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Long-Term Opacity of Intraocular Lens after Cataract Surgery in 1 Case

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Abstract

Objective: To analyze the clinical manifestations of intraocular lens (IOL) opacity after cataract surgery through case reports, and to explore its pathogenesis and diagnosis and treatment ideas, so as to provide a basis for the early diagnosis and correct treatment of IOL opacity. **Methods**: The clinical data of one patient diagnosed with IOL opacity and underwent intraocular lens replacement in the Department of Ophthalmology, Affiliated Hospital of Youjiang Medical College for Nationalities in December 2023 were reported. The characteristics of IOL opacity were observed, and the research progress and pathogenesis of IOL opacity were understood by consulting the literature. **Results**: This patient is the first case of IOL opacity in our hospital. The specific reason is unclear. It is considered to be related to the IOL material. **Conclusion**: Hydrophilic acrylic IOL is widely used in clinic because of its good histocompatibility. However, due to its hydrophilicity, there are more cases of IOL opacity than other types of IOL. At present, there is no unified conclusion on the etiology and mechanism of IOL opacity. IOL opacity can seriously affect vision and is easily misdiagnosed as a posterior cataract. We should fully disperse the large pupil and carefully observe under the slit lamp. The most effective treatment for this disease is IOL replacement.

Keywords

Intraocular Lens, Long-Term Opacity, Cataract

1. Introduction

Cataract is the leading cause of blindness in the world. According to the World Health Organization, there are about 20 million people worldwide who are blind due to cataracts, and the number is on the rise, which may reach 50 million by

2050 [1].

According to the survey data, about 3.6 million (66.9%) of the approximately 5.4 million blind people over the age of 50 in China have cataracts. With the aging of the population in China, the prevalence of cataract patients is increasing year by year [2]. For cataract patients, surgery is the only effective treatment at present. With the progress of science and technology, cataract extraction combined with intraocular lens (IOL) implantation has become a safe and effective surgery. Even so, there may still be some complications after surgery. Among them, IOL opacity is a relatively rare complication, which is easily misdiagnosed as posterior capsular opacity [3]. Among them, Haymore *et al.* [4] analyzed 8 cases of IOL opacity and found that 4 cases were misdiagnosed as posterior cataracts, and the other 4 cases were misdiagnosed as vitreous diseases (2 cases of vitreous opacity, 2 cases of vitreous hemorrhage). In this paper, a case of IOL opacity after cataract surgery was reported in order to deepen the understanding of this complication by ophthalmologists.

2 Case Introduction

2.1. Medical History

A 68-year-old female presented with cataract in the left eye for more than 5 years after surgery, and with recurrent hazy vision for more than 1 year. He was admitted to hospital on December 24, 2023. Previously, on January 24, 2018, left eye extra-capsular cataract extraction combined with IOL implantation was performed in our hospital (860UV, American Unique Vision Company, constant 117.5 + 20.5D). The operation was smooth and the visual acuity at discharge was 0.5. Deny the history of hypertension, diabetes and other special diseases.

2.2. Eye Examination Visual Acuity

Right eye 0.5, best corrected visual acuity 0.6, left eye 0.2, best corrected visual acuity 0.25, intraocular pressure: right eye 13.0 mmHg, left eye 16.5 mmHg. The eyes were right, the eye movement was normal, the conjunctiva had no congestion and edema, the cornea was clear, the anterior chamber was normal and shallow, the aqueous humor was clear, the iris texture was clear, the pupil was round, the diameter was 3 mm, and the light reflection was normal. The right eye lens C2N1P1, mydriasis showed that the central optical surface of the left eye IOL was milky white turbidity, and both eyes were transparent (**Figure 1**). Fundus: The color of the optic papilla in the right eye is light red, the boundary is clear, the artery becomes thinner, A:V is about 1:2, and the reflection of the macular fovea disappears. The left eye fundus peep is not clear.

Auxiliary examination: (2023-12-21) outpatient department of our hospital) binocular color Doppler ultrasound: (left eye axis 23 mm, right eye axis 22 mm) left eye intraocular lens opacity; cataract in right eye; binocular vitreous opacity.

Admission diagnosis: 1) Left eye IOL opacity; 2) Right eye age-related cataract.

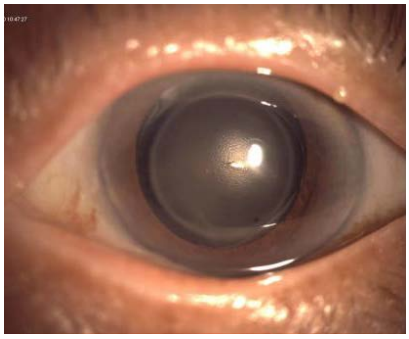

Figure 1. Preoperative anterior segment photography.

2.3. Admission Diagnosis and Treatment Laboratory Examination

Blood routine, liver function, renal function, electrolyte (calcium 2.33 mmol/L, phosphorus 1.24 mmol/L), coagulation function were not significantly abnormal. On December 27, 2023, a left eye IOL replacement was performed under local anesthesia. A clear corneal incision was made during the operation. The viscoelastic agent was used to maintain the anterior chamber. The IOL was bluntly separated from the anterior and posterior capsular membranes by extending the adjustment hook. The width of the IOL from the optical part was cut by about 1/2 diameter. The IOL was completely removed from the corneal incision along the edge of the optical part. A new posterior chamber IOL (HOYA, constant 118.4, +21.5D) was implanted again in the capsular band. The removed IOL was visually milky white turbid in the central optical part, with granular changes on the surface. The peripheral optical part is covered by the anterior capsule and the double climbing transparent, soft, and still foldable (**Figure 2**). After exposure to air for 20 minutes, the degree of turbidity deepened, showing brownish yellow, hard, and unfoldable (**Figure 3**). The uncorrected visual acuity was 0.3 on the first day after operation, and 0.4 on the second day after operation. The patient was discharged from the hospital with stable condition. The best corrected visual acuity was 0.8 at 15 days after operation, and the best corrected visual acuity was 0.9 at 1 month, 3 months and half a year after operation.

Figure 2. Removed during operation.

Figure 3. Exposure to air for 20 min followed by exposure to water.

3. Discussions

IOL opacity is one of the rare complications after cataract extraction combined with IOL implantation, with an incidence of 0.03% [5]. Since 1991, sporadic cases have been reported in China and abroad, and there is a lack of large sample size research. At present, there is no unified conclusion on the etiology and mechanism of IOL opacification. Scholars at home and abroad believe that it is mainly related to IOL material factors, surgical factors (including intraoperative perfusion fluid, staining agent, viscoelastic agent use, surgical methods, etc.) and patients' own factors [6].

3.1. IOL Material Factors

With the optimization of cataract surgical incision, foldable IOL is widely used in clinical practice. Its materials mainly include silicone gel, hydrogel, hydrophobic acrylate and hydrophilic acrylate. It has been reported at home and abroad that IOL opacity after cataract surgery can occur in IOLs of any material. The morphological characteristics and clinical manifestations of IOLs of different materials are not the same. Among them, the probability and degree of opacity of hydrophilic acrylic IOLs are much higher than other materials. Gao Xiaoyun [7] and other scholars conducted a retrospective case study, and 46 cases (47 eyes) of IOL opacity were statistically studied, of which 37 were hydrophilic acrylic spherical 860 UV (US). Two were three-piece hydrophobic acrylate MA60MA (Alcon company). The turbid hydrophilic acrylic sphere 860 UV (US) was observed to have a large number of dense deposits on its surface under an optical microscope.

Excessive deposition of calcium and phosphorus in the eye is considered to be the main cause of the opacity of the hydrophilic acrylate IOL [8], which is manifested as calcified opacity. It is granular and crustal in appearance, grayish white, light brown or light yellow, and can occur in any part of the IOL. Similarly, many scholars have reported that a large amount of calcium and phosphorus deposits [9] [10] can be detected by energy spectrum analysis in the opacity of hydrophilic material IOL, which is consistent with the former view. Schmidbauer and other researchers [11] believe that in addition to calcium and phosphorus deposition, the degeneration of UV absorbers may also play a role at the same time, resulting

in IOL opacity. It may be due to the long-term exposure of IOL to ultraviolet light. The absorbed ultraviolet energy causes the ultraviolet absorber molecules in the IOL to decompose and produce active free radicals, which in turn leads to secondary reaction of the IOL material and opacity.

Flash like degeneration turbidity is mainly found in hydrophobic acrylic IOL, which is characterized by small vacuoles in IOL, more common in the anterior and posterior surfaces of IOL. The pathological mechanism is considered to be related to hydrophobic acrylic material, manufacturing process, packaging and temperature change [12]. In most cases, the degree of this lesion is relatively light, which has little effect on vision and does not require special treatment.

Silicone IOL is the first foldable IOL. Because it is easy to adsorb intraocular metabolites, it is easy to cause inflammation in the eye and increase the risk of endophthalmitis. At present, it is less used in clinical practice. The report on the opacity of silicone IOL was first reported in 1991, and it is also the earliest report of IOL opacity. Nimoy [13] found that 15 cases of silicone IOL implantation showed different degrees of brown opacity 15 - 60 months after implantation. It is believed that the discoloration of silicone IOL may be due to the long-term chemical reaction between IOL and intraocular substances in the intraocular environment, resulting in structural changes and discoloration. It may also be caused by long-term light irradiation, which causes the photochemical reaction of the IOL material to change color.

Due to the water permeability of hydrogel IOL, the intraocular metabolites can enter the interior of IOL and cause adhesion and pollution, resulting in a decrease in the transparency of IOL [14]. Studies have found that hydrogel IOL will form hydroxyapatite after implantation in the eye, so its clinical application has been gradually reduced [15].

3.2. Surgical Factors

Some scholars believe that viscoelastic agent, perfusion fluid and anterior lens capsule staining agent used in cataract surgery can lead to IOL calcification. Werner [16] reported for the first time the early blue-like changes after hydrophilic acrylic IOL surgery, and experiments showed that it was caused by the dye used during the operation. Jensen MK *et al.* [17] believed that the phosphate in the viscoelastic agent may react with some components in the IOL and calcium in the perfusate and aqueous humor or active ions in other preparations, resulting in material deposition and IOL opacity. Hickman *et al.* [18] reported two cases of single-chip hydrophobic acrylic IOL injected into the anterior chamber, the IOL surface was immediately covered with deposits, and the deposits could not be completely removed by flushing/aspiration. Subsequently, optical microscopy, scanning electron microscopy and energy dispersive X-ray spectroscopy were performed. Examinations such as analysis and other examinations suggested that the use of viscoelastic agents during surgery may be the cause of IOL opacity, supporting the former view. However, some scholars believe that the main cause of

IOL opacity is the IOL itself, which is not necessarily related to the individual factors of the patient, the operation, the perfusion fluid and viscoelastic agent used during the operation [19].

In addition, some studies have found that other surgical factors can also cause IOL opacification. Gartaganis *et al.* [20] proposed that residual lens cortex may lead to calcification and opacity of IOL after experimental analysis of opaque IOL. Vitrectomy combined with intraocular injection of gas or silicone oil can lead to IOL opacity, which may be caused by direct contact between IOL and intraocular air or silicone oil [21] [22].

3.3. Patient Factors

Some scholars believe that patients with hypertension, diabetes, uveitis or previous vitreoretinal surgery are more likely to have IOL opacity, which may be related to the damage of the intraocular blood aqueous barrier [10].

In some large sample studies abroad, it was found that patients with IOL opacity were mostly complicated with systemic diseases or metabolic diseases such as hypertension and diabetes. In Gurabardhi *et al.* [8], 63 cases of IOL opacity were studied. Patients with hypertension accounted for 52% and patients with diabetes accounted for 22.5%. Other scholars have studied 90 cases of 10 L turbidity, 63.3% of patients with hypertension and 31.1% of patients with diabetes [23]. However, statistical analysis showed that 10 L turbidity was not associated with these two systemic diseases. This is consistent with the conclusion of Scherer *et al.* [24].

Colin *et al.* [25] found that the incidence of IOL flare-like opacity in patients with glaucoma was more than 80%, and the proportion of severe evaluation was 49.1%. The results showed that there was a potential correlation between the occurrence and severity of IOL opacity and glaucoma, which may be related to the change of aqueous humor composition or the use of anti-glaucoma drugs in glaucoma patients. Sharon *et al.* [26] immersed the same type of IOL in six different intraocular pressure lowering drugs in the experiment, and used the balanced salt solution as the control group to observe the opacity or color change of the IOL. The results showed that there was no color change in the IOL immersed in the balanced salt solution, and the IOL in the two solutions containing brimonidine tartrate/timolol maleate mixture and brimonidine tartrate changed yellow. The color change of the former is more obvious than that of the latter. The IOL immersed in two solutions containing dozoamine and dozoamine/timolol maleate mixture showed brown opacity, and the former was more significant than the latter.

4. Conclusion

At present, there is no unified conclusion on the etiology and mechanism of IOL opacity. This patient is the first case of IOL opacity in our hospital. The specific reason is unclear. It is considered to be related to the IOL material. However, there is a lack of sufficient sample size for statistical analysis. IOL opacity can seriously

affect vision, and it is also difficult to diagnose and treat. At present, the most effective treatment for this disease is IOL replacement. However, IOL opacity is sometimes easily confused with after the cataract, especially under the small pupil. After cataract opacity occurs in the posterior capsule, only YAG laser treatment is needed. The former is the opacity of the IOL itself, and IOL replacement is needed to improve visual function when the vision is seriously affected. Li Zhaochun [27] reported a patient with IOL opacity who was misdiagnosed with posterior capsular opacification and underwent YAG laser treatment, resulting in posterior capsulotomy, resulting in capsular instability during IOL replacement, which will increase the difficulty and risk of IOL replacement. It has even been reported that YAG laser can aggravate the opacity of IOL [28]. Therefore, it is very important to distinguish IOL opacity from posterior capsular opacification. Misdiagnosis will affect the formulation of follow-up treatment plans and may increase the difficulty of intraoperative treatment. Therefore, it is very important for the early and correct diagnosis of IOL opacity. We should examine carefully under the slit lamp microscope after mydriasis as far as possible, and the diagnosis can be generally confirmed.

Consent

Informed consent was obtained from the patient for this case report.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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