Case Report

Familial POAG to Refractory Glaucoma: A Case Report on a Low-Cost Glaucoma Implant

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ABSTRACT

This case report presents the management of refractory glaucoma in a middle-aged patient with a familial history of primary open-angle glaucoma (POAG). The patient had previously received two trabeculectomies in the right eye with persistently elevated intraocular pressure (IOP) despite maximal medical therapy. The results showed that there was advanced glaucomatous damage and an IOP of 43.4 mmHg (NCT). Due to financial constraints, Virna Glaucoma Implant (VGI) was selected as a low-cost drainage device. Postoperative IOP on Day 18 was 10 mmHg with a best-corrected visual acuity (BCVA) of 6/7, and by Day 32, IOP was 19 mmHg with BCVA of 6/8. The patient reported symptomatic relief and tolerated the implant well without complications or the need for additional medication. This case showed the potential of low-cost glaucoma implant as an effective alternative for managing refractory glaucoma in resource-limited settings, where access to high-cost surgical devices is limited.

Keywords: Glaucoma, Trabeculotomy, Trabeculectomy, Primary Open-Angle Glaucoma, Intraocular Pressure.

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INTRODUCTION

Primary open-angle glaucoma (POAG) is one of the leading causes of irreversible blindness the management of which becomes challenging when it progresses to the refractory stage, where intraocular pressure (IOP) remains uncontrolled.[1] Familial history of glaucoma, which accounts for over 60% of cases, increases the disease risk by approximately 10 times among first-degree relatives.[2] This shows the need for early detection and aggressive management strategies in high-risk individuals.

When conventional filtering surgeries such as trabeculectomy fail, glaucoma drainage devices (GDDs) become the next line of treatment. However, access to premium implants including the Ahmed or Baerveldt valves remains limited in low- and middle-income countries (LMICs) due to prohibitive costs. In Indonesia, the local manufacturing of the Virna Glaucoma Implant (VGI) has decreased production costs to approximately USD 150 per unit, representing a 90% cost reduction compared to imported GDDs.[3,4]A previous prospective study comprising 252 patients with refractory glaucoma reported that the VGI could reduce IOP by 61.4% at 12 months, with complete surgical success (IOP ≤21 mmHg without medication) achieved in 57% of cases.[3]These outcomes show the potential of implant as a viable and cost-effective option for glaucoma care in LMICs.

Based on the background, this case report presents the use of the VGI in a patient with familial POAG and previously failed trabeculectomies. The objective was to document the clinical outcomes and emphasize the importance of affordable surgical alternatives in regions where access to advanced glaucoma devices is

limited.

Case Presentation

A 57-year-old male was referred to glaucoma clinic due to progressive vision loss and high intraocular pressure (IOP) despite previous surgical treatments. The patient experienced a gradual decline in peripheral vision, difficulties with night vision, and discomfort in eyes. The main concern was the deterioration of visual ability, particularly after earlier interventions. There were no significant systemic health issues, but a family history of glaucoma, with both parents including a nephew being diagnosed and treated for POAG. As a resident of a rural region, there was limited access to specialized eye care, and financial barriers affected treatment options. The patient received two trabeculectomy surgeries on right eye, conducted in the span of two years, and one trabeculectomy in the left eye. However, the right eye IOP remained elevated, and the left eye was effectively managed. This situation progressed to refractory glaucoma, leading to the consideration of glaucoma drainage device (GDD) implantation.

After the initial evaluation, the patient's BCVA was 2/10, with IOP of 43.4 mmHg in the right eye. A slit-lamp examination showed a deep and quiet anterior chamber in both eyes, with no signs of inflammation. Gonioscopy showed open angles in all quadrants bilaterally. There was no peripheral anterior synechiae or neovascularization. The examination of the optic nerve indicated cup-to-disc ratio of 0.79 in the right eye. Visual field testing (Humphrey 24-2) in 2023 showed a normal field with a mean deviation (MD) of -0.89 dB in the right eye and a glaucomatous field loss with an MD of -7.84 dB in the left eye. Optical coherence tomography (OCT) showed thinning of the retinal nerve fiber layer (RNFL) in the left eye’s superior, inferior, and temporal quadrants, as well as the inferior and superior quadrant of the right eye.

The patient was prescribed daily doses of acetazolamide 250 mg four times, potassium tablet

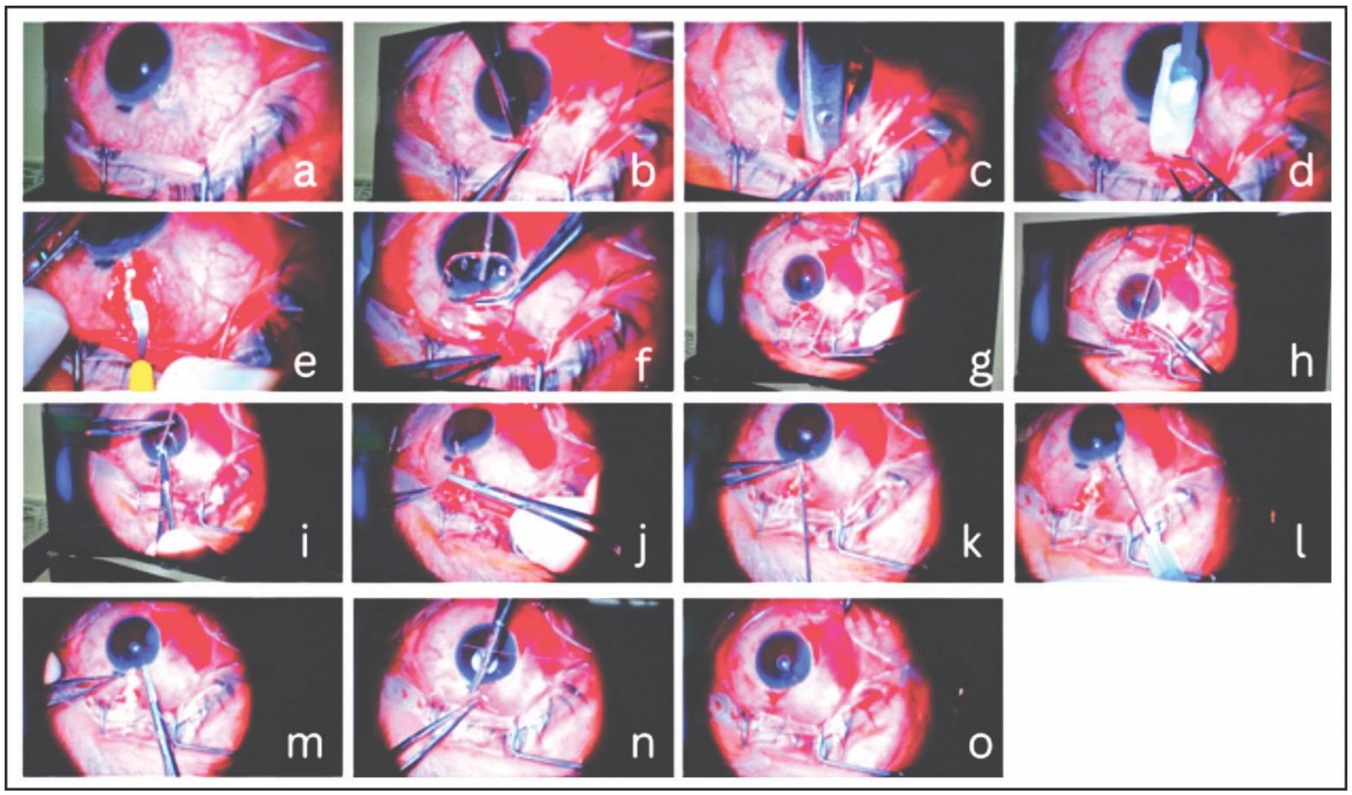

Figure 1: GDD implantation surgery steps on the right eye; a. setting up the eye; b. conjunctival incision 5mm from the limbus; c. conjunctival undermine; d. control the bleeding; e. make scleral flap; f. insertion of the GDD; g. plate fixation with ethylon 8.0; h. tube ligation; i. tube measurement and cutting; j. tube insertion under scleral flap; k. tube insertion into the anterior chamber; l. corneal hydration; m. suturing the limbal conjunctiva with nylon 10.0; n. suturing conjunctiva with Vicryl 8.0; o. evaluation of anterior chamber, cefuroxime intracameral injection, antibiotic eyedrops, and corticosteroid eyedrops.

once, and one drop of topical timolol for the right eye two times. VGI was used as a non-valved drainage device. VGI was placed in the superotemporal quadrant using local anesthesia. Before insertion, the implant was primed with a balanced salt solution, positioned with the aid of a scleral flap, and patch graft coverage (Figure 1).

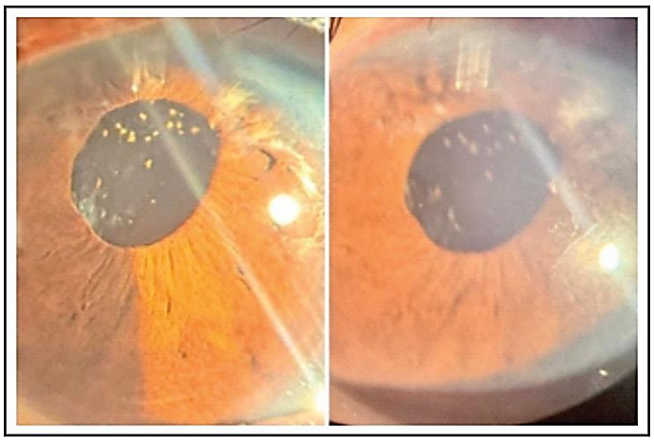

Figure 2: Right eye, day 18 post-VGI implantation surgery shows deep anterior chamber and tube located at 2 o'clock on the superotemporal quadrant.

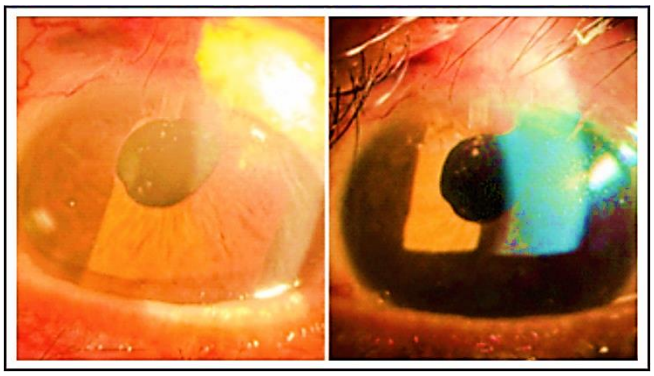

Figure 3: Right eye, 32 days after VGI implantation shows deep anterior chamber, tube at 11 o'clock superotemporal quadrant.

Postoperative medications comprised topical antibiotics and corticosteroids for approximately four weeks, with gradual tapering of dosages. On postoperative day 18, IOP in the right eye (OD), measured using NCT, was 10 mmHg, and BCVA was 6/7 (Figure 2). By day 32, a slit lamp examination showed a deep anterior chamber with the tube positioned at 2 O'clock supero-temporally. Further observation showed that the conjunctival suture had not been fully absorbed. IOP increased to 19 mmHg (NCT), while BCVA was 6/8 (Figure 3). The patient showed improved VA without any discomfort or significant complications during the postoperative phase. The prompt stabilization of IOP and retention of VA suggested a positive initial response to the VGI. Furthermore, the early stabilization of IOP and maintenance of BCVA showed favorable results of VGI.

DISCUSSION

A 57-year-old male presented with uncontrolled POAG, despite two trabeculectomies and maximum medical therapy. The patient continued to have decreased visual field and elevated IOP. The condition gradually led to refractory glaucoma prompting consideration of Glaucoma Drainage Device (GDD) implantation.

Refractory glaucoma represents a subtype of glaucoma characterized by uncontrolled IOP despite the use of maximally tolerable glaucoma medications, failed filtration surgery, or conditions that respond poorly to it.[1,3] The patient had received two trabeculectomies in the span of two years, but IOP was elevated after the second surgery. Although trabeculectomy is regarded as the standard filtration method for open-angle glaucoma, it can lead to failure later. The failure rates also reach approximately 50% in individuals requiring repeat trabeculectomy surgery.[5] A recent study showed that in patients with a previous history of unsuccessful filtering surgery, GDD implantation was preferred.[6]

The implantation of GDD in refractory glaucoma shows varying success rates. The efficacy and safety of GDD implantation also depends on the specific type of GDD model used and the underlying etiologies of glaucoma.[7] The Ahmed or Baerveldt devices are currently used for treatment, although these devices are often inaccessible in low and middle-income countries due to financial constraints. In this context, VGI is often used as a viable alternative for cost-effective implantation.

Previous research has demonstrated the effectiveness of VGI implantation in various clinical scenarios. In a study of 279 patients with primary glaucoma followed for one year, mean IOP was maintained at 14.3 ± 5.9 mmHg at 12 months postoperatively.[3] Similarly, in eyes with failed trabeculectomy, VGI implantation has been associated with a substantial IOP reduction from 32 mmHg to 8 mmHg.[4]

In this study, the patient's IOP stabilized within the early postoperative period, reflecting findings from previous research that non-valved glaucoma drainage devices (GDD) generally achieve greater IOP reduction than valved types.[8,9] The absence of valve-induced resistance in non-valved GDD facilitates more efficient aqueous outflow, leading to sustained pressure control and, in the long term, reduced dependence on glaucoma medications.[8] Evidence from randomized controlled trials also suggests higher success rates with non-valved devices (60%) compared to valved models (47%).[10] However, these benefits must be balanced against a small but noteworthy risk of hypotony, reported in approximately 2% of non-valved cases versus none in valved groups, likely due to the protective flow restriction mechanism of the latter.[9,10] This trade-off highlights the importance of individualized device selection based on the patient's risk profile and therapeutic goals.

The results of this study found no complications related to hypotony. These results showed a favorable response regarding early stabilization achieved through using VGI. Given the limitation of this single-case report and its short-term follow-up, extended longitudinal observation is necessary to assess the long-term durability of outcomes and to detect any delayed complications. However, in this case, continued follow-up was constrained by the patient's socioeconomic status, particularly the cost of transportation and limited income, as the patient resides in a rural area. These challenges highlight the real-world barriers to consistent postoperative monitoring. A longer follow-up period, when feasible, would also enable more meaningful comparisons across diverse patient populations and clinical settings.

CONCLUSION

Low-cost GDD such as VGI was identified as an effective alternative in managing refractory glaucoma, particularly among patients with a familial history of POAG and limited access to premium implants. Based on the results, the implant provided stable IOP control and visual function after the failure of two trabeculectomies. The case presented showed the importance of accessible surgical options in resource-limited settings and supported the role of cost-effective interventions in glaucoma care.

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Conflict of Interest: Authors declared no conflict of interest.

Availability of Data and Materials: The data supporting the results of this case report are available from the corresponding author upon reasonable request.

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Authors Designation and Contribution

Lydia Nuradianti; Consultant Ophthalmologist: *Concepts, Design, Data acquisition, Manuscript Review.*

Chandra Prabaswara; General Practician: *Design, Literature Search, Data acquisition, Manuscript Preparation, Manuscript Editing.*

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