgery,” was developed to prevent complications that can occur with implantation into the anterior chamber, such as a shallow anterior chamber, corneal decompensation, and adhesion of the iris, and is done for cases of secondary glaucoma, such as neovascular glaucoma (NVG). In a pseudophakic eye treated with a silicone oil tamponade, insertion of the glaucoma valve tube into the anterior chamber seems to result in a better clinical course, due to the fact that the effect of silicone oil on the tube can probably be prevented. Therefore, it would be advantageous if transfer of the tube from the vitreous into the anterior chamber is possible, especially in cases of pseudophakic eye.

The purpose of this present case report was to report a case involving the transfer of an Ahmed™ Glaucoma Valve (AGV™) (New World Medical, Inc, Rancho Cucamonga, CA, USA) from the vitreous cavity into the anterior chamber, in a patient with NVG who had undergone pars plana AGV™ implantation and ultimately needed a silicone oil tamponade.

Case report

This case report involved a 41-year-old male patient who first became aware of visual loss in both eyes in the summer in 2009. He later visited an ophthalmologist in December 2009, and was diagnosed with proliferative diabetic retinopathy (PDR) in both eyes. The patient was subsequently referred to us in the same month of that year, and he also visited a general physician and was diagnosed with diabetes mellitus on the same day (blood sugar: 501 mg/dL, glycated hemoglobin [HbA_{1c}]: 14.0%). Consultation with the patient revealed that his father had undergone dialysis treatment for kidney disease, yet the patient's own past medical history had nothing in particular to reveal.

At the initial examination, the patient's visual acuity was 30 cm/HM in his right eye and 0.5 in his left eye. His IOP was 16 mmHg in both eyes. Fundus examination of the patient revealed PDR with fibrovascular membrane, preretinal hemorrhage, and tractional retinal detachment in his right eye; and PDR with fibrovascular membrane in his left eye (Figure 1).

In the right eye of the patient, vision was lost despite twice undergoing pars plana vitrectomy (PPV), in February and July, 2010. In October 2010, we performed panretinal photocoagulation on his left eye; however, the tractional retinal detachment in that eye progressed. Therefore, we considered PPV to be indicated for this case. Examination of the patient

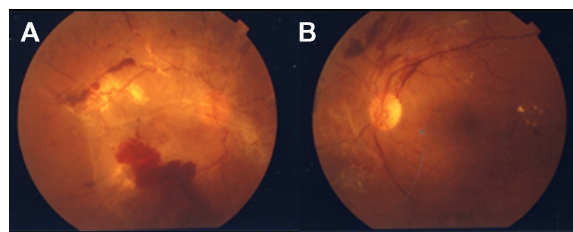


Figure 1 Ocular fundus findings at the initial examination of the patient showed (A) Right eye: PDR with fibrovascular membrane, preretinal hemorrhage, and tractional retinal detachment; and (B) Left eye: PDR with fibrovascular membrane. **Abbreviation:** PDR, proliferative diabetic retinopathy.

in October 2010 revealed that visual acuity was 0.09 and IOP was 12 mmHg in his left eye. In addition, iris neovascularization, ectropion uvea, and tractional retinal detachment were found, and peripheral anterior synechia (PAS) index was approximately 60% in his left eye (Figure 2).

Later in December 2010, the patient underwent PPV combined with additional photocoagulation and cataract surgery. However, 1 month after surgery, IOP rose to 50 mmHg and the PAS index was 100%, in his left eye. He thus underwent PPV combined with trabeculectomy in December 2010. The vitreous hemorrhage was removed and fibrovascular membrane of the peripheral retina was resected, followed by additional photocoagulation. At 1 month postoperative, the IOP was again elevated for the filtering bleb dysfunction, due to repeated vitreous hemorrhage. Thus, the surgical intervention was no longer effective against IOP elevation. The patient then underwent pars plana implantation of an AGV™ (model AGV-PC7) in January 2011. The implant tube was inserted at the 2 o'clock position. Postoperatively, although

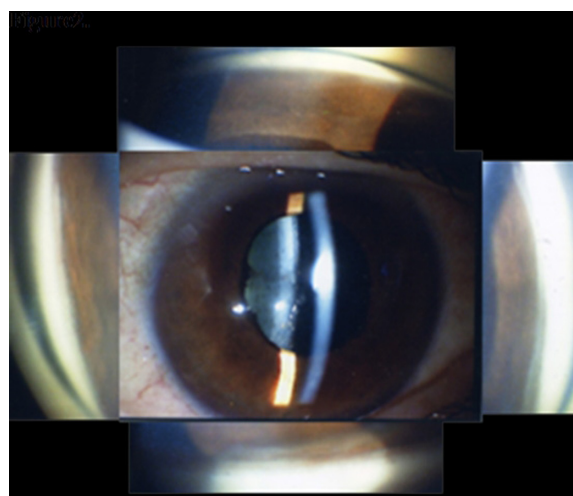


Figure 2 Slit-lamp biomicroscopy and gonioscopy findings at the visit on October 16, 2010.

Note: The left eye showed iris neovascularization, PAS index: 60%. **Abbreviation:** PAS, peripheral anterior synechia.

his IOP was stabilized at approximately 10 mmHg, the patient had repeated vitreous hemorrhage without improvement. He subsequently underwent PPV + silicone oil tamponade + insertion of a pars plana AGV™ tube into the anterior chamber in May 2011. During that operation, the tube was pulled out from the vitreous cavity and inserted into the anterior chamber, in order to avoid complications caused by the silicone oil (Figure 3, Supplementary material).

Four months after the last operation, the patient's visual acuity was 0.01 and IOP stabilized at 10 mmHg. Corneal endothelial cells were 1970/mm² and corneal transparency was preserved. He suffered no recurrence of vitreous hemorrhage and no complications, such as disorder of eye movement (Figure 4).

The patient suffered from cerebral hemorrhage in October 2011 and lost vision in his left eye. In December 2012, the patient's IOP was still stabilized at 10 mmHg and there was no silicone oil migration into the anterior chamber, although fundus examination revealed tractional retinal detachment in the superior part of the fundus.

Discussion

It has been reported that 3%–15% of diabetic retinopathy cases that needed vitrectomy were complicated by NVG.² The findings of other studies have shown that 10%–15% of PDR cases that underwent vitrectomy had repeated vitreous hemorrhage.^{3–5} Moreover, 7.5% of cases that underwent vitrectomy for PDR reportedly required a silicone oil tamponade.⁶ Therefore, it can be considered that cases of severe diabetic retinopathy complicated by NVG have a high possibility of needing a silicone oil tamponade. Reported results of pars plana tube implantation for the treatment of NVG showed a good success rate (72%–94.4%) at 6 months to 14.2 months, and if tube-based surgeries are performed widely in the future, many cases will require the insertion of a tube for an eye that

has undergone silicone oil tamponade after vitrectomy, or require a silicone oil tamponade for an eye that has already undergone tube implantation.⁷

The AGV™ and the Baerveldt® Pars Plana Glaucoma Implant (Model BG 102-350; Abbot Laboratories Inc, Abbott Park, IL, USA) are the two main types of valves that are currently used. The AGV™ Model PC7 joins a pars plana clip to the usual AGV™ Model FP7 tube for the anterior chamber, and this pars plana clip is movable (for positioning); on the other hand, the Baerveldt® Pars Plana Glaucoma Implant uses a Hoffman elbow at the tip of the tube for insertion into the pars plana and is fixed. Thus, the AGV™ tube can be transferred from the vitreous cavity into the anterior chamber.

When tubes are implanted in eyes that have undergone a silicone oil tamponade, there is a high possibility of deterioration of the intraocular inflammation and subsequent blockage of the tube caused by the silicone oil. Therefore, having undergone a silicone oil tamponade is a risk factor for implantation.⁸ Our method of implanting a tube in the superior temporal location is used to avoid silicone oil leakage and blockage of the tube by silicone oil when we implant a tube for an eye that has undergone a silicone oil tamponade. Several studies have reported that a massive amount of silicone oil moved into the subconjunctival space and orbit of the eyes through the tubes when implanted tubes were exposed to silicone oil, such as in cases of aphakic eyes or eyes with pars plana-implanted tubes.^{9–11} Thus, we considered that it would be possible to put an implant tube in the superotemporal location in a pseudophakic eye, such as in the case presented in this study, because silicone oil only slightly migrates into the anterior chamber. In fact, the IOP in this patient was stabilized, and there have been no complications to date.

In conclusion, the findings of this case show that insertion of a pars plana AGV™ tube into the anterior chamber in a

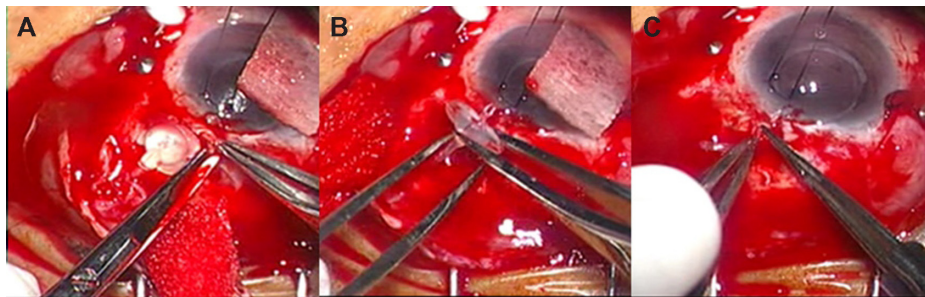


Figure 3 Transfer of a pars plana AGV™ tube into the anterior chamber. (A) The tube being inserted into the vitreous body; (B) The tube being pulled out from the vitreous cavity; and (C) The tube being inserted into the anterior chamber.

Abbreviation: AGV™, Ahmed™ glaucoma valve.

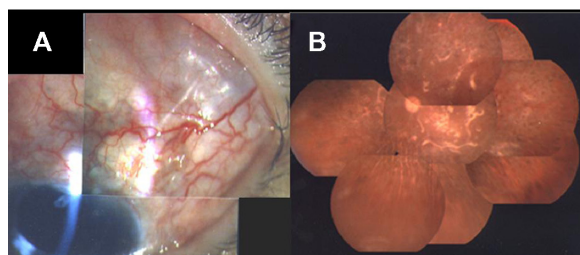


Figure 4 Slit-lamp biomicroscopy and ocular fundus findings after the patient's final surgery. **(A)** A pars plana AGV™ tube inserted into the anterior chamber; and **(B)** PDR was stable, with no recurrence of vitreous hemorrhage.
Abbreviations: AGV™, Ahmed™ glaucoma valve; PDR, proliferative diabetic retinopathy.

patient undergoing silicone oil tamponade is both effective and safe in the short term. However, further investigation is needed to elucidate the long-term efficacy and safety of this treatment.

Disclosure

The authors report no conflicts of interest in this work.

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Supplementary material

[Video presentation](#) of the operation performed in May 2011.

The tube of the pars plana AGV™ was pulled out from the vitreous cavity and inserted into the anterior chamber, before silicone oil tamponade.

Abbreviations: AGV™, Ahmed™ glaucoma valve.

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