



ORIGINAL ARTICLE

## A comparative study on intraoperative complication with posterior vitrectorhexis versus forcepsorhexis before implantation of intraocular lens in children.

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**ABSTRACT... Objective:** To compare intraoperative complications in manual posterior capsulorhexis (forcepsorhexis) and posterior vitrectorhexis, before implantation of the IOL in patients of paediatric cataract surgery. **Study Design:** Observational study. **Setting:** Department of Ophthalmology, Shaheed Mohtarma Benazir Bhutto Medical University Larkana. **Period:** July 2021 to June 2022. **Methods:** Our study included patients within the age range of 1-12 years who were diagnosed with congenital cataract and did not exhibit any other abnormalities in the anterior or posterior segments. A comprehensive ophthalmic and systemic examination was conducted, and the patients were categorized into two groups: Group A for Forceps Capsulorhexis and Group B for Posterior Vitrectorhexis. **Results:** There were a total of 154 cases of paediatric cataracts that underwent surgical procedures known as Posterior capsulorhexis (forcepsorhexis) and posterior vitrectorhexis. Both groups had participants with ages ranging from 1 year to 12 years, with a minimum age of 1 year. The mean age for the Forceps Capsulorhexis group was 6.1 + 1.8 years, while the mean age for the Posterior Vitrectorhexis group was 6.9 + 1.3 years. The outcomes during surgery showed that in the Forceps Capsulorhexis group, 60 patients (77.92%) had organization of the capsular bag, while in the Posterior Vitrectorhexis group, 49 patients (63.63%) had organization of the capsular bag. Additionally, 55 patients (71.42%) in the Forceps Capsulorhexis group experienced vitreous thrust into the anterior chamber, compared to 66 patients (85.71%) in the Posterior Vitrectorhexis group. **Conclusion:** The safety and effectiveness of Forceps capsulorhexis as a treatment for paediatric cataract surpasses that of the posterior vitrectorhexis procedure, as concluded by our study.

**Key words:** Cataract Surgery, Intraoperative Complications, Manual Posterior Capsulorhexis (Forcepsorhexis), Posterior Vitrectorhexis.

### INTRODUCTION

Cataract is the term used to describe the opacification of the crystalline lens. Our focus is on paediatric cataract, which can either be congenital or developmental in nature. It is a major contributor to visual impairment in children across the globe.<sup>1</sup> The global occurrence of congenital cataracts has been documented to be 1 in 10,000 to 15,000 children, with a prevalence of 1-4/10,000 in developing nations. In contrast, the incidence in industrialized countries is less than 1/10,000 children.<sup>2</sup> A Lenticular opacity in the visual axis that measures at least 3 mm in size is considered visually significant in cases

of Congenital Cataract. However, if the opacity is small or located in the peripheral part of the crystalline lens, it is deemed visually insignificant.<sup>3,4</sup> The visual system in children is underdeveloped, and if a visually significant cataract is not treated, it can lead to amblyopia. The surgical approach for pediatric cataract is distinct from that of adults, with a focus on addressing posterior capsular opacification and preventing amblyopia.<sup>5</sup> An unacceptably high rate of posterior capsular opacification is observed when the posterior capsule remains intact following the implantation of an Intraocular Lens (IOL) in children.<sup>6</sup> Posterior capsular opacification, also known as visual axes

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opacification, is caused by the migration of lens epithelial cells on the anterior vitreous, which acts as a scaffold. In children below 8 years of age, primary posterior capsulotomy and anterior vitrectomy are recommended.<sup>7</sup> There are two approaches for this procedure in the pediatric population: anterior limbal or posterior pars plana approach.<sup>8,9</sup>

There are two methods for performing posterior capsulotomy through the anterior (limbal) approach. The first method involves manual posterior capsulorhexis and anterior vitrectomy, while the second method involves posterior vitrectorhexis and anterior vitrectomy. It is possible to perform posterior capsulotomy using either of these techniques before or after the implantation of an intraocular lens (IOL).<sup>9</sup>

To ensure proper fixation of an IOL in the desired plane, posterior capsulorhexis and anterior vitrectomy are often performed. However, this method can make posterior capsular maneuvers and anterior vitrectomy more challenging due to scleral collapse and positive vitreous pressure, which can lead to the capsular bag being obliterated and difficulty in implanting the IOL. To address these issues, it is recommended to perform posterior capsulotomy and anterior vitrectomy prior to IOL implantation and use viscoelastic agents.<sup>10</sup> Performing an anterior vitrectomy following a posterior capsulotomy has the benefit of reducing the volume of vitreous and making it easier to implant an intraocular lens (IOL) in the bag. This procedure also helps maintain clarity of the eye's media. Additionally, the capsular bag can be kept expanded by injecting viscoelastic agents into an endobag.<sup>11</sup>

International studies have shown that there are two main techniques for performing posterior capsule opening: manual technique (capsulorhexis) and vitrector. In cases where more vitrectomy is needed, some surgeons opt for using the vitrector to create the opening. On the other hand, others prefer to perform manual primary posterior continuous curvilinear capsulorhexis using forceps (forcepsorhexis). The utilization of primary posterior continuous curvilinear

capsulorhexis enables the creation of an opening with a robust margin that can withstand peripheral tears and secures the vitreous in position. This technique facilitates a secure anterior vitrectomy and prevents unregulated expansion of the opening. Additionally, it is thought to produce a more durable margin than the vitrectorhexis, allowing for the IOL to be supported over the capsule.<sup>12,13,14</sup>

The complications encountered will be compared after manipulating the posterior capsule and anterior vitreous either through manual posterior capsulorhexis (forcepsorhexis) or posterior vitrectorhexis, without any risk of globe collapse, following the optimization of anterior chamber dynamics prior to IOL implantation.

## METHODS

This is an observational Study conducted at the Department of Ophthalmology, Shaheed Mohtarma Banazir Bhutto Medical University Larkana. The study was carried out with the approval of the institution's ethical committee (SMBBMU/OPHTH/152) (Dated: 23/11/2023), and written consent was obtained from the parents/guardian of the patients participating in the study.

Our study included patients within the age range of 1-12 years who were diagnosed with congenital cataract and did not exhibit any other abnormalities in the anterior or posterior segments. These patients were referred to our Paediatric Ophthalmology outpatient department for further evaluation. Patients with microcornea, corneal dystrophies, microphthalmos, traumatic cataract, subluxated/dislocated lens, congenital glaucoma, previous ocular surgery, uveitis, persistent fetal vasculature, and retinal detachment were not included in the study. A comprehensive ophthalmic and systemic examination was conducted, and the patients were categorized into two groups: Group A for Forceps Capsulorhexis and Group B for Posterior Vitrectorhexis.

After collection of data the analyses was conducted by using Statistical Package for Social Science (SPSS) software, Version 21. All the data

was presented in the form of tables and graphs.

**RESULTS**

There were a total of 154 cases of paediatric cataracts that underwent surgical procedures known as Posterior capsulorhexis (forcepsorhexis) and posterior vitrectorhexis. These cases were then divided into two distinct groups. Group A consisted of 77 patients who underwent Forceps Capsulorhexis, while Group B consisted of the remaining 77 patients who underwent Posterior Vitrectorhexis. In the group of patients who underwent forceps capsulorhexis, there were 36 males (46.75%) and 41 females (53.24%). The male to female ratio was 1:1.3. On the other hand, in the posterior vitrectorhexis group, there were 40 males (51.94%) and 37 females (48.05%), resulting in a male to female ratio of 1:1.08 (Table-I).

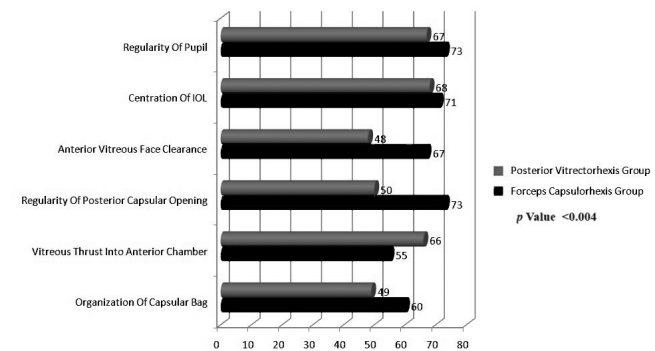
Both groups had participants with ages ranging from 1 year to 12 years, with a minimum age of 1 year. The mean age for the Forceps Capsulorhexis group was 6.1+1.8 years, while the mean age for the Posterior Vitrectorhexis group was 6.9+1.3 years (Table-I).

The outcomes during surgery showed that in the Forceps Capsulorhexis group, 60 patients (77.92%) had organization of the capsular bag, while in the Posterior Vitrectorhexis group, 49 patients (63.63%) had organization of the capsular bag. Additionally, 55 patients (71.42%) in the Forceps Capsulorhexis group experienced vitreous thrust into the anterior chamber, compared to 66 patients (85.71%) in the Posterior Vitrectorhexis group. The regularity of the posterior capsular opening was observed in 73 patients (94.80%) in the Forceps Capsulorhexis group, whereas only 50 patients (64.93%) in the Posterior Vitrectorhexis group exhibited regularity. Furthermore, 67 patients (87.01%) in the Forceps Capsulorhexis group had anterior vitreous face clearance, while 48 patients (62.33%) in the Posterior Vitrectorhexis group achieved the same clearance. The centration of the intraocular lens (IOL) was achieved in 71 patients (92.20%) in the Forceps Capsulorhexis group, compared to 68 patients (88.31%) in the Posterior Vitrectorhexis

group. Lastly, the regularity of the pupil was observed in 73 patients (94.80%) in the Forceps Capsulorhexis group, whereas 67 patients (87.01%) in the Posterior Vitrectorhexis group exhibited regularity (Figure-1).

Variable	Forceps Capsulorhexis Group	Posterior Vitrectorhexis Group
	No: of Patients (%)	No: of Patients (%)
<b>Gender</b>		
• Male	36(46.75%)	40(51.94%)
• Female	41(53.24%)	37(48.05%)
<b>Age ( years )</b>		
• 1-6 years	12(15.58%)	15(19.48%)
• 7-12 years	65(84.41%)	62(80.51%)

**Table-I. Demographic variable**



**Figure-1. Peroperative outcome**

**DISCUSSION**

There are several distinctions between pediatric cataract surgery and adult cataract surgery. One notable difference is delay in presentation due to amblyopia. Additionally, the sclera in pediatric cases is less rigid compared to adults. Moreover, the axial length and refractive status of the eye continue to change in children. It is also important to note that the chances of postoperative inflammation and posterior capsule opacification (PCO) are higher in pediatric cases.<sup>15,16,17</sup> Although the outcomes of pediatric cataract surgery may not be as impressive as those of adult cataract surgery, it is still a crucial intervention as restoring a child’s vision can greatly reduce the number of blind person-years. According to a study in Spain<sup>18</sup>, congenital cataract is the most common cause of pediatric cataract, while a study in central India<sup>19</sup> found trauma to be the leading cause of pediatric cataract.

Both groups had participants ranging in age from 1 year to 12 years old. The Forceps Capsulorhexis group had a mean age of 6.1 + 1.8 years, while the Posterior Vitrectorhexis group had a mean age of 6.9 + 1.3 years. These ages are similar to those found in a study by Randrianotahina HC, where the mean age at presentation for congenital cataract was 6.9 years ( $\pm$ SD 4.3).<sup>20</sup>

In the forceps capsulorhexis group, the male to female ratio was 1:1.3, while in the posterior vitrectorhexis group, it was 1:1.08. Nonetheless, Rishikeshi Nikhil<sup>21</sup> reported a male to female ratio of 1.2:1, which is nearly identical to the current study.

The most widely accepted approach in pediatric cataract surgery nowadays is phacoaspiration combined with primary posterior capsulotomy. This technique may or may not involve anterior vitrectomy and capsular bag implantation or optic capture of an intraocular lens.<sup>22</sup>

Performing a posterior capsulotomy is widely agreed upon, particularly for younger children. In our practice, we conduct posterior capsulorhexis for children below the age of 8 who undergo cataract surgery. However, when utilizing acrylic IOLs with a square edge and capsular bag implantation, certain surgeons choose to solely perform a primary posterior capsulotomy for children under 4 years old, while excluding older children from this procedure. There are multiple methods to achieve a posterior capsulotomy from a technical standpoint. The primary posterior forceps capsulorhexis method is considered safe due to the smooth margin created at the opening, which prevents tears from extending peripherally. Manual posterior capsulorhexis, with the assistance of a cystotome and utrata forceps, is the preferred method over others. In certain situations, a vitrector-assisted posterior capsulotomy may also be performed. The use of high viscosity viscoelastic aids in achieving a successful posterior capsulorhexis.<sup>23</sup> In our study we observed good organization of capsular bag were forceps capsulorhexis group in 60(77.92%) cases as compared to posterior vitrectorhexis group in 49(63.63%) cases.

In our research, we noted that 55 cases (71.42%) in the forceps capsulorhexis Group exhibited Vitreous upthrust into the anterior chamber. The occurrence of capsulorhexis in children poses a higher risk of peripheral extension, primarily due to the increased elasticity of the anterior capsule and higher posterior vitreous pressure. However, surgeons must overcome the challenges associated with anterior and posterior capsulorhexis in children to ensure a successful cataract extraction and IOL implantation.<sup>24</sup>

The principles for creating an opening in the posterior capsule are the same as those for the anterior capsule. When opening the posterior capsule, there is an option to not prevent the forward movement of the vitreous if a vitrectomy is planned, and therefore no precautions need to be taken to protect it. However, if one wishes to avoid a vitrectomy and protect the vitreous, it is important to initiate the capsulorhexis with a hooking snag instead of a cutting puncture.<sup>25</sup> In our study, we observed a higher success rate of regularity in the posterior capsular opening in the forceps capsulorhexis group, with 73 cases (94.80%) compared to 50 cases (64.93%) in the posterior vitrectorhexis group.

The anterior capsular collapse and the need for small, precise corneal or scleral incisions are caused by the decreased rigidity of the sclera. These factors require a higher level of surgical skill and pose a greater risk of complications such as vitreous loss, improper lens centration or placement, postoperative inflammation, and astigmatism. Additionally, the challenging task of achieving proper lens centration, along with increased manipulation of the anterior capsule and scleral dissections in the manual technique, results in a heightened inflammatory response in children. This leads to a higher incidence of posterior capsule opacification and immediate postoperative inflammation.<sup>26</sup> In our study, the forceps capsulorhexis group showed better outcomes in 71 (92.20%) cases compared to the posterior vitrectorhexis group.

## CONCLUSION

The use of forceps capsulorhexis is a secure



and efficient method for treating pediatric cataracts. This procedure has a minimal risk of complications and offers improved outcomes, ensuring that patients experience greater comfort during the postoperative period compared to the posterior vitrectorhexis procedure.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.






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### AUTHORSHIP AND CONTRIBUTION DECLARATION

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2	Dur-e-yakta Durghahi Shaikh	Statistical expertise.	
3	Zakaullah Gopang	Conception & design, Critical revision of the article for important intellectual content.	
4	Shabeer Ahmed Bhutto	Statistical expertise.	
5	Safder Ali Abbasi	Drafting of the article.	
6	Prince Aakash Gul	Drafting of the article.	