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Refreshing Glaucoma surgery: The Role of Bleb Needling after Trabeculectomy

M N Islam[1]

Glaucoma, a leading cause of irreversible blindness globally, requires innovative and effective treatment strategies to preserve vision. Trabeculectomy or filtration surgery - a well-established gold standard surgical procedure, has been successful in reducing intraocular pressure (IOP) in many patients. However, the risk of postoperative scarring and decreased bleb function remains a challenge. In this editorial, let me explore the promising technique of bleb needling after trabeculectomy and highlight its potential benefits in managing glaucoma.

The Concept of Bleb Needling

Bleb needling is a technique used in ophthalmology to manage a poorly functioning or blocked bleb following trabeculectomy. The specific inventor of bleb needling is not attributed to a single individual. The technique has evolved over time and has been refined by various ophthalmologists and researchers in the field. Early reports of bleb needling can be found in the medical literature as early as the 1970s. Since then, many ophthalmologists have contributed to the development and advancement of this procedure. Dr. Robert Ritch and Dr. Paul Palmberg from USA are among the pioneers who have made significant contributions to the understanding and practice of bleb needling.

Bleb needling, a minimally invasive procedure, involves the use of a fine needle usually curved 26 G needle to create fenestrations or release encapsulated fluid within the bleb. It aims to improve bleb function by reducing scarring and improving aqueous outflow, leading to better IOP control[1]. This technique can be performed in an operation theatre or even at the OPD at doctor's chamber, offering an efficient and cost-effective alternative to more invasive interventions[1].

Enhanced Bleb Functionality

One of the primary benefits of bleb needling is the restoration of bleb functionality. By creating fenestrations or relieving fluid accumulation, the procedure helps to maintain a functioning filtration pathway. This improvement in bleb function often results in better IOP control, reducing the need for additional medications or surgical interventions[2].

Reduced Scarring and Fibrosis

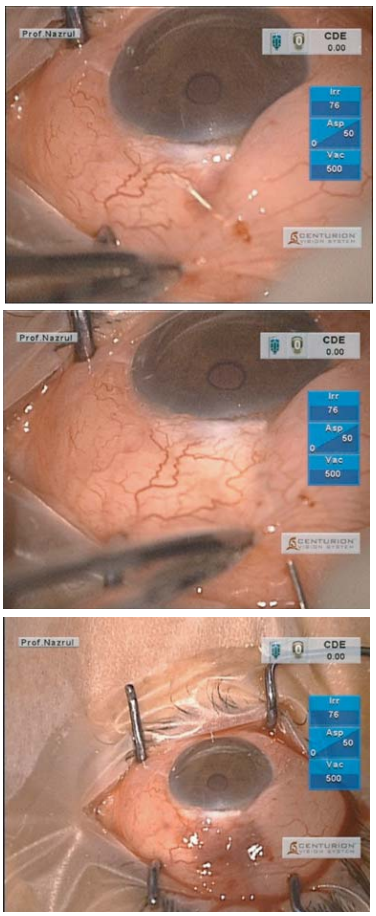
Postoperative scarring and fibrosis are significant concerns following trabeculectomy[3]. These can compromise the success of the surgery by limiting aqueous outflow and leading to elevated IOP. Bleb needling plays a crucial role in disrupting the fibrotic tissue and reducing scarring, thereby improving the long-term success rate of trabeculectomy. Anti scarring agents like MMC or 5 FU can also be used in refractory glaucoma cases. I give diluted MMC around the bleb after completing the bleb needling. Care is taken if any MMC should not enter to the anterior chamber. Anti VEGF bivacizumabis also effective if MMC is contraindicated. It can be given intra vitreally or intra cameral or subcutaneous route[4].

When is the indication of bleb needling – a commonly asked question.

The timing for bleb needling after trabeculectomy can vary depending on several factors, including the individual patient's healing response and the specific indications for the procedure. Typically, bleb needling is considered as an option for managing a poorly functioning or blocked bleb that is causing elevated intraocular pressure (IOP).

In some cases, bleb needling may be performed relatively soon after trabeculectomy if there are signs of early bleb failure or inadequate IOP control even after digital massage and flap

suture removal by argon laser. This could be within a few weeks to a few months after the initial surgery.Ultimately, the decision on the timing of bleb needling will be made after monitoring the patient's post-operative progress. The factors such as the patient's IOP levels, medication response, and any signs or symptoms of bleb dysfunction should be considered.



Bleb needling offers a personalized approach to managing glaucoma, as it can be tailored to individual patient needs. The procedure can be performed at different intervals, depending on the patient's IOP control and bleb functionality. This flexibility allows ophthalmologists to address specific challenges faced by each patient, optimizing treatment outcomes. Usually I prefer bleb needling if digital bleb massage, suture removal does not help to decrease IOP or if the bleb is cystic or fibrosed with high IOP within 6 months of surgery. After 6 months needling not workswell when revision of trabeculectomy is more effective.

Safety and Efficacy

Numerous studies have demonstrated the safety and efficacy of bleb needling as a post-trabeculectomy intervention. The procedure has shown a low complication rate and minimal discomfort for patients. Subcutaneous haemorrhage, hyphaema are not uncommon but it resolves within a 1-2 weeks. More vision threatening complications like hypotony and endophthalmitis is rare. Moreover, it can be performed under topical anesthesia, making it a viable option for patients who are not suitable candidates for more invasive interventions[3].

In conclusion, bleb needling after trabeculectomy represents an exciting advancement in glaucoma management. By enhancing bleb functionality, reducing scarring, and providing a personalized treatment approach, this technique offers new possibilities for improved IOP control and long-term vision preservation. As researchers continue to explore and refine this procedure, it is expected to play an increasingly vital role in the comprehensive management of glaucoma.

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Original Article

Result of Ahmed Glaucoma Valve Implantation in Treating Refractory Glaucoma in a Tertiary Eye Care Center in Bangladesh

Z Hassan[1], J Kabir[2], B K D Sarker[3], S M R Raju[4], M I Iqbal[5]

Abstract

Background: Ahmed glaucoma valve (AGV) implantation is a surgical technique to reduce intraocular pressure in glaucoma patients. This (AGV) mechanism was designed to prevent postoperative hypotony allowing for AH drainage when intraocular pressure IOP is in the range of 8–12 mmHg. In Bangladesh, we have very limited research-based information regarding the clinical outcomes of Ahmed valve implants in patients with medically uncontrolled refractory glaucoma.

Aim of the study: This study aimed to evaluate the clinical outcomes of Ahmed valve implants in patients with medically uncontrolled glaucoma in a tertiary eye care center in Bangladesh.

Methods: This retrospective study was performed in the Ispahani Islamia Eye Institute and Hospital, Dhaka, Bangladesh from March 2021 to July 2022. In total 35 patients underwent Ahmed valve implantation for glaucoma refractory to maximum tolerated therapy and/or prior surgery failure since January 2016 were studied. All data regarding the demographic status, type of glaucoma, prior ocular surgeries, intraocular pressure (IOP) value and the number of drops needed before and after surgery, during several follow-up visits and postoperative complications were recorded. The success of the Ahmed valve surgery was defined as IOP <6 to $<$ 21 mmHg or 20% reduction in IOP concerning preoperative values. All data were processed, analyzed and disseminated by using the MS Office program and described by mean and standard deviation.

Results: In this study, the mean intraocular pressure (IOP) of the participants was 37.72% at the baseline. But the mean IOPs were found 13.7%, 13.9%, 19.4% 18.43%, 16.5% and 17.6% on 1st day of surgery, at 1 week, at 1 month, at 3 months, at 6 months and at the end of 1 year respectively. The mean (±SD) numbers of topical medications decreased from 3.1 ±0.9 (Preoperatively) to 1.01 ± .2 at 6 months and to 1.04 ±.1 at 1 year. There was no change in visual acuity and vision-threatening complication from the pre-operative period to the postoperative period.

Conclusion: Ahmed glaucoma valve (AGV) implantation is a safe and effective treatment option for patients with uncontrolled glaucoma which provide a significant and sustained drop in IOP and it may not cause any serious vision-threatening complication in treating medically uncontrolled glaucoma.

Keywords: Ahmed glaucoma valve, AGV, IOP, Refractory glaucoma, Eye, Ophthalmology

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Introduction

Worldwide, glaucoma is a leading cause of irreversible blindness, which can affect up to 111 million people globally by the year 2040 [1, 2]. Ischemia triggers the release of various angiogenic factors, including vascular endothelial growth factor, penetrating the anterior chamber to cause neo-vascularization of the iris and angle. In recent times, with the increasing incidence rate of vascular diseases and diabetes, neovascular glaucoma is also increasing resolutely, accounting for more than 30% of refractory glaucoma[3]. As a result, the selection of optimal treatments for refractory glaucoma has become the focus of various ophthalmologists in clinics globally. Unfortunately, refractory glaucoma patients generally respond poorly to anti-glaucoma drugs. Therefore, proper surgical interventions are generally required, including ciliary body destructive surgery, drainage valve implantation and trabeculectomy with mitomycin C. Drainage valve implantation has become increasingly popular for the treatment of refractory glaucoma patients caused by the potential for severe complications in ciliary body destructive surgery and low-slung success ratio observed in conventional trabeculectomy surgery[4,5]. The Ahmed glaucoma valve (AGV), a glaucoma drainage implant (GDI) device, was permitted by the FDA (Food and Drug Administration) in the year of 1993 for use in glaucoma patients with uncontrolled IOP[6]. The Ahmed valve has a one-way pressure-sensitive control valve that

restricts the drainage device to be operative single under an IOP of 8 to 14 mmHg, hence preventing early and late time surgical complications, including too much aqueous drainage, shallow anterior chamber and intra-ocular hypotension. Ahmed glaucoma valve (AGV) implantation was reserved for glaucoma patients low controlled after one or other filtration procedures, however, the recent evidence has recently encouraged its use as a primary surgery in treating refractory glaucoma for example secondary to neovascular glaucoma, pars plana vitrectomy (PPV), penetrating keratoplasty and uveitis[7]. Glaucoma drainage implants that have been applied extensively enrolled nonrestrictive glaucoma drainage devices such as like Molteno implant, the Baerveldt implant and the Schocket tube shunt and the valved restrictive devices like the Krupin Denver Valve and the Ahmed Glaucoma Valve implants.[8] The objective of this current study was to evaluate the clinical outcomes of Ahmed valve implants in patients with medically uncontrolled refractory glaucoma in a tertiary eye care center in Bangladesh.

Methodology

This was a retrospective study that was performed in the Ispahani Islamia Eye Institute and Hospital, Dhaka, Bangladesh from March 2021 to July 2022. In total 35 patients (Single eye) who underwent Ahmed valve implantation for refractory glaucoma to the maximum tolerated therapy and/or prior surgery failure since January 2016 were enrolled in this study as the study subjects. The study was approved by the ethical committee of the mentioned hospital. Properly written consent was taken from all the participants before data collection. The whole intervention was conducted following the principles of human research specified in the Helsinki Declaration[9] and executed in compliance with currently applicable regulations and the provisions of the General Data Protection Regulation (GDPR)[10]. According to the exclusion criteria of this study, patients with less than 6 months of follow-up were excluded. All data regarding the demographic status, type of glaucoma, prior ocular surgeries, intraocular pressure (IOP) value and the number of drops needed before and after surgery. During several follow-up visits and postoperative complications were recorded. The success of the Ahmed valve surgery was defined as IOP 6 to 21 mmHg or 20% reduction in IOP concerning preoperative values. In the last visit, with or without medication. Absolute success was achieved when these IOP values were obtained without medication. All data were processed, analyzed and disseminated by using the MS Office program and described by mean and standard deviation.

Result

In this study, among the total participants, 66% were male whereas the rest 34% were female. So, the male-female ratio of the participants was 2:1. The majority of our patients (40%) were from the 19-35 years age group, 31% were from the 36-65 years age group, 23% were from 18 years age group and only 6% were from >65 years age group. In this study, in analyzing the diagnostic findings among our participants we observed that the majority of the participants (54%) were with aphakic glaucoma. Besides 14% and 11% were with neovascular glaucoma (NVG) and proliferative diabetic retinopathy with glaucoma respectively which was also noticeable. In analyzing the mean intraocular pressure (IOP) changes of eyes among the participants we observed that the mean IOP was 37.72% at the baseline. But the mean IOPs were 13.7%, 13.9%, 19.4% 18.43%, 16.5% and 17.6% on the 1st day of surgery, at 1 week, at 1 month, at 3 months, at 6 months and the end of 1 year respectively. As the most frequent complication, hyphema was found in 11% of the total cases. Besides. vertical heterophoria, Descemet folds, shallow anterior chamber and ciliochoroidal detachment were found in some cases. The mean (±SD) numbers of topical medications decreased from 3.1 ±0.9 (Preoperatively) to 1.01 ± .2 at 6 months and to 1.04 ±.1 at 1 year. There was no change in visual acuity and vision-threatening complication from the pre-operative period to the postoperative period. In the first three months, we found transient hypotony in 3 patients, shallow anterior chamber in 3, and serous choroidal detachment in 2 patients all of which resolved on conservative treatment.

Table 1: Distribution of participants as per age (N=35)

Age (Year)	n	%
⩽ 18	8	23%
19-35	14	40%
36-65	11	31%
>65	2	6%

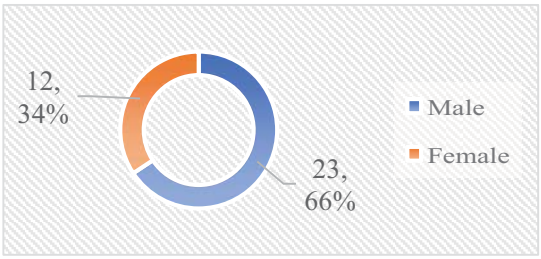

Figure 1: Distribution of participants as per gender (N=35)

Table 2: Distribution of participants as per the diagnostic findings (N=35)

Findings	n	%
Aphakic glaucoma	19	54%
Neovascular glaucoma (NVG)	5	14%
Proliferative diabetic retinopathy with glaucoma	4	11%
Glaucomatous optic atrophy	2	6%
Non-proliferative diabetic retinopathy	2	6%
Corneal opacity with secondary glaucoma	2	6%
Steroid-induced glaucoma	1	3%

Figure 2: The mean IOP changes of eyes among the participants (N=35)

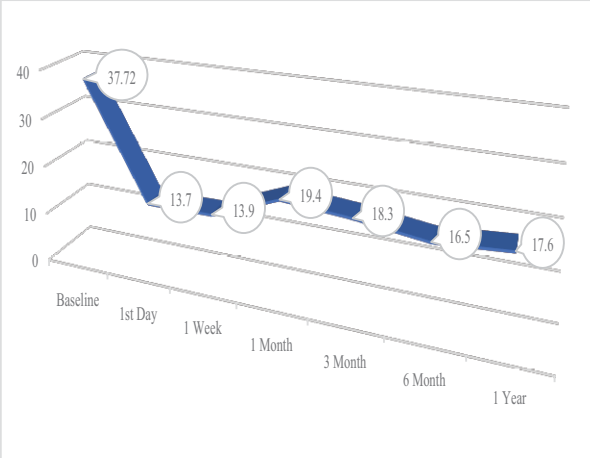

Table 3: Postoperative complications among the participants (N=35)

Complications	n	%
Hyphemia	4	11%
Vertical heterophoria	1	3%
Descemet folds	1	3%
Shallow anterior chamber	1	3%
Ciliochoroidal detachment	1	3%

Discussion

This study aimed to evaluate the clinical outcomes of Ahmed valve implants in patients with medically uncontrolled glaucoma in a tertiary eye care center in Bangladesh. In this study, among the total participants, 66% were male whereas the rest 34% were female. So male participants were dominating in number and the male-female ratio of the participants was 2:1.

In our study, the majority of our patients (40%) were from the 19-35 years age group, 31% were from the 36-65 years age group, 23% were from the 18 years age group and only 6% were from >65 years age group. In this study, the majority of the participants (54%) were with aphakic glaucoma. Besides 14% and 11% were with neovascular glaucoma (NVG) and proliferative diabetic retinopathy with glaucoma respectively which is also noticeable. In some studies, it was revealed that refractory glaucoma was common among eyes with secondary glaucoma especially neovascular glaucoma and aphakic glaucoma.[11,12] The mean intraocular pressure (IOP) of our participants was 37.72% at the baseline. But the mean IOPs were 13.7%, 13.9%, 19.4% 18.43%, 16.5% and 17.6% at 1st day, 1 week 1 month, 3 months 6 months and 1 year respectively. Previously, Yalvac et al found, the 1-year surgical success rate of 38 NVG eyes receiving Ahmed valve implantation was 63.3%[13]. On the other hand, Netland found a 1-year surgical success rate of 73.1% in 38 eyes[14]. In our study, as the most frequent complication hyphemia was found in 11% of the

total cases. So hyphemia is a potential complication. Several complications such as hyphema, hypotony, cataract, corneal decompensation and failure to control intraocular pressure, trans-scleral erosion and endophthalmitis (1.7%) are reported after AGVI[15,16]. In the research conducted by Choo J et al, postoperative hyphema could be associated with increased conjunctival inflammation as well as scarring, leading to a higher risk of failure[17]. Shunji Nakatake et al found in their research that post-operative hyphema or increased concentrations of some cytokines may lead to a failure of conjunctival bleb formation[18]. All the findings of this current study may be helpful in further similar studies.

Limitation of the study

This was a single-centered study with small-sized samples. Moreover, the study was conducted over a very short period. So, the findings of this study may not reflect the exact scenario of the whole country.

Conclusion & Recommendation

As per the findings of this current study, we can conclude that Ahmed glaucoma valve (AGV) implantation is a safe and effective treatment option for patients with uncontrolled glaucoma which provide a significant and sustained drop in IOP and it may not cause any serious vision-threatening complication in treating medically uncontrolled refractory glaucoma. For getting more specific results, we would like to recommend conducting similar studies in several places with larger-sized samples.

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Conflict of interest: None declared.

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Original Article

Pattern of presentation, management outcome of lens induced glaucoma at a tertiary eye care centre

S M Noman[1], U S Akbar[2], M A Mahfuzullah[3], T Mehtaj[4]

Abstract

Objective: To outline the clinical presentation, management and outcome of lens induced glaucoma in Chittagong Eye Infirmary and Training Complex.

Methods: A case series review was done among the patients who visited Chittagong Eye Infirmary and Training Complex from January 2015 to December 2018. Demographic data, clinical presentations, management and outcome were recorded and analysed.

Results: 30 phacomorphic cases and 20 phacolytic glaucoma patients were included in our study. The mean age at presentation was 60 years. Female to male ratio was 2:1. The reason for late presentation was distance which was 60% in phacomorphic glaucoma and 50% in phacolytic glaucoma. The main symptoms were reduced vision followed by ocular pain and redness of eye. Visual acuity was either HM or just PL in all eyes before surgery. All patients underwent SICS with posterior chamber lens implantation. IOP reduced tremendously upon discharge and vision kept improving upto a month after surgery.

Conclusion: Reduced vision, ocular pain and redness are the main clinical presentations of lens induced glaucoma. Cataract surgery proves to be effective in lowering IOP and visual recovery in patients with lens induced glaucoma.

Key words: Lens induced glaucoma, phacomorphic glaucoma, phacolytic glaucoma.

Introduction

Lens induced glaucoma, one of the commonest cause of 2º glaucoma due to senile cataract mandates an early recognition and management to prevent blindness.

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Although lens induced glaucoma is prevalent in developing countries it also occurs in developed countries.

Lens-related elevation in IOP results from a variety of mechanisms such as lens dislocation, lens swelling (intumescent cataract), inflammation due to phcacoanaphylaxis and lens particle blocking the trabecular meshwork. Untreated rise in IOP damages the optic nerve mechanically which inevitably leads to blindness.

Cataract occurs when crystalline lens loses its transparency normally as part of ageing process.

Neglected cataractous lens may swell because of osmotic effect of degenerated lens proteins.

In phacomorphic glaucoma, the swollen lens may block the anterior flow of the aqueous humour from the posterior chamber pushing the iris forward. Eventually, the trabecular meshwork gets blocked by the iris and leads to a sudden and extreme rise in IOP.

Phacolytic glaucoma is a principle complication of hypermature cataract. Hypermature cataract may cause leakage of lens protein from an intact capsule. The lens protein causes intense inflammation and blockage of trabecular meshwork, subsequently responsible for elevation of IOP.

The purpose of this review is to study and determine the clinical presentations, management and outcome of lens induced glaucoma at Chittagong Eye Infirmary and Training Complex.

Methods

A case series review was conducted on records of patients who were diagnosed with lens induced glaucoma in Chittagong Eye Infirmary and Training Complex between January 2013

and December 2018.

Lens induced glaucoma was diagnosed on the presence of increased IOP and lens related problem. The diagnosis of phacomorphic glaucoma was based on the presence of pain and redness, shallow anterior chamber, corneal oedema and increased IOP with intumescent lens.

Phacolytic glaucoma was diagnosed clinically based on the presence of hypermature cataract, presence of lens protein and flare in anterior chamber. Goldmann applanation tonometry was used to measure IOP. All patients underwent small incision cataract surgery with posterior chamber lens implantation. Exclusion criteria included those patients who had primary glaucoma or other underlying causes of secondary glaucoma and inadequate data.

Demographic data, clinical presentations, management and outcome were documented and statistical analysis was conducted using SPSS 26.

Results

A total of 50 cases were included in our study. Phacomorphic glaucoma was found to be more 30 (70%) than phacolytic 20 (30%). There was a female preponderance compared to male with female to male ratio of 2:1. At presentation, all patients in the effected eye had VA either of HM or PL. Examination of fellow eye revealed 53.33% had immature cataract, 43.33% were pseudophakic and 3.33% were normal eyes in phacomorphic glaucoma and in case of phacolytic glaucoma 35 % had immature cataract, 55% were pseudophakic and 10% were normal eyes. The reason for delay in presentation was distance which was 60% in phacomorphic glaucoma and 50% in phacolytic glaucoma. All patients underwent SICS +PCIOL implantation. IOP at presentation ranged from 21 to 60mm Hg. 33.33% had IOP more than 40mm Hg at presentation in case of phacomorphic glaucoma and 50% in case of phacolytic glaucoma. Following surgery, 90% had an IOP of 21mm Hg at discharge.

After 1 month follow-up, 19 (63.33%) had VA 6/60 or better, 5 (16.67%) had less than 6/60 and 6(20%) had less than 3/60 in case of phacomorphic glaucoma. In case of phacolytic glaucoma, 11(55%) had VA 6/60 or better, 6/30%) had less than 6/60 and 3 (1%) had less than 3/60.

Table 1: Presenting Visual Acuity:

Presenting Visual Acuity	Phacolytic Glaucoma		Phacomorphic Glaucoma	
	n	Percentage %	n	Percentage %
6/6 - 6/18	0	0	0	0
6/18 - 6/60	0	0	0	0
6/60 - PL	20	40	30	60

Table 2: Condition of Other Eye:

Condition of Other Eye	Phacolytic Glaucoma		Phacomorphic Glaucoma	
	n	Percentage %	n	Percentage %
Normal	2	4	1	2
Cataract	7	14	16	32
Pseudophakia	11	22	9	18
Glaucoma	0	0	4	8

Table 3: 1 Month visual acuity:

1 Month VA	Phacolytic Glaucoma		Phacomorphic Glaucoma	
	n	Percentage %	n	Percentage %
6/6 - 6/18	11	22	19	38
6/18 - 6/60	6	12	5	10
6/60 - PL	3	6	6	12

Discussion

In our study, the phacomorphic glaucoma was more common than phacolytic glaucoma which is similar to in study by Prajina et al. Nirmalan et al reported a prevalence of phacomorphic glaucoma of 3.9% of all cataract surgeries. In our study, females seemed to have a significant increased risk of having lens induced glaucoma.

In our study, VA at discharge was better which is similar to a study by Prajina et al. IOP after cataract surgery was below 21 mm of Hg in 90% in our study. In our setup, the patients presented late, probably because of distance from hospital, poverty, ignorance, lack of awareness and facilities for treatment.

Conclusion

Lens induced glaucoma is an important vision-threatening disease. Phacomorphic lens disease secondary to a neglected senile cataract is the major cause of lens induced glaucoma. Removal of the cataractous lens results in prompt reduction in IOP and a favourable visual outcome.

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Original Article

Effect of Cataract Extraction on Intraocular Pressure in Chronic Angle-Closure Glaucoma

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Abstract

Purpose: To evaluate the effect of phacoemulsification and posterior chamber intraocular lens (PCIOL) implantation and intraocular pressure (IOP) in eyes with chronic angle-closure glaucoma.

Methods: Twenty-two patients with chronic angle-closure glaucoma (CACG) and visually significant cataract were included in our study. All under went phacoemulsification and PCIOL implantation. Visual Acuity, IOP, Depth of angle and the number of anti glaucoma medications were recorded preoperatively and at one day, one week, one month, two months, and six months postoperatively.

Results: The mean age was71.04 ± 6.55 years and there were 8 males (36.4%) and 14 females (63.6%). The mean IOP was 19.54 ± 1.49mm Hg preoperatively and16.04 ± 1.49mm Hg six months postoperatively. The mean number of anti glaucoma medications were 2 preoperatively and 0.18 ± 0.50 at final follow-up. The mean preoperative Log MAR visual acuity was 1.00 and 0.3 at final follow-up ($P < 0.005$).

Conclusion: When chronic angle-closure glaucoma is associated with visually significant cataract, phacoemulsification and PCIOL implantation alone can significantly reduce intraocular pressure.

Keywords: Chronic Angle-Closure Glaucoma, Phacoemulsification, Intraocular Pressure.

Introduction

Chronic angle-closure glaucoma may develop either after acute angle closure in which synechial closure persists or when the chamber angle closes gradually and IOP rises slowly as enough angle is compromised. Sufficiently extensive apposition or synechial adhesion of the peripheral iris to the pigmented part of trabecular meshwork results in raised IOP. Surgical management of patients with coexisting visually significant cataract and glaucoma is difficult. We have 3 options to manage this problem: Cataract surgery alone, glaucoma surgery alone followed by later cataract extraction or performing combined surgery.[1-5]

Trabeculectomy in CACG is however associated with potential complications such as: shallow anterior chamber, malignant glaucoma, supra choroidal hemorrhage and endophthalmitis.[4-5]

Many studies have shown that cataract extraction and PCIOL insertion decreases IOP in eyes with glaucoma and visually significant cataract. Although the effect depends considerably on the type of glaucoma it can be significant in CACG patients. In these studies, the IOP reduction was attributed to significant widening of the anterior chamber angle. It is known that CACG patients have thicker lenses than normal eyes which is significantly positioned anteriorly. These two mechanisms may completely account for the shallow anterior chamber and indirectly narrow angle in these patients. Therefore it seems reasonable that cataract surgery can improve IOP control in eyes with CACG.

Methods

We studied 22 eyes of 22 patients with CACG who underwent phacoemulsification and PCIOL implantation from 2015 to 2017 at Chittagong eye infirmary and training complex (Table 1).

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No of subjects	22
Mean Age	71.04±6.55
Gender	8M/14F
Follow-up	6months

Inclusion criterion was CACG with visually significant cataract. Exclusion criteria were:

IOP>30, Pseudoexfoliation (PEX) glaucoma, any pervious intraocular surgery except peripheral iridectomy, Cup to disc (C/D) ratio >0.7, neovascularization of iris (NVI), and phacodonesis. All eyes underwent phacoemulsification and PCIOL insertion. Briefly, a 3.2 mm clear corneal incision was made temporally. After viscoelastic injection and capsulorhexis of average 5 mm size, hydro dissection and hydro delineation were performed and then phacoemulsification was done and a single- piece PCIOL was implanted in the bag. All patients were followed for 6 months. Pre- and postoperative best corrected visual acuity, IOP, angle grading (by gonioscopy), and anterior chamber depth with Spaeth method were assessed and medications were recorded. IOP was measured by Goldman tonometer before and after surgery at intervals of 1, 7, 30, 60, and 180 days.

Also C/D ratio was recorded pre- and postoperatively with slit-lamp and +90 D lens. Failure was defined as: IOP 21 in two visits one week apart or need for more anti glaucoma medication than before surgery. Our study was interventional case series. Statistical analysis was performed with paired t-test. P value less than 0.05 was considered significant.

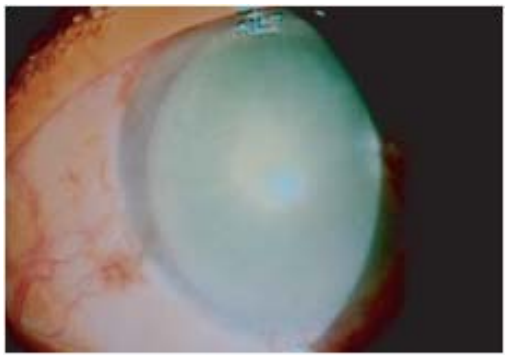
Results

There were 8 males (36.4%) and 14 females (63.6%) in our study. The mean age was 71.04±6.55 years. Follow-up period was 6 months. All surgeries were completed with no major complication. 9 patients (40.9%) had hypertension, 6 (27.3%) ischemic heart disease, and 7 (31.8%) diabetes mellitus. All eyes had laser peripheral iridotomy. 5 eyes (22.7%) had glaucomflecken. The mean preoperative medications were 2 drugs and decreased to 0.18 postoperatively (P<0.001). Mean IOP was 19.54±2.9 mm Hg before surgery and 16.81±3.2 mm Hg (P<0.05), 15.63±2.3 (P<0.05), 16.13±1.6 (P<0.05), 16.68±3.3 (P<0.05) and 16.04±1.04 (P<0.05) at 1, 7, 30, 60 and 180 days respectively after surgery (Table 2).

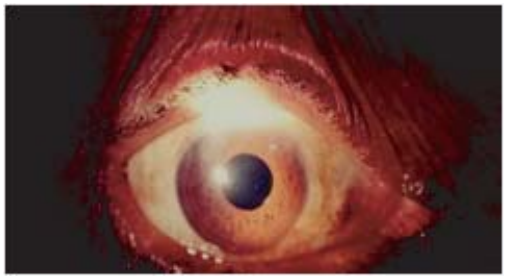
Table 2. Mean IOP (mm Hg) and decrease in IOP (mm Hg) over time

Examination	Mean IOP (mmHg)	Mean decrease (mmHg)
Preop	19.54±2.92	
Postop 1D	16.81±3.21	2.72±4.08
7D	15.63±2.34	3.90±3.68
30D	16.13±1.61	3.40±3.48
60D	16.68±3.32	2.86±3.77
180D	16.04±1.49	3.50±2.77

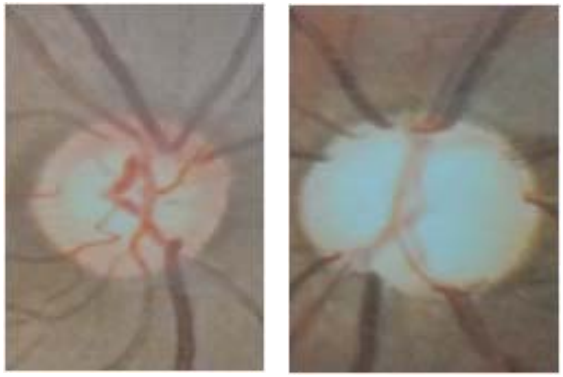
Anterior chamber depth after surgery was wider than before operation (Spaeth classification average one degree). Mean Log MAR visual acuity was 1.00 before cataract extraction and 0.3 at final follow-up. Visual acuity improved in all eyes.



Picture 1: CACG & Cataract



Picture 2: Post Operative



Picture 3: Glaucomatous Disc

Discussion

There are 3 treatment options for patients with CACG and cataract: cataract surgery alone, combined surgery, and glaucoma surgery alone followed by cataract extraction.[5-7] Cataract surgery in these patients poses some unique difficulties. The anterior chamber is characteristically shallow and also the phaco surgeon applies forces through ultrasonic power closer to the corneal endothelium leading to endothelial loss and corneal edema. In view of all these inherent difficulties of performing phaco in these eyes, we had no major complications. In all eyes the anterior chamber depth increased after surgery and there was some angle widening. It has been reported that cataract surgery alone decreases IOP to some extent in glaucoma patients. The degree of IOP reduction differs depending on the type of glaucoma. Ming Zhiet al reported a 9 mm Hg drop in first day postoperative IOP in acute primary angle-closure glaucoma.[7-8] Hayashi et al reported a 5 mm Hg drop in mean IOP one month postoperatively in ACG patients[9-12] and Lai et al showed a 4 mm Hg drop in postoperative IOP in CACG patients. In our study cataract extraction significantly decreased IOP in eyes with chronic angle-closure glaucoma and this decrease continued for up to 6 months. In this study, mean decrease in IOP after cataract surgery was 3.5±2.7 mm Hg which is comparable to previous reports. Also the number of glaucoma medications decreased after cataract extraction.

Hayashi et al showed significant increase in angle width after lens extraction in CACG patients[9] which was comparable with our study. Visual acuity was significantly improved after cataract surgery. No eye developed serious complication or had impaired visual acuity. Our study had some limitations. We did not have ultra sound biomicroscopy to compare preoperative and postoperative ultrasonic findings of the angle. The number of our patients was also limited.

Conclusion

Phacoemulsification and PCIOL implantation significantly decreases IOP and the number of anti glaucoma medications in CACG patients. Furthermore if cataract extraction fails to control IOP, subsequent filtering surgery can be performed.

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Thermocyclo Laser and its Outcome in Advanced Glaucoma Patients

S Rahman[1], U Kawsar[2], Z Farhana[3], Z J Ruma[4]

Purpose: To study the outcomes of performing the thermocyclo-laser procedure on 20 patients with advanced glaucoma.

Case Summary: After taking detailed history and meticulous examination, 20 advanced glaucoma patientswith visual acuity of NPL, PL and HM with IOP > 30mm of Hg and painful eyes were selected. After thermocyclo laser, outcome of most of the cases were satisfied in 1st to 2nd session. 6 cases needed 3rd session and pain was subsided in every cases after 1st session.

Conclusion: Thermocyclo laser photocoagulation is safe and effective procedure for reducing of IOP and pain of advanced glaucoma patients and it improves their quality of life.

Key words: Thermo cyclo laser, IOP, Advanced glaucoma.

Introduction:

Glaucoma represents a spectrum of diseases that culminates in a progressive optic neuropathy characterized by optic disc excavation, loss of the retinal ganglion cells, and eventual visual field loss.[1][2] Intraocular pressure (IOP) is a significant primary risk factor and is the only modifiable risk factor for which treatment can be directed to slow or halt progression.[3] In glaucomatous disease, the main treatment sites to lower IOP are targeted to improve the facility of aqueous outflow from the eye or reduce aqueous production at the ciliary processes.

Cyclo destruction has been performed by various methods, including diathermy, surgical excision, cryotherapy, ultrasound, and laser. Cyclodiode laser has now become the mainstay treatment of ciliary body destruction using an 810 nm laser.[2][4] Various subtypes of cyclodiode laser now exist, from Trans-scleral cyclophotocoagulation (TCP) to Micropulse (MP-TCP) and Endocyclo photocoagulation (ECP).[5]

The continuous-wave TCP diode laser emits laser energy at a wavelength of 810 nm. When directed at the ciliary processes, it causes ablation of the ciliary epithelium resulting in homogenous blanching and shrinking of the ciliary processes. Histopathologic studies have demonstrated significant damage to the pars plicata and surrounding tissues, including the sclera, pars plana, and iris root. Adjacent damage to the pars plana provides another mechanism by which cyclodiode acts by enhancing uveoscleral outflow.[4]

Case report:

Among 20 cases we found IOP were decreased in most cases. In 3 cases IOP remained the same, and in one case IOP increased compared to the previous value. After the second session, the IOP of 10 cases was within normal limits. The remaining 6 cases required a third session,

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after which IOP was reduced to a satisfactory level. The three cases that did not respond to thermocyclo laser were treated with other glaucoma protocols. After first session, pain were subsided in all of 20 patients

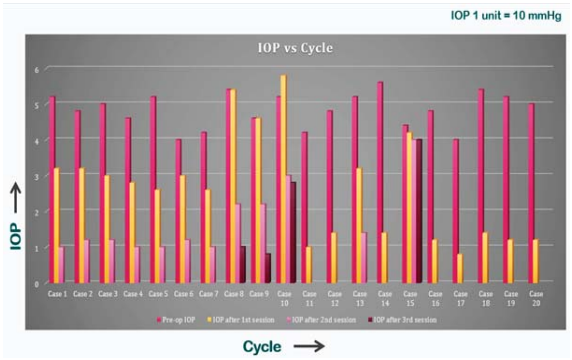

Fig. 1: Outcome of thermocyclo laser after each sessions .

Discussion

Cyclodiode laser is also recommended for eyes with significant conjunctival scarring due to previous surgery, trauma, or inflammation, and congenital/developmental glaucoma. Cyclodiode laser is also recommended in eyes with significant conjunctival scarring from previous surgery, trauma, or inflammation Furthermore, blind, painful eyes or eyes with poor visual potential are also candidates for cyclodiode laser treatment.

Cyclodiode laser has also been described for cases of acute angle-closure glaucoma that is unresponsive to conventional medical and laser treatment. This allows IOP to stabilize and inflammation to subside before more definitive surgical procedures are undertaken.[6]

Vitra 810 is versatile infrared laser, featuring single spot and subliminal technologies which can be used for multiple treatment purposes

Fig. 2: Vitra 810 machine.

The TCP unit is a portable, compact device that consists of a semiconductor solid-state diode laser system that emits 810 nm laser energy. This device is connected to a handpiece in the shape of a curved footplate, matching the spherical curvature of the sclera and enabling laser energy delivery.[7][8]

The laser energy is transmitted through a 600-um diameter quartz fiber oriented within the handpiece 1.2mm posterior to the limbus. A tip protrudes 0.7mm beyond the probe to provide indentation on the ocular surface, thereby improving laser energy effectiveness. The continuous- wave laser energy is administered with the handpiece aligned to the visual axis on the conjunctiva surface for the duration of the desired burn.[8][9]

During the laser procedure, protective safety wear must be worn by all participants in the room to avoid inadvertent laser scatter.

If performed under local anesthesia, a peribulbar block or retrobulbar block is administered preoperatively. The patient may also receive sedation or, in rare cases, a general anesthetic.[4] The diode laser unit is calibrated to the user's desired settings, typically 1000 to 2000 mW for 1500 to 2000 ms duration.[10]

The patient remains supine on the bed, and a speculum may be inserted to obtain adequate exposure of the eye.[11]

Avoiding the 3 and 9 o'clock positions, representing the long ciliary artery and nerve, the handpiece is aligned with the heel of the footplate adjacent to the limbus with the probe directed vertically in line with the visual axis.[11][4] The laser burns are applied around the limbus spaced half the width of the handpiece apart from one another by approximately 2 mm. This typically represents five burns per quadrant.[7][12]

The power is increased in increments from 150 to 250 mW/shot until an audible pop is heard, implying an excess of power resulting in an explosion of the ciliary processes and surrounding tissues. From here, the power level

is titrated to just below the audible popping noise by similar increments. Depending on the desired IOP-lowering effect, 180 to 360 degrees can be administered to the eye, ranging from 12 to 40 spot burns.[4]

Fig. 3: Procedure of thermocyclo laser

A viscous coupling gel is applied to the eye to enable sustained contact of the probe to the ocular surface. The probe is placed adjacent to the limbus on the sclera, and the handpiece is aligned perpendicularly to the globe.

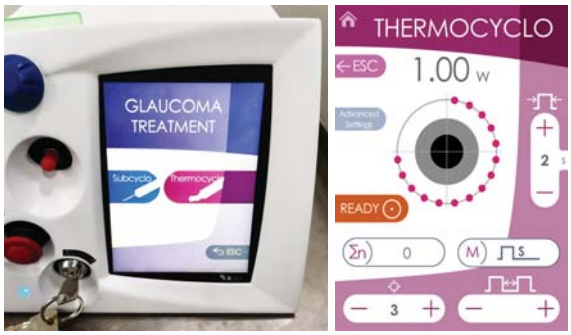

Fig. 4: Parameter of thermocyclo laser

The probe is then moved in a smooth continuous back and forth painting motion with constant gentle pressure on the eye along the arc of the limbus coursing over each quadrant or hemisphere. This technique similarly spares the 3 and 9 o'clock regions. Each quadrant receives 10 to 15 seconds of sweeping laser application and can undergo 3 to 5 repeat passes, with the total duration of laser application ranging from 80 to 360 seconds.[13][14]

We are aware of few studies on symptom control following cyclodiode laser treatment. However, Walland et al. reported pain control in six of eight painful, blind glaucomatous eyes using a treatment protocol similar to ours. 15

We have demonstrated that Cyclodiode treatment is very effective at relieving pain in patients with blind, painful, glaucomatous eyes. The treatment was well tolerated, and no patient complained of pain after the first session.

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Postoperatively, topical corticosteroid drops are prescribed 4 to 8 times per day; depending on patient characteristics and clinician discretion.[7]

After performing thermocyclo-laser, IOP was measured consecutively after 4 hours, 7 days and 1 month in first cycle. The second cycle starts right after 1 month in case of higher IOP measurement, and third cycle is applied after 1 month of second cycle for the same scenario.

Conclusion:

Cyclodiode laser treatment very effectively eliminated discomfort in previously painful, blind, glaucomatous eyes. The best predictor of successful pain relief was reduction in IOP of > 30% from baseline. “Ideal” treatment parameters remain uncertain and protocols using slightly less total energy delivery to the ciliary body might have a lower risk of hypotony, although a corresponding increase in the need for retreatments might be expected.

Although longer observation in a large number of patients is required to assess the effect of thermocyclo laser. As the number of patient is less, and due to short period of time only series of cases are documented, but with time by increasing patient data we will work on a proper study.

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Outcomes of Ab Interno Bleb Needling on Post Trabeculectomy Patient

S Rahman[1], U Kawsar[2], Z J Ruma[3], Aye Myat Mon[4]

Abstract

Purpose: To study the outcomes of performing an Ab interno bleb revision procedure on three patients with high intraocular pressure (IOP) and previously failed bleb surgeries.

Case Summary : Three patients, two with the history of Primary Open Angle Glaucoma (POAG) and one with the history of Primary Angle Closure Glaucoma presented with uncontrolled high IOP and a nonfunctioning bleb post-trabeculectomy in our clinic. Ab interno bleb needling procedure using the Grover-Fellman sclerostomy spatula without Mytomycin C (MMC) were performed in all three patients and the results were satisfactory.

Conclusion : Ab interno bleb needling is a valuable option for managing trabeculectomy failure due to scarring and elevated IOP potentially avoiding aggressive surgery or prolonged medical therapy. The presented cases highlight its effectiveness in restoring IOP control and bleb functionality emphasizing its potential benefits for glaucoma patients.

Key words : Ab interno bleb needling, IOP, bleb revision.

Introduction

Although the success rate of trabeculectomy using the advanced surgical techniques remains high, encountering trabeculectomy failure is not uncommon in our daily practice. Elevated intraocular pressure (IOP) often results from the gradual scarring of the soft tissue surrounding the trabeculectomy opening, which has been a primary cause of trabeculectomy surgery failure. This can happen shortly after the trabeculectomy or even months or years later. In such conditions, needle revision of the encapsulated bleb is a wise choice before opting for more aggressive surgical interventions or advising long-term additional medical therapy.[1]

The needling procedure effectively opens up the scar tissue, rejuvenating the trabeculectomys function.[2]

Bleb revision can be accomplished through Ab externo and Ab interno needling procedures. In this report we focus on the outcomes of Ab interno bleb needling procedure.

Case report:

Case 1

A 46 years woman, previously diagnosed with Primary Angle-Closure Glaucoma (PACG), presented with a nuclear cataract and elevated IOP in both eyes. This elevated IOP resulted in shallow anterior chamber and advanced glaucomatous damage. She was advised to undergo combined Phacoemulsification and trabeclectomy procedure under mannitol coverage in her left eye.

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On examination:

	RIGHT EYE	LEFT EYE
VA(unaided)	6/18	6/24
BCVAR	6/18	6/24
Cornea	Clear	Clear
Anterior chamber	Shallow, angle 0	Shallow, angle 0
Lens	Opaque, NSII	Opaque, NSII+ cataract
Pupil	RRR	RAPD
Iris	Normal	Normal
Fundus	Glaucomatous disc, C:D 0.85	Glaucomatous disc, C:D 0.9
IOP	22 mm of Hg	23 mm of Hg

Then the patient underwent phacoemulsification combined with trabeculectomy using Mitomycin C (MMC) and mannitol support. On the first postoperative day (1 st POD), the IOP in her right eye (R/E) was 21 mm of Hg, while her left eye (L/E) was 14mm of Hg with a functioning bleb. However, on the 7th postoperative day (7th POD), the patient presented with an IOP of 22 mm Hg in her left eye and a flat bleb. Subsequently, ab interno bleb needling and suture removal were performed one month after the initial surgery. Following the bleb needling procedure, the IOP returned to normal, and the bleb regained its functionality.

Case 2

A 52-year-old man with Primary Open-Angle Glaucoma (POAG) underwent a combined phacoemulsification and trabeculectomy in his right eye at our hospital one year ago. He remained free from the use of anti-glaucoma medications and showed good IOP control. However, he presented with high IOP (24 mm Hg) and a nonfunctioning flat bleb two months ago. After that the patient underwent ab interno bleb needling to enable visualization of the angle and internal os. Notably, Mitomycin C was not used in this procedure. After the Ab interno bleb revision, the patient's IOP returned to normal.

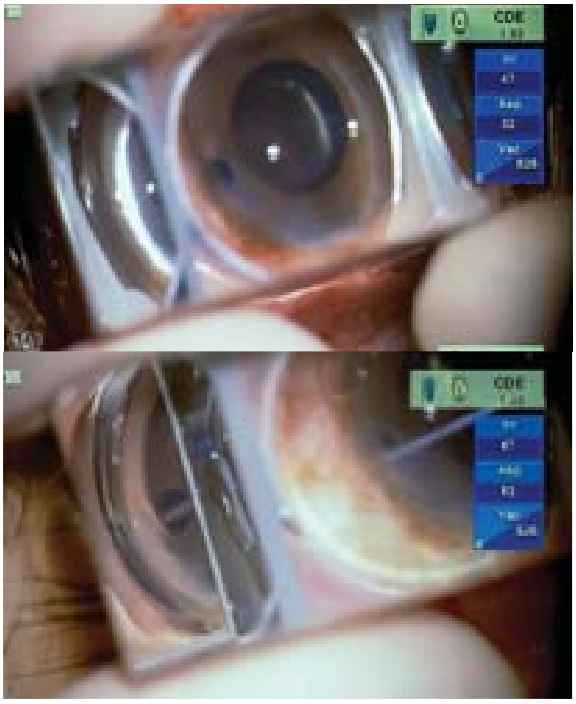

Fig.1 and 2: Visualization the angle by using Morrie lens (Gonio lens).

Case 3

A 58-year-old woman presented in our hospital with increased intraocular pressure (IOP) in her right eye. She had been previously diagnosed with primary open-angle glaucoma and underwent trabeculectomy elsewhere 3 months prior.

On examination:

	RIGHT EYE	LEFT EYE
BCVA	6/36	6/24
Bleb	No functioning, flat	No
Cornea	Clear	Clear
Anterior chamber	Deep, angle grade 4	Deep, angle grade 4
Lens	Transparent	Transparent
Pupil	RRR	RRR
Iris	Normal	Normal
Fundus	Glaucomatous disc, C:D 0.85	Glaucomatous disc, C:D 0.9
IOP	32 mm of Hg	28 mm of Hg

Despite the use of anti-glaucoma medications, her IOP remained uncontrolled, and her bleb was nonfunctional. As a result, it was decided to perform a bleb revision through Ab interno bleb needling. Throughout the follow-up assessments on the 1st postoperative day, 7th postoperative day, and one month later, the patient's IOP was within the normal range, and her bleb was functioning properly.

Discussion:

Trabeculectomy remains the mainstay of treatment in medically uncontrolled glaucoma. The use of anti-metabolites to inhibit wound healing has significantly enhanced the success rates of trabeculectomy (3)

However, failure of the trabeculectomy bleb can result from fibrotic proliferation as part of the wound healing response.

The 5-fluorouracil (5-FU) augmented bleb needling,(ab externo approach) first described in 1990, is a relatively simple method to salvage failing blebs4

In this article we present a new approach we have been using for years, Ab-interno trans-corneal needling of the scleral wound and bleb performed under operating microscope. Nowadays, this procedure has gained increased acceptance. The procedure offers several advantages in terms of logistic, finance, and patient satisfactions compared the standard trans-conjunctival bleb needling techniques. Preliminary, unpublished results suggest relatively high efficacy and safety compared to trans-conjunctival techniques.

This procedure specifically targets the episcleral and intrascleral fibrosis that often develops in late failing blebs. The procedure should be performed in the operating theatre using a goniolens.

After taking all aseptic precautions, local anaesthesia was given subconjunctivally in bleb area to induce conjunctiva swelling and separation. A port was made by a 15 degree needle.

A Morrie lens was used to visualize the internal ostium and angle structure.

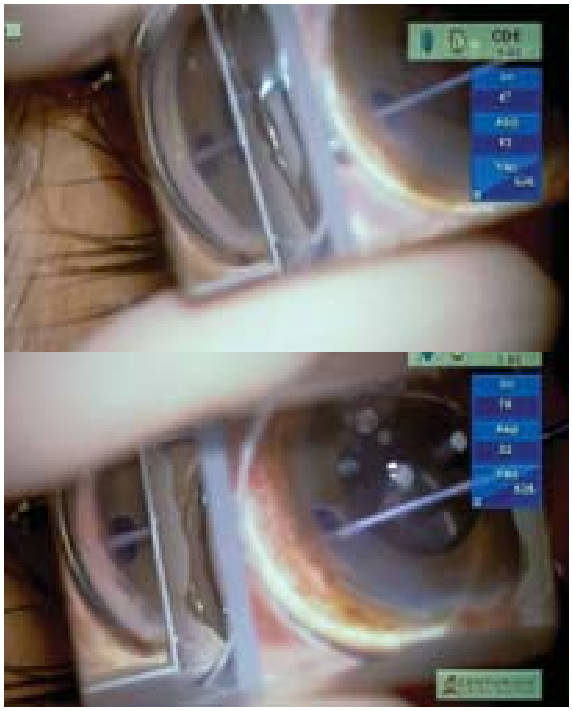

Fig.3 and 4: Accessing the internal ostium by using Grover-Fellman spatula.

Then a Grover- Fellman sclerostomy spatula was introduced to access internal ostium, super- temporally to the scarred area. A side-to-side sweeping motion was employed to lyse the scar tissue using the edge of the spatula until a raised bleb was observed.

Having the constant infusion enables the surgeon to see the bleb rise and confirms successful outflow.

Ab interno trabeculectomy revision using a Grover-Fellman spatula without the use of Mitomycin C (MMC) achieved effective IOP control in all three patients within this series and this suggests that this approach is a viable option for reviving a failed bleb without violating the conjunctiva.

In a study, the authors reported slightly higher rates of IOP failure and surgical complication rates compared to previous Ab externo procedure.[5]

In another study, they found that after a failed filtration surgery, a low-diffuse bleb was successfully reestablished by pretreating with subconjunctival Mitomycin C followed by Ab interno bleb revision with the Grover-Fellman biplanar sclerostomy spatula, reducing the need for more invasive glaucoma procedures.6

Conclusion

In conclusion, while trabeculectomy remains a successful treatment for glaucoma, Trabeculectomy failures due to scarring associated with elevated intraocular pressure (IOP) remains a common issue in our clinical practice. In such cases, Ab interno bleb needling should be considered as a valuable

option for restoring trabeculectomy function without the need for aggressive surgery or prolonged additional medical therapy.

The three presented cases illustrate the effectiveness of ab interno bleb needling in controlling IOP and reviving nonfunctioning blebs. This procedure offers a promising alternative for managing trabeculectomy failures. Further research is needed to validate these findings, but they highlight the potential benefits of this approach for glaucoma patients with elevated IOP and nonfunctioning bleb.

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Review Article

Low-Cost Minimally Invasive Glaucoma Surgery (MIGS): Expanding Access to Effective Treatment in the Developing country

M N Islam[1]

Introduction

Glaucoma is a chronic eye disease that affects millions of individuals worldwide. It is characterized by progressive damage to the optic nerve, often leading to irreversible vision loss. While there are numerous treatment options available, the cost and invasiveness of traditional glaucoma surgeries can limit their accessibility, particularly in resource-limited settings. In recent years, there has been growing interest in low-cost minimally invasive glaucoma surgery (MIGS) techniques, which offer a promising solution to address this challenge[1,2,3,4]. This article aims to explore the benefits and potential of low-cost MIGS in expanding access to effective glaucoma treatment specially in the developing country.This literature review comprehensively examines the distinct MIGS devices and procedures, their underlying mechanisms, and clinical outcomes, emphasizing the importance of evaluating the efficacy and complications of each approach individually[1].

Section 1: Understanding MIGS and its Advantages

1.1 Definition and Principles of MIGS:

Low-cost MIGS encompasses a range of surgical techniques that are performed using small incisions and specialized devices. These procedures are typically aimed at enhancing the natural outflow of aqueous humor, thereby reducing intraocular pressure (IOP) and preserving vision.

1.2 Advantages of MIGS:

Minimally invasive nature: MIGS procedures are less traumatic than traditional glaucoma surgeries, resulting in reduced postoperative complications, faster recovery, and improved patient comfort.

Cost-effectiveness: MIGS techniques utilize simpler surgical instruments and require shorter operating times, making them more affordable and accessible compared to traditional surgeries.

Safety profile: MIGS procedures have a favorable safety profile, with a lower risk of complications such as infection, hypotony, and visual disturbances.

Complementary to existing treatments: MIGS can be performed as standalone procedures or in combination with cataract surgery, making them versatile and suitable for a wide range of glaucoma patients[1].

Section 2: MIGS Techniques in the developed country

MIGS can be broadly classified into several categories:

2.1 Those that enhance trabecular outflow (Trabectome, iStent, Hydrus Microstent, Kahook Dual Blade, Bent Ab interno Needle Goniectomy, high frequency deep sclerotomy, and gonioscopy-assisted transluminal trabeculotomy or ab externo360⁰ trabeculotomy)[5,6,7,8]

2.3 Those that augment suprachoroidal outflow (CyPassMicrostent and iStent Supra)

2.4 Those that target Schlemm's canal (TRAB360 and the OMNI Surgical System, Streamline, and Ab Interno Canaloplasty)[4]

2.5 Conjunctival bleb-forming procedures (EX-PRESS Glaucoma Filtration Device, Xen Gel Stent and PreserFloMicroShunt)[7,8,9].

The above mentioned MIGS devices are not all cheap. Some devices are very expensive and not covered by insurance for the patients. In the

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developing country the patients come for surgery in the late stages when most of the MIGS do not decrease IOP to the target level. So, few MIGS can be practiced in the developing countries in the mild to moderate glaucoma. Trab and Tube are still popular methods of glaucoma surgery for the advanced glaucoma cases. Hopefully all MIGS devices will be cheaper in future so it will be used to all. Till today the economic but fairly effective MIGS are

3. Economic MIGS

3.1 Bent Ab Interno Needle Goniectomy (BANG):

BANG is a novel MIGS technique that involves the use of a simple 25 G needle to perform a controlled and precise incision in the trabecular meshwork. The procedure is performed ab interno, meaning it is done from the inside of the eye, without the need for a conjunctival incision. BANG allows for direct visualization of the target tissue using a surgical gonioscopic lens, enabling accurate and targeted removal of the trabecular meshwork to enhance aqueous outflow. Many studies showing similar IOP lowering effects with Kahook Dual Blade (KDB)[7,8]

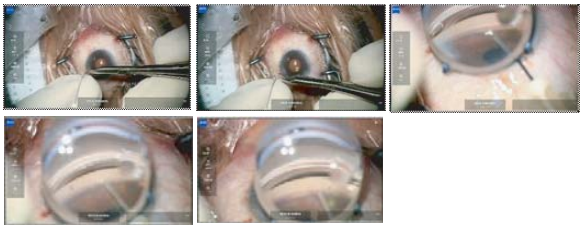

Fig. 1 BANG procedure

Advantages of BANG:

1. Minimally Invasive: BANG is a minimally invasive procedure that can be performed under topical anesthesia, resulting in reduced surgical trauma, faster recovery, and fewer postoperative complications compared to traditional glaucoma surgeries.

2. Preservation of Conjunctiva: Unlike traditional glaucoma surgeries, BANG does not require a conjunctival incision, preserving the conjunctiva and reducing the risk of bleb-related complications.

3. Combined Approach: BANG can be combined with cataract surgery, allowing for the management of both glaucoma and cataract in a single procedure, further enhancing patient convenience and reducing healthcare costs.

Clinical Evidence: Several studies have demonstrated the efficacy and safety of BANG in reducing IOP and medication burden in glaucoma patients. Grover et al. reported successful outcomes of BANG with a mean IOP reduction of 39% at 12 months postoperatively. Similarly, Ferguson et al. demonstrated a significant reduction in IOP and medication use in patients who underwent BANG combined with cataract surgery. These studies highlight the potential of BANG as an effective treatment option for glaucoma management[7].

So, Bent Ab Interno Needle Goniectomy (BANG) is a novel and promising technique for glaucoma management. This minimally invasive procedure offers several advantages, including reduced surgical trauma, preservation of conjunctiva, and the ability to combine with cataract surgery.

3.2 Suture GATT: GonioscopyAssisted Transluminal Trabeculotomy (GATT) by 5/0 proline suture- The GATT procedure needs a 5/0 proline suture instead of expensive illuminated i- track micro catheter.

GATT is a minimally invasive surgical technique that has gained popularity in recent years as an alternative to traditional glaucoma surgeries. The procedure involves using a 5/0 proline suture to cleave the trabecular meshwork directly behind Schwalbe's line, leaving the so-called trabecular shelf[1,7]. GATT is a conjunctiva-sparing approach that aims to enhance the natural physiological outflow from the eye and decrease intraocular pressure (IOP)[2].

GATT is a promising approach to treating glaucoma that has gained significant attention in recent years. The procedure is typically less invasive than traditional glaucoma surgeries, and it is often associated with shorter recovery times and less postoperative discomfort[1]. Additionally, GATT is typically less expensive than traditional glaucoma surgeries, making it an attractive

option for patients who may not be able to afford more expensive procedures[4,8].

So proline GATT is a promising approach to treating glaucoma that has gained significant attention in recent years. GATT procedures are typically less invasive than traditional glaucoma surgeries, and they are often associated with shorter recovery times and less postoperative discomfort.

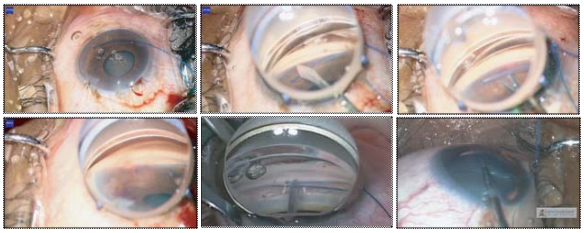

Fig. 2 GATT procedure

3.3 Ab Externo360^{O} Trabeculotomy- It is also done by 5/0 proline but from external opening. It is now a popular surgery for the paediatric glaucoma[10].

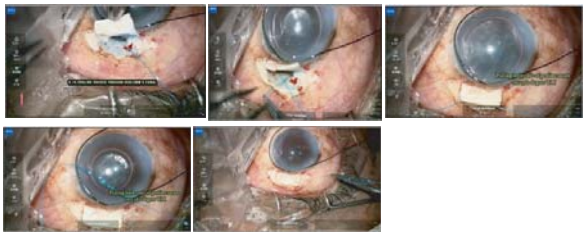

Fig. 3 Ab Externo360° Trabeculotomy procedure

Section 4: Expanding Access and Overcoming Challenges

4.1 Benefits of Low-Cost MIGS in Resource-Limited Settings:

Affordability: Low-cost MIGS techniques provide a cost-effective alternative to traditional surgeries, enabling broader access to glaucoma treatment in regions with limited healthcare resources.

Simplicity: The straightforward techniques and instruments used in low-cost MIGS make them easier to adopt and implement in various healthcare settings.

Minimized follow-up requirements: The reduced invasiveness of MIGS procedures often leads to fewer postoperative visits, which can be particularly advantageous in areas where access to specialized eye care is limited.

4.2 Training and Education:

Establishing comprehensive training programs to educate ophthalmologists and eye care professionals on low-cost MIGS techniques.

Collaborations between international organizations, local institutions, and industry partners to facilitate knowledge transfer and share best practices.

4.3 Regulatory Considerations:

Developing guidelines and regulations specific to low-cost MIGS procedures to ensure patient safety and quality standards.

Encouraging innovation and research to further refine and expand the range of low-cost MIGS options available.

Conclusion

MIGS has transformed the landscape of glaucoma management by providing a safer and less invasive alternative to traditional glaucoma surgeries. These innovative devices and procedures target various anatomical pathways to enhance aqueous humor outflow and effectively reduce IOP. The array of MIGS options, ranging from trabecular meshwork bypass stents to subconjunctival and suprachoroidal shunts, allows for tailored treatment strategies based on the specific needs and disease severity of each patient. The growing field of MIGS signifies a paradigm shift in glaucoma management, offering hope for improved quality of life and visual outcomes for patients with this potentially blinding condition. By continuing to expand our understanding of these devices, procedures, and surgical techniques, clinicians and researchers can further enhance patient care and strive towards the ultimate goal of preserving vision in those affected by glaucoma.

Low-cost minimally invasive glaucoma surgery (MIGS) holds tremendous potential in expanding access to effective glaucoma treatment,

especially in resource-limited settings. By providing cost-effective, safe, and minimally invasive alternatives to traditional surgeries, MIGS techniques offer new hope for millions of individuals affected by glaucoma worldwide. However, further research, collaboration, and investment are needed to fully realize the benefits of low-cost MIGS and ensure its integration into routine glaucoma care. Through these efforts, we can strive towards a future where effective glaucoma treatment is accessible to all, irrespective of their economic circumstances.

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Management of Secondary Angle Closure Glaucoma

S M Noman[1], M A Karim[2], S Parvin[3]

Introduction

In secondary angle closure glaucoma, the underlying cause can close the angle directly by local iris and angle factors or by acting to move the crystalline lens forward causing pupillary block (secondary pupillary block). This is important since some of these patients with secondary pupillary block will respond to laser iridotomy. They are common causes of glaucoma and can produce high elevations of intraocular pressure (IOP) and ocular morbidity. This review will discuss the risk factors, signs and symptoms, pathophysiology, imaging and the treatment modalities of secondary angle closure glaucomas.

Secondary angle closure glaucoma's can be categorized by the existence of pupillary block or not though some overlap can be seen (Table 1).

Table 1: Classification of secondary angle closure glaucomas

With pupillary block	Without pupillary block
Aqueous misdirection	Neovascular glaucoma
	Iridocorneal endothelial syndromes (ICE)
	Infammatory glaucoma
	Ciliary body cysts, tumors
	Scleral buckling and postvitreoretinal procedures
	Ciliary body swelling secondary to:
	a. Central retinal vein occlusion (CRVO)
	b. Panretinal photocoagulation (PRP)
	c. Drugs or infammation

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Aqueous Misdirection Syndrome

The aqueous misdirection syndrome is a form of secondary angle closure glaucoma occurring postsurgery with raised intraocular pressure (IOP), shallow or fat anterior chamber (AC) in the presence of a patent peripheral iridectomy (PI)[1] (Figs 1A to toC).C). It is unresponsive to miotic or fltering surgery. It can occur after fltering surgery,[2] cataract[3]/combined surgery, surgical peripheral iridectomy, following suturelysis,[4] glaucoma drainage device implantation[5] or even after laser iridotomy.[6] The predisposing factors are preexisting angle closure glaucoma, shallow anterior chamber due to wound leak or overflteration.

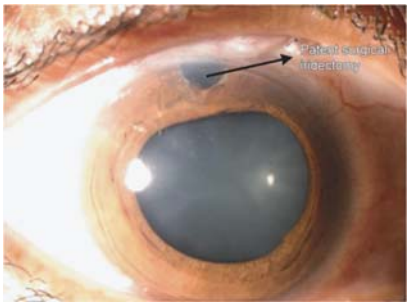


Fig. 1A : Aqueous misdirection post fltering surgery showing a patent surgical iridectomy

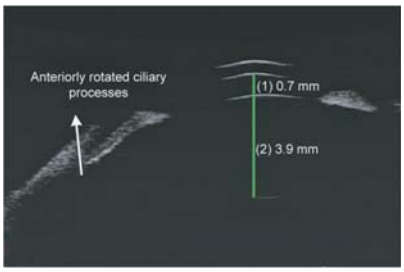


Fig. 1C : UBM showing shallow anterior chamber with anterior rotation of ciliary processes

The pathophysiology is not completely understood, but is believed that the primary mechanism is a blockage of anterior aqueous

fow at the level of the ciliary body combined with an inherent impermeability defect in the anterior hyaloid.[7] Recently, choroidal expansion has been proposed as a contributory factor as evidenced by ultrasound biomicro-scopy (UBM) studies showing fuid in the suprachoroidal space in some patients with ciliary block glaucomas.[8]

Clinical Features

It is seen in the postoperative period anytime from the 1st day to weeks, sometimes months later. The features are axial shallowing of AC, high IOP or normal IOP in case of functioning blebs, patent PI, closed angle on gonioscopy and ciliary processes can be seen rotated forward pressing against the base of the iris in case of choroidal effusions. UBM shows anterior rotation of ciliary processes pressing against the lens equator (or anterior hyaloid in aphakia).[9]

The principles of treatment are to relieve the obstruction of aqueous fow and restore normal intraocular pressure by medical therapy, to surgically correct the block to aqueous fow, re-establish a normal aqueous fow pathway and drain the aqueous from its abnormal location.

Medical Therapy

Rule out pupillary block by verifying or creating a patent iridectomy/iridotomy. Start mydriatic-cycloplegic therapy[10] consisting of 1% atropine and 5% phenylephrine twice a day in phakic and pseudophakic eyes. This tightens the lens–zonular diaphragm to resist the force from behind and also dilate the ciliary body ring to move the ciliary body away from peripheral anterior hyaloid. Fifty percent success rate has been noted with this therapy. Additionally, topical steroids, aqueous suppressants are used to reduce infammation and IOP. Osmotics help to lower the IOP as well as to reduce the vitreous volume. Conservative treatment is advised for 5 days to see for resolution.

YAG hyaloidotomy disrupts the anterior hyaloid face allowing aqueous to drain out of the vitreous. It's an elective procedure done in pseudophakics and aphakics through the surgical iridectomy, first perforating the posterior lens capsule and then the hyaloid face. Slight deepening of the anterior chamber is noticeable immediately, dramatic deepening is noticeable after 12 to 24 hours.

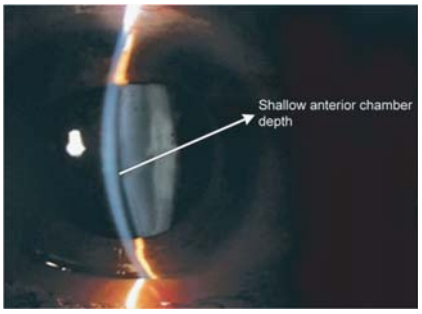


Fig. 1B : Slit photo showing shallow anterior chamber

Surgical Therapy

In cases of medical and laser therapy failure, vitreous surgery almost always cures this condition. The surgery is intended to establish an opening through the anterior hyaloid membrane and the vitreous body for aqueous humour to escape forward to the posterior and anterior chambers. Pars plana vitrectomy[2,3] is done in pseudophakic and aphakic eyes and IOP control is achieved in 67 to 100% of cases. Vitrectomy-phacoemulsificaton-vitrectomy[11] was studied in 5 phakic eyes, the preliminary vitrectomy was limited to core vitrectomy to debulk the vitreous, the residual vitrectomy, zonulohyaloidectomy and peripheral iridectomy was performed to create a free communication between the anterior and posterior chambers. Cyclodiode laser photocoagulation has also been proposed in patients with failed medical therapy to break the cycle of aqueous misdirection and prevent future recurrences.[12]

YAG PI done preoperatively in occludable eyes can reduce aqueous misdirection. In patients with increased risk like in decompression related shallowing of the anterior chamber, using viscoelastics during surgery, tighter closure and cycloplegics after surgery prevents aqueous misdirection. It must be remembered that recurrence can occur so vigorous follow-up and chronic atropine drops may be necessary. The fellow eye is also at a high-risk for aqueous misdirection.

Neovascular Glaucoma

Neovascular glaucoma (NVG) arises in response to retinal ischemia, the common predisposing factors being central retinal vein occlusion and diabetic retinopathy. An NVG patient requires a broad diagnostic workup to determine the underlying cause[13] and also a predisposed patient requires careful monitoring to detect NVG in its earliest stages.

The pathogenesis of NVG is retinal ischemia which produces angiogenic factors (VEGF, angiogenin, PDGF, TGF-á, â, TNF-á) which in turn causes new vessel formation on the iris and angle leading to formation of fibrovascular membrane which eventually contracts to form peripheral anterior synechiae (PAS) and ultimately complete closure of the angle. VEGF levels are elevated to 40 to 100 times normal in aqueous and vitreous of patients with rubeosis and NVG.[14] The clinicopathologic course and treatment may be described in the following stages.[15]

Rubeosis Stage (Preglaucoma)

Neovascularization is typically first seen in the pupillary border;[16] however, gonioscopy should be done in all patients under the risk to look for angle neovascularization, since it can precede iris neovascularization.[17] The IOP is usually normal, rubeosis is seen as fine randomly oriented vessels near pupillary border or may be first seen in the angle in diabetic and CRVO patients.[18] Pan retinal photocoagulation (PRP) is indicated which decreases the retinal oxygen demand, thereby reducing the stimulus for release of angio genesis factors.[19]

Open-angle Glaucoma Stage

The rubeosis is more forid in this stage with elevated IOP and open angles with intense neovascularization of the angle. PRP can reverse IOP elevation in this stage. Aqueous suppressants, topical corticosteroids and atropine are used.

Angle Closure Glaucoma Stage

PAS formation can eventually close the angle with ectropion uveae formation resulting in severe glaucoma requiring surgical intervention. PRP is still useful in this stage to reduce IOP if synechial closure is less than 270°[20] and even if the angle is closed for more than 270° PRP is useful in reducing anterior segment neovascularization before any surgical intervention.[21]

Filtering surgery is rarely successful because of the risk of bleeding and postoperative progression of fibrovascular membrane. In a study in NVG patients, mitomycin C (MMC) augmented trabeculectomy yielded success rates of 62.6, 58.2 and 51.7% at 1, 2 and 5 years respectively.[22] Modifed trabeculectomy can be performed with intraocular bipolar cautery of peripheral iris and ciliary processes to prevent bleeding.[23] Intracameral Bevacizumab (avastin)[24] has been tried in NVG patients resulting in rapid regression of the iris and angle neovascularization and could act as an adjunct in the surgical treatment of these patients. Preoperative intravitreal bevacizumab combined with mitomycin C augmented trabeculectomy has been studied to be a safe and effective method for controlling IOP in NVG, though long-term effects are not known.[25] Even comparative studies between combined intravitreal bevacizumab (IVB) and trabeculectomy with MMC verses trabeculectomy with mitomycin C alone concluded that IVB significantly reduces postoperative hyphema and controls early postoperative IOP with no difference in long-term results.[26]

GDDS have gained wide acceptance as a primary procedure for NVG patients because the tube bypasses the fibro-vascular membrane. The aqueous tube shunts have reported success rates of 22 to 97% in these patients.[27,28] Molteno tube shunts[29] Ahmed glaucoma valve[30] and Baerveldt glaucoma implants[31] have shown comparable success rates. Successful IOP control was achieved with com bined pars plana vitrectom y and glaucoma drainage implant in selected patients with refractory NVG.[32]

In eyes with little or no visual potential, treatment is mainly with topical cycloplegics, steroids and aqueous sup-pressants. Ablation of

the ciliary body is undertaken in cases of symptomatic patients. Bloom et al reported a mean IOP reduction of 53% in 25 patients with diode laser for refractory glaucoma.[33] However of note is the study by Ramli et al[34] that underlying NVG was a significant risk factor for hypotony post transscleral cyclophoto-coagulation. A less aggressive energy setting and a more limited treatment was advised to prevent hypotony.

Iridocorneal Endothelial Syndromes

Iridocorneal endothelial (ICE) syndrome is a spectrum of ocular diseases characterized by corneal endothelial abnormalities, unilateral glaucoma and iris stromal abnor-malities.[35] They include progressive iris atrophy, Chandler syndrome and Cogan-Reese syndrome (Figs 2A to toC).C). They may be regarded as different manifestations of the same disease process. It is caused by an abnormal corneal endo-thelium which forms a membrane (ICE membrane) over the anterior surface of the iris and the angle structures, which on contraction distorts the iris, forms peripheral anterior synechiae and closes the angle leading to glaucoma.[36] Half of all the patients of ICE syndrome develop glaucoma.[37]

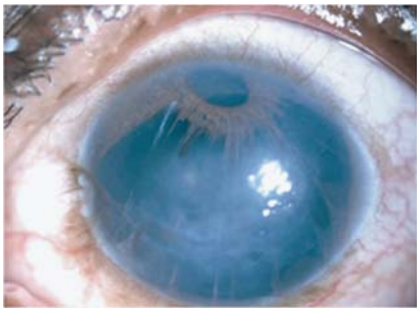


Fig. 2A : Progressive iris atrophy

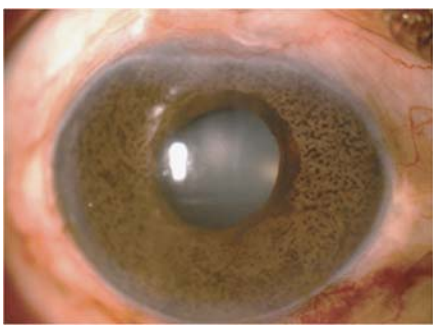


Fig. 2C : Cogan-Reese syndrome

Management of glaucoma in ICE syndromes is difficult and medical therapy is restricted to aqueous suppressants which is often unsuccessful.[38] The success rate of fltering surgery is also lower than most other forms of glaucoma.[39,40] A study of surgical outcome of trabeculectomy with MMC in 10 ICE syndrome patients showed 8 of 10 patients having adequate IOP control after fltering surgery with mitomycin-C, with a mean follow-up of 14.9 months. The results of their study suggested that trabeculectomy with adjunctive mitomycin-C may offer better intermediate-term success than trabeculectomy alone or trabeculectomy with 5-fluorouracil.[41] Failure of fltering surgery is often due to the continued growth of the endothelial membrane over the fltration site.

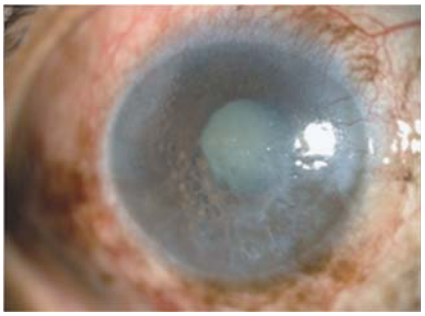


Fig. 2B : Chandler's syndrome

With GDDs the growth of ICE membrane over the ostium is bypassed. A long-term study of 10 patients with ICE syndrome[42] showed IOP control of less than 21 mm Hg in four patients and in three required tube repositioning due to membrane formation. They proposed that in ICE patients the tube should be left long in the anterior chamber away from the potential source of ICE cells and entry through pars plana can be used in pseudophakicvitrectomized eyes. Cyclophotocoagulation is indicated in eyes with refractory glaucoma who have failed trabeculectomy or shunt surgery.

Infammatory Glaucoma

Glaucoma is a potentially devastating complication of uveitis and remains a therapeutic challenge despite availability of new modalities of treatment in both the conditions.[43]

Inflammation can produce secondary angle

closure glaucoma with pupillary block mechanism due to posterior synechiae formation or without pupillary block due to infam matory peripheral iris swelling, exudates in the angle contracting to form PAS or due to forward rotation of the ciliary body. PAS form easily in eyes with shallow anterior chamber and in eyes with chronic infammatory processes.

Infammatory glaucoma can occur after trauma, surgery, idiopathic infammatory condition or due to specific uveitic entities.

Principles of Management

Usually control of infammation alone leads to normalization of IOP. Management of infammation is done by topical or systemic corticosteroids, mydriatics-cycloplegics and systemic immunosuppressives. Medical therapy to control IOP basically involves aqueous suppressants. Intracameral tissue plasminogen activator has been reported to be of use in impending pupillary block glaucoma due to acute fibrin-ous HLA-B27 uveitis.[44]

YAG PI is done for pupillary block glaucomas, although fibrin can close small iridotomies in an infamed eye.[45] When this is unsuccessful surgical iridectomy is useful if less than 75% of the angle is closed by PAS.[46]

If medical or laser therapy is unable to control the IOP then fltration surgery has to be considered. Trabeculectomy in uveitic eyes generally carries less success due to acceleration of wound healing by postoperative fibrinous and cellular responses.[47] Antimetabolites like 5FU and Mitomycin C are used to increase the success of trabeculectomy in uveitic eyes (5FU, MMC). A success of 95% (IOP less than 21 mm Hg with 1 or no medication) was achieved with MMC augmented trabeculectomy.[48] Aggressive anti-infammatory therapy should be given before and after trabeculectomy in these patients.

All the three glaucoma drainage implants (Molteno, Baerveldt and Ahmed valve) have been tried with a success of 79% with Molteno implants,[49] 94% with Ahmed valve[50,51] and 91.7% with Baerveldt implant.[52]

Trabeculodialysis[53] (a modifed goniotomy) was studied in children with infammatory glaucomas with a success of 60%. Goniotomy in chronic childhood uveitis was reported to be successful in 75% of their patients by Freedman et al.[54]

Trans scleral diode cyclophotocoagulation is considered in low visual potential eyes; however, the rate of hypotony in uveitis eyes can be higher (19%) than other refractory glaucomas.[55]

Ciliary Body Cysts

Benign iris/ciliary body cysts can cause glaucoma if they are multiple by pushing the peripheral iris forward to close the angle and cause raised intraocular pressure. The onset of glaucoma can mimic acute angle closure glaucoma. It is also called as pseudoplateau iris since it produces a clinical picture identical to plateau iris. Cysts should be suspected when plateau iris configuration appears more in one segment of the angle giving a characteristic bumpy contour to the peripheral iris. They are often multiple and diffusely distri-buted.[56] Around 10% of the iris cysts can because glaucoma associated with or without pupillary block glaucoma. They can be confirmed and their extent can be noted by UBM.[57]

Laser iridotomy,[58] Argon laser iridoplasty,[59] Laser cystostomy and intermittent pilocarpine therapy[60-62] have been described as therapeutic approaches.

Glaucoma following Scleral Buckling Procedures

Here angle closure glaucoma is produced by swelling of the ciliary body due to impaired venous drainage from the vortex veins by the scleral buckle. The incidence of angle closure glaucoma after scleral buckling procedures range from 1.4 to 4.4%.[63] The risk factors are pre-existing narrow angles, use of an encircling band, placement of the band anterior to the equator and high myopia.

It usually resolves spontaneously over several days to weeks. Cycloplegics are used to shift the lens-iris diaphragm posteriorly by relaxing the ciliary muscle and topical steroids to reduce the infammation. IOP is reduced by means of

aqueous suppressants. Miotics should be avoided. Laser PI is not beneficial; rather laser iridoplasty is useful in opening the angle in some of these patients.[64]

GDDs offer an alternative approach in uncontrolled glaucoma as evidenced by the study done by Scott Ingrid U et al with Baerveldt glaucoma implant in eyes with preexisting episcleral bands where IOP control was achieved in all 16 patients with or without medications during the follow-up period of 19.1 to 45.5 months with none of the usual complications reported with glaucoma drainage devices (GDD).[65]

Intraocular gases have been increasingly used in vitreo-retinal surgeries for tamponade effect on the retinal breaks. The gases used are air, Perfluoropropane (C3F8), sulphur hexafluoride (SF6). SF6[66] expands to twice its volume within 24 to 48 hours and stays in the eye for 10 to 14 days, C3F8 expands to four times its volume in 48 to 72 hours and stays for 55 to 65 days.[67] The increase in the volume of the gas causes anterior displacement of the lens-iris diaphragm even when prone position is maintained. The IOP rise is high during the period of maximum expansion of gas. The incidence of IOP elevation with SF6 has been reported to range from 6.1 to 67%, maximum with 100% SF6 and minimum with 20% SF6.[68] C3F8 causes IOP elevation of 18 to 59%, minimum when 14% of C3F8 is used.[69] Patients should be instructed to maintain head down position to prevent forward movement of iris lens diaphragm. They should be warned against air travel due to IOP variation during atmospheric changes.[70]

Medical therapy consists of aqueous suppressants. If IOP is not responsive to medical therapy then aspiration of a portion of gas may be performed to lower IOP. Laser PI is useful in pupillary block.

Glaucoma after Silicone Oil Injection

Silicone oil is used as a vitreous substitute for retinal tampo-nade. It can produce glaucoma by pupillary block, infa-mmation, synechial closure, neovascularization, migration of oil into anterior chamber or by open angle mechanism. Secondary glaucoma after silicone oil injection has been reported to be in 6 to 30% of eyes.[71] Angle closure glaucoma can occur after silicone oil injection due to synechial closure. Overflling of the oil in the eye has to be avoided to prevent secondary glaucoma. Inferior prophylactic iridectomy prevents pupillary block in pseudophakic and aphakic eyes. Medical therapy consists of aqueous suppressants, cortico-steroids and cycloplegics. Postoperative closed iridectomies due to fibrin can be relieved by laser PI.

Silicone oil removal[72] with or without concurrent glaucoma surgery has been performed to lower IOP, but oil removal carries some risk of retinal detachment. In patients with complete synechial closure silicone oil removal alone cannot be expected to lower IOP, rather glaucoma surgery is indicated in such cases and the decision to remove silicone oil or not depends on the relative risk of redetachment on oil removal and emulsification of oil.[73] If silicone oil remains in the eye, the GDD should be positioned in the inferior quadrant.[74]

Cyclophotocoagulation by transscleral cytophotoco-agulation (TSC) or endo cytophotocoagulation (ECP) can be used[75] in refractory cases. Eyes with relatively intact central visual acuity are appropriate candidates for ECP and can be combined with intraocular surgery.[76]

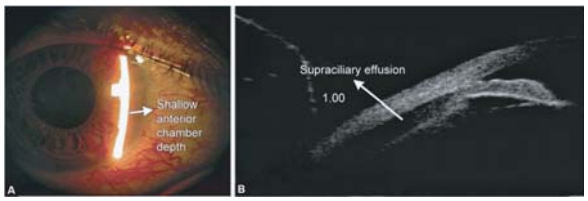
Ciliary Body Swelling

Secondary angle closure glaucoma can occur due to ciliary body (CB) swelling secondary to vortex vein obstruction (venous stasis), drugs or infammation.

Vortex vein obstruction occurs secondary to extensive PRP or CRVO producing angle closure glaucoma similar to scleral buckling procedures. It is a self limiting condition and will resolve with or without medical therapy. Laser PI has no role in this condition.

Ciliary body swelling secondary to drug use is an idiosyncratic reaction causing relaxation of zonules, anterolateral rotation of the ciliary body

leading to anterior displacement of iris–lens diaphragm producing induced myopia. Choroidal detachment and supraciliary effusions are frequently present detected by UBM. Sulfa-based drugs are associated with this type of secondary angle closure glaucomas like topiramate[77] (Figs 3A and B), acetazolamide,[78] hydrochloro-thiazide and contrimoxazole. It presents as bilateral angle closure glaucoma. The management requires stopping of the drug, instituting aqueous suppressants and cycloplegics.[79] Miotics, topical and systemic carbonic anhydrase inhibitors are contraindicated and laser PI has no role.



Figs 3A and B : (A) Shallow anterior chamber depth due to topiramate induced angle closure, (B) UBM showing supraciliary effusion following topiramate intake causing secondary angle closure

Conclusion

Secondary angle closure glaucomas require meticulous history taking, clinical examination, if necessary anterior segment imagings like UBM to identify the specific cause if possible and formulate a treatment plan to avoid ocular morbidity.

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Case Report

Pseudophakic malignant glaucoma and its management – a rare case report

F Yasmin[1], A H M E Reza[2], N M K Arnob[3], F Afzal[4]

Abstract

Background: To report a case of malignant glaucoma in a pseudophakic patient, managed through pars plana anterior vitrectomy.

Method: A 70-years old woman presented with complaint of 5 days history of pain in her left eye. She had a history of cataract surgery in that eye 7 days back. Visual acuity was light perception and intraocular pressure was 55 mm of Hg in her LE. Slit lamp biomicroscopy revealed corneal oedema, flattening peripheral and central anterior chamber. B scan ultrasonography showed no vitreous or choroidal abnormalities. The patient was treated with topical timolol and brimonidine combination, topical brinzolamide, topical cycloplegic, intravenous mannitol and ND YAG laser peripheral iridotomy was performed. After 12 hours despite a patent iridotomy in the left eye, intraocular pressure (IOP) was 47 mm of Hg, absent AC with severe corneal edema. The diagnosis of pseudophakic malignant glaucoma was made and YAG laser capsulotomy performed with no resolution of symptoms and signs. 24 hours later, we performed pars plana anterior vitrectomy. Postoperatively, the AC depth increased and the IOP decreased to 28 mm of Hg. 5 days later, the patient was discharged with visual acuity hand movement in her LE, reduced corneal edema and normal AC depth. After a month, the corneal edema resolved, the visual acuity was 6/60 and IOP was 20 mm of Hg.

Conclusion: Malignant glaucoma is a sight threatening condition in pseudophakic patients. Proper clinical diagnosis and timely management by pars plana anterior vitrectomy is essential for the resolution of symptoms and signs.

Keywords: malignant glaucoma, pars plana anterior vitrectomy

Introduction

Malignant glaucoma first described in 1869 by Von Graefe[1]. It is an uncommon condition. Malignant glaucoma is defined by raised intraocular pressure associated with a shallow or absent anterior chamber despite a patent iridotomy[2], and, in the absence of choroidal or vitreous effusions, unresponsive to miotics, with relief from cycloplegic therapy[3]. Typically, it can occur after trabeculectomy in hypermetropic patients with angle closure glaucoma[4], after filtration surgery[1] after cataract surgery from postoperative day one to many months[5], laser capsulotomy, iridotomy[6,7], cyclophotocoagulation[7], penetrating keratoplasty[9] or spontaneously[6].

Exact etiology of the disease is not yet fully understood, it is believed that posterior misdirection of aqueous humor into or behind the vitreous. The resultant pressure difference between the posterior and anterior chambers causes an anterior displacement of the lens iris diaphragm, anterior chamber shallowing or flattening, and secondary angle closure glaucoma.

Malignant glaucoma associated with poor visual outcome[1] despite proper treatment We described an uncommon case of malignant glaucoma after cataract surgery in a patient with no history of glaucoma

Case History: A 70-year-old lady came to our hospital with the complaint of increasing pain and decreased visual acuity and heavyness in the left eye for 5 days. She had a history of cataract surgery in the left eye 7 days back. On examination visual acuity was light perception and intraocular pressure by Goldman applanation tonometer was 55mm of Hg in her LE. Slit lamp biomicroscopy revealed severe conjunctival injection, intense corneal oedema absent central and peripheral anterior chamber, iridocorneal touch centrally and posterior chamber pseudophakia. An ultrasound B-scan was performed to rule out posterior segment

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pathology, which showed no vitreous or choroidal abnormalities. with no other ocular history. Based on history and clinical examination we diagnosed the patient as malignant glaucoma.

In the RE, the visual acuity was 6/6 with correction and spectacle, Intraocular pressure was 17mmof Hg by Goldman applanation tonometer, slit lamp biomicroscopy revealed no abnormality in the posterior chamber and fundus.

Immediately patient was admitted in the hospital and treated with oral acetazolamide 3x500mg, topical timolol and brimonidine combination 2x1 and topical brinzolamide 3x1 along with topical cycloplegic atropine 1% 3x1, iv mannitol 20% 2x500 ml. ND YAG laser peripheral iridotomy was performed. After 12 hours intraocular pressure (IOP) was 47 mm of Hg despite a patent iridotomy in the left eye, absent AC with severe corneal edema. The diagnosis of pseudophakic malignant glaucoma was confirmed as no resolution of symptoms and signs. ND YAG laser capsulotomy was done.

Despite maximal systemic and topical therapy the desired result was not achieved. Finally after 24 hours we decided to perform 23G pars plana anterior vitrectomy and anterior hyaloidotomy. Anterior hyaloid face and anterior vitreous were removed in order to eliminate the blockage and aqueous misdirection completely. That was confirmed by the deepening of the anterior chamber per operatively.

First day postoperatively, the AC depth increased and the IOP became decreased to 28mm of Hg. The patient was discharged with visual acuity hand movement in her LE, reduced corneal edema and normal AC depth. After a month, the corneal edema resolved, the visual acuity was 1/60 and IOP was 20 mm of Hg.

The fundus showed peripapillary atrophy, with cup disc ratio 0.6. After 3 months postoperatively, the visual acuity improved in the LE to 3/ 60, IOP 17 mm of Hg, and normal AC depth. The patient continue with topical brimonidine and timolol combination, with no relapse of signs and symptoms in a 6-month follow up.

Fig 1: Patient

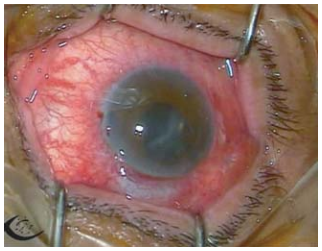

Fig 2: Peroperative aspect

Fig 3: Peroperative aspect

Fig 4: 1st postoperative day

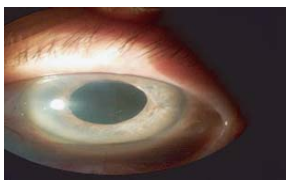

Fig 5: 3 months postoperatively

Discussion

Malignant glaucoma is a very rare complication of all kinds of ocular surgeries with an incidence of 2-4 %[3]. It is the most serious and difficult types of secondary glaucoma to treat and manage.[2] It is characterized by increased IOP with a very shallow or flat AC, unresponsive to peripheral iridotomy with normal posterior segment.

The etiology of malignant glaucoma is still unknown but it is almost certainly associated with the anatomical relation between lens, anterior hyaloid, ciliary body and zonules[3]. According to Shaffer and Hoskins posterior deviation of aqueous flow, leads to accumulation behind and posterior hyaloid detachment and a forward displacement of the iris-lens diaphragm[4].

Pseudophakic malignant glaucoma is a rare complication and most frequently occur in the immediate postoperative period of cataract surgery. The mechanisms for pseudophakic malignant glaucoma were studied. According to Chandler the cause is zonular weakness which lead to anterior subluxation of the IOL[5] as anterior chamber becomes normal after anterior hyaloidotomy[6], According to Tello C et al.an intact anterior hyaloid has an important role in the etiopathogenesis of malignant glaucoma in pseudophakic eyes. We consider that etiology is anterior displacement of the ciliary body and zonular weakness in the presence of an intact anterior hyaloid.

Regarding management the patient initially treated with osmotic agents, cycloplegics and antiglaucoma associated with YAG laser iridotomy and YAG capsulotomy, with no resolution of signs and symptoms. 24 hours after medical treatment we decided to perform pars plana anterior vitrectomy to create a direct communication between the vitreous cavity and AC. This involves anterior vitrectomy, anterior hyaloidotomy, and posterior capsulotomy. During the procedure AC deepened. In the next day, the AC remained deep, the IOP decreased to 28 mm of Hg and the corneal edema decreased significantly. We observed the patient monthly and after 6 months the patient remained stable.

Conclusions

Proper diagnosis and timely management is crucial for pseudophakic malignant glaucoma. Pars plana anterior vitrectomy with hyaloidotomy and capsulotomy proved to be an appropriate surgical procedure. Delaying cataract surgery contributes to the development of malignant glaucoma due to zonular weakness Urgency for the surgery should give the top priority to prevent the total vision loss of this patient.

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Marfan syndrome : A Case Report

R E Alam[1], S M Noman[2], M E Rahman[3], S Begum[4]

Abstract

Purpose: To report a case of Marfan Syndrome atypically presented with inferotemporal subluxation of lens .

Case Report: A 25 year old male presented with chief complaint of progressive painless reduction of vision in right eye for the past 3 years . His best corrected visual acuity was 6/24 in right eye and 6/9 in left eye. He uses high powered spectacles in both eyes since his 10 years of age. His anterior segment findings were remarkable with bilateral inferotemporal subluxation of lens with intact zonules. He has tall stature, armspan > height, arachnodactyly, high arched palate, hypermobility of joints ,pesplanus deformity of foot, thumb sign and wrist signs of marfan syndrome.On echocardiography there was aortic root dilatation, prolapsed tricuspid valve. On chest X ray P/A view- There was pneumothorax and emphysematous lung .He was suffering from occational breathlessness for which he uses inhaler salbutamol.His younger brother was diagnosed as a case of Marfan syndrome.Through these findings we diagnosed the patient as having marfan syndrome.

Conclusions: Without careful examination and comprehensive history, diagnosis of Marfan syndrome can be eluded. In eye typical presentation of marfan syndrome is superotemporal subluxation of lens. But this case atypically presented with bilateral inferotemporal subluxation of lens.

Keywords: Marfan syndrome, Subluxation of lens, Hypermobility of joints, Arachnodactyly, Aortic root dilatation.

Introduction

Marfan syndrome is a genetic disorder characterized by defect in connective tissue of skeleton, Eye, Heart, blood vessels. About 1 in 5000 to 10000 people have Marfan syndrome. In Marfan syndrome there occurs mutation of FBN1 gene of chromosome 15 which provides instructions for making protein fibrillin-1(the major extracellular microfibril) which results in production of abnormal connective tissue. It is an autosomal dominant disorder in about 75% cases and while 25% occurs from newly mutation.

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Case History

A 25 yr old university student presented with chief complaint of reduction of vision of his right eye for 3 yrs. He uses high powered spectacles in both eyes since his 10 years of age. His brother also uses high powered spectacles and also a diagnosed case of Marfan syndrome. His best corrected distant visual acuity were in right eye 6/24 with +9.00 DSP and in left eye 6/12 with +8.50 DSP X +1.00 DCyl @ 80. Slit lamp examination of eyes revealed bilateral inferotemporal subluxation of lens with intact zonules with phacodonesis and iridodonesis in both eyes. On fundoscopic examination – Optic disc is tilted in both eyes, C:D ratio 0.4:1 in both eyes, fundus is tessellated in both eyes.

On systemic examination : There were Armspan (78 inch) > height (73.5 inch), kyphoscoliosis, hypermobility of joints, Arachnodactyly of fingers, pes planus deformity of foot, Wrist and thumb sign(steinberg sign) of marfan syndrome present, high arched palate. On echocardiography –there was dilatation of aortic root, tricuspid regurgitation, tricuspid valve prolapse. X- ray chest P/A view is suggestive of pneumothorax and emphysematous lung fields.

On the basis of family history, bilateral subluxation of lens, aortic root dilatation, tricuspid regurgitation, increased armspan to height ratio and musculoskeletal features, respiratory features the diagnosis of Marfan syndrome was made. Patient was treated with multidisciplinary approach with cardiac evaluation and monitoring, bronchodilator and

respiratory management and plan for Pars plana vitrectomy with pars plana lensectomy with scleral fixation IOL implantation in right eye followed by left eye and restriction to strenuous exercise.

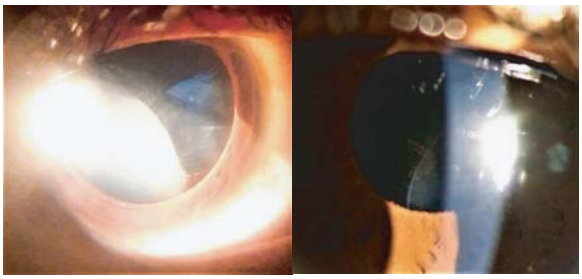

Figure: Inferolateral subluxation of lens in right eye and inferotemporal subluxation of lens in left eye with intact jonules in both eyes.

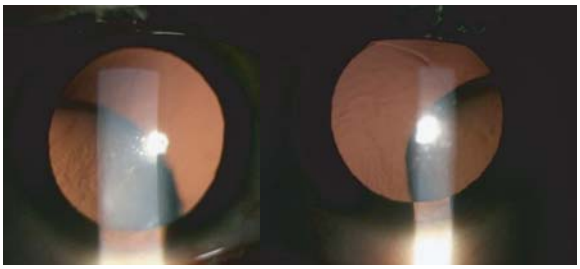

Fig:Retroillumination of eyes shows bilateral inferotemporal subluxation of lens.

Fig: Steinberg sign, Hypermobility of joints,Wrist signs of Marfan syndrome.

Discussion

In 1896, the French pediatrician Antoine-Bernard Marfan first described the skeletal abnormalities (i.e., overgrowth and joint laxity) that characterize a hereditary connective tissue disorder that eventually was named after him. The gene linked to Marfan syndrome was first identified by Francesco Ramirez at the Mount Sinai Medical Center in New York City in 1991. Everyone has a fibrillin-1 protein, which makes elastic fibers in connective tissue. Fibrillin-1 also affects another protein in our body, transforming growth factor-beta (TGF-beta), which helps control how the body grows and develops. In Marfan syndrome there occurs mutation of FBN1 gene of chromosome 15. FBN1 encodes a protein called fibrillin, which is essential for the formation of elastic fibres found in connective tissue. People with Marfan syndrome inherit one normal copy of the FBN1 gene and one abnormal copy of FBN1 from their parents. The abnormal copy of the gene is stronger or "dominant" over the normal copy of the gene and causes Marfan syndrome.

The syndrome affects the skeletal, cardiovascular, ocular, respiratory systems but all fibrous connective tissue throughout the body can be affected. In other studies it was found that- Skeletal system problems include increased arm span to height ratio more than 1.05, disproportionately long, slender limbs with thin, weak wrists and long fingers and toes. The Steinberg sign, clinical test in which the tip of the thumb extends beyond the palm when the thumb is clasped in the clenched hand. Marfan syndrome can cause spine scoliosis, pectus excavatum or pectus carinatum of the sternum, hypermobility of joints, a high-arched palate, arachnodactyly, loss of medial longitudinal arch of foot, unexplained stretch marks on the skin. In this case we found increased arm span to height ratio, positive steinberg sign, abnormal joint flexibility, arachnodactyly, high arched palate, loss of medial longitudinal arch of foot, patients usually have good intellectual. To differentiate from other ectopia lentis syndromes - in homocysteinuria patients have usually low intellectual, rigid joints, high plasma homocystein level. In Weill-Marchesani syndrome there is bradydactyly, short stature, patients found mentally handicap.

In Marfan syndrome commonest change is subluxation of lens which occurs due to weakness in the ciliary zonules. The mutations responsible for Marfan syndrome weaken the zonules and cause them to stretch. The inferior

zonules are most frequently stretched resulting in the lens shifting upwards and outwards with intact zonules. Myopia due to connective tissue disorder causes increased length along the axis of the globe, corneal flatness, strabismus, exotropia, and esotropia. Inferonasal subluxation of lens with absent zonules usually found in homocysteinuria, Inferior subluxation usually found in Weill Marchesani syndrome. Aypically in this case of Marfan syndrome inferotemporal subluxation of lens with intact zonules was found and Hypermetropia present due to excessive subluxation of lens from visual axis.

The most serious signs and symptoms associated with Marfan syndrome involve the weakness of the aorta which leads to serious problems including aortic dissection, aortic aneurysm, mitral valve prolapse, aortic valve regurgitation and pneumothorax as pulmonary system involvement. In this case there was dilatation of aortic root, tricuspid regurgitation and tricuspid valve prolapse found and pneumothorax was found.

Whereas in homocysteinuria aorta is normal, but arterial thromboembolic events usually present.

Diagnosis of Marfan syndrome is established by-

- In absence of family history-Major criteria in at least two different organ systems and involvement in a third organ system
- In presence of family history –one major criterion in an organ system, and involvement of a second organ system

No definite treatment exists for Marfan syndrome. Treatment aim is to relieve symptoms and prevent additional problems or complications. Treatment for Marfan syndrome includes beta or angiotensin receptor blockers (ARBs), or surgical interventions such as aortic root replacement.People with dislocated lenses and refractive error may be treated with glasses or contact lenses to help with vision. Lens extraction combined with artificial intraocular lens replacement is another choice for surgery. Respiratory evaluation and supportive treatment is needed.

Conclusion

It is important to recognize Marfan syndrome in the course of the disease. This is facilitated by an integrated approach to diagnosis. Early diagnosis can improve longevity and improve prognosis of marfan syndrome.

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