CASE REPORT

EMERGING CHALLENGES OF ACUTE BILATERAL DIABETIC CATARACT IN PEDIATRIC: INSIGHT TO EARLY DETECTION AND MANAGEMENT– A CASE REPORT

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ABSTRACT

Introduction: *Intraocular foreign body (IOFB) is a serious form of open-globe injury that can cause a serious ocular trauma that lead to blindness (10–40% of all open eye injuries). This case report is aimed to report a challenging management of anterior chamber foreign body.*

Case Report: *A 17-year-old male patient complained of blurry vision and glare in both eyes(BE) since 3 months in newly diagnosed T1DM (HbA1c 10% → now 6.3%). Visual Acuity(VA) was 6/45PH6/21f2, with correction S-1.50 advancing to 6/18 in BE. Slitlamp examination revealed lens opacity(P3),central,3mm, retinometri 0.32. Posterior segment evaluation and intraocular pressure (IOP) were within normal limits. Right eye(RE) was underwent lensectomy with IOL under GA(General Anesthesia).*

Discussion: *Postoperative RE with final VA of 6/18 PHNI and IOP of 43 mmHg. Patient was given antiinflammation eyedrops, oral and topical antiglaucoma, and achieved final IOP of 8mmHg within 3 days and remains stable without antiglaucoma. Result was satisfying despite of uncomplicated secondary glaucoma as short-term complication that resolved with therapy.*

Conclusion: *Early detection for ocular complication in DM is needed as cataract genesis process still progressing despite of good glycemic control. Ocular manifestation may present as early sign of undiagnosed T1DM or as its complications. Comprehensive multidiscipline treatment, glycemic control, and routine evaluation is essential for the success of metabolic cataract therapy and progression of microvascular complications due to DM. Lensectomy with IOL implantation still the mainstay therapy in pediatric cataract. Awareness play vital role as it possibly cause decreased vision and or amblyopia, leading to blindness.*

Keywords: *Lensectomy, Type I Diabetes Mellitus, Posterior Subcapsular Cataract, Acute Bilateral Cataract*

INTRODUCTION

IOFBs are the worldwide problems and represent a serious form of open-globe injuries that can result in visual loss. Intraocular foreign bodies (IOFB) cause a serious ocular trauma that can lead to blindness (10–40% of all open eye injuries). IOFB is closely related to the living

and working environment, as well as the individual awareness of protection and protective measures. [1,2]

The most eye injuries with IOFBs are work related. The three most common causes of eye injuries were grass trimming, chiselling, and hammering. [3] Penetrating ocular trauma is a potentially vision-threatening injury. The extent of injury depends on factors that include size and composition of the foreign body, force of entry into the eye, location of the resulting wound, and the final location of the foreign body. Other important factors that might influence the final prognosis are initial visual acuity, presence of an afferent pupillary defect, perforation of the globe, and endophthalmitis.[4]

We report a case of an adult male with a retained intraocular stone foreign body in the anterior chamber of the eye and discuss the various considerations in the management of such cases.

CASE ILLUSTRATION

A male patient, 17 years old was consulted for eye evaluation from Endocrine Department with diagnosis of T1DM and AKI (Acute Kidney Injury) prerenal stage. The patient has received insulin therapy.

He complained of blurry vision in both eyes (BE) and glare since diagnosed with T1DM 4 months ago and get worsened since the last 1 month. Complaints of blurry vision didn't improve with wearing glasses and glares especially during the day. Other complaints in BE such as red eye and pain, headache, nausea, and vomiting were denied. History of wearing glasses since 3 years ago with S-1.00 in RE and S -0.75 in LE but felt uncomfortable since the last 4 months.

History of previous eye pain, eye surgery, drug allergies, and trauma were denied. Confirmed history of Diabetic Ketoacidosis (DKA) on DMTI with HbA1c 10%, currently controlled to 6.3% and random blood glucose 115 mg/dl with insulin therapy. History of malaise and unconscious in intensive room and underwent hemodialysis. History of grandmother with DM (+) but the detail is unknown.

On ophthalmological examination, it was found that the visual acuity in BE was 6/45 PH 6/21f2, with spherical correction in BE -1.50 progressing to 6/18. Refraction examination with cycloplegic was obtained in BE 6/45 PH 6/21 with binocular vision of 6/18, hirschberg was orthotrophia, and nystagmus was negative. Examination of the anterior segments of BE showed normal conjunctiva, clear cornea, AC VH4, cells (-) flare (-), posterior lens opacity (P3), central, 3 mm in diameter, was found on retro illumination examination. The pupillary reflex of both

eyes, both direct and indirect light reflex, and RAPD were within normal limits.

On examination of the posterior segments : papil N II were round, well defined, CDR 0.3, a/v 2/3, good retina, dot (-) blot (-) microaneurysm (-) intraretinal microvascular abnormality (IRMA) (-) neovascularization (-) and positive macular reflex. IOP of 14 mmHg in RE and 11 mmHg in LE. The patient's eye movements and confrontation tests were within normal limits in both eyes.

The biometry results of the RE showed that the lens size with the IOL Avansee 21 D (right eye) had a refraction target of -0.34 and Avansee 20.5 D had a refraction target of -0.39 using the SRK/T formula. Specular examination of RE: NUM 253, CD 3529, CV 27, MAX 1062, HEX 64, CT 610 and LE NUM 284, CD 3753, CV 26, MAX 681, HEX 66, CT 611. The patient was then planned for RE pro lens mass aspiration with IOL (Avansee 21 D) under GA. Patients and families are educated about the eye condition, visual prognosis, risks, and complications of surgery. The patient was also consulted to the Cataract and Refractive Surgery (CRS) division for evaluation and assistance for surgery. The paediatric endocrine department and anesthesia department stated that surgery was feasible.

Figure 1a and 1b. both eyes in the time of presentation

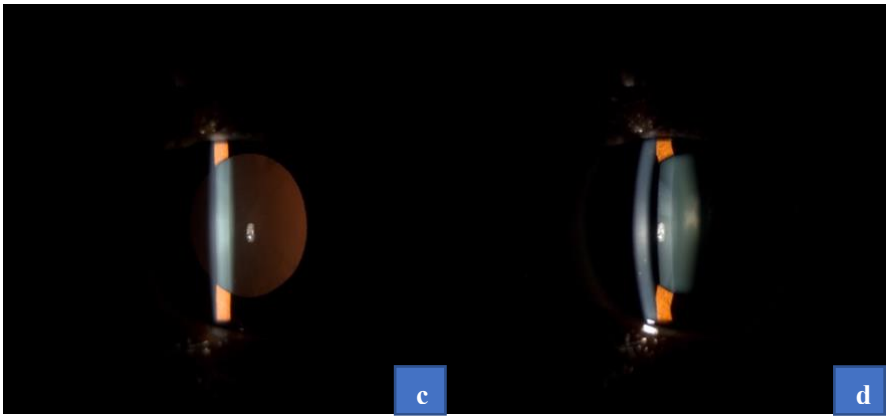

Figure 1c and 1d. Slit lamp image of the right eye with retroillumination

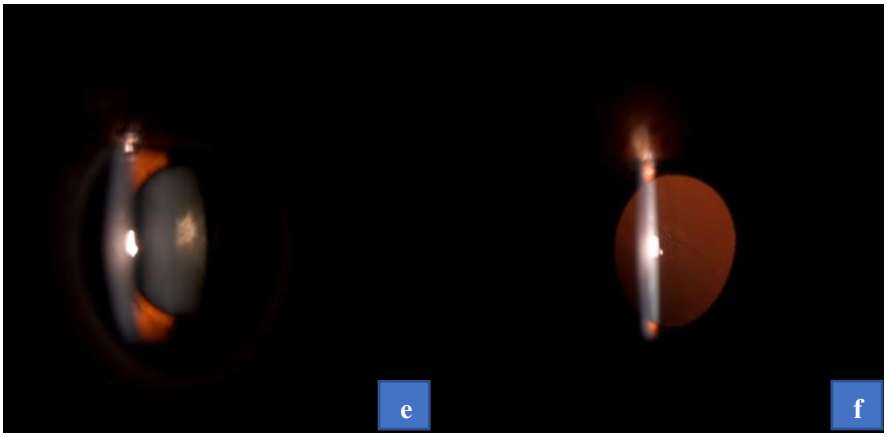

Figure 1e and f. Slit lamp image of the left eye with retroillumination

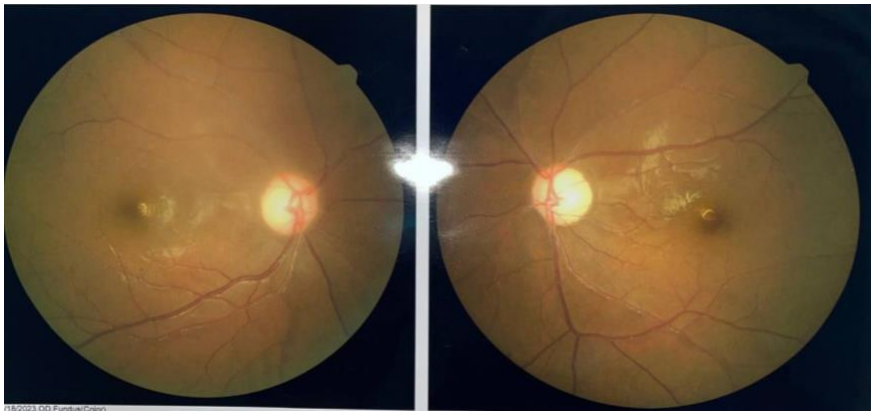

Figure 2. Fundus photo of both eyes

The patient was then diagnosed with RLE Acute Metabolic Cataract (PSC) ec T1DM + susp. Amblyopia Deprivation and planned for RLE lensectomy with IOL implantation under GA (RE first).

After general anaesthesia and disinfection, a blepharostat and eye drape were placed on the right eye. The initial step begins with a lateral corneal incision in the temporal direction at 2 and 5 o'clock and injection of trypan blue to visualize the anterior capsule of the lens and administration of viscoelastic. The operator then performed the capsulorhexis technique with a 27 G needle and microforceps, hydrodissection, and aspiration irrigation of the lens mass. Injection of viscoelastic and IOL placement in the bag followed by aspiration irrigation of remaining visco and intra-cameral and myostat antibiotic injection and corneal hydration. The next steps are bubble and betadine injection to see the tightness of the anterior chamber, subconjunctival anaesthesia + anti-inflammatory injection, betadine wash, and steroid + antibiotics drops in the right eye, and the operation is complete.

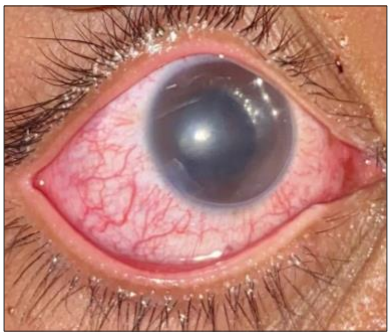

Figure 3. Photo of the right eye after surgery on the first day

The first day after the procedure, the patient complained of blurry vision in RE accompanied with slight pain (+), headache (-), nausea and vomiting (-). On ophthalmological examination, VA of light perception good projection (LPGP) in RE. Conjunctiva CVI (+) PCVI (+), cornea Descemet fold (+) minimal, iris regular (+), pupillary reflex (+/+) RAPD (-), bubble ¾ anterior chamber (AC), AC deep, IOL (+) central. In the posterior segment, the fundus reflex (+) but the details were difficult to evaluate and the IOP of 56 mmHg. The patient was then advised to take a head up position with paracetamol 4x500 mg, xitrol ed 6x1 in RE, lyteers ed 6x1 in RE, acetazolamide 3x250 mg, and kalium aspartate 1x300 mg (IOP dropped to 43mmHg) and was consulted to the Glaucoma Division for management of secondary glaucoma. The Glaucoma Division diagnosed with OD Secondary Glaucoma + Pseudophakia; LE PSC, and recommend continuing the therapy given and observing IOP.

On third day, patient controlled with no significant complaints : no pain in the eyes and head, right eye vision still blurry but brighter than before, nausea (-), vomiting (-). VA in RE was 6/45PHNI with normal eyelids. Calm conjunctiva, minimal descemet fold (+), bubble as high as ½ AC (+),AC VH4, pupillary reflex (+), IOL (+) central, iris pigment (+) in the lens, posterior segment reflex fundus (+) detail is difficult to evaluate, and IOP of 7 mmHg. Treatment of xitrol ed 6x1 in the RE was continued, all antiglaucoma drugs were stopped, and planned for LE pro lensectomy with IOL implantation under GA.

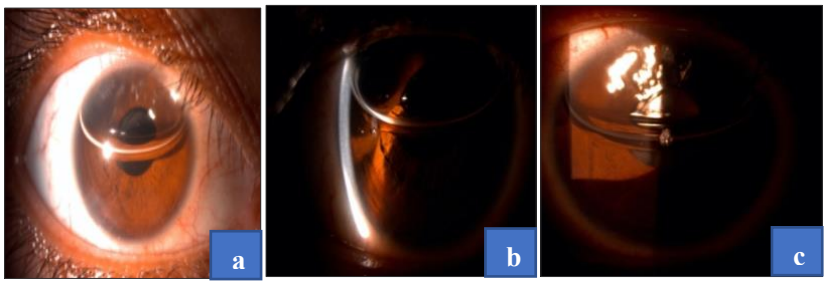

Figure 4 a-c. Photo after lensectomy + IOL surgery on the third day.

The patient came for control 10 days after surgery to the Glaucoma division and admitted that the vision in the RE was brighter and no pain. Red eyes (-), watery (-), discharge (-), headache (-), nausea (-), vomiting (-). On visual examination of the RE, it was found to be 6/21 PH 6/18. Normal eyelids, calm conjunctiva, deep AC, bubble (-), regular iris (+), pupillary reflex (+) IOL (+) in the center, iris pigment (+) in the lens. Posterior segment examination showed fundus reflex (+),NII papil was round, well defined, CDR 0.3-0.4, good retina, macular reflex (+) and IOP of 8 mmHg. The patient was diagnosed with RE Secondary Glaucoma + Pseudophakia post Lensectomy + IOL D+10; OS PSC and receive therapy in the form of observation, control back to the Glaucoma Division if IOP is high, medication according to POS Division, control according to schedule to POS Division; xitrol ed 6x1 in RE and other therapy according to POS Division.

On third week post surgery, the patient came back for control. RE was brighter and no complaints in both eyes. On examination, the visual acuity examination in RE showed 6/18 PHNI. Palpebra normal, conjunctiva calm, AC Van Herick 4, pupillary reflex (+), IOL (+) central position. Posterior segment examination showed fundus reflex (+), NII round, well defined, CDR 0.3, good retina, macular reflex (+) and IOP of 8 mmHg, retinometry of BE was 0.32. The patient was diagnosed with RE Pseudophakia post Lensectomy with IOL D+19; LE PSC and received therapy in the form of Xitrol ed 4x1 and Lyteers ed 4x1 in RE.

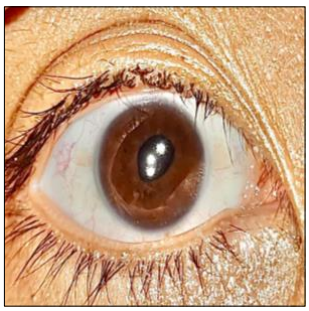

Figure 5. Photo of the right eye after lensectomy + IOL surgery on the 19th day.

DISCUSSION

Cataract is an ocular complication with a prevalence of 0.7%-3.4% and can be an early sign of type I diabetes mellitus (DM) in children and young adults.[3] A person's age when diagnosed with cataracts varies greatly, with the age range being as young as 5 years and there is no gender predilection for T1DM.[7,8] The time span for acute bilateral cataracts after diagnosis of T1DM and initiation of insulin is 3 weeks – 24 months.[9]

The pathophysiology of cataract formation in T1DM still cannot be fully explained, but

there are several hypotheses that are most widely accepted, namely activation of the polyol pathway, osmotic disturbances, increased lens hydration from sorbitol accumulation, glycation of lens proteins, oxidative stress, and currently being studied is autoimmune, due to the condition hyperglycemia which leads to lens opacification in diabetes patients.[9] Hyperglycemia conditions and HbA1c levels of 12.8-14.1% at the time of diagnosis are said to increase the risk of cataracts by 3.6 times.[8]

Several morphologies that can be found in T1DM are posterior subcapsular, lamellar, cortical, snowflake, and milky white cataracts, where posterior subcapsular cataracts are the most common type of diabetic cataract in children.[4] PSC is a type of cataract characterized by causing significant glare and occurring at a younger age than nuclear and cortical cataracts. This type forms in the cortex at the back of the lens and only causes complaints of visual acuity problems if its location covers the visual axis.[5]

The typical early symptoms of T1DM in the form of polyuria, polydipsia, polyphagia and weight loss were alerted and early detection has an important role in reducing lens exposure to hyperglycemia and other consequences of severe metabolic conditions, which might have a positive impact on early diabetic cataract formation in pediatric populations.[10,11]

The American Diabetes Association (ADA) and the International Society for Pediatric and Adolescent Diabetes (ISPAD) are the two main pediatric diabetes expert societies that have issued comprehensive guidelines for the prevention, diagnosis, and treatment of T1DM.[10,12] The ADA does not include recommendations about screening for early diabetic cataract, although it recommends that the first ophthalmologic examination for assessment of retinopathy should be performed when the patient reaches age 10 years, soon after puberty, or when the duration of T1DM is longer than 3–5 years.[12] In addition, ISPAD guidelines recommend that initial eye examination should be considered for early detection of diabetic cataract or major refractive errors, but there is no clear further guidance on expanding screening for diabetic cataract in the pediatric and adolescent population.[10]

In this case, a 17-years-old male patient was detected to have cataracts in both eyes 3 months after being diagnosed with T1DM, which was categorized as an acute case if measured from the duration of cataract formation. The patient complained of blurry vision and glare in BE that did not improve with the use of glasses over the last 3 months. On ophthalmological examination, central PSC type cataract was found to be 3mm, while other anterior segment, posterior segment examinations, and IOP were within normal limits. The patient's complaints was depend on the type, size, and position of the cataract. In younger children under 10 years, which is a critical period of visual development, cataracts removal must be done as soon as

possible. The size, type, and location of the cataract will determine visual prognosis. Cataracts with a diameter of >2 mm, especially central or nuclear cataracts, have the potential to cause amblyopia.[5] In cases of diabetes, posterior examination must also be evaluated considering the high incidence of complications of diabetic retinopathy. Regular diabetic retinopathy screening every three years is recommended for early detection of vascular and retinal changes.

The patient was consulted from TS Pediatric Endocrine for eye evaluation. He had history of hospitalization due to diabetic ketoacidosis on T1DM and a history of dialysis due to prerenal AKI. There were complaints of polydipsia, polyphagia and polyuria at that time, but the patient's parents were not aware of this symptoms because they thought it was normal because he is in growing period. Four months ago an HbA1c test was carried out with a value of 10%, but it has been controlled now with insulin to 6.3%. High levels of HbA1c (>10%) and hyperglycemic conditions are believed to increase the risk of cataract formation. On the other hand, even though the patient has good glycemic control and insulin initiation, the patient still experiences eye complications in the form of cataracts. There have been several similar cases reported where there were cases of 17-years-old and 19-years-old children who were newly diagnosed with T1DM and developed bilateral cataracts within 6 weeks.[13] Another report also reported cases of acute bilateral cataracts within 3 months after diagnosis of T1DM, these three cases occurred even though the patient had good glycemic control.[14]

A case study hypothesizes the possible role of the autoimmune hypothesis where upon initial patient arrival, ophthalmological examination was within normal limits and insulin autoantibody levels were negative, accumulation of sorbitol in the lens via the polyol pathway, causing osmotic stress and influx of aqueous humor resulting in intracellular edema, damaged fibrils or experiencing disruption and turbidity. However, lens disruption due to aldose-reductase alone is not sufficient to explain the development of opacities in patients with acute cataracts. Another suspected mechanism is non-enzymatic glycation of lens proteins related to oxidative stress. Glucose autooxidation and nonenzymatic glycation may contribute to an increase in free radicals in the lens, and loss of antioxidants in the lens under hyperglycemic conditions.[4]

Metabolic changes associated with diabetic ketoacidosis may further reduce antioxidant levels and induce cataract formation. In these various mechanisms, intracellular electrolyte and biochemical changes that occur cause protein damage and cell death and ultimately acute irreversible cataract. However, the reason why all patients with T1DM and irreversible acute bilateral cataracts always develop several months after diagnosis and initiation of insulin therapy, in a period with proven good metabolic control, remains need further study to be

explained.[13]

Some theories hypothesize that hyperglycemia is not the only factor because not all patients with hyperglycemia develop cataracts and good glycemic control is also thought to not prevent cataract formation. Other factors such as autoimmune disease, genetic propensity, nutritional status, and use of drugs such as steroids contribute.

Currently, there are many experimental therapies for the treatment of diabetic cataracts, but cataract surgery remains the gold standard in the treatment of diabetic cataracts.[6] Postoperative vision is generally favorable with good recovery of visual acuity. A study by Wilson, *et al*. reported nineteen of twenty-three operated eyes had postoperative better-corrected visual acuity of 20/40 or better.[4] In the last two decades, phacoemulsification is the most common cataract extraction technique in developed countries. The type of surgery differentiates between younger and older children. Because cataracts are soft at younger ages, the use of phacoemulsification is not mandatory, while in older children and adolescent phacoemulsification is recommended.[15,16]

Lensectomy and IOL insertion provide optimal results in primary IOL implantation considering that his lens nucleus is still soft and his age has passed the emmetropization period, so that the power of the lens installed won't change much. Despite the high success rate of cataract surgery, it is important to remember that cataract surgery is not without complications, and it is important to consider the long-term risk of T1DM and its effect on the growth and development of the anterior eye segment The most common complications after cataract surgery are Posterior Capsular Opacification (PCO), secondary glaucoma, retinal detachment, amblyopia, and acute complications (incision leak, increased intraocular pressure, edema, and uveitis).[17,18]

There are differences in the management of PCO between younger and older children, because PCO occurs more often in younger children. It is generally recommended that Primary Posterior Capsulotomy (PPC) should be performed in children under 4 years of age, as the risk of developing PCO even if the posterior capsule remains intact is very high, due to the more reactive inflammatory response at younger age.[15,19] Even after PPC is performed, there is a substantial risk of secondary visual axis opacification due to migration of lens epithelial cells from the anterior vitreous; thus, it is recommended to perform anterior vitrectomy (AV) along with PPC in infants and young children.[19] Whitman and Vanderveen suggest that older children with simple PCO can undergo laser capsulotomy and those with PCO and secondary visual axis opacification can proceed to surgery.[20] In this patient, inflammatory reaction and incidence of PCO are considered low thereby PPC and AV was not performed. However, if PCO occurs in

the future, this patient is considered cooperative to undergo NdYag laser in the polyclinic.

Complications that occurred after cataract extraction in this case were secondary glaucoma where in the first 2 days after surgery, the patient's IOP in the right eye was quite high, reaching 52 mmHg, but it was controlled on the third day, reduced to 7 mmHg after administering analgesic, anti-inflammatory and antiglaucoma drugs, and head up position. In first day post surgery, VA of RE is still 6/45 due to the presence of a bubble ½ AC and IOP was increased due to suspected bubbles being trapped between the IOL and the iris, but the AC is formed well without significant signs of inflammation and subjective symptoms are only found with minimal pain.

On the tenth day VA of RE improved to 6/21 PH 6/18 and controlled IOP of 8mmHg without antiglaucoma medication, examination of the anterior and posterior segments was within normal limits where the bubble had been absorbed and posterior segment could be evaluated with NII papil was found to be round, well defined, CDR 0.3-0.4, cupping (+), good retina, macular reflex (+).

On the nineteenth day post surgery, VA of RE had improved to 6/18 PHNI, the anterior and posterior segments were within normal limits, the IOP was controlled at 8mmHg, and retinometry showed 0.32 in BE, which is an indicator that the vision will not progressing optimally to normal vision. Overall process of the surgery, from preparation, intra-operatively, and post-operative complications management, has gone well. The next thing that needs attention is education to patient and his family about his eye conditions, monitoring blood glucose regulation, and routine evaluation for ocular complications in DM.

CONCLUSION

Type 1 diabetes often appears early and is manifested in the form of cataracts in children and vice versa, so there is a need for collaboration and screening as well as multidisciplinary therapy between pediatricians, endocrine, eye and other related departments. Metabolic regulation and good glycemic control, educating patient and family, aggressive management and evaluation are very important and play a role in the successful therapy and other complications in DM.

Lensectomy and primary IOL implantation are management that have high success rate in children and adolescents. However routine monitoring and evaluation for cataract (amblyopia, secondary glaucoma) and ocular diabetic complication (metabolic cataracts, diabetic retinopathy), as well as complications from surgery (secondary cataract, macular edema) and planning further therapy are essential to achieve optimal vision and good visual

prognosis.

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