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Strategies for Preserving Vision in Secondary Glaucoma Post Congenital Cataract Surgery

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Abstract

Congenital cataract is an eye disorder in the form of impaired lens transparency due to cloudiness that appears at birth or immediately after birth. Post-congenital cataract surgery requires regular monitoring to prevent complications that can reduce visual function. Therefore, this case report aims to describe the incidence of secondary glaucoma in patients with aphakia after congenital cataract surgery with uncontrolled post-operative monitoring regularly. A 4-year-old boy patient was brought by his parents with complaints of reappearance of white spots in the left eye which had become increasingly widespread in the last 2-3 months. Complaints accompanied by a feeling of glare in bright places. The patient's parents said the patient could not focus on seeing objects around him. The patient had a history of congenital cataract surgery in both eyes 2 years ago and did not have routine follow-up after cataract surgery. Congenital cataract is a lens clouding that can occur unilaterally or bilaterally when the child is born or immediately after birth. If monitoring is not carried out routinely, the most common condition that occurs in aphakic after congenital cataract surgery is secondary glaucoma. Regular monitoring after congenital cataract surgery is necessary to achieve successful management and prevent complications.

1. Introduction

Cataract is an eye disorder which causes blindness due to clouding of the eye lens so that preventing the light to reach retina [1]. According to the World Health Organization (WHO), cataract is the main cause of blindness that occurs around 65.2 million people in the world. About 51% of blindness is caused by cataract and a major factor of poor vision in developing countries. The prevalence of cataract in those aged over 40 years are 11.8%-18.8% [2]. Cataract is not only a disease of the elderly, but cataract also occur in children [3, 4].

Management of pediatric cataract requires comprehensive ocular evaluation and appropriate timing of surgical intervention. After surgery, long-term monitoring is required to prevent major complications such as posterior capsular opacification (PCO) and secondary glaucoma [5]. Glaucoma is a progressive optic neuropathy with characteristic structural changes and visual field damage [6]. This condition could be accompanied by an increase of intraocular pressure [7]. Glaucoma is the second cause of blindness in the world after cataract [8]. In a study by Murphy, et al [9], it was found that the highest incidence of secondary glaucoma

occurred in patients with a bilateral aphakic and a corneal diameter of the eyes <9.5 mm [5].

In the management of pediatric glaucoma, interventions to lower intraocular pressure (IOP) encompass surgical procedures, medications, and laser therapy, with a particular emphasis on cyclophotocoagulation. The choice of treatment depends on the type of glaucoma and the condition of the anterior chamber angle. Medications are commonly employed prior to surgical interventions, especially in cases of secondary glaucoma with open angles. Surgical approaches can be categorized into those that enhance the natural drainage of aqueous humor (angle surgery), establish an alternative drainage pathway for aqueous humor (trabeculectomy and glaucoma drainage device), and reduce aqueous production by targeting the ciliary body through methods such as cyclophotocoagulation [10].

Despite several available options for management of pediatric glaucoma, the prognosis is often sub-optimal. People with history of glaucoma in childhood have a reduced quality of life [11]. Visual prognosis depends on the initial disease presentation, promptness of interventions, and the extent of structural damage at presentation (the extent of optic nerve damage, corneal damage, amblyopia, and progressive refractive errors) [10].

The risk factors that play role the most in this case are the occurrence of congenital cataract in the patient and low compliance with re-control. Successful management of pediatric cataract depend on routine control pasca surgery in monitoring visual function [5]. Therefore, it is important to educate that the management of this patient is not limited to surgery, but further monitoring is needed to reduce the risk of complications. This case report aims to describe the incidence of secondary glaucoma in patients with aphakia after congenital cataract surgery with uncontrolled post-operative monitoring regularly.

2. Cases

A 4-year-old boy was brought by his parents to the Pediatric Ophthalmology Polyclinic Dr. Zainoel Abidin General Hospital (RSUDZA) with complaints of a white spot in the patient's left eye. The parents said that this white spot had become increasingly clear in the last 2-3 months. The complaints accompanied by a feeling of glare in bright places. The patient's parents also said that the patient could not focus on seeing objects around him. There was no history of trauma. Patient with a history of congenital cataract surgery in both eyes 2 years ago. After cataract surgery, the patient did not control routinely as recommended by the ophthalmologist. The family members did not have complaints similar to the patient. The patient had congenital cataract since the age of 4 months and Patent Ductus Arteriosus (PDA), a congenital disorder of heart. Patient also experience global development delay. At this time, the patient could not speak and his parents feel that the patient's interaction poorly with the people around him. The patient was able to walk from the age of 3 years and 6 months. The patient is the fifth out of five siblings. The mother did not routinely perform antenatal care (ANC). During pregnancy, the mother never experienced symptoms of rash and fever and did not take medication. The patient was born at term normally at the Indrapuri Community Health Center, Aceh Province, with a birth weight of 1500 grams. When the patient was born, he immediately cried loudly and no cyanotic throughout his body. There was no history of Neonatal Intensive Care Unit (NICU) admission after birth.

Physical examination was conducted on October 11th 2023 under general anaesthesia, the right eye was found having a calm conjunctiva, clear cornea, corneal diameter of 10 mm, deep anterior chamber, round pupil, aphakic, visible primary posterior capsulotomy (PPC) hole, and without any visual axis opacity (VAO) (Figure 1a). Meanwhile, in the left eye, the conjunctiva was hyperemia, the cornea was cloudy and the cornea diameter was 14 mm, the anterior chamber had a shallow impression, and other structures were difficult to assess (Figure 1b). Intraocular pressure using Perkins IOP was obtained from the right eye of 18 mmHg and the left eye of 30 mmHg. Then, the patient's left eye underwent trabeculectomy + 5-fluorouracil (5-FU) on October 11th, 2023 (Figure 2). The patient was given post-operative medication in the form of systemic antibiotics, topical antibiotics, analgesics, and a combination of topical antibiotics and corticosteroids.

3. Discussions

Congenital cataract requires surgery to clear the visual axis [12]. Posterior capsulotomy and anterior vitrectomy are important to reduce posterior capsule opacification. Anterior vitrectomy is recommended until 4–8 years of age, which considered the cooperative age for laser procedures such as; neodymium, yttrium, aluminum, and garnet (Nd:YAG) [13]. In this patient, aspiration irrigation (AI), primary posterior capsulotomy (PPC), and anterior vitrectomy (AV) were performed. PPC causes communication between the anterior segment of the eye and the posterior segment of the eye so that the vitreous can fill the anterior chamber and the vitreous can push against the corner of the anterior chamber, resulting a secondary glaucoma in aphakic conditions.

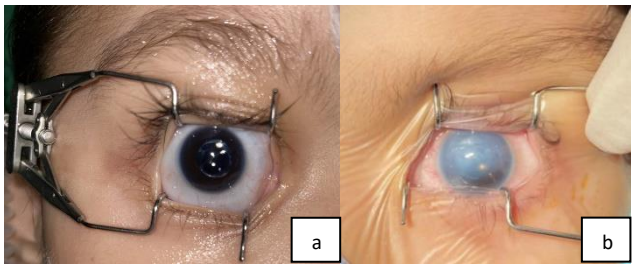

Figure 1. The right eye (1a) and the left eye (1b) on Examination under Anaesthesia (EUA).

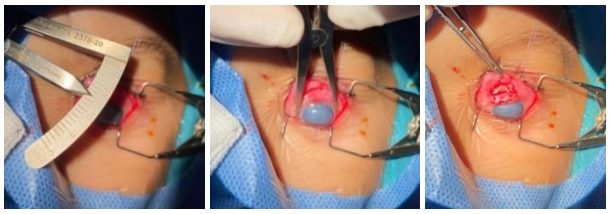

Figure 2. Trabeculectomy + 5-fluorouracil (5-FU) in the left eye.

This patient did not perform intraocular lens (IOL) implantation because the corneal diameter was smaller, about 9 mm. Based on the literature, IOL implantation is not recommended for pediatric cataract with microcorneas (corneal diameter < 9 mm). IOL implantation is recommended for corneal diameters > 9.5 mm [14]. IOL implantation before 7 months of age is considered to have a high risk of postoperative complications, such as inflammation, PCO, and glaucoma. A meta-analysis showed that primary IOL implantation in children under 2 years of age resulted in better visual acuity compared with aphakic and contact lens wear, but increased the incidence of PCO [12]. Foreign bodies such as IOLs will induce an inflammatory reaction immediately after surgery in the anterior chamber, which includes multinucleated leukocytes, giant cells, and fibroblasts [15]. The presence of an IOL does not prevent posterior migration of the epithelium and fibrous metaplasia [16]. Therefore, monitoring for glaucoma is mandatory for every child that conducting early cataract surgery. However, this case post-operative monitoring was still lacking.

The absence of the crystalline lens (aphakic condition) poses a risk of obstructing the corner of the eye chamber through vitreous changes that alter the structure and maturation of the trabecular meshwork [17]. Various theories attempt to explain the obstruction of the anterior chamber corner. The initial theory suggests that a chemical component in the vitreous (toxicity to the trabecular meshwork) gains access to the trabecular meshwork in the aphakic eye. In phakic conditions, the anterior hyaloid surface is robust (Weigert's ligament) and impermeable, preventing or minimizing the entry of chemical components into the trabecular meshwork. In eyes with primary IOL implantation, the IOL similarly hinders the access of chemical components to the anterior chamber. In aphakic conditions, even if the posterior capsule and anterior hyaloid surface remain intact during surgery, the obstruction needs to be eliminated to clear the visual axis due to the swift opacification of the posterior capsule. This facilitates the entry of chemical components into the trabecular meshwork. The second theory is a mechanical one, suggesting that aphakic conditions may lead to the disorganization or collapse of the trabecular meshwork, resulting in a reduction of its function as a filter and an active metabolic network [18].

Late onset open-angle glaucoma is the most prevalent form of glaucoma following congenital cataract surgery, constituting 75.0%–93.8% of cases. The development of glaucoma in individuals who are aphakic or pseudophakic after congenital cataract surgery is influenced by various factors. These include the age at the time of surgery, pre-existing eye conditions, the type of cataract, and the impact of lens particles, lens proteins, inflammatory cells, and residual lens material. Additionally, factors such as microcornea, secondary diseases, chronic postoperative inflammation, the type of lensectomy procedure or instrumentation used, pupillary block, and the duration of postoperative observation can affect the likelihood of glaucoma occurring after pediatric cataract surgery [16–18]. The removal of the lens may result in decreased tension in the zonules, reducing traction on the trabecular meshwork and potentially leading to a reduction in anterior chamber dimensions and hindering outflow [19].

In this case, trabeculectomy + 5-fluorouracil (5-FU) was performed which aims to reduce eye pressure. In trabeculectomy, a fistula was formed between the anterior chamber and the subconjunctival space, so that the aqueous humor entering the filtration bleb and absorbed into the surrounding structures. 5-FU as an antimetabolic agent to modulate the postoperative healing response by preventing rapid activation, proliferation and migration of fibroblasts in pediatrics thereby preventing re-closure of fistula that have formed. After the procedure, the patient was given medication in the form of systemic antibiotics, topical antibiotics, analgesics, and a combination of topical antibiotics and corticosteroids. Systemic and topical antibiotics were used as prophylactic agents to prevent postoperative infections. Analgesics were given as anti-pain and a combination of topical antibiotics and corticosteroids act as anti-inflammatory after surgery [20, 21].

4. Conclusions

Regular routine monitoring after congenital cataract surgery is very important in reducing the complications including PCO, secondary glaucoma, and inflammation for the overall success of congenital cataract management and preventing short-term and long-term complications. This is still a difficult challenge in facing patients with low education, socio-economic, and long distances to hospital for controlling because it requires cooperation and compliance from the patient's family.

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References

1. Imelda, E., Siti Rain Jannah, Sarra Mutiara Adev, and Toshniwal, N. S. (2023). Complexity of Handling Posterior Subcapsular Cataract Case, *Heca Journal of Applied Sciences*, Vol. 1, No. 1, 14–18. doi:10.60084/hjas.v1i1.13.
2. Chen, X., Xu, J., Chen, X., and Yao, K. (2021). Cataract: Advances in surgery and whether surgery remains the only treatment in future, *Advances in Ophthalmology Practice and Research*, Vol. 1, No. 1, 100008. doi:10.1016/j.aopr.2021.100008.
3. Imelda, E., Jannah, R., Jannah, S. R., Adev, S. M., and Toshniwal, N. S. (2023). Challenges in Hypermature Senile Cataract with Intracapsular Cataract Extraction for Wide Zonular Dehiscence: A Case Study, *Indonesian Journal of Case Reports*, Vol. 1, No. 1, 10–14. doi:10.60084/ijcr.v1i1.70.
4. Imelda, E., Fitria, U., Mutia, U. P., Syahrul, S., Sari, M. D., Adev, S. M., and Adev, A. M. (2023). Hippobroma longiflora L Leaves as a Natural Inhibitor of Cataract Progression: An Ethanol Extract Analysis, *Grimsa Journal of Science Engineering and Technology*, Vol. 1, No. 2, 40–51.
5. Nischal, K. K., and Medsinge, A. (2015). Pediatric Cataract: Challenges and Future Directions, *Clinical Ophthalmology*, 77. doi:10.2147/OPTH.S59009.
6. Jiang, J., Ye, C., Zhang, C., Lin, Z., Tang, Y., Ye, W., Xu, X., Zhang, S., Lu, F., and Liang, Y. (2023). The Patterns of Visual Field Defects in Primary Angle-Closure Glaucoma Compared to High-Tension Glaucoma and Normal-Tension Glaucoma, *Ophthalmic Research*, 940–948. doi:10.1159/000530175.
7. Riordan-Eva, P., and Augsburger, J. J. (2018). *Vaughan & Asbury's General Ophthalmology*, McGraw-Hill Education, New York.
8. Ma, P., Liu, Y., Su, Y., and Yang, Y. (2023). Vision-Related Quality of Life in Primary Angle-Closure Glaucoma Patients with or without Visual Field Dysfunction, *Journal of Ophthalmology*, Vol. 2023, 1–6. doi:10.1155/2023/9981060.
9. Murphy, M., Murtagh, P., McAnena, L., Eldouri, A., Kirwan, C., and O'Keefe, M. (2020). Secondary glaucoma and visual axis opacification in aphakic and pseudophakic patients following congenital cataract surgery: A 28-year longitudinal case series, *European Journal of Ophthalmology*, Vol. 30, No. 6, 1370–1380. doi:10.1177/1120672119862878.
10. Shen, R., Li, V. S. W., Wong, M. O. M., and Chan, P. P. M. (2023). Pediatric Glaucoma—From Screening, Early Detection to Management, *Children*, Vol. 10, No. 2, 181. doi:10.3390/children10020181.
11. Lingham, G., Thakur, S., Safi, S., Gordon, I., Evans, J. R., and Keel, S. (2022). A systematic review of clinical practice guidelines for childhood glaucoma, *BMJ Open Ophthalmology*, Vol. 7, No. 1, e000933. doi:10.1136/bmjophth-2021-000933.
12. Qadir, A., Naeem, S., Khan, T. A., Khan, U. N., Liaqat, T., and Butt, W. R. (2023). Infective Etiologies in Patients with Bilateral Congenital Cataract, *Pakistan Armed Forces Medical Journal*, Vol. 73, No. SUPPL-2, S304-07. doi:10.51253/pafmj.v73iSUPPL-2.10392.
13. Tătaru, C.-I., Tătaru, C.-P., Costache, A., Boruga, O., Zemba, M., Ciuluvică, R. C., and Sima, G. (2020). Congenital cataract – clinical and morphological aspects, *Romanian Journal of Morphology and Embryology*, Vol. 61, No. 1, 105–112. doi:10.47162/RJME.61.1.11.
14. Al Shamrani, M., and Al Turkmani, S. (2012). Update of intraocular lens implantation in children, *Saudi Journal of Ophthalmology*, Vol. 26, No. 3, 271–275. doi:10.1016/j.sjopt.2012.05.005.
15. Lenhart, P. D., and Lambert, S. R. (2022). Current management of infantile cataracts, *Survey of Ophthalmology*, Vol. 67, No. 5, 1476–1505. doi:10.1016/j.survophthal.2022.03.005.
16. Zhang, Z., Fu, Y., Wang, J., Ji, X., Li, Z., Zhao, Y., Chang, P., and Zhao, Y. (2022). Glaucoma and risk factors three years after congenital cataract surgery, *BMC Ophthalmology*, Vol. 22, No. 1, 118. doi:10.1186/s12886-022-02343-9.
17. Alaa, M. I., Hamied, F. M., and Al-Hasani, K. F. (2022). The prevalence of secondary glaucoma after congenital cataract surgery and associated risk factors in a Tertiary Center in Iraq, *Ophthalmology Journal*, Vol. 7, 219–226. doi:10.5603/OJ.2022.0032.
18. Zhang, S., Wang, J., Li, Y., Liu, Y., He, L., and Xia, X. (2019). The role of primary intraocular lens implantation in the risk of secondary glaucoma following congenital cataract surgery: A systematic review and meta-analysis, *PLOS ONE*, Vol. 14, No. 4, e0214684. doi:10.1371/journal.pone.0214684.
19. Yang, K., Liang, Z., Lv, K., Ma, Y., Hou, X., and Wu, H. (2022). Anterior Segment Parameter Changes after Cataract Surgery in Open-Angle and Angle-Closure Eyes: A Prospective Study, *Journal of Clinical Medicine*, Vol. 12, No. 1, 327. doi:10.3390/jcm12010327.
20. Nadeem, S. (2021). Subconjunctival Bevacizumab as an Adjunct to 5-Fluorouracil Enhanced Trabeculectomy: 1 Year Outcomes, *Pakistan Journal of Ophthalmology*, Vol. 37, No. 3. doi:10.36351/pjo.v37i3.1159.
21. Zhang, Y., Song, Y., Zhou, Y., Bai, B., Zhang, X., and Chen, W. (2023). A Comprehensive Review of Pediatric Glaucoma Following Cataract Surgery and Progress in Treatment, *Asia-Pacific Journal of Ophthalmology*, Vol. 12, No. 1, 94–102. doi:10.1097/APO.0000000000000586.