



## CASE REPORT

# Aqueous Misdirection Glaucoma Following Uneventful Cataract Surgery

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### Abstract

Aqueous misdirection glaucoma is a rare post ophthalmic surgery complication. It is mostly encountered after a glaucoma filtration surgery, and less commonly comes after cataract extraction surgery. The clinical scenario usually appears immediately after the procedure, in which the intraocular pressure increases, the anterior chamber becomes flat or shallow, and the peripheral iridotomy is appropriate and patent. Several theories have been proposed to determine the pathologic background of this condition. This case report is a supplementary evidence to the mechanism involved in which an aqueous misdirection to the posterior segment of the eye is the etiology of the disease.

**Keywords:** Anterior Chamber, Cataract, Glaucoma, Intraocular Pressure, Pseudophakia, Vitrectomy

### Introduction

Aqueous misdirection glaucoma (AMG) is a rare disorder, first described by Von Graefe in 1869.<sup>1</sup> It is characterized by an acute elevation of intraocular pressure (IOP) and the presence of a shallow or flat anterior chamber in the presence of patent peripheral iridotomy (PI).<sup>2-4</sup> It is most often occurring after a glaucoma filtration surgery, but it has been reported following cataract extraction surgery, laser iridotomy, capsulotomy, cyclophotocoagulation, and usage of topical miotic treatment.<sup>5-7</sup>

Medical therapy is the standard initial approach of treatment which includes topical and oral aqueous suppressants, cycloplegics, and hyperosmotic agents. The success rate of medical therapy is

variable, which has led to the development of various surgical techniques to achieve the desired results.<sup>4</sup>

In this report, we are presenting a surgical technique aiming to manage a case of Pseudophakic AMG.

### Case report

A 68-year-old female with a history of type 2 diabetes mellitus and hypertension presented to the ophthalmology emergency clinic on the first day after an uncomplicated left eye phacoemulsification with intraocular lens implantation surgery, complaining of intermittent left eye pain, diminution of vision, and redness. Her ophthalmic history and examination were unremarkable prior to procedure.

Her visual acuity was 6/60 (by Snellen chart) in the left eye. Examination of the anterior segment of the left eye showed moderate corneal edema and shallow anterior chamber with pupillary block. The IOP was 30 millimeters of mercury (mm Hg), measured with a Goldman tonometer, in the left eye. Fundus examination showed no abnormalities. On the other hand, right eye examination was within normal limits.

A diagnosis of angle-closure glaucoma with a pupillary block in the left eye was suspected. Despite administering local and systemic IOP-lowering agents which involve topical timolol and brimonidine drops, oral acetazolamide and intravenous 20% mannitol, the IOP remained high. A PI was done using Neodymium-doped Yttrium Aluminium Garnet (Nd-YAG) laser and a patent iridotomy was created.

A further examination was carried out after two hours, which revealed an increase in the corneal edema intensity, a raise in the anterior chamber inflammation, an anterior displacement of the central and peripheral iris diaphragm and the intraocular lens, and the development of peripheral anterior synechiae (PAS) in the left eye (Figure 1).



**Figure 1:** Anterior segment findings of left eye of showed corneal edema, posterior synechiae (PAS) and the attempted peripheral iridotomy (PI)

Furthermore, the IOP remained above 40 mm Hg. Therefore, in view of worsening of the eye condition; the pupillary block glaucoma was excluded as the primary diagnosis.

A diagnosis of AMG was suspected, and medical treatment was attempted by introducing a topical cycloplegic agent to restore the anatomic malposition; but no improvement noticed in the

eye condition. Unfortunately, the corneal edema obscured the view, and the Nd-YAG laser could not be used for an intended hyaloidotomy. Finally, surgical management was carried out with the purpose of creating a path to restore the normal flow of aqueous humour.

#### *Surgical procedure*

The procedure was done under general anaesthesia. It was initiated with the placement of two trocars at the level of the pars plana and the insertion of a continuous infusion port to maintain the IOP. The anterior vitreous face was penetrated, and a core vitrectomy was performed using a vitreous cutter through the trocar. A corneal incision was made, and the anterior chamber was deepened with a viscoelastic dispersive agent. An irido-zonulo-hyaloidectomy (IZH) was done using the vitreous cutter in the anterior chamber (Figure 2). At the end of the surgery, irrigation and aspiration of the anterior chamber were done, and the corneal wound was secured with a suture. Before the end of the operation, the shallowness of the anterior chamber was immediately reduced, and a good path for aqueous humour outflow was restored.



**Figure 2:** Anterior segment finding of left eye showed the irido-zonulo-hyaloidectomy (IZH)

#### *Post-operative outcome*

On the first day after the surgery, the patient's vision was 6/15 in the involved eye with an IOP of 7 mm Hg. The anterior chamber depth was maintained without any blockage of flow both in the pupillary margin and the peripheral iridectomy site. She continued to follow up in the ophthalmology outpatient clinic for three months with a stable condition of the eye. In addition, the visual acuity improved to 6/9 at

the last visit, the IOP was stable, and there was no need to use any topical IOP lowering medications. A written consent was obtained from the patient for the publication of this report and clinical images.

## Discussion

AMG is a rare disorder characterized by an elevation of IOP along with a shallow or flat anterior chamber usually following an incisional surgery of the eye.<sup>5-7</sup> Although the mechanism of action remains unknown, a theory suggests a misdirection of aqueous flow due to alterations in the position of the lens, ciliary body, and anterior hyaloid face.<sup>2</sup> Aqueous might build up in the vitreous cavity or as a separated fluid-filled cavities within the vitreous, which may consequently lead to the abnormal forward positioning of the anterior hyaloid face and increase contact with the lens-ciliary body junction that subsequently will lead to the elevation of the IOP.<sup>8</sup>

The incidence of AMG is high in eyes with primary angle-closure glaucoma and it's more susceptible following glaucoma filtration surgery.<sup>9</sup> Moreover, it may occur in the early or late post-operative period of trabeculectomy, phakic, aphakic, or pseudophakic eyes, Nd-YAG laser for iridotomy, capsulotomy or laser suture lysis, miotic drops use, or needling of filtering blebs.<sup>5,9</sup> AMG following surgery can occur at any stage from the first day after surgery to many years later.<sup>2,7</sup>

Symptomatically, patients often complain of a painful red eye and diminution of vision, which might be associated with nausea or vomiting.<sup>2,10</sup> The ocular examination usually shows a flat appearance in the peripheral and central parts of the anterior chamber with anterior displacement of the iris, lens or intraocular lens, and vitreous face.<sup>2,5</sup>

A differential diagnosis must be carried out to rule out other disorders that share the same clinical presentation, which includes acute angle-closure glaucoma with pupillary block, suprachoroidal hemorrhage, choroidal effusion, and secondary causes of angle closure.<sup>2</sup>

Once the diagnosis is confirmed, a series of combined medical and surgical therapies will be

initiated based on the patient's response. Medical therapy should be initiated and involves the use of topical beta-blockers, alpha-adrenergic agonists, topical and oral carbonic anhydrase inhibitors, oral or intravenous osmotic agents, and cycloplegic agents.<sup>11</sup> The goal of this therapy is to induce a reduction in the aqueous production rate, shrinking the vitreous body and create a backward movement of the misdirected iris lens diaphragm. The success rate of the medical therapy accounts for up to fifty percent with a higher rate of recurrence after cessation of the cycloplegics.<sup>4</sup>

Another modality of treatment that has been documented as an adjunct to medical therapy is the use of Nd-YAG laser to perform a capsulotomy and hyaloidotomy, which is a method used for cases of aphakic or pseudophakic cases of AMG. This has achieved varying degrees of success.<sup>12-13</sup> The principle of this therapy is to create an opening in the posterior capsule and anterior hyaloid face to allow the aqueous flow to return into its normal pathway of drainage.

A surgical therapy must be carried out if the previous therapies failed to relieve the condition. Different surgical approaches have been utilized with a variable outcomes and rate of relapses. The type of surgical method used depends on the surgeon, whether a vitreoretinal or an anterior segment surgeon is handling the procedure. Pars plana vitrectomy (PPV) has a high success rate in which a total vitrectomy should be implemented rather than an anterior vitrectomy.<sup>13</sup> This is thought to be due to the failure of breaking the blockage of aqueous inside the vitreous cavity despite removing the central vitreous.<sup>12</sup> Another approach is by creating a path to the misdirected aqueous by an anterior vitrectomy followed by irido-zonulo-hyaloidectomy (IZH), which was used in this case.<sup>8</sup>

In more recent retrospective studies, the relapse rate was 100% after medical therapy, 75% after Nd-YAG Capsulotomy and hyaloidotomy, 75% after PPV, and 66% after anterior vitrectomy combined with IZH.<sup>13</sup> Given these results, surgical therapy is the most effective method to achieve a long-term control of IOP and to decrease the rate of relapses.

## References

1. A. von Graefe. Beitrage zur pathologie und therapie des glaukoms. *Archives of Ophthalmology*. 1869;15:108.
2. Foreman-Larkin J, Netland PA, Salim S. Clinical Management of Malignant Glaucoma. *Journal of Ophthalmology*. 2015:283707.
3. Fekih O, Zgolli HM, Mabrouk S, et al. Malignant glaucoma management: literature review. *La Tunisie Medicale*. 2019;97(8-9):945–949.
4. Shen C J, Chen YY, Sheu SJ, et al. Treatment course of recurrent malignant glaucoma monitoring by ultrasound biomicroscopy: a report of two cases. *The Kaohsiung Journal of Medical Sciences*. 2008;24(11),608–613.
5. Ștefănescu Dima AȘ, Tănasie CA, Mercuț MF, et al. Pseudophakic malignant glaucoma: a case report. *Romanian Journal of Ophthalmology*. 2019;63(3),268–272.
6. Varma DK, Belovay GW, Tam DY, Ahmed II. Malignant glaucoma after cataract surgery. *Journal of Cataract and Refractive Surgery*. 2014;40(11),1843–1849.
7. H Shahid, JF Salmon. Malignant Glaucoma: A Review of the Modern Literature. *Journal of Ophthalmology*. 2012:852659
8. Grzybowski A, Kanclerz P. Acute and chronic fluid misdirection syndrome: pathophysiology and treatment. *Graefe's Archive for Clinical and Experimental Ophthalmology*. 2018;256(1),135–154.
9. Balekudaru S, Choudhari N, Rewri P, et al. Surgical management of malignant glaucoma: a retrospective analysis of fifty eight eyes. *Eye*. 2017;31,947–955.
10. Ellis PP. Malignant glaucoma occurring 16 years after successful filtering surgery. *Annals of Ophthalmology*. 1984;16(2),177–179.
11. Basgil Pasaoglu I, Altan C, Bayraktar S, et al. Surgical Management of Pseudophakic Malignant Glaucoma via Anterior Segment-Peripheral Iridectomy Capsulo-Hyaloidectomy and Anterior Vitrectomy. *Case Reports in Ophthalmological Medicine*. 2012;794938.
12. Little BC, Hitchings RA. Pseudophakic malignant glaucoma: Nd:YAG capsulotomy as a primary treatment. *Eye (Lond.)*.1993;7(Pt 1),102–104.
13. Debrouwere V, Stalmans P, Van Calster J, et al. Outcomes of different management options for malignant glaucoma: a retrospective study. *Graefe's Archive for Clinical and Experimental Ophthalmology*. 2012;250(1):131–141.