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# The Outcome of Pediatric Cataract Surgery in Sohag University Hospital

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## Abstract

**Introduction**: Worldwide, an estimated 1.4 million children are blind, of whom approximately 190,000 (14%) are blind owing to bilateral un-operated cataract, complications of surgery, amblyopia due to delayed surgery, or the presence of other associated anomalies. Pediatric cataract blindness presents an enormous problem to developing countries in terms of human morbidity, economic loss, and social burden. Managing cataracts in children remains a challenge, even in the industrialized world. Treatment is often difficult and tedious and requires a dedicated team effort.

**Aim of the work**: To evaluate the experience with the surgical management of various types of pediatric cataract, managed at the Ophthalmology department, Sohag University Hospital during the period of the study

**Patients and Methods**: A prospective, randomized study, patients were divided into 3 groups based on the surgical technique they had undergone. Group A "25 patients" : patients who have undergone Lensectomy anterior vitrectomy (LAV). GroupB"24patients": patients who have undergone Extracapsular cataract extraction, primary posterior capsulorhexis or capsulotomy, anterior vitrectomy, and IOL implantation (ECCE/PPC/AV/IOL). Group C"26patients": patients who have undergone Extracapsular Cataract Extraction and IOL Implantation (ECCE/IOL)

**Results**: Uncorrected visual acuity was better than 6/60 in 27 eyes (27.8%); 13 (13.4%) in group B and 14 (14.4%) in group C. Acuity of 1/60 to 6/60 was measured in 5 eyes (5.1%); 3 (3.1%) in group B and 2 (2%) in group C. The remaining 5 eyes had visual acuity less than 1/60 and this was attributed to amblyopia.

**Conclusion**: IOL implantation at primary cataract surgery helps to prevent development of secondry glaucoma, but increases the number of interventions for VAO in infants.

**Key words**: *Cataract, Sohag university.*

## Introduction

Worldwide, an estimated 1.4 million children are blind, of whom approximately 190,000 (14%) are blind owing to bilateral un-operated cataract, complications of surgery, amblyopia due to delayed surgery, or the presence of other associated anomalies. Pediatric cataract blindness presents an enormous problem to developing countries in terms of human morbidity, economic loss, and social burden. Managing cataracts in children remains a challenge, even in the industrialized world. Treatment is often difficult and tedious and requires a dedicated team effort [(1)].

Since the future of any society is in children, it is time to give childhood cataract treatment the attention that adult cataract treatment has received for many years. To assure the best long-term outcome for cataract-blind children, appropriate pediatric surgical techniques need to be defined and adopted by ophthalmic surgeons of developing countries. This chapter focuses on practical guidelines and recommendations for ophthalmic

surgeons and health planners dealing with childhood cataract in the developing world [(1)].

Characteristics of developing nations have high birth and infant mortality rates and high rates of curable and preventable blindness. A child becomes bilaterally blind every minute, primarily within developing nations. Of the 1.4 million blind children in the world, approximately 90% live in Asia and Africa, and 75% of all causes are preventable or curable. The prevalence of blindness varies according to the socioeconomic development of the country and the mortality rate of those <5 years of age. In developing countries, the rate of blindness can be as high as 1.5 per 1,000 populations [(1)].

Compared to industrialized countries, this figure is 10 times higher. Irrespective of the cause, childhood blindness has far-reaching effects on the child and family throughout life. It profoundly influences educational, employment, personal, and social prospects. The control of childhood blindness has been identified as a priority of the World Health Organization's (WHO) global initiative for the elimination of avoidable blindness by the year 2020 [(2)].

Pediatric cataract is the most common cause of treatable childhood blindness, accounting for 5–20% of blindness in children worldwide. Managing cataracts in children remains a challenge. Treatment is often difficult and tedious and requires a dedicated team effort, the most important members being parents [(2)].

Appropriate management of the pediatric cataract patient presents the ophthalmic surgeon with a unique set of challenges. The entire process, from diagnosis and evaluation to surgical intervention and postoperative care, is significantly different from that of the typical adult cataract patient. This is highlighted by the need for close follow up and support, both by the family and the ophthalmologist, to help the child develop vision and avoid amblyopia by employing appropriate optical correction and regular visual stimulation. Therefore, while an ophthalmologist may be extremely skilled in performing adult cataract surgery, this does not ensure similar success in children. Also remember that the cataract removal is only the first step in the process. Refraction, amblyopia treatment, and frequent follow up visits monitoring the reaction of the eye, are essential steps leading to successful surgery [(2)].

***Aim of the work:***

This study aimed to evaluate the experience with the surgical management of various types of pediatric cataract, managed at the Ophthalmology department, Sohag University Hospital during the period of the study

***Patients and Methods:***

**Design:**

A prospective, randomized clinical study.

**Patients:**

Out of 116 patients (142 eyes) who started the study, only 75 patients (97 eyes) completed the 2-years follow up period and their data were analyzed and presented here.

This study was conducted in the Ophthalmology Department, Sohag University Hospital in the period from February 2008 to June 2013.

**Methods:**

Patients were divided into 3 groups based on the surgical technique they had undergone.

Group A "25 patients": patients who have undergone Lensectomy anterior vitrectomy (LAV).

GroupB"24patients": patients who

have undergone Extracapsular cataract extraction, primary posterior capsulorhexis or capsulotomy, anterior vitrectomy, and IOL implantation (ECCE/PPC/AV/IOL).

Group C"26patients": patients who have undergone Extracapsular Cataract Extraction and IOL Implantation (ECCE/IOL)

**Preoperative evaluation**

- Complete medical history and physical examination
- Complete ophthalmological evaluation, including:

**a.** Visual acuity assessment (if possible)

**b.** Anterior segment examination by slitlamp

**c.** Fundus examination after pupillary dilatation (if cataract density allowed) to exclude associated posterior segment anomalies

**d.** IOP under general anesthesia.

**e.** Ultrasound examination: (A- and B-scan) was performed under sedation or UGA to exclude posterior segment pathology

**Inclusion criteria:**

- Patients aged from birth to 12 years.
- Patients with pediatric cataract; including congenital, developmental and post-traumatic cataract after blunt trauma.
- Patients with a follow up period of at least 2 years after surgery.
- Patients fulfilling the previous criteria and followed the protocol of management of this study.

**Exclusion criteria:**

- Patients with traumatic cataract after penetrating trauma were excluded from the study.
- Patients with a follow up period of less than 2 years after surgery were excluded from the study.
- Patients with associated posterior segment anomalies on fundus examination.

# Results

The mean age of our patients at the time of surgery was 5.25±4.35 years (range from 14 days to 11.8 years). The mean age of patients in group (A) was 5.6±3.2 months (range: 14 days to 1 year), in group (B) was 5.8±2.3 years (range: 1.8 to 10.8 years, and in group (C) 5.1± 2.2 years (range: 13 months to 11.8 years). All patients under age of one year had congenital cataract. Out of the 75 patients included in this study 47 patients (63 %) were males. The etiological type of cataract was congenital in 51 eyes (52.6%), developmental in 25 eyes (25.8%), and traumatic in 21 eyes (21.6%). Out of the 75 patients included in this study, 22 patients (29.3%) had bilateral cataract. Eighty-six percent of congenital cataract cases were bilateral while all developmental and traumatic cataract cases were unilateral. Associated ocular anomalies were recognized in 12 eyes (12.4%). All had congenital cataract. These anomalies included coloboma of the iris in 2 eyes (2%), microcornea in 4 eyes (4.1%), subluxated lens in 2 eyes of 2 patients with Marfan syndrome (2%). Fundus examination using direct ophthalmoscope was not possible in 30 eyes (30.9%) due to high cataract density. All the remaining 67 eyes (69.1%) had normal fundus examination. B-scan ultrasonography was done for all patients; all had clear vitreous and in-place retina , also a scan for IOL power calculation.

**Table 1** show Preoperative visual acuity

| Preoperative VA | Group (A) No. (%) | Group (B) No. (%) | Group (C) No. (%) | Total No. (%) |
|---|---|---|---|---|
| **Could not be assessed** | ***39 (40.2)*** | ***10 (10.3)*** | ***11 (11.3)*** | ***60 (62)*** |
| **Better than 6/60** | ***0*** | ***3 (3.1)*** | ***5 (5.1)*** | ***8 (8.2)*** |
| **1/60-6/60** | ***0*** | ***6 (6.2)*** | ***7 (7.2)*** | ***13 (13.4)*** |
| **HM-1/60** | ***0*** | ***3 (3.1)*** | ***4 (4.1)*** | ***7 (7.2)*** |
| **PLGP** | ***0*** | ***5 (5.1)*** | ***4 (4.1)*** | ***9 (9.2)*** |
| **Total** | ***39 (40.2)*** | ***27 (27.8)*** | ***31 (32)*** | ***97 (11)*** |

**Table 2** show Number of patients accourding to the implanted IOL

| IOL | Group A No. (%) | Group B No. (%) | Group C No. (%) | Total No. (%) |
|---|---|---|---|---|
| PMMA | **0 (0)** | **11 (11.3)** | **10 (10.3)** | **21 (21.6)** |
| Foldable 1 piece | **0 (0)** | **0** | **21 (21.6)** | **21 (21.6)** |
| Foldable 3 pieces | **0 (0)** | **16 (16.5)** | **0 (0)** | **16 (16.5)** |
| **Total** | **0 (0)** | **27 (27.8)** | **31 (31.9)** | **58 (58.7)** |

**Postoperative visual acuity:**

Postoperative visual acuity was assessed at one month, and at 2 years postoperatively. All patients of group A were not assessed for visual acuity due to age limitations.

Visual acuity at one month postoperatively was possible to asses in only 37 eyes (38%). Uncorrected visual acuity was better than 6/60 in 27 eyes (27.8%); 13 (13.4%) in group B and 14 (14.4%) in group C. Acuity of 1/60 to 6/60 was measured in 5 eyes (5.1%); 3 (3.1%) in group B and 2 (2%) in group C. The remaining 5 eyes had visual acuity less than 1/60 and this was attributed to amblyopia.

## *Discussion*

In the current study, most of causes of pediatric cataract were congenital (52%). This etiology of congenital cataract was confirmed by Stagno [(2)], but still the most common cause is inheritance as autosomal dominant trait [(3)] and chromosomal abnormalities are the second cause [(4)]. The obstecles of the current study in analysis of these etiology is lack of genetic analysis and study of the patient due to unavailability and economic load.

In the present study, these are associated ocular anomalies like microcornea, coloboma of iris. All these cases were undergone lensectomy and anterior vitrectomy. Vasavada et al. [(5)] suggested that good visual outcome can be obtained in microphthalmic patients with bilateral congenital cataract after early surgical intervention, with an acceptable rate of serious postoperative complications; 10% eyes had an incomplete anterior capsulorhexis, 6.7% had iris trauma, and 6.7% had peripheral extension of the posterior capsulectomy edge. The complications noted in postoperative period were posterior synechias in 35.7%, glaucoma in 30.9%, and VAO in 16.7% eyes.

Yu et al. [(6)] recommended secondary PC IOL implantation in pediatric cataract with microcornea and/or microphthalmos as a means of

improving vision in order to avoid possible complications.

Mullner-Eidenbock et al [7] reported that in congenital cataract caused by persistent fetal vasculature or minimal fetal vascular remnants, cataract surgery must be performed in a guarded fashion because of high risk of preexisting posterior capsule breaks. Kuhli-Hattenbach et al. [8] noted that patients with preoperative predictors at presentation, such as persistent fetal vasculature (PFV), require extensive postoperative care after congenital cataract surgery. Khan. [9] reported emmetropization in a case, caused by corneal steepening and axial elongation, after lensectomy and anterior vitrectomy for cataract with persistent hyperplastic primary vitreous.

In our study, surgeons decided to under correct the postoperative refraction by reduction 20 % of total diopteric power in patients aging 1-2 years and under coorect those aging 2-4 years by 10 % of the total diopteric power. Patients aging older than 4 years had full correction. These decsions were agreed by other studies e.g. Chen et al. [10] in a retrospective study, advised to categorize the children as (1) children younger than 2 years of age or (2) children older than 2 years. For the first group, in whom AL and keratometry readings change rapidly, they advised to undercorrect by 20%.

For the second group, in whom the changes are slower and more moderate, they advised to undercorrect by 10%. Ram et al. [11] concluded that most surgeons aim for moderate hyperopia (≥3 D and <7 D) in infants at 6 months of age and mild (<3 D) to moderate hyperopia in infants at 12 months.

Lam et al. [12] recommended a postoperative goal of +6 D for a 1 year old, +5 D for a 2 year old, +4 D for a 3 year old, +3 D for a 4 year old, +2 D for a 5 year old, +1 D for a 6 year old, plano for a 7 year old and −1 to −2 D for an 8 year old or older children. Xie et al. [13] recommended that the refractive goal should be +4 D for less than 2 years, +2 to +3 D for 2–4 years of age, +1 to +2 D for 4–6 years of age and up to +1 D for 6–8 years of age.

In the present study, more than 50% of cases cannot be assessed by using chart but had good fixation of light and following light source and only 8% cases had VA better than 6\60 (20\200). Stager et al. [14] reported that VA of more than 50% of cases recorded only by fixation pattern.

Regarding IOL implantation, in the present study PMMA IOL were implanted in 21.6 % of cases, multiple pieces acrylic IOL implanted in cases. Single piece acyrilic implanted in %. PCO occurred in a higher rate in eyes PMMA IOL compared with eyes with acrylic foldable IOL in either intact posterior capsule, or PECCE was performed. These results cope with results of Aasuri et al. [15], in a comparative evaluation of acrylic and polymethyl methacrylate (PMMA) lenses in pediatric cases, reported that the incidence of posterior capsular opacification (PCO) and postoperative uveal inflammation is significantly less with acrylic lenses.

Posterior capsular opacification (PCO) with capture of IOL optic was zero percent in the current study. These results were agreed by result reported by Raina et al. [16] noted that PCCC with optic capture of PC IOL prevented secondary VAO even in the absence of vitrectomy.

Grieshaber et al. [17] reported that posterior capsulotomy with optic

entrapment of IOL proved to be a safe and efficient surgical procedure for preventing PCO in children with congenital cataracts. They concluded that an intact anterior hyaloid does not induce capsule opacification in association with optic entrapment; therefore, a vitrectomy is not indicated even in infants and children under 5 years.

Chen et al. [10] reported that optic capture of PC IOL is safe and effective in prevention of secondary opacification of the visual axis in children. However, Ram et al. [11] reported that it is the management of the posterior capsule rather than IOL design and material that influences the incidence of PCO.

Regarding anterior vitrectomy (AV) effect in decreasing or preventing PCO development, the results of the present study shows that incidence of PCO in anteriorly vitrectomized eyes much less than non vitrectomized ones, that group A only 5 eyes of total 39 eyes develop PCO i.e. less than 13 %. Similar role to AV, posterior curvilinear capsulorehexis PCC prevent or at least decreasing incidence of postoperative PCO in group C, all eyes had intact posterior capsule so 18.5 % develop PCO compared to only 5% in group B for which PECC was performed.

Regarding management of PCO either Nd:YAG laser capsulotomy or surgical posterior capsulotomy, in the current study, it is an age-related issue as young children not cooperative for slit lamp delivery of YAG laser so under general anesthesia, surgical posterior capsulotomy was performed.

Other studies like Lam et al. [12] reported that posterior capsulotomy using 25-G vitrectomy system is safe and effective in management of PCO in pseudophakic children. There is ease of manipulation with smaller instruments in these small eyes. Also Xie et al. [13] noted that pars plana capsulectomy and vitrectomy is safe and effective in thick PCOs in pseudophakic children. Stager et al. [14] reported that Nd:YAG laser capsulotomy is an acceptable option for the management of PCO after AcrySof IOL implantation in children and produces complications infrequently.

In the present study, postoperative visual acuity VA (at the end of follow up) all cases measured by chart and 38.5% of cases had VA better than 6\60 compared to only 8% preoperatively. Stager et al. [14] had similar improvement of VA.

## *Conclusion*

Becauses of all the surgical chalanges and the relatively low incidence of pediatric cataract, the postoperative care ideally is centralized. The routine uses of highly viscous OVDs, anterior and posterior continuous curvilinear capsulorrhexes, in-the-bag or bag-in-the-lens implantation and modem-design foldable acrylic IOLs significantly improves outcomes in pediatric cataract surgery.

IOL implantation at primary cataract surgery helps to prevent development of secondry glaucoma, but increases the number of interventions for VAO in infants.

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