# Surgical Outcomes of Ahmed Glaucoma Valve and Aurolab Aqueous Drainage Implant in Nepalese Eyes: Comparison in the First Year

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## ABSTRACT

**Introduction**: Glaucoma is the leading cause of irreversible blindness worldwide. Though trabeculectomy still remains the surgical modality of choice for the management of glaucoma, the outcome of glaucoma drainage devices (GDDs) too has been encouraging in recent years.

**Objectives**: To compare the surgical outcomes of Ahmed glaucoma valve (AGV) and Aurolab aqueous drainage implant (AADI) in cases of refractory glaucoma in Nepalese eyes.

**Materials and methods**: We retrospectively studied the charts of the patients with refractory glaucoma who had undergone GDD implantation at Tilganga Institute of Ophthalmology (TIO), Kathmandu, Nepal. Depending on which GDD was implanted, the eyes of the patients were divided into: AGV group and AADI group. The outcome measures of the study were intraocular pressure (IOP), requirement of anti-glaucoma medications (AGMs), surgical success and complications.

**Results**: There were 24 eyes of 23 patients in AGV group and 31 eyes of 30 patients in AADI group with a median (quartiles) follow-up of 12 (12,12) months. In the final visit, IOP and AGMs were both significantly lower than the baseline in both the groups (P <0.001). The median IOP in mmHg and AGMs were both significantly lower in the AADI group compared to AGV group in the final visit, p <0.001 and p=0.002, respectively. The overall success was similar in both the groups: AGV (n=22, 91.67%) and AADI (n=29, 93.55%), p=1.0. However, complete success was significantly more in AADI group (n=16, 51.61%) compared to AGV group (n=6, 25%), p=0.046. Complications and their rates were comparable between the two groups (p=0.4).

**Conclusion**: Both AGV and AADI safely and effectively reduced the IOP and the number of AGMs in cases of refractory glaucoma in Nepalese eyes.

**Key words**: Ahmed glaucoma valve, Aurolab aqueous drainage implant, Glaucoma drainage device, Refractory glaucoma.

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## INTRODUCTION

Glaucoma is one of the leading causes of irreversible blindness worldwide (Pascolini and Mariotti, 2012; Quigley and Broman, 2006; Leske et al, 2003; Kass et al, 2002) including Nepal (Brilliant et al, 1985). Glaucoma drainage devices are being increasingly used in the management of high risk and complicated cases of glaucoma, both as primary and secondary surgical modality ( Wilson et al, 2003; Ayyala et al, 2002; Lai et al, 2000; Wilson et al, 2000; Kook et al, 2000; Topouzis et al, 1999; Leuenberger et al, 1999; Huang et al, 1999; Ayyala et al, 1998; Coleman et al, 1995). This change in practice can be attributed mainly to the outcomes of the Tube Versus Trabeculectomy (TVT) study (Gedde et al, 2012a; Gedde et al, 2012b; Gedde et al, 2009).

Various manufacturers have developed different GDDs that differ in biochemical properties and the presence or absence of valve (Tsai et al, 2003). They all, however, share a common design in having a tube connecting the anterior chamber (AC) to a plate located in the equatorial region of the globe (Budenz et al, 2011). The valved GDDs were designed to reduce the incidence of postoperative hypotony, however, the long-term success in terms of reduction in IOP and number of AGMs has been better with the non-valved devices ( Christakis et al, 2016; Budenz et al, 2015; Ayyala et al, 2002). The Ahmed glaucoma valve (AGV; New World Medical, Rancho Cucamonga, CA, USA) and the Baerveldt glaucoma implant (BGI; Advanced Medical Optics, Santa Ana, CA) are the two most commonly used valved and non-valved GDDs, respectively. The Aurolab aqueous drainage implant (AADI; Aurolab, Madurai, India) is a non-valved GDD designed as a prototype of the BGI to remove the cost barrier to easy access to non-valved GDD in developing countries (Pathak et al, 2018b). AADI has already gained a European conformity (CE) mark and is yet to receive approval from the Food and Drug Administration (FDA). However, studies from India have shown that the outcomes of AADI are comparable to AGV implant ( Pandav et al, 2020; Pathak et al, 2018a; Rathi et al, 2018). A recent retrospective study from Saudi Arabia reported that AADI was comparable to BGI in terms of safety and efficacy (Hafeezullah et al, 2021).

With more Nepalese glaucoma specialists being trained to perform implant surgery, the number of GDD surgeries too is rising here. However, there is a lack of a study looking into the outcomes of implant surgeries in Nepalese eyes. This study aims to investigate and compare the safety and efficacy of AGV and AADI in Nepalese eyes.

## MATERIALS AND METHODS

This retrospective chart review was conducted in accordance with the Declaration of Helsinki and good clinical practice guidelines. The authors retrospectively analyzed the data of patients who had undergone GDD surgery from April 2017 to May 2020 at a tertiary eye hospital in Nepal. The Institutional Review Committee of Tilganga Institute of Ophthalmology (TIO), Kathmandu, Nepal, approved the study and waived the requirement of informed consent because of the nature of the study (Reference number: 05/2022).

Electronic medical records of the hospital were reviewed to collect the detail demographic,

medical and ocular history of the patients. Besides recording which GDD the patients received, we also recorded pre-operative data like: IOP, number of AGMs, lens status, diagnosis and history of previous ocular surgery including filtration surgery.

IOP was measured with slit-lamp-mounted Haag-Streit Goldmann applanation tonometer (Haag-Streit, Bern, Switzerland). Eyes of the patients were divided into two groups depending on which GDD was implanted: AGV group {eyes that received AGV (AGV-FP7) implant} and AADI group {eyes that received AADI (AADI Model 350) implant}. We included only those patients who had a minimum follow-up of six months. We however, did not exclude the eyes that had undergone failure within the first six months of surgery, but their data of IOP and AGM were censored from further analysis. We excluded cases with no perception of light (NPL), those with a history of previous GDD surgery, cyclodestructive procedures and cases in which IOP was not monitored in two or more consecutive follow-up visits.

Patients were reviewed post-operatively on day one, week one, week two, month one, month two, month third, month six, month nine, and month 12. We recorded IOP and AGM on every post-operative visit and noted any complication.

All surgeries were performed by one of two fellowship-trained glaucoma specialists (**SST** and **IP**). Following localized conjunctival peritomy, the sub-tenon space was dissected, most commonly in the supero-temporal quadrant. The implant (AGV/AADI) was inserted into the subtenon space. In case of AADI the lateral expansions of the plate were fashioned beneath the adjacent recti according to the surgeon's usual practice (under superior rectus and lateral rectus for supero-temporal GDDs). The plate was fixed to the sclera around 10 mm from limbus using 6-0 silk suture (Aurosilk; Aurolab, Madurai, India). The tube of AADI was ligated near tube plate junction with Polyglactin 910, 6-0 suture (Vicryl, Ethicon, Johnson & Johnson Ltd., India) and tested for occlusion. Two to three pairs of venting incisions were made anterior to the ligated tube and tested for patency. The tube of AGV was primed with balanced salt solution (BSS) to check for patency. A 23-gauge needle was used to create a scleral track starting 1.5-2 mm behind the limbus to enter the anterior chamber. The tube was shortened to the required length with a beveled tip opening towards the cornea. The tube was inserted through the needle track and secured to the sclera with monofilament polyamide black nylon, 10-0 suture (Ethilon; Ethicon, Johnson & Johnson Ltd., India). A corneal patch graft was used to cover the tube in the perilimbal area. The conjunctival peritomy was closed with Polyglactin 910, 8-0 suture (Vicryl, Ethicon, Johnson & Johnson Ltd., India).

Post-operatively, topical steroid (Pred Forte, Prednisolone Acetate 1%; Allergan India, Bengaluru, India) was prescribed in tapering doses for eight weeks. Topical antibiotic (Exocin, Ofloxacin 0.3%; Allergan India, Bengaluru, India) was used four times per day for one month and topical cycloplegic mydriatic (N-Pin, Atropine sulfate 1%; National Healthcare, Kathmandu, Nepal) was used three times per day for two weeks. The patients were also prescribed an antibiotic steroid combination

ointment containing Chloramphenicol 1%, Polymyxin B 10,000 units/gram, and Dexamethasone 0.1% (Ocupol-D®, Centaur Pharmaceuticals, Mumbai, India) once daily for two weeks. Anti-glaucoma medications were prescribed post-operatively to control the IOP, at the operating surgeon's discretion.

Primary outcome measures of the study were IOP and AGMs. The secondary outcome measures were surgical success and complications. We defined success as IOP greater than 5 mmHg and less than or equal to 21 mmHg on final visit. Success was further classified as qualified or complete when the above-mentioned IOP was attained with or without the use of AGM, respectively. Failure to maintain IOP within 6-21 mmHg either with or without maximally tolerated AGMs, any additional glaucoma surgery to decrease IOP, removal of implant for any reason, or devastating complications like loss of perception of light and malignant glaucoma were defined as surgical failure. Surgical revisions performed in the operating room like: tube readjustment, re-suturing of conjunctiva, needling or removal of iris plugs were not considered glaucoma reoperations.

We defined any episode of IOP ≤5mmHg on a single visit as transient hypotony, similar to Pandav et al (2020). Lai et al (2000) defined transient hypotony as IOP <5 mmHg on any single visit post-operatively. We defined persistent hypotony as IOP ≤5mmHg on two consecutive visits after three months post-operatively, similar to the TVT study (Gedde et al, 2009). We defined hypertensive phase (HTP) as a rise in IOP to >21 mmHg during the first three months of surgery after an initial reduction of IOP to <22 mm Hg during the first postoperative week and not associated with any evident cause; as defined by Nouri-Mahdavi and Caprioli (2003).

IBM SPSS Statistics for Macintosh, Version 20.0. Armonk, NY: IBM Corp. was used for statistical analysis. The test of normality of the data was done using the Shapiro-Wilk test. Pearson's Chi-square ($\chi^2$) test and Fisher's exact test were used wherever applicable to see the difference between the two groups by various qualitative variables. Wilcoxon signed rank test was used to compare the baseline and final follow-up parameters within the group. We used Mann-Whitney U test to compare the various baseline and final follow-up parameters between the two groups. Kaplan-Meier survival analysis was performed to compare times to failure. p values less than 0.05 were considered statistically significant.

## RESULTS

A total of 55 eyes of 53 patients were included in the study. There were 24 eyes of 23 patients in AGV group and 31 eyes of 30 patients in AADI group. The median (quartiles) follow-up in both groups was 12 (12,12) months. There was no significant difference between the two groups (AGV vs. AADI) in terms of median age, gender, preoperative IOP, number of AGMs, lens status, history of previous filtration surgery and etiology of glaucoma (**Table 1 and 2**).

**Table 1: Demographic and baseline characteristics of participants**

| | Shunt group | | |
|---|---|---|---|
| **Characteristics** | **AGV** (N=23, n=24) | **AADI** (N=30, n=31) | P value |
| Age (years) | 19.0 (9.0, 30.0) | 19.5 (12.75, 30.0) | 0.587* |
| Gender (M: F) | 15:8 | 24:6 | 0.226# |
| Pre-op IOP (mmHg) | 32.0 (26.5,38.0) | 34.0(28.0,40.0) | 0.549* |
| Pre-op AGM | 4.0 (3.25,4.0) | 4 (3.0,4.0) | 0.911* |
| **Lens status** | | | |
| Phakic | 12 | 17 | 0.721# |
| Pseudophakic | 9 | 8 | 0.352# |
| Apakic | 3 | 6 | 0.716@ |
| **Previous filtration surgery** | 10 | 8 | 0.214# |

Note: Age and pre-op IOP values are presented as median (quartiles). N = number of patients, n = number of eyes, * = Mann-Whitney U test, # = Chi-square test, @ = Fisher's Exact Test

**Table 2: Etiology of glaucoma**

| Diagnosis | AGV | AADI | P value* |
|---|---|---|---|
| POAG | 0 | 2 | 0.499 |
| JOAG | 3 | 5 | 1.0 |
| PCG | 1 | 2 | 1.0 |
| Aniridia | 0 | 3 | 0.248 |
| Aphakic glaucoma | 2 | 3 | 1.0 |
| Bechet's disease | 1 | 0 | 0.436 |
| ICE syndrome | 4 | 1 | 0.156 |
| NVG | 0 | 2 | 0.499 |
| PACG | 1 | 0 | 0.436 |
| Post PK | 2 | 5 | 0.451 |
| Post PPV | 3 | 3 | 1.0 |
| Pseudophakic glaucoma | 2 | 0 | 0.186 |
| Traumatic glaucoma | 2 | 4 | 0.686 |
| Uveitic glaucoma | 3 | 1 | 0.307 |
| Total (n) | 24 | 31 | |

**Note:** POAG= Primary open angle glaucoma, JOAG= Juvenile open angle glaucoma, PCG = Primary congenital glaucoma, ICE syndrome= Iridocorneal endothelial syndrome, NVG= Neovascular glaucoma, PACG= Primary angle closure glaucoma, Post PK= Post penetrating keratoplasty, Post PPV= Post Pars Plana Vitrectomy; *= Fisher's Exact Test

The median (quartiles) IOP in mmHg in AGV and AADI group decreased from 32 (26.5,38) and 34 (28,40), respectively, at baseline, to 16.5 (16,18) and 16 (14,16), respectively, at final visit (both, P <0.001). Similarly, the median (quartiles) AGMs in AGV and AADI groups decreased from 4 (3.25,4) and 4 (3,4), respectively, at baseline, to 2 (0,2) and 0 (0,1), respectively, at final visit (both, P <0.001) (**Table 3 and Figure 1**).

**Table 3: Comparison of IOP and AGMs between the two groups at baseline and various follow-ups**

| Timeline | AGV | | AADI | | P value* | AGV | | AADI | | P value* |
|---|---|---|---|---|---|---|---|---|---|---|
| | IOP (mmHg) | n | IOP (mmHg) | n | | AGM | n | AGM | n | |
| Pre-op | 32 (26.5,38.0) | 24 | 34 (28,40) | 31 | 0.549 | 4.0 (3.25,4.0) | 24 | 4 (3.0,4.0) | 31 | 0.911 |
| POD1 | 10 (9.25,14.0) | 24 | 20 (18.0,22.0) | 31 | <0.001 | - | - | - | - | - |
| POW1 | 12 (10.0,16.0) | 24 | 20 (18.0,24.0) | 31 | <0.001 | 0 (0,0) | 24 | 0 (0,1) | 31 | 0.008 |
| POW2 | 14 (14.0,16.0) | 24 | 20 (18.0,21.0) | 31 | <0.001 | 0 (0,0) | 24 | 1 (0,1) | 31 | <0.001 |
| POM1 | 17.5 (14.0,20.0) | 24 | 18 (16.0,20.0) | 31 | 0.322 | 0 (0,0) | 24 | 1 (0,1) | 31 | <0.001 |
| POM2 | 22 (17.5,26.0) | 22 | 16 (14.0,16.0) | 31 | <0.001 | 0 (0,0.25) | 22 | 1 (0,1) | 31 | 0.009 |
| POM3 | 18 (16.0,18.5) | 22 | 16 (14.0,16) | 31 | <0.001 | 2 (0.0,2.0) | 22 | 1 (0,1) | 31 | 0.028 |
| POM6 | 17 (16.0,18.0) | 22 | 16 (14.0,16.0) | 31 | <0.001 | 2 (0.0,2.0) | 22 | 1 (0,1) | 31 | 0.002 |
| POM9 | 17 (16.0,18.0) | 20 | 16 (14.0,16.0) | 26 | 0.001 | 2 (0.0,2.0) | 20 | 1 (0,1) | 26 | 0.011 |
| POM12 | 17 (16.0,18.0) | 19 | 15 (14.0,16.0) | 25 | <0.001 | 2 (0.0,2.0) | 19 | 0 (0,1) | 25 | 0.003 |
| Final visit | 16.5 (16.0,18.0) | 22 | 16 (14.0,16.0) | 29 | <0.001 | 2 (0,2) | 22 | 0 (0,1) | 29 | 0.002 |

**Note:** IOP and AGM are presented as median (quartiles), *= Mann-Whitney U test, POD= Post-operative day, POW= Post-operative week, POM= Post-operative month, n= number of eyes

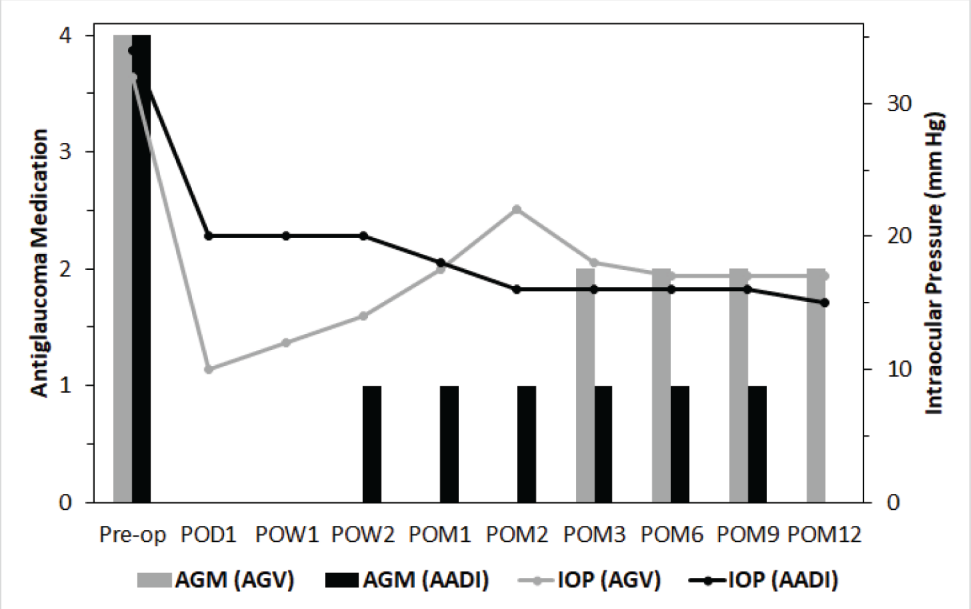


**Figure 1: Trend of IOP and AGMs in both the groups at various post-operative periods**

The median IOP was significantly lower in AGV group than AADI group at post-operative day one, week one, and week two (all P <0.001). There was no significant difference in median IOP between the two groups at one month post-operatively. The median IOP in AADI group was significantly lower than AGV group at every post-operative visit after one month. The AGV group required significantly fewer AGMs than the AADI group until two months post-operatively. The AADI group required significantly fewer AGMs than the AGV group at every post-operative visit after the second post-operative month.

Two eyes with Ahmed implant had undergone failure within three months post-operatively and were excluded from analysis for hypertensive phase. Fifteen eyes (68.18%) out of 22 in AGV group and six eyes (19.35%) out of 31 eyes in AADI group developed hypertensive phase (p <0.001).

**Table 4: Post-operative complications and their interventions in both the groups.**

| Complications | AGV, n | AADI, n | p value | Intervention |
|---|---|---|---|---|
| **Early (<3 months)** | | | | |
| Transient Hypotony | 4 | 6 | 1.0* | All managed conservatively |
| CD | 1 | 3 | 0.624* | All managed conservatively except one with persistent CD underwent explantation at 6 month[@] |
| Exposed plate, flat AC | 1 | 0 | 0.436* | Implant removed |
| Hyphema | 1 | 2 | 1.0* | All encountered at POD 1 and managed conservatively |
| Persistent Hypotony | 0 | 1 | 1.0 | Implant removed at 6 months due to persistent CD[@] |
| Tube cornea touch | 1 | 1 | 1.0* | Tube trimming |
| Malignant Glaucoma | 1 | 0 | 0.436* | Core vitrectomy and implant removal |
| Tube exposure | 0 | 3 | 0.248* | Conjunctival resuturing |
| **Late (>3 months)** | | | | |
| Clogged Iris | 1 | 0 | 0.436* | Surgical release of blockage |
| Long tube touching lens | 0 | 1 | 1.0* | Phacoemulsification with PCIOL and tube trimming |
| Exposed plate, flat AC | 0 | 1 | 1.0* | Implant removed |
| **Total complications** (early+late) | 10 | 18 | 0.228[#] | |

**Note:** One eye could have had more than 1 complication, n= number of eyes, *= Fisher's Exact test, # Chi-square test, CD= choroidal detachment, AC= anterior chamber, [@] = this case developed hypotony with CD at 2nd post-operative month (POM) and the implant was removed at 6th POM because of no improvement.

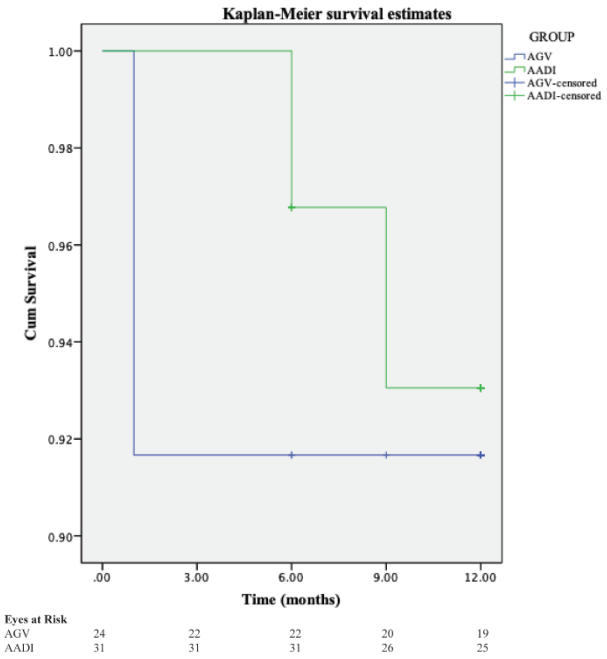


**Figure 2: Kaplan-Meier survival plots for overall success in AGV group and AADI group**

None of the eyes developed any significant intraoperative complication. Both groups had comparable early (<3 months) and late (≥3 months) complications. (**Table 4)**. As one eye could have had more than one complication, total number of eyes with complications in AGV group was 6 (24%) and 11 (35.48%) in AADI group (p=0.4, Chi-square test).

At final follow-up, two eyes (8.33% vs. 6.45%) in each group (AGV vs. AADI) had surgical failure; complete success was seen in 6 eyes (25.00%) and qualified success in 16 eyes (66.67%) eyes in AGV group (overall success n=22,91.67%) while complete success was seen in 16 eyes (51.61%) and qualified success in 13 eyes (41.94%) of eyes (overall success n=29, 93.55%) in AADI group. Though there was no significant difference between the two groups in terms of overall success (p=1.0, Fisher's Exact Test), AADI group had significantly higher complete success compared to AGV group (p=0.046, Chi-square test). None of the eyes in either group failed on the IOP criterion.

The cumulative probability of survival at one year using Kaplan-Meier analysis was 91.7% in AGV group and 93.1% in AADI group (p=0.7, Log Rank test) (**Figure 2**).

## DISCUSSION

Glaucoma is a public health problem (Thapa et al, 2021;Lawlor and Thomas, 2014; Kyari et al, 2013 ). The number of people with glaucoma worldwide is expected to increase to 111 million by 2040, disproportionately affecting Africans and Asians (Tham et al, 2014). Though

trabeculectomy still remains the most commonly performed glaucoma surgery worldwide (Leite et al, 2011; Racette et al, 2003; Thomas et al, 2003), the use of glaucoma drainage devices in the management of glaucoma too is rising (Wilson et al, 2003;Ayyala et al, 2002; Kook et al, 2000; Lai et al, 2000; Wilson et al, 2000; Leuenberger et al, 1999; Huang et al, 1999; Topouzis et al, 1999; Ayyala et al, 1998; Coleman et al, 1995 ). However, the high price of the GDDs is a huge barrier to its easy availability to the general public of developing countries like Nepal where the gross domestic product (GDP) per capita is just over US$ 1000 (Finance and Nepal, 2019). With the price of approximately US $50, the AADI implant has the potential to break this barrier.

To our knowledge, this is the first study on outcomes of GDDs in Nepalese eyes. We observed that both AGV and AADI lowered IOP and AGMs significantly at each post-operative visit compared to the baseline. Compared to the AADI group, the AGV group had significantly lower IOP until the second post-operative week and required fewer AGMs until two months post-operatively. The AADI group had significantly lower IOP starting from second post-operative month and required significantly fewer AGMs starting from third post-operative month. Similar findings have been reported by studies comparing AGV and AADI in the Indian population (Pandav et al, 2020; Pathak et al, 2018a; Rathi et al, 2018 ). The Ahmed Baerveldt Comparison study (Budenz et al, 2015) and the Ahmed Versus Baerveldt study (Christakis et al, 2016) compared Baerveldt implant with the AGV implant. These studies also reported significantly lower IOP and fewer AGM use in the AGV group during the first few months post-operatively that was followed by significantly lower IOP and fewer AGMs in the Baerveldt group in the long run ( Christakis et al., 2016Budenz et al., 2015;Barton et al., 2014; Budenz et al., 2011).

We observed similar overall success in both groups, AGV (n=22, 91.67%) and AADI (n=29, 93.55%), p=1.93.55 However, AADI group had a significantly higher rate of complete success compared to AGV group (n=16, 51.61% vs. n=6, 25%, p=0.046). Studies comparing the outcome of AADI and AGV implant in the Indian population too have reported similar outcomes at six months (Rathi et al, 2018) and one-year (Pandav et al, 2020; Pathak et al, 2018a ) follow-up. Studies from India (Pandav et al, 2020; Pathak et al, 2018a) and Egypt (Elhefney et al, 2018) have reported the overall and complete success at one year in cases of AGV implant to range from 66.24% to 88.7% and 11.46% to 58.1%, respectively. Likewise, the overall and complete success at one year in cases of AADI have been reported to range from 83.33% to 92.6% and 38.0% to 66.6%, respectively, in studies from India ( Pandav et al, 2020; Pathak et al, 2018a; Pathak et al., 2018b). The findings of these studies match with our results.

The cumulative survival probability at 1 year in case of AGV in our study was 91.7%, which is higher than that reported in studies from India {80.5% and 68.9% by Pathak et al(2018a) and Pandav et al (2020) respectively}. The cumulative survival probability at one year in case of AADI in our study was 93.1%, which is similar to studies from India [92.3%, 88.0%, and 90.5% reported by Pathak et al (2018a); Pandav et al (2020); Puthuran et al (2019) respectively].

Posterior encapsulation is an established complication after implant surgery with a higher prevalence in cases with AGV implant ( Schwartz et al, 2006; Tsai et al, 2003; Lai et al, 2000 ). None of our patients developed this complication. Das et al (2005) in their study on AGV implant, also reported that none of their cases developed posterior encapsulation.

We observed hypertensive phase (HTP) in 15 eyes (68.18%) out of 22 eyes in AGV group and 6 eyes (19.35%) out of 31 eyes in AADI group ($p < 0.001$). Our results for AGV group match with the studies, which based on different criteria, have reported HTP to range from 21.3% to 84.6% in cases of AGV ( Pandav et al, 2020; Osman et al, 2020;Nouri-Mahdavi and Caprioli, 2003; Pathak et al, 2018a; Jung et al., 2015; Ayyala et al, 1998). However, there are conflicting reports on incidence of hypertensive phase (HTP) in cases of non-valved implants. Some studies have asserted HTP to be unusual after the non-valved implants (Nouri-Mahdavi and Caprioli, 2003, Siegner et al,1995). Few studies reporting the outcomes of AADI implant have not commented on HTP (Pandav et al, 2020; Puthuran et al, 2019; Kaushik et al, 2017). Additionally, there are studies that have reported HTP to range from 21.1% to 31.2% in cases of AADI (Ray and Rao, 2020; Pathak et al, 2018b; Pathak et al, 2018a ). Our results for AADI group match with the ones reporting HTP and seem to suggest that HTP is not an unusual occurrence after non-valved GDD surgery as well.

Complications were comparable between the two groups in our study. Majority of the complications were transient and managed conservatively. We observed transient hypotony in four (16.67%) eyes in AGV group and six (19.35%) eyes in AADI group, among which one (4.16%) eye from AGV group and two (6.45%) eyes from AADI group developed transient choroidal detachment (CD) as well. We observed persistent hypotony in one (3.22%) eye in the AADI group that also developed persistent CD. Transient hypotony in cases of AGV has been reported to range from 3.27% to 12.17% in different studies (Pandav et al, 2020; Lai et al, 2000; Huang et al, 1999; Das et al, 2005), which is similar to our study. Puthuran et al (2019) reported 8% of cases with transient CD due to hypotony in their study on outcomes of AADI implant which also matches the result of our study. In their study on AGV implant, Das et al (2005) reported four (3.27%) cases of transient hypotony, among which one (0.82%) developed shallow AC with transient CD. Pandav et al (2020) reported persistent hypotony in 3.40% of eyes in AADI group and 0.53 % of eyes in AGV group. Tube exposure was seen only in AADI group (9.67%) in our study (P=0.24). Pandav et al (2020) too reported the incidence of tube exposure only in cases of AADI group (3.4%). The incidence of tube exposure was equal (5.26%) in cases of AADI and AGV in a study by Rathi et al (2018).

As a retrospective study, there was no randomization between the two groups, which is a major limitation of our study. Most of our surgeries were performed as a charity, using implants donated to the glaucoma department of the institute. As such, in most cases, the type of implant used depended upon the availability of the implant (free of cost). No standardized protocol was followed while adding IOP-lowering drugs post-operatively and this was left to the discretion of the operating surgeon.

This may have affected the ratio of complete to qualified success.

In conclusion, both AGV and AADI appear to be safe and effective in decreasing IOP and AGMs significantly in cases of refractory glaucoma in Nepalese eyes.

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