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Case Series

A case series on small incision cataract surgery + PMMA IOL with primary posterior capsulorrhexis: A safe and cheaper alternative in management of pediatric cataracts

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ABSTRACT

Pediatric cataracts, a significant cause of childhood blindness, present pronounced challenges in low-income countries where conventional phacoemulsification with hydrophobic foldable IOLs may be economically unfeasible. In resource-limited settings, the conventional method of employing phacoemulsification with hydrophobic foldable IOLs is often impractical. This case series explores an economically pragmatic alternative, centering on Small-incision cataract surgery (SICS) paired with rigid polymethyl methacrylate (PMMA) intraocular lenses (IOLs). This study delves into the visual outcomes of SICS with in-the-bag PMMA IOLs, Primary Posterior Capsulorrhexis (PPC), and anterior vitrectomy to mitigate Posterior Capsule Opacification (PCO) formation in the Visual Axis (VA). The evaluation, conducted at specific postoperative intervals spanning from Post-op Day 01 to the 6th month, provides a comprehensive understanding of the efficacy and safety of this approach. Findings underscore PMMA IOLs as both durable and cost-effective substitutes, with an emphasis on SICS with PPC as a reliable technique for cataract removal. This research delivers a practical solution to enhance visual outcomes, tackling the distinct challenges confronted in resource-limited settings and contributing to the broader global endeavor to alleviate preventable childhood blindness.

1. Introduction

Pediatric cataracts are a primary cause of childhood blindness contributing to 7.4%–15.3% of childhood blindness and results in a substantial number of preventable disability-adjusted life years.[1] Its prevalence is notably higher in low-income countries (0.63-13.6 per 10,000) compared to high-income countries (0.42-2.05 per 10,000)[2] posing a significant challenge. Majority of cases (41%) are diagnosed during routine screening, while 24% of diagnoses result from leukocoria and 19% from strabismus.[1,2]

Phacoemulsification with foldable IOL (hydrophobic-acrylic) with primary posterior capsulorrhexis (PPC) + anterior vitrectomy to further reduce the incidence of PCO formation in the visual axis (VA) is the preferred technique.[2–4] As PCO formation occurs in nearly all cases following pediatric cataract surgery with or without IOL implantation.[5,6]

However, in underdeveloped or economically constrained regions; phacoemulsification with hydrophobic foldable IOLs is not practical due to cost constraints or limited resources. Cheaper hydrophilic foldable IOLs have higher rates of PCO formation. Thus, Small-incision cataract surgery (SICS) combined with rigid polymethyl

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methacrylate (PMMA) IOL with diameter of 12-12.5 mm and optic size of 5.5 mm, presents a viable and cost-effective option. PMMA lenses are durable and less expensive compared to foldable IOLs. Additionally, SICS with PPC, although a more traditional technique, can be an effective and safe method for cataract removal in resource-limited areas.

In this case series, we evaluated the visual outcome of pediatric cataract cases done by SICS with in-the-bag PMMA IOL with PPC & anterior vitrectomy as required under general anesthesia. Children with congenital ocular diseases like - coloboma, nystagmus, strabismus, any posterior segment pathology, congenital diseases, metabolic disorders, traumatic cataract were not included. They were followed up on Post-operative Day 01, 02, 03, 14 and 1^{st}, 3^{rd} & 6^{th} month.

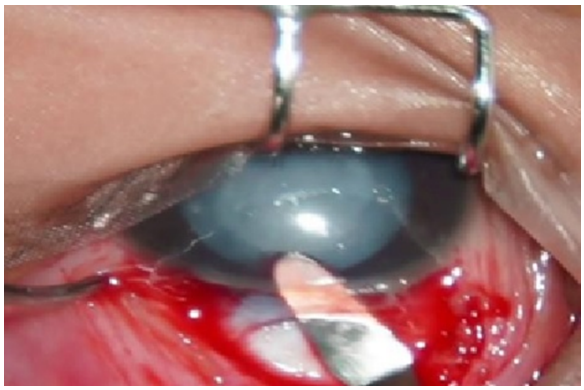

Figure 1:

2. Case Series

Written informed consent was taken from the parent/guardian of each participant before enrolling into the study (Consent form in english and local vernacular enclosed). Written informed consent with details of the surgical procedure was also taken from the guardian of each patient.

Surgery was done by a single surgeon. Eye drop Tropicamide 0.8% + Phenylephrine 5%, Moxifloxacin 0.5% and 5% betadine given before surgery. 5.5 mm corneo-scleral tunnel made 2 mm from the superior limbus. (Figure 1) Sideport entry done, trypan blue & HPMC 2% was used in all cases. Anterior capsulorrhexis (5 – 5.5 mm) with a bent cystitome & nucleus removed via viscoexpression after hydrodissection. After cortical cleanup using 23G Simcoe cannula, Primary posterior capsulorrhexis is done using capsulorrhexis forceps after inflating the bag with HPMC 2% (Figure 2). Anterior vitrectomy was done in required cases where the anterior vitreous phase was disturbed. PMMA IOL (12-12.5mm, Optic size < 5.5mm) was inserted using lens-in-bag method without primary optic capture. Through viscoremoval was done & sideport sealed by stromal hydration. Each tunnel was sutured (Figure 8) with a 10-0 ethilon suture. (Figure 3)

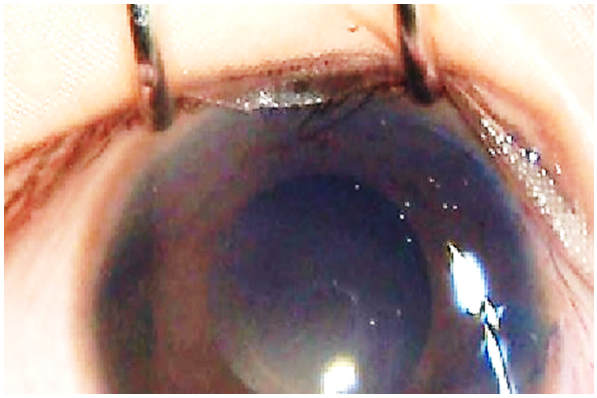

Figure 2:

Amblyopia therapy and spectacle correction was started for every case as necessary.

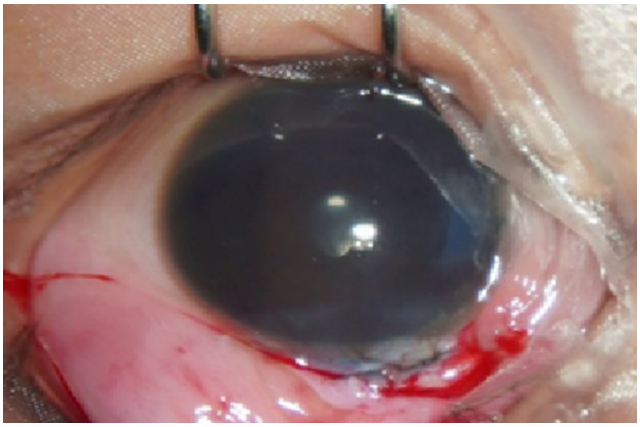

Figure 3:

2.1. Case 1

3-year child with bilateral zonular cataract. Preop visual acuity – doesn't follow light source, PL (+). Post-op Day 01 showed wound site healthy & no significant findings. IOL remained in situ with VA clear till 6^{th} month follow-up, visual acuity = follows objects and light source.

2.2. Case 2

5-year child with unilateral zonular cataract.(Figures 4 and 5) Preop visual acuity – HM (+). Post-op Day 1 -14, wound site healthy, no significant findings. IOL remained in situ with VA clear till 6^{th} month follow-up (Figure 6), visual acuity = 6/12.

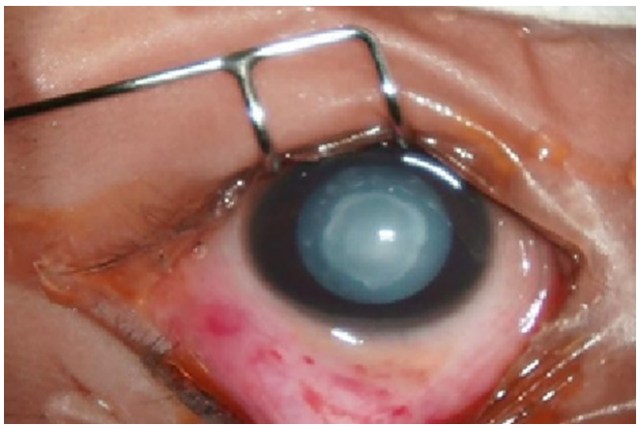

Figure 4:

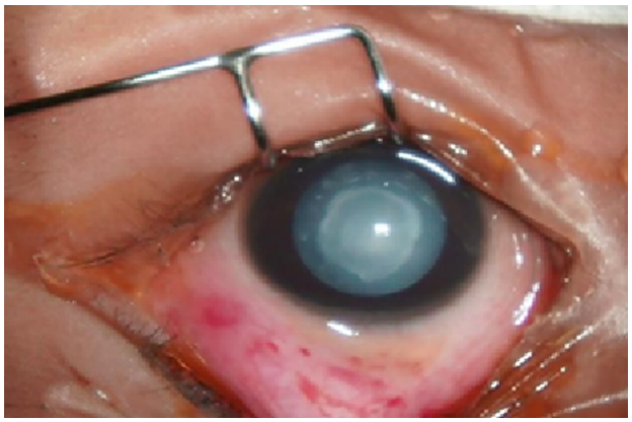

Figure 5:

2.3. Case 3

4-year child with bilateral total cataract. (Figures 7 and 8) Preop visual acuity – doesn't follow light source, PL (+). Post-op Day 01 showed Wound site healthy & mild iritis, resolved by Day 14. IOL remained in situ with VA clear till 6^{th} month follow-up, visual acuity = follows objects and light source.

2.4. Case 4

5-year child with unilateral cortical cataract. Preop visual acuity – 1/60. Post-op Day 01, wound site healthy, no significant findings. IOL remained in situ with VA clear till 6^{th} month follow-up, visual acuity = 6/9.

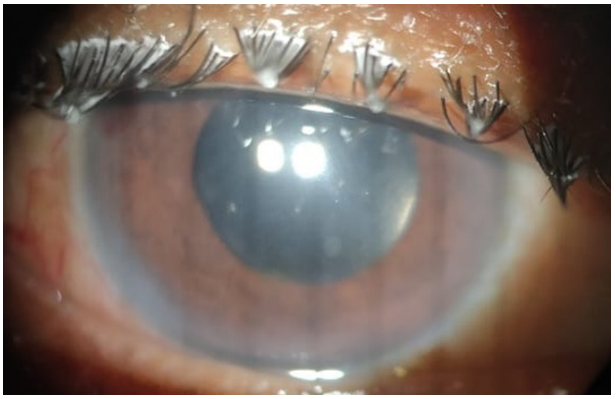

Figure 6:

Figure 7:

Figure 8:

2.5. Case 5

8-year child with bilateral total cataract. Preop visual acuity – HM (+). Post-op Day 01 showed wound site healthy, mild iritis, corneal haze and IOL decentration. IOL repositioning was done on Day 03. (Figure 9) Subsequently, there was moderate iritis which resolved by Day 14.; wound site healthy, IOL remained in situ with VA clear till 6^{th} month follow-up, visual acuity = 6/18.

2.6. Case 6

The same child (Case 05) was operated for the other eye. Preop visual acuity – HM (+). Post-op Day 01, wound site healthy, no significant findings. IOL remained in situ with VA clear till 6^{th} month follow-up, visual acuity = 6/18.

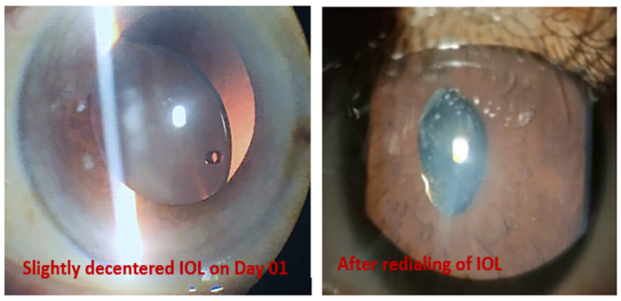

Figure 9:

2.7. Case 8

7-year child with bilateral zonular cataract. Preop visual acuity – FC (+) at 1m. Post-op Day 01 showed moderate iritis and corneal haze, resolved by Day 14. Wound site healthy. IOL remained in situ with VA clear till 6^{th} month follow-up, Visual acuity = 6/9.

2.8. Case 9

6-yr child with bilateral zonular cataract. Preop visual acuity – FC (+) at 2m. Post-operative Day 01 showed mild corneal haze, resolved by Day 03. Wound site healthy. IOL remained in situ with VA clear till 6^{th} month follow-up, visual acuity = 6/12.

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3. Discussion

Congenital cataract is one of the most common causes of visual impairment in children, after refractive error. It is estimated that paediatric cataract contributes to 7.4%–15.3% of preventable childhood blindness, varying country-wise and region-wise, with children in poor socio-economic conditions being more affected.[1,7,8] Paediatric cataract and subsequent amblyopia management is vital for the visual development of the child. Early surgical intervention is preferred as delay leads to amblyopia and poor visual outcome.

Management can be challenging for a surgeon intra-operatively as well as post-operatively because of potential immediate and long-term complications and the necessary long-term follow up required for adequate management of associated amblyopia.

The primary cause of visual axis opacity post-surgery is formation of Posterior Capsule Opacification (PCO) in children. Posterior capsule opacification (PCO) tends to develop quickly and is nearly unavoidable in very young children when the posterior capsule remains intact. In the context of very young children, there are certain factors that may contribute to a higher incidence of PCO.[2] One of the reasons is that the lens capsule of infants and young children has a higher regenerative capacity, leading to a more rapid development of opacification.[2] Zhang et al. reported that 100% of patients when posterior capsulorrhexis is left intact with 38.75% of patients affecting vision.[3]

The combination of cataract extraction, posterior capsule capsulotomy, and anterior vitrectomy has been recommended for pediatric patients with cataracts to proactively prevent the development of posterior capsule opacification (PCO) and eliminate the necessity for Nd:YAG laser treatment was originally introduced by Parks.[9] In 1983 & shown in subsequent studies.[10,11]

Grieshaber et al. reported Primary posterior continuous curvilinear capsulorhexis with anterior vitrectomy can effectively reduce the incidence of PCO, it may increase the postoperative inflammation in children and formation of proliferative membrane.[12] Also, Kaur et al. reported manipulation of vitreous body may lead to post-operative macular edema.[13]

Dholakia SA et al. reported a much higher incidence of post-operative inflammation after phacoemulsification and primary posterior capsulorrhexis and anterior vitrectomy attributed to long operation time, vitreous disturbance, and connection between vitreous and anterior chamber. SICS + PCIOL is associated with less vitreous disturbance and post-operative iritis.[14]

In our case series, small incision cataract surgery with PCIOL and primary capsulorrhexis of size 2 mm diameter was done in all cases. Out of 9 patients, 03 patients developed iritis, 3 patients developed corneal haze in post-op day 01 which resolved subsequently. 1 patient had decentered IOL which was repositioned.

4. Conclusion

Pediatric cataract poses a significant health burden in low-socioeconomic regions and its management is challenging in such conditions. This case series concludes that the surgical technique of SICS + PMMA IOLs, combined with primary posterior capsulorrhexis, provides satisfactory visual outcomes and offers a safe and cost-effective alternative for overcoming economic challenges in the management of pediatric cataracts.

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None.

6. Conflict of Interest

None.

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