GLAUCOMA VALVE IMPLANTS IN NIGERIANS A Report of Early Experience with the Ahmed Glaucoma Valve

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SUMMARY

Objective: To show the value of glaucoma valve implant surgery in the management of glaucoma in Nigerians.

Design: A prospective study of two glaucoma patients who had an Ahmed glaucoma valve implant at the University of Benin Teaching Hospital and DDS Eye Surgery in Benin City.

Materials and method: One patient with a history of failed trabeculectomy and another with refractory glaucoma from complications of cataract surgery had Ahmed valve implantation. The pre-operative and post-operative intraocular pressures were measured with the Keeler non-contact tonometer and the patients were followed up for 6 months.

Results: The two eyes had intraocular pressure reduction far above the 20% benchmark reduction in pre-operative intraocular pressure and this was maintained throughout the 6-month follow-up period. The complications encountered were minimal with hypotony as the significant complication.

Conclusion: This preliminary report demonstrates the value of glaucoma valve implant surgery in Nigerian patients with glaucoma that is difficult to manage or refractory to other forms of treatment.

Key words: glaucoma, glaucoma valve implant, intraocular pressure

INTRODUCTION

Glaucoma belongs to the group of optic neuropathies characterized by typical visual field loss and structural damage to the optic nerve fibres with intraocular pressure as the most significant, measurable and manageable aspect of the disease. This disorder has a high rate of occurrence among African populations. There have been numerous attempts to manage glaucoma outside use of medication to control intra-ocular pressure. Limbo-sclera trephination was described in 1909 by Elliot.[1] It was effective but had series of complications including severe hypotony. Singh introduced the micro-trephination with a diameter of 0.6mm in 1988. This cheap and simple technique had satisfactory early term results in Nigerians,[2] but the long term is now doubtful, as the small diameter made this simple technique unsuitable for Africans, for the fistula tended to obliterate in the long term because of high fibroblast activity in Africans.[3] Laser trabeculoplasty has a short effectivity period and is also less effective in Africans.[4] Trabeculectomy, a partial thickness filtering procedure was described in 1968 by Cairns.[5] It is the most popular glaucoma surgery today, but it has the problem of filtering failure.[6,7] The advent of anti-metabolites improved the outcome of cases with high failure rates, but the control of the flow, despite various adjustments and procedures remained a problem,[8] leading to excess drainage and hypotony.

Valved glaucoma implants also called glaucoma drainage devices (GDD) offer a great possibility for regulating flow and attaining the desired eye pressure in glaucoma. The first attempt at GDD was in 1906 using a horsehair pin to drain the anterior chamber externally via a corneal paracentesis;[9] but it was in 1912 that Zorab used a seton device to drain the eye into the sub conjunctival space in refractory glaucoma.[10] The early GDD were designed to prevent filtration failure, but

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be conjunctival fibrosis.[11,12] This discovery caused the modification of the GDD to have a tube and a plate design; the plate providing for a flow control mechanism to prevent hypotony.

Their initial popular uses have been in refractory glaucoma,[13] but good results are recommending them for non refractory cases. The prominent examples of GDD today in chronological order are Molteno, Krupin, Baerveldt, Ahmed and Optimed. The Ahmed valve is generally acclaimed to be the most successful of the GDD in use. This study examines the initial experience with the Ahmed GDD in two Nigerian patients.

MATERIALS AND METHODS AND PATIENTS

The Ahmed device comprises a silicon drainage tube and polypropylene valve/reservoir body, which houses a silicon elastomer valve membrane. The valve/reservoir body conforms to the shape of the globe at its equator and protects the valve membrane from blockage by fibrous tissue growth.

Two patients with glaucoma were recruited into this study. One had a history of failed glaucoma filtering surgery (trabeculectomy) and was now on medication but was having problems procuring his medication because of the high cost. The other patient developed refractory glaucoma as a complication from cataract surgery, lens implant and closed vitrectomy. The new procedure (the Ahmed device) was clearly explained to the patients and informed consent was obtained from them. The procedure was also cleared with the standing ethical committee of the University of Benin Teaching Hospital (UBTH) Hospital, and the medical director of DDS Eye Surgery. Both patients had their visual acuity (VA) tested with the Snellen chart. Their intraocular pressures (IOP) were measured with a Keeler non-contact tonometer (Easy Eye). The cup disc ratio (CDR) was recorded with a Keeler specialist ophthalmoscope.

The surgery involved first priming the implant with balanced salt solution. A fornix-based conjunctival incision was made in the supero-temporal quadrant and blunt dissection lifted the tenons from the episclera creating the desired pocket. The second patient had mitomycin C (not available at the time the first patient had the surgery) application with cotton tips in the pocket between the tenons and the episclera. The implant was fixed to the sclera 8-10mm away from the limbus. The implant tubing was measured, trimmed and inserted into the anterior chamber (AC) through a paracentesis performed with a 23-gauge needle at the limbus. The exposed tube was covered with a raised partial thickness scleral flap and the conjunctiva was closed with an 8/0 silk suture. Post-operatively, each patient had steroid antibiotic eye drops instilled and the eye was padded for a day or two, after which the steroid antibiotic eye drops were continued for about 4 weeks.

Post-operatively, the IOP was measured with the Keeler non-contact tonometer weekly for the first one month, then bi-weekly for the next one month and then monthly. In this study, success was determined by a post-op IOP reduction of at least 20% of pre-operative intraocular pressure.

PATIENT 1

Patient 1 was a 51-year-old oil worker who had advanced glaucoma. When first seen, ocular statistics were as follows:

VA	RE	= 6/6	VA	LE	= 6/6
ODC	RE	= 75%	ODC	LE	= 70%
IOP	RE	= 35mmHg	IOP	LE	= 33mmHg

He was on xalatan eye drops (latanoprost) for both eyes. The medication controlled his IOP which was in the range of 33 mmHg to about 22mmHg. He resigned from his job, however, following the crisis in the Niger Delta, and was out of job for about 6 months. It became difficult for him to purchase xalatan and in some instances; he could not find xalatan to buy.

He had trabeculectomy with mitomycin C in both eyes. The left eye was successful with IOP dropping from 33 to 16mmHg. It has remained so. The right eye however, had a problematic post-operative period. There was delayed reformation of the AC and we took invasive procedures such as injection of whole blood under the bleb and visco-elastic into the AC, etc. Five months later, the filtering procedure failed because of fibrosis. The glaucoma surgery was repeated at ten o'clock. This also failed. The patient was again placed on xalatan eye drops and the IOP dropped to about 24mmHg. He was unable to continue this treatment due to his financial problems. So we decided he would be a good candidate for the Ahmed GDD. At the time of the implant surgery IOP was 26mmHg (on xalatan drops); and VA 6/9 RE. The surgery was simple and the patient very co-operative.

At the immediate post-operative period (3 days post surgery), the IOP was very low — about 6 to 7mmHg. A steel suture (0.04mm) diameter was passed under the drainage tube from outside through the conjunctiva and tied. This temporarily reduced the lumen of the tube allowing the AC to form properly. The suture was removed two weeks later and the IOP has remained between 10mmHg and 11 mmHg. The patient is not on any anti-glaucoma medication. His vision returned to the pre-operative vision of 6/9 as soon as the AC was well formed.

PATIENT 2

Patient 2 was a 68-year-old man who had refractory glaucoma as a complication from cataract surgery and lens implant and closed vitrectomy for massive vitreous haemorrhage of two months duration.

Ocular statistics were as follows:

VA	RE	HM	VA	LE	6/12
IOP	RE	= 51mmHg	IOP	LE	= 12mmHg
ODR	RE	= poor view	ODR	LE	= 30%

The patient presented with severe pains in the RE which was also very congested. He was on active glaucoma and uveitis medications at presentation. The vigorous anti-glaucoma medications were continued and the patient also had two paracenteses; these had a slight effect on the RE intraocular pressure, which dropped to 43 mmHg. The patient was offered Ahmed glaucoma surgery for the refractory glaucoma. The surgery was successful and the eye pressure dropped satisfactorily. At 6 months post-op, the intraocular pressure in the RE was 13mmHg.

RESULTS

This preliminary report presents the first two eyes from two patients who had Ahmed GDD implant at the University of Benin Teaching Hospital (UBTH) and DDS Eye Surgery in Benin. The follow-up period for the two eyes at the time of this report was 6 months. The IOP measurements were done with the Keeler non-contact tonometer. Both eyes had very significant reduction of their pre-operative IOPs (much higher than the bench mark of 20% reduction in the pre-operative IOP).[13]

Patient 1 had a pre-op IOP in the operated LE of 33mmHg. On the 3rd day post op, patient 1 had a very low IOP of 6 to 7mmHg (non-contact tonometry) caused by excessive drainage. A partial ligation of the tube with a 0.04mm diameter steel suture was carried out. This corrected the excessive drainage and allowed the AC to reform properly and satisfactorily. Patient had weekly IOP measurements for the first one month, bi-weekly for the next one month and thereafter once a month. The average IOP measurements for each month are as shown in table 1. The 6 month post operative IOP LE was between 10mmHg and 12mmHg. No other complication was encountered.

Table 1. Pre & post surgery average IOP measurements (mmHg)

Patient	IOP (pre)	IOP Post Surgery / months					
		1	2	3	4	5	6
1	35	10	12	10	12	11	11
2	51	9	12	11	12	11	13

Comment

The quick intervention in ligating the tube and decreasing the lumen, thus reducing the flow rate was because of the past experience we had with the patient when he had his filtering surgery. The patient now attends the clinic every two months for IOP measurement and other vital ocular statistics such as ODC assessment and visual acuity. More important is that the patient is no longer on his expensive anti glaucoma medication.

Patient 2 had a pre-operative IOP in the operated RE of 51mmHg. Post-operatively, the patient had no problems. Patient 2 had his IOP measured weekly for the first one month, then bi-weekly for the next one month, and then monthly. The average IOP measurements are as shown in table 1. At 6 month post-op, the IOP in the LE was 13mmHg.

DISCUSSION

Glaucoma is more devastating in the African for a variety of reasons. Africans have a greater rate of failure in glaucoma filtering surgery because trauma[6] and fibroblastic activities are more pronounced.[3] All these combine to make glaucoma management challenging to the African ophthalmologist. African glaucoma patients need more interventions that can provide reliable control of IOP such as GDD offers and especially the Ahmed valve GDD that is now acclaimed to be the most successful, having a success rate above 80%, all factors considered (table 2). In this early report, the two cases have been followed up for only 6 months, but both patients have been able to discontinue their expensive eye medications. These patients need to be followed up continuously being pioneer recipients, to find out the intermediate and long-term performance of the Ahmed valve in the African eye.

Table 2. Comparison of the common glaucoma valves

Valve Type	Molteno	Baerveldt	Ahmed
Success Rate (lowering IOP)	60.0%	72.0%	95.0%
Visual Acuity (improved or within one Snellen line)	70.0%	62.0%	82.0%
Hypotony (occurrence)	14.6%	76.0%	8.0%
Success rates with corneal grafts	76.0%	54.0%	84.1%

* Reference No. 15

Our two cases had a successful lowering of their IOP. We cannot generalize from this considering the sample size and the short follow-up duration, but others with larger sample sizes and longer follow-up periods have reported success rates of about 90% using the Ahmed GDD.[15] Coleman et al. obtained 77.9% in complicated paediatric cases,[14] Lai et al. reported 74% in the eyes of Chinese patients with complicated glaucoma.[16] In this study, we had a case of hypotony, on which we acted quickly to bring under control because of our past experience with the patient. Hypotony is a recognized complication of valved GDD although the valves are supposed to prevent this. Lai et al. had 10.8%

cases of hypotony while Coleman et al. had one case out of 21 children fitted with the Ahmed GDD. The rate of hypotony is higher if intra-operative mitomycin C is used.[8] However, we did not experience any hypotony in the patient who had intra-operative mitomycin C. Encapsulated bleb can be a problem with GDD, including Ahmed, if anti-metabolites are not used in the surgery. Lai et al. found encapsulated bleb as the commonest post-op complication of the GDD implant with a rate of 24.6% after a variable follow-up of 6 to 37 months in a series of 65 eyes. However, Kook et al., in a series of 40 eyes had no cases of encapsulated bleb[17] when they used intra-operative mitomycin C, but had much higher cases of hypotony, shallow AC, and other complications associated with mitomycin C use intra-operatively. The common complication of encapsulated bleb is a serious concern to the African ophthalmologist as Africans are more predisposed to develop this complication.

Hypotony in any glaucoma surgery is worrisome but can be controlled with a partial reduction of the lumen by ligation of the tube, thereby decreasing the drainage of aqueous. The finding by Kook et al. that adjunctive intra-operative use of mitomycin C eliminates the development of an encapsulated bleb is welcome advice for the African ophthalmologist who can forestall the high possibility of encapsulated bleb developing in Africans with GDD implant by intra-operative use of mitomycin C.

Table 3. Brief comparison of adjunctive mitomycin C and non mitomycin C

Complications	Mitomycin C (40) *	Non Mitomycin C (65)**
Encapsulated bleb	Nil	(16) 24.6%
Hypotony	7 (17.5)	(7) 10.8
Hyphaema	(5) 12.5	(9) 13.9
Choroidal detachment	(5) 12.5	(7) 10.8
Tube obstruction	(5) 12.5	(4) 6.2

* Reference No. 17

** Reference No. 16

In conclusion, we encourage Nigerian ophthalmologists to take advantage of the high success rate of the Ahmed GDD; the ease of insertion and the good advice to use intra-operative mitomycin C to combat difficult and refractory glaucomas while we follow up the cases in this report for a longer period.

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