Long-term Outcome of Ahmed Glaucoma Valve Implantation in Eyes With Intractably Raised Intraocular Pressure Following Pars Plana Vitrectomy

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Precis: Ahmed glaucoma valve (AGV) implantation led to a significant reduction in intraocular pressure (IOP) and in antiglaucoma medications in vitrectomized eyes in previously nonglaucomatous eyes. The most common indication for vitrectomy was ocular trauma-related complications.

Purpose: The purpose of this study was to report the long-term outcomes of AGV implantation in patients of uncontrolled IOP after pars plana vitrectomy (PPV).

Materials and Methods: Medical records of patients (age 18 y and above) who underwent AGV implantation between January 2006 and December 2017 for uncontrolled IOP following PPV with ≥2 years follow-up were reviewed. The underlying etiology for PPV, IOP, best-corrected visual acuity, and number of anti-glaucoma medications (AGMs) were recorded at baseline. The main outcomes measures were IOP, number of AGM, best-corrected visual acuity, and postoperative complications. Postoperative complications were classified as early (<3 mo)/intermediate (>3 mo to ≤1 y), or late (>1 y).

Results: In all, 78 eyes of 78 patients with a mean age of 38.06 ± 17.83 years were included. The mean follow-up was 70.46 ± 36.96 (range: 24 to 180) months. The main underlying etiology for PPV was trauma (38.4%) followed by rhegmatogenous retinal detachment (28.2%). The mean preoperative IOP was 29.33 ± 9.84 mm Hg with an average of 4.07 ± 1.2 AGM. The mean IOP and number of AGM was significantly reduced in all follow-up visits (P < 0.001) following AGV implantation. The cumulative probability of success was 92.3%, 80.7%, and 74% at 2, 5, and 10 years, respectively. Thirty-one complications were observed in 25 (32%) eyes and reoperation (23 procedures) was performed in 22 (28.2%) eyes.

Conclusions: AGV implantation had good outcome in patients with intractably elevated IOP following PPV. Trauma-related pathologies were a major contributor to the indications for PPV and had more chances of failure following AGV implantation.

Key Words: glaucoma, pars plana vitrectomy, Ahmed glaucoma valve, vitrectomized eyes, refractory glaucoma

J Glaucoma 2021;30:362–367

Pars plana vitrectomy (PPV) is a commonly used technique in vitreoretinal surgery that enables access to the posterior segment in a controlled and closed system. The most common indication for PPV includes retinal detachment, vitreous hemorrhage, retained intraocular foreign body, endophthalmitis, epiretinal membrane, and macular hole. The elevated intraocular pressure (IOP) and glaucomatous damage are not uncommon complications following vitrectomy. The incidence of glaucoma following uncomplicated PPV ranges from 7.9% to 20%. Secondary rise in IOP that develops due to surgery and tamponade agents is usually transient and often controlled by medication alone. Sometimes, glaucoma may be refractory, and surgical interventions, such as early removal of silicone oil, anterior chamber reformation, trabeculectomy, and valve implants are warranted.

Conventional glaucoma filtering surgery has poor outcomes with respect to IOP reduction in vitrectomized eyes due to scarring and altered conjunctival anatomy. The altered intraocular environment, such as retinal ischemia or excessive intraocular ischemia, also contributes to the early failure of glaucoma filtering surgery. The utility of glaucoma drainage devices (GDDs) to control the IOP in refractory glaucoma, such as glaucoma associated with aphakia, neovascularization, postpenetrating keratoplasty and postvitrectomy, is established. Among the various GDDs, Ahmed glaucoma valve (AGV) is easy to insert and ensures an immediate decline in the IOP in these refractory cases. Previous studies have reported that AGV is highly successful in terms of IOP reduction and low complication rate in refractory glaucoma. However, studies reporting the long-term outcome of AGV in vitrectomized eyes are sparse. Hence, we report the long-term outcome of AGV in eyes with intractable rise in IOP following PPV.

MATERIALS AND METHODS

This retrospective study was conducted at the Advanced Eye Centre, Postgraduate Institute of Medical Education and Research, Chandigarh, India, and was approved by the Institutional Ethics Committee (IEC-No: INT/IEC/2018/2165). The medical records of patients who underwent AGV implantation following PPV between January 2006 and December 2017 were retrieved from the electronic database and cross-checked with the physical records. The data of these patients (age 18 y and above) with a minimum follow-up of 2 years were included. Patients
with age below 18 years, post-AGV follow-up of <2 years, pre-AGV vision of no light perception, and eyes with any form of glaucoma diagnosed before PPV were excluded from the current study.

Demographic factors, such as age, sex, and laterality, followed by preoperative parameters, such as best-corrected visual acuity (BCVA), baseline IOP, number of antiglaucoma medications (AGMs), underlying etiology for PPV, previous surgical details, and visual field evaluation, were assimilated from the database for eligible patients. Intraoperative details were collected from the surgical notes of the patients. The data on postoperative parameters, such as BCVA, IOP, number of AGMs, complications, and resurgery were collected at postoperative visits on day 1, 1 week, 1, 3, 6 months, 1, 2, 3, 5 years and at last follow-up after 24 months.

Surgical Procedure
Under general or peribulbar anesthesia, a fornix-based conjunctival-Tenon capsule flap was created at the superotemporal quadrant. However, the choice of quadrant was as per the surgeon’s discretion based on the factors, such as subconjunctival fibrosis, presence of broad scleral buckle, and/or presence of silicone oil. The sub-Tenon space between the rectus muscles was exposed carefully. The AGV-FP7 model (New World Medical, Rancho Cucamonga, CA) was used in all subjects. AGV was primed with balanced salt solution through a 27 G cannula attached to a 2 mL syringe. The AGV plate was tacked posteriorly into the sub-Tenon space and sutured to the sclera with 6-0 dacron (Polyester, Green Braided; Alcon Laboratories Inc., Fort Worth, TX) 9 to 10 mm posterior to the limbus. The tube was trimmed to the desired length, inserted into the anterior chamber (in phakic and in pseudophakic eyes) through a 1.5-mm-long scleral track created with a 23 G needle and positioned away from the corneal endothelium without touching the iris. Conversely, in aphakic eyes, the tube was inserted into the posterior segment through the pars plana. The anterior part of the tube outside the eye was covered with a 4-mm×5-mm donor scleral patch graft. Conjunctiva was then sutured to the limbus with 8-0 Vicryl sutures (Braided and Coated Polyglyactin 910 Violet; Ethicon, Johnson & Johnson Ltd, Mumbai, Maharashtra, India).

Postoperatively, all patients received topical antibiotic (moxifloxacin 0.5%) 4 times a day for 4 weeks and topical steroid (betamethasone 0.1%) 4 times a day for 4 to 6 weeks in tapering doses. Also, the topical application of cyclo-plegic (homatropine hydrobromide 2%) was prescribed twice a day for 2 weeks. After AGV implantation, all AGMs were stopped and restarted as needed.

The primary outcome measures were IOP reduction from baseline value and the number of postoperative AGMs. The secondary outcome measures were BCVA, complications, and additional interventions following AGV implantation. Complete success was defined as IOP ≥6 and ≤21 mm Hg without any AGM or additional surgery. Qualified success was defined as the same IOP criteria with additional AGMs. Treatment failure was defined when any of the following were present: (1) IOP >21 mm Hg or reduction of IOP by <30% of baseline with maximal tolerable AGM on 2 consecutive follow-up visits after the initial 3 months. (2) IOP <6 mm Hg on 2 consecutive visits after the initial 3 months, (3) presence of vision-threatening (≥2 lines loss in visual acuity) complications or vision deterioration to no light perception, (4) requirement of additional IOP-lowering procedure, (5) explanation of AGV. Complications recorded within the initial 3 months were defined as early complications, at last follow-up after 24 months.

Table 1. Various Baseline Parameters of all Enrolled Subjects

| Variables                  | Mean ± SD/N | SD (95% CI)/% |
|----------------------------|-------------|---------------|
| Age (y)                    | 38.06 ± 17.83 | 34.14, 41.95  |
| Sex (male:female)          | 58:20       |               |
| LogMAR BCVA                | 0.97 ± 0.73  | 0.75, 0.95    |
| Preoperative IOP (mm Hg)   | 29.33 ± 9.84 | 27.18, 31.48  |
| Preoperative AGM           | 4.07 ± 0.67  | 3.92, 4.22    |
| Cup-disc ratio             | 0.71 ± 0.171 | 0.659, 0.764  |
| Etiology [n (%)]           |             |               |
| Rhegmatogenous RD          | 22 (28.2)    |               |
| VHR/TRD (DR)               | 7 (8.97)     |               |
| Non-DR VH                  | 5 (6.41)     |               |
| Trauma                     | 30 (38.4)    |               |
| Lens dislocation (crystalline/IOL) | 5 (6.41) | |
| Noninfectious uveitis      | 4 (5.12)     |               |
| Macular disorders          | 1 (1.28)     |               |
| Endophthalmitis            | 3 (3.84)     |               |
| Aniridia                   | 1 (1.28)     |               |
| Lens status [n (%)]        |             |               |
| Phakic                     | 17 (21.79)   |               |
| Pseudophakic               | 29 (37.17)   |               |
| Aphakic                    | 32 (41.02)   |               |

AGM indicates antiglaucoma medication; BCVA, best-corrected visual acuity; CI, confidence interval; DR, diabetic retinopathy; IOL, intraocular lens; IOP, intraocular pressure; RD, retinal detachment; TRD, tractional retinal detachment; VH, vitreous hemorrhage.

RESULTS
A total of 87 eyes from 87 patients were subjected to AGV implantation for medically uncontrolled IOP following PPV during the study period. Of these, 78 eyes of 78 patients fulfilled the entry criteria and were included for analysis. The mean age of included patients was 38.06 ± 17.83 years. The average follow-up was 70.46 ± 36.96 (24 to 180) months. The baseline clinical and demographic parameters are shown in Table 1.

Thirty-two of 78 (41.02%) eyes were aphakic, and 29/78 (37.17%) were pseudophakic at the time of AGV implantation. The indications for PPV included trauma-related pathology (38.4%), rhegmatogenous retinal detachment (28.2%),
proliferative diabetic retinopathy (8.97%), nondiabetic vitreous hemorrhage (6.41%), lens dislocation (6.41%), noninfectious uveitis (5.12%), endophthalmitis (3.84%), macular pathology (1.28%), and aniridia (1.28%). Furthermore, 37/78 (47.43%) eyes had undergone concurrent scleral buckling along with PPV, and 27/78 (34.62%) eyes had undergone combined lensectomy and vitrectomy. The mean interval between PPV and AGV implantation was 18.53 ± 23.96 (95% confidence interval: 12.69-24.39) months. Sixty-seven of 78 (85.9%) eyes underwent AGV as the primary glaucoma procedure, and the remaining 11 eyes of 11 patients had undergone previous IOP-lowering procedures [9 trabeculectomy and 2 diode laser cyclophotocoagulation (DLCP)]. The superotemporal quadrant was the site of AGV implantation in 68 eyes, inferotemporal quadrant in 7 eyes, and inferonasal quadrant in 3 eyes. The AGV tube was inserted into the anterior chamber in 49 eyes, ciliary sulcus in 9 eyes, and posterior segment via pars plana route in 20 eyes.

The mean preoperative LogMAR BCVA was 0.977 ± 0.7, which was increased to 0.84 ± 0.22 at the final follow-up ($P<0.001$). The mean preoperative IOP was 29.33 ± 9.84 (95% confidence interval: 27.18-31.48; median: 28) mm Hg and ranged from 16 to 44 mm Hg with a median of 4 AGMs. The mean IOP and median AGM at different time points are listed in Table 2. The mean IOP was significantly reduced than the baseline value ($P<0.0001$) at all the follow-up visits, along with a significant reduction in the number of AGMs. The IOP was reduced by 44% at 2-year follow-up and by 47.5% at the 5-year follow-up. The minimum reduction in IOP was noticed at postoperative 1 month (29.38%), followed by postoperative 3 months (33.25%). This change could be attributed to the hypertensive phase (in 35.33% of eyes). The mean number of AGMs was reduced by ≥50% at any time point following AGV implantation. The percentage reduction in IOP and AGM are shown in Figure 1. Strikingly, the subgroup analysis did not show any

### TABLE 2. IOP, Number of AGM, and Success Rate Comparison at Various Study Visits

|                | IOP  | SD (95% CI) | IOP Reduction (Mean ± SD) | No. AGM (Mean, Median) | $P^*$ | $P^+$ |
|----------------|------|-------------|---------------------------|------------------------|-------|-------|
| Baseline       | 29.33| 9.84 (27.18, 31.48) | 4.07, 4                  |                        |       |       |
| Day 1          | 8.75 | 6.06 (7.38, 10.12)  | 20.51 ± 12.92            | __                     | <0.0001|       |
| 1 wk           | 11.51| 6.41 (10.06, 12.95) | 17.55 ± 12.55            | 0.18, 0                | <0.0001| <0.0001|
| 1 mo           | 18.87| 8.46 (16.96, 20.77) | 10.39 ± 11.92            | 0.77, 1                | <0.0001| <0.0001|
| 3 mo           | 17.42| 6.72 (15.90, 18.93) | 11.83 ± 11.84            | 1.5, 1                 | <0.0001| <0.0001|
| 6 mo           | 16.34| 5.42 (13.12, 17.56) | 12.91 ± 10.71            | 1.57, 1                | <0.0001| <0.0001|
| 1 y            | 14.69| 4.17 (13.75, 15.63) | 14.39 ± 10.38            | 1.75, 2                | <0.0001| <0.0001|
| 2 y            | 14.84| 5.48 (13.61, 16.08) | 14.42 ± 10.42            | 1.73, 1                | <0.0001| <0.0001|
| 3 y (N=64)     | 14.67| 5.52 (13.29, 16.05) | 13.51 ± 9.61             | 1.75, 2                | <0.0001| <0.0001|
| 4 y (N=57)     | 13.68| 3.49 (12.75, 14.61) | 14.35 ± 9.42             | 1.78, 2                | <0.0001| <0.0001|
| 5 y (N=53)     | 13.75| 3.5 (12.78, 14.72)  | 14.72 ± 9.69             | 1.43, 1                | <0.0001| <0.0001|
| Last follow-up | 13.46| 4.15 (12.52, 14.32) | 15.8 ± 9.64              | 1.87, 2                | <0.0001| <0.0001|

Success

|                | 1 year (N=78) | 2 years (N=78) | 3 years (N=64) | 4 years (N=57) | 5 years (N=53) |
|----------------|---------------|----------------|----------------|----------------|---------------|
| Complete success [n (%)] | 17 (21.7)     | 12 (15.3)      | 10 (15.6)      | 10 (17.5)      | 10 (18.8)     |
| Qualified success [n (%)]  | 57 (73.1)     | 60 (76.9)      | 46 (71.8)      | 40 (70.1)      | 36 (67.8)     |
| Failure [n (%)]            | 4 (5.1)       | 6 (7.6)        | 8 (12.5)       | 7 (12.2)       | 7 (13.2)      |

* $P$-value compared with baseline IOP.
† $P$-value compared with baseline AGM.

AGM indicates antiglaucoma medication; CI, confidence interval; IOP, intraocular pressure.

FIGURE 1. Percentage reduction of intraocular pressure (IOP) and antiglaucoma medication (AGM) over baseline at various time intervals following Ahmed glaucoma valve implantation in eyes with post pars plana vitrectomy intractably raised IOP. Figure 1 can be viewed in color online at www.glaucomajournal.com.
Complication and Resurgery at Different Time Points During the Follow-up*

| Complication/Resurgery | Early (< 3 mo) | Intermediate (3-12 mo) | Late ( > 12 mo) | Total |
|------------------------|----------------|------------------------|----------------|-------|
| Complication           |                |                        |                |       |
| Hyphema                | 7 (8.9)        | 1 (1.25)               | —              | 8 (10.2) |
| Shallow AC             | 2 (2.3)        | —                      | —              | 2 (2.3) |
| Choroidal detachment   | 4 (5.1)        | —                      | —              | 4 (5.1) |
| Vitreous hemorrhage    | 1 (1.28)       | —                      | —              | 1 (1.28) |
| Tube block by vitreous/residual oil | 1 (1.28) | 1 (1.28)               | —              | 2 (2.5) |
| Conjunctival leak/retraction | 1 (1.28) | 1 (1.28)               | —              | 2 (2.5) |
| Tube cornea touch      | 1 (1.28)       | 1 (1.28)               | 1 (1.28)       | 3 (3.84) |
| Tube exposure          | —              | —                      | 1 (1.28)       | 1 (1.28) |
| Plate exposure         | —              | —                      | 1 (1.28)       | 1 (1.28) |
| Tube retraction        | 2 (2.5)        | 1 (1.28)               | 2 (2.5)        | 5 (6.4) |
| Re-RD                  | 1 (1.28)       | —                      | —              | 1 (1.28) |
| Graft failure†         | —              | —                      | 1 (1.28)       | 1 (1.28) |
| Total complication     | 20 (25.6)      | 5 (6.4)                | 6 (7.6)        | 31 (39.7) |
| Resurgery              |                |                        |                |       |
| AC wash                | 1 (1.28)       | —                      | —              | 1 (1.28) |
| Anterior vitrectomy    | 1 (1.28)       | —                      | —              | 1 (1.28) |
| Vitreous lavage        | —              | 1 (1.28)               | —              | 1 (1.28) |
| Conjunctival resuturing| 1 (1.28)       | 1 (1.28)               | 1 (1.28)       | 3 (3.8) |
| Tube repositioning     | 3 (3.8)        | 2 (2.56)               | 2 (2.56)       | 7 (8.94) |
| AGV explantation       | —              | —                      | 1 (1.28)       | 1 (1.28) |
| Re-OPK                 | —              | —                      | 1 (1.28)       | 1 (1.28) |
| DLCP                   | —              | —                      | 4 (5.12)       | 4 (5.12) |
| Capsule excision       | —              | —                      | 3 (3.8)†       | 3 (3.8) |
| Second AGV             | 1 (1.28)‡      | —                      | 1 (1.28)       | 1 (1.28) |
| Total resurgery        | 6 (7.69)       | 4 (5.12)               | 13 (16.6)      | 23 (29.4) |

*All % are out of total eyes (N=78).
†Occurred after 5 years.
‡Same eye.
AC indicates anterior chamber; AGV, Ahmed glaucoma valve; DLCP, diode laser cyclophotocoagulation; OPK, optical penetrating keratoplasty; RD, retinal detachment.

statistically significant difference in IOP reduction/AGM requirement between trauma-associated pathology groups and nontraumatic etiology groups (*P > 0.05*) or silicone oil-exposed eyes versus nonexposed eyes (*P > 0.05*) at any follow-up visit. Notably, all silicone oil-exposed eyes had undergone silicone oil removal before planning the glaucoma procedure.

At 2-year follow-up, complete success was seen in 15.3% of the eyes, and qualified success was observed in 76.9% of the eyes. The procedure failed in 6 eyes (7.69%). The causes of failure were the inability to control IOP (5 eyes) and the development of vision-threatening complication (1 eye). Furthermore, of the 5 eyes with uncontrolled IOP, 2 underwent additional procedures (DLCP) before the 2-year follow-up visit, and the remaining 3 underwent these additional procedures (1 DLCP and 2 AGV capsule excision) after the 2-year follow-up visit. The vision-threatening complication in 1 eye was the development of hemorrhagic choroidal detachment with retinal detachment ultimately leading to phthisis. One patient required AGV explantation due to plate exposure after 2-year of implantation but was lost to follow-up subsequently.

At 5-year follow-up (n = 53), complete success was seen in 10 (18.8%) eyes, and qualified success was seen in 36 (69.9%) eyes. The procedure failed in 7 (13.2%) eyes, of which, 5 had been categorized as a failure at the 2-year visit. The other 2 eyes showed raised IOP and required additional IOP-lowering procedures (1 DLCP and 1 capsule excision). Even at the 5-year follow-up, only 2 patients required systemic AGM, where topical AGM could not be applied due to drug allergy. The success rate at various time points based on different criteria is shown in Table 2.

A total of 31 complications were detected in 25 (32%) eyes during the study period, and > 1 complication was observed in some eyes. The complications were classified into early (20), intermediate (5), and late (6) during the follow-up. Resurgery (23 procedures, including additional IOP-lowering procedure) was performed in 22 (28.2%) eyes during the follow-up period. Various complications and resurgery are described in Table 3.

The cumulative probability of success is depicted by the Kaplan-Meier estimate plot in Figure 2. The cumulative probability of success was 94.8%, 92.5%, 78%, and 74% at 1, 2, 5, and 10 years, respectively. The multiple regression analyses showed that various factors, such as age, sex, lens status, etiology, and presence or absence of scleral buckle, were not likely to affect the IOP reduction after AGV implantation. Conversely, high baseline IOP was found to be the only positive predictor of IOP reduction at the final follow-up after AGV implantation.

**DISCUSSION**

This retrospective study reviewed the long-term outcome of AGV implantation following PPV in the North Indian population. None of these patients were known cases of glucoma and developed high IOP following PPV, which was nonresponsive to maximal medical therapy. Traumatic etiology constituted a significant proportion of the eyes undergoing PPV that contributed to the mechanism...
underlying raised IOP along with the vitrectomy procedure. The AGV led to a significant reduction in the IOP and the number of AGMs. In this series of 78 patients with a median follow-up of 61.5 months, 92.3% and 86.8% achieved overall success at 2 and 5 years, respectively. The cumulative probability of overall success at 7 and 10 years was 78% and 74%, respectively.

Transient or long-term elevation of IOP is a common complication after PPV and often requires aggressive medical or surgical interventions. Previous studies have postulated that PPV increases the level of oxygen in the vitreous cavity that remains elevated for months, leading to oxidative cell damage of the trabecular meshwork. Furthermore, it has been hypothesized that surgical injuries to trabecular meshwork constitute the mechanism associated with an increase in IOP after PPV along with this oxidative damage. Other mechanisms underlying elevated IOP include gas expansion, inflammation, hemorrhagic complication, silicone oil-related complication, ciliary body edema, and steroid response. Hwang et al reported that early and late elevation in IOP occurred in 40.3% and 40.7% of the patients, respectively, following PPV. Han et al reported an acute elevation in IOP after PPV in 61.3%, and late elevation occurred in 26% of the patients. With the advancement in the technique and instrumentation, the indications for PPV have also expanded. This could potentially increase the incidence of raised IOP post-PPV.

When medical treatment fails to control elevated IOP, GDDs are preferred as conventional filtration surgery has a low success rate. Han et al reported that 11% of the study cohort patients required any form of surgical intervention. In our study, an 86% of eyes underwent AGV as the primary glaucoma procedure. AGV has a unidirectional valve system that allows an immediate flow of aqueous to sub-Tenon space postoperatively while preventing hypotony but may require additional medication in the long term. Valved devices (AGV) have advantage over nonvalved implants (Baerveldt or Aurolab Aqueous Drainage Implant) in such patients due to their characteristics, such as immediate pressure reduction, less challenging implantation in the presence of preexisting scleral buckle, lesser refractory hypotony, and fewer tube/plate-related complications. Hence, we preferred AGV implantation in a patient with intractably elevated IOP following vitrectomy.

The mean age of the patients in the current study was 38.06 ± 17.83 years, which was significantly less as compared with that in the previous reports by Erçalik et al (53.93 ± 16 y) and Jo et al (51.8 ± 14.9 y); this difference could be attributed to significant trauma-related pathologies in our series. The overall success rate was 92.2% and 86% at 2 and 5 years follow-up, respectively. In a small case series, Erçalik and Imamoğlu reported a surgical success of 84% at the final follow-up. Another case series of 17 eyes by Hong and Choi reported that the surgical success rate was 83.4% and 76.4% at 6 months and at the final visit (the mean follow-up was 14.9 mo). Both of these studies had fewer patients with shorter mean follow-up compared with the current study. Another study by Jo et al reported an overall success of 80.1% during a mean follow-up period of 43.6 months in a large cohort of patients (146 eyes). The current study has a better overall success rate (88.5%) during a mean follow-up period of 61.5 months. However, our sample size was smaller than the series by Jo et al. The predominant underlying cause for PPV in this series was trauma-related pathology, including traumatic retinal detachment, traumatic nonresolving vitreous hemorrhage, retained intraocular foreign bodies and traumatic cataract with nonresolving vitreous hemorrhage. Rhegmatogenous retinal detachment was the second predominant cause of PPV. In contrast, studies by Hong and Choi and Jo et al have reported proliferative diabetic retinopathy as the predominant cause for vitrectomy.

Various complications, including one vision-threatening complication, were encountered in about 32% of the eyes during a 5 years follow-up. Most of these occurred before 12 months after AGV implantation. A hypertensive phase was encountered in ~35% of the cases, 83% of which were resolved with AGM over 4 to 5 weeks. The incidence of hypertensive phase is much less in this study as compared with that described in previous studies by Hong and Choi (41%), Huh and Kee (50%), and Ayyala et al (82%).
In this series, complications, such as tube retraction, conjunctival retraction, and tube/plate exposure occurred in patients who had undergone concurrent buckling procedures along with PPV. Hence, one should be cautious to not miss these complications during follow-up in patients with a preexistent scleral buckle.

At the final study visit, we observed 9 failures; of these, 6 eyes failed within 2 years postoperatively. This suggests that chances of failure are high in the early postoperative period, necessitating close monitoring/follow-up. Four of the 9 (44.4%) failed cases had trauma-related pathologies as an indication for PPV. Hence, trauma might be a risk factor for failure; however, this subgroup had a small number of patients, and further study is required to ascertain the same conclusion. In addition, no difference was detected in the outcome between silicone oil-exposed and nonexposed eyes. Also, evidence on whether silicone oil exposure is a risk factor for failure in AGV implantation is controversial. The present study has some limitations due to its retrospective design, homogeneous ethnicity, multiple surgeons, variable follow-up, and lack of control group. Hence, the data should be interpreted accordingly. The strengths of this study include a relatively large sample size of patients and prolonged follow-up.

In conclusion, the long-term success of AGV in eyes with an intractable rise in IOP following PPV was high, and chances of failure were mainly in the early postoperative period. Despite various complications necessitating medical or surgical intervention, we found a significant reduction in the IOP and AGM following AGV implantation.

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