• Letter to the Editor •

Secondary in-the-bag intraocular lens implantation combined with 120- and 360-degree goniotomy in glaucoma following congenital cataract surgery: a case report

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Dear Editor,

Glaucoma following cataract surgery (GFCS) is one of the most sight-threatening postoperative complications of pediatric cataract surgery, and often becomes refractory to medical treatment[1]. Goniotomy has been an increasingly popular procedure for primary open angle glaucoma and primary angle-closure glaucoma with 120-, 240-, or 360-degree[2]. The 120-degree goniotomy and 360-degree goniotomy (gonioscopy and microcatheter-assisted transluminal trabeculotomy; GATT) have been reported effective for childhood glaucoma[3-4]. Constantly, conventional glaucoma surgery, including trabeculectomy and glaucoma drainage device (GDD) implantation would be followed by secondary intraocular lens (IOL) implantation for aphakic eyes with GFCS separately, and there was only one study which reported GDD implantation combined with secondary IOL implantation[5]. We report the successful performance of bilateral secondary IOL implantation combined with goniotomy, 120- and 360-degree respectively, in aphakic eyes with GFCS. Our report may provide new insight into the treatment of GFCS. This is the first time to perform goniotomy combined with secondary IOL implantation in pediatric aphakic eyes with GFCS, which can reduce the need for second surgery and anesthesia. In addition, 120-degree goniotomy is simpler and quicker comparing with GATT, though both were effective in GFCS. Therefore, we recommend 120-degree goniotomy when combining with secondary IOL implantation.

Ethical Approval This study was approved by the Institutional Review Board of Sun Yat-sen University-Zhongshan Ophthalmic Center-Institutional Review Board (Approval number: 2021KYPJ194). Written informed consent to participate and allow publication was obtained from the guardian of the patient.

CASE REPORT

A 4-year-old patient who was diagnosed with bilateral congenital cataracts underwent bilateral cataract extraction when he was 11 months old. At 33mo after cataract extraction, the intraocular pressure (IOP) of the left eye (OS) elevated to 28.0 mm Hg and the IOP of the right eye (OD) was 15.5 mm Hg with rebound tonometry (ICare PRO; ICare, Helsinki, Finland) in sitting position and in the absence of anesthesia. A β-receptor blocker was used to control IOP. However, the IOP elevated to 30.3 mm Hg OD and 27.0 mm Hg OS after 7mo, which revealed a poor control of IOP. Direct ophthalmoscopy revealed an enlarged cup-to-disc ratio of 0.6 in both eyes (OU) compared with 0.4 OU 1 year ago. Axial length increased with 2.6 mm OD and 2.0 mm OS comparing with that of 1 year ago, which outpaced normal growth. Central corneal thickness was 556 μm OD and 536 μm OS. Based on Childhood Glaucoma Research Network diagnostic criteria[6], the patient was diagnosed as bilateral GFCS[6]. Then 120-degree goniotomy with a Tanito microhook with secondary IOL implantation OD and GATT with secondary IOL implantation OS were scheduled.

Surgical Procedure The 120-degree goniotomy combined with secondary in-the-bag IOL implantation were performed in the right eye. With gonioscopy, the angle was wide and

open, and the functional trabecular meshwork was visible under gonioscopy. Minimal iris processes were seen inserting onto the scleral spur or trabecular meshwork. The scleral spur was visible through the gap between processes (Figure 1A). First, a cystotome was inserted at the outer edge of the fibrous membrane and gently hooked towards the center. Then, capsulorhexis forceps were used to grasp the separated fibrous flap, which was peeled off with the continuous curvilinear capsulorhexis technique, resulting in separation of the fibrous membrane from the edges of the anterior and posterior capsule opening. Next, an irrigation/aspiration device was used to remove the cortical material followed by an opened capsular bag. Finally, a one-piece IOL was implanted into the capsular bag (Figure 2A-2F). After IOL implantation in the bag, Tanito microhook was used to incise the inner wall of Schlemm's canal, reaching to 120-degree without intraoperative complications.

The 360-degree goniotomy combined with secondary in-the-bag IOL implantation were performed in the left eye. The anterior chamber angle structure is as the same as the right eye (Figure 1B). GATT was performed as described as follow. In brief, after incising a section of the inner wall of Schlemm's canal, the microcatheter was inserted into the Schlemm's canal and passed circumferentially around the entire canal. The two ends of the microcatheter were fixed and retrieved within the chamber using microsurgical forceps. Then, an IOL was implanted in the capsular bag with the same procedure as the right eye. Massive anterior chamber hemorrhage occurred during the surgery.

At 1d postoperatively, the IOP was 11.3 mm Hg OD and 8.4 mm Hg OS, and a 3 mm hyphema was presented on the GATT-performed left eye (Figure 3A, 3B). At 3d postoperatively, the hyphema of the left eye was almost absorbed and had turned to blood clot (Figure 3C, 3D). After 2wk, hyphema of left eye was absorbed completely, while IOP elevated to 21 mm Hg OD and 37 mm Hg OS. The use of topic corticosteroids was stopped bilaterally, and two topical IOP-lowering medications were applied to the left eye. At 1mo postoperatively, the IOP was controlled without IOP-lowering medication (14.0 mm Hg OD, 15.0 mm Hg OS), which was retained until the last follow-up at 12mo postoperatively (14.0 mm Hg OD, 13.0 mm Hg OS). The IOLs of bilateral eyes were well-centered (Figure 3E, 3F).

DISCUSSION

This case report presented bilateral aphakia with GFCS treated with secondary in-the-bag IOL implantation combined with goniotomy of different degrees bilaterally. After follow-up visits over 12mo, the IOP controlled without IOP-lowering medication and IOLs of bilateral eyes were well-centered. As far as we know, this is the first report of goniotomy combined with secondary IOL implantation to treat pediatric aphakic patients with GFCS.

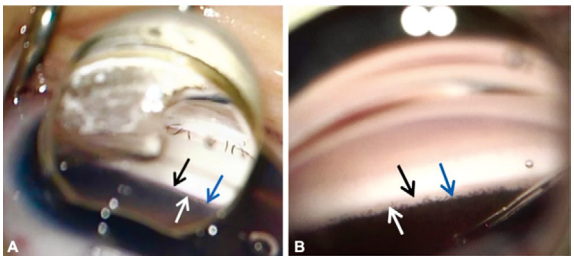

Figure 1 Intraoperative image of anterior chamber angle structure A: Right eye; B: Left eye. Both eyes' angles were wide and open. The black arrows indicate the functional trabecular meshwork. The white arrows indicate the scleral spur. The blue arrows indicate the iris processes inserting onto the scleral spur or trabecular meshwork.

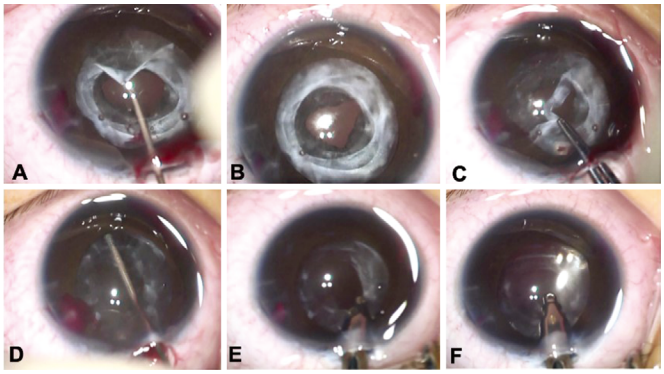

Figure 2 The secondary in-the-bag IOL implantation with capsular bag reopening surgical procedure A: A fibrous membrane was seen stridden over the anterior-posterior-capsulotomy edges; B: A cystotome was inserted at the outer edge of the fibrous membrane and gently hooked towards the center; C: A capsulorhexis forcep was used to grasp the separated fibrous flap, which was peeled off with the continuous curvilinear capsulorhexis technique; D: Hydrodissection was performed; E: An irrigation/aspiration (I/A) device was used to remove the cortex followed by an opened capsular bag; F: Ocular viscoelastic device was removed following in-the bag IOL implantation. IOL: Intraocular lens.

GDD implantation is the most widely used surgery for GFCS currently[7]. However, endothelial cell loss is a persistent long-term complication following GDD implantation that continues to increase with time, especially in children[8]. Comparing with GDD implantation, goniotomy has the benefit of avoiding intraocular implants and does not require antimetabolites, that is to say, failure due to increased fibrotic activity and rapid wound healing response in younger patients[9] and endothelial cell loss following GDD implantation may be avoided. In addition, 120-degree goniotomy with Kahook dual blade for treating GFCS was reported in one case report[3] and GATT was reported in limited cases[4,10]. Therefore, goniotomy may be an appropriate treatment for GFCS in pediatric patients. Until now, studies showed no significant difference in IOP reduction between 120- and 360-degree goniotomy[11-14], which were both effective in our case.

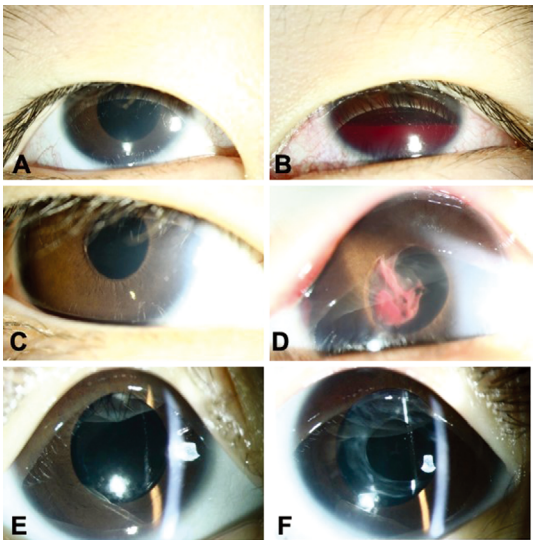

Figure 3 Postoperative images of the anterior segment A, C, E: Right eye. A: Clear anterior chamber of the right eye at 1d postoperatively; C: Clear anterior chamber of the right eye at 3d postoperatively; E: Clear anterior chamber with well-centered IOL of the right eye at 1mo postoperatively (dilated pupil). B, D, F: Left eye. B: Hyphema of the left eye at 1d postoperatively; D: Blood clot on the surface of the IOL of the left eye at 3d postoperatively; F: Clear anterior chamber with well-centered IOL of the right eye at 1mo postoperatively (dilated pupil). IOL: Intraocular lens.

Constantly, conventional glaucoma surgery is followed by secondary IOL implantation for aphakic eyes with GFCS separately. As a previous study reported, there are cases who underwent secondary IOL implantation and GDD implantation[5]. However, it increased massive surgical time and technical difficulty due to complexity of GDD implantation, while goniotomy is relatively simple and quick, especially 120-degree. The 120-degree goniotomy combined with secondary IOL implantation increase a small amount of surgical time and technical difficulty but offers a dual advantage of reducing the IOP and optical rehabilitation to pediatric aphakic patients with GFCS, which can reduce the need for reoperation and general anesthesia. Therefore, 120-degree goniotomy combined with secondary IOL implantation may be an appropriate treatment for pediatric aphakic patients with GFCS.

Hyphema is the most common postoperative complication of goniotomy and is significantly more likely in 360-degree than 120-degree goniotomy. Hyphema also occurred in the left eye of our case with GATT, though it absorbed completely in the short term postoperatively. During the operation, IOL implantation was performed before goniotomy OD, with the opposite sequence OS. At the time of surgery in the left eye, massive hyphema after GATT distracted IOL implantation. Therefore, we suggest that IOL implantation should be performed followed by goniotomy during the combination surgery.

IOP spike is one of the common postoperative complications of goniotomy, which is mostly induced by the use of topical corticosteroids postoperatively[15]. However, due to the relatively severe postoperative inflammatory reaction of secondary IOL implantation in pediatric cataracts, topical corticosteroids are of the essence. Steroid-induced ocular hypertension also occurred in this case. The IOP lowered gradually following withdrawal of the topical corticosteroids. Therefore, rational use and adjustment of topical corticosteroids postoperatively is significant.

In conclusion, secondary IOL implantation combined with goniotomy is effective and safe in treating aphakic eyes with GFCS, which can reduce the need for second surgery and anesthesia. Though 120- and 360-degree goniotomy are both effective treatment in our case, 120-degree goniotomy is recommended when combined with secondary IOL implantation.

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Conflicts of Interest: Zhang Y, None; **Zhou Y,** None; **Song YH,** None; **Zhang XL,** None; **Chen WR,** None.

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