

## Comparison of Two Methods of Wound Closure in Paediatric Cataract Surgery

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### Abstract

**Purpose:** To compare the efficacy and outcome of viscosealing of incisions with suturing in pediatric cataract surgery

**Methods:** This prospective study was performed in children less than 5 years with congenital cataract who underwent phacoaspiration with primary posterior capsulorhexis and anterior vitrectomy with intraocular lens implantation at a tertiary care institute. Patients were divided into two groups. Group 1 included patients where 10-0 polyglactin (Vicryl) suture was used to close the sideports and main incision and in group 2 the incisions were sealed with 1.4% sodium hyaluronate. The patients were subsequently examined on serial follow up for one year.

**Results:** 50 paediatric eyes undergoing phacoaspiration with intraocular lens implantation were included (25 in each group). Mean age at surgery was  $10.65 \pm 8.20$  months in group 1 and  $12.6 \pm 9.57$  months in Group 2. Complications encountered in group 1 were hyphema in 8 eyes, sideport synechiae in 4 eyes, iridolenticular adhesions in 12 eyes and vascularisation of the ports in 6 eyes post operatively. In group 2 synechiae at sideport was seen in 2 eyes, iridolenticular adhesions in 2 eyes, and shallow anterior chamber in 1 eye post operatively. Most of the complications in group 2 were seen in children <12 months of age (46.4%).

**Conclusion:** Viscosealing is comparable to suturing of incisions in children undergoing cataract surgery. It avoids the suture related complications related to vascularization and hyphaema besides a second time general anesthesia needed to manage them.

**Keywords:** Paediatric; Cataract; Inflammation

### Introduction

Sutureless cataract surgery is the established norm in adults. However, low scleral rigidity in children necessitates suturing of corneal wounds after cataract surgery [1]. Sutures secure the incisions in the post-operative period but at the same time lead to a variety of complications. These include loose sutures, adherent mucus, vascularization of the cornea, astigmatism, recurrent conjunctivitis and in very few cases even endophthalmitis [2,3]. Constant irritation in such cases leads to excessive eye rubbing and hence iatrogenic inflammation. All these factors combined lead to an increased risk of infection and amblyopia in the pediatric age group.

Keeping in mind the problems relating to sutures in children, we tried to study an alternative procedure to secure the incisions. The aim of our study was to analyse the outcome of this novel technique and compare it with suturing of incisions in pediatric cataract surgery.

### Methods

This prospective study included all patients under the age of 5 years who underwent cataract surgery with intraocular lens implantation performed by one surgeon between January 2013 and December 2013. Informed consent was obtained from parents after ethical clearance

from institute ethics committee. The study confirmed to the declaration of tenets of Helsinki.

Consecutive patients were assigned into either of the two groups (25 patients in each group). In group 1 all incisions were closed with 10-0 polyglactin suture at the end of surgery and in group 2 plugging of the incisions was done with 1.4% sodium hyaluronate. Inclusion criteria were patients under 5 years diagnosed with congenital cataract who underwent phacoaspiration and intraocular lens implantation in the bag with a minimum follow up of 12 months. Patients were excluded if there was a history of trauma to the eye, any other coexisting pathology of the eye, children with aphakia or retinal complications. We recorded the age at surgery, laterality, gender of the child, type of cataract, biometric profile preoperatively, type and power of intraocular lens, complications if any and postoperative refraction.

**Surgical technique:** All surgeries were performed by the same surgeon under general anaesthesia. Two limbal side ports (tunnelled 1mm wide) were made at 2 o'clock and 10 o'clock using 15 degree paracentesis knife. Trypan blue was injected to aid visualization of the anterior capsule. Anterior chamber was formed with sodium hyaluronate 1.4%. Thereafter a 2.8 mm limbal incision was made. Continuous curvilinear anterior capsulorhexis of approximately 5.0 mm diameter was performed with utrata forceps. Aspiration of the lens was accomplished using an automated irrigation/aspiration handpiece. Primary posterior capsulotomy of about 3-3.5 mm was performed by the anterior route through the same limbal side ports manually

(Cystitome and Utrata forceps). Anterior vitrectomy parameters were cut rate, 800 cuts/minute; aspiration flow rate, 5 cc/minute; and vacuum, 150 mm Hg performed through side ports. Thereafter hydrophobic intraocular lens (Hoya PC 60 AD, HOYA Inc, Japan) was implanted in the bag. Thereafter in group 1, all ports were closed by 10-0 Vicryl (polygalactin 901) suture. A single suture was used and the knots were buried using a smooth suture tying forceps into the wound. In group 2, the tip of the needle was inserted into the wound and a drop of cohesive viscoelastic (1.4% sodium hyaluronate) was painted across the internal lip of the incision margin. Seidel test was done to confirm that the wounds were water tight. Subconjunctival steroid and antibiotic injection was given at the end of surgery.

All patients were treated postoperatively with intensive prednisolone acetate 1% eye drops for the first week followed by tapering over the next 6 weeks. Topical moxifloxacin was given 4 times a day for 1 week postoperatively. Homatropine drops were given for a week. Parents in both the groups were instructed to use a postoperative shield at night. All patients underwent follow up examination on day 1, day 3, 3 weeks, 6 weeks and three monthly till atleast one year of follow up. Retinoscopy was done at 1 month, 4 months and at one year.

### Statistical analysis

Analysis was done using SPSS software version 20. All descriptive variables were tested using the software and the comparison between two groups was done using t test. Values were expressed as mean +Standard Deviation and p<0.05 was considered significant. In cases of bilateral cataract only the right eye of the patient was included in the study.

### Results

There were 21 females and 29 males. The mean age of the patients at the time of surgery was 11.64 ± 8.88 months (range 3 months to 3 years). The demographics profile of the two groups is shown in Table 1. In all eyes anterior capsulorhexis with lens aspiration, posterior capsulotomy, and anterior vitrectomy were successfully performed with implantation of hydrophobic intraocular lens (IOL).

	Group 1	Group 2	P value
Mean age(months)	10.65+8.20	12.60+9.57	0.44
<7 months	7	5	
7-12 months	13	14	
>12 months	5	6	
Gender	12 M; 13 F	17 M; 8 F	0.25
Laterality	13 R; 12 L	16 R; 9 F	0.56
Type of cataract	15 Total; 7; Zonular; 3 PHPV	22 Total; 3 Zonular	0.51
Axial length (mm)	19.6+1.06	20.68+1.25	0.03 <sup>^</sup>
Average keratometry (D)	45.24+2.329	43.69+0.410	0.155

IOP pre-op	9.3+3.19	8.00+2.00	0.506
IOP post op	9.0+1.15	11+1.41	0.132
Mean IOL power(D)	27.94+2.5	24.63+1.8	0.01 <sup>^</sup>
Site of IOL	Bag 16; sulcus 5; captured 4	Bag 22; sulcus 2; captured 1	0.133
Mean S.E. 3 months	2.2+1.2	1.08+0.572	0.72
Mean S.E. 1 Year (n=38)	0.64+0.437	0.93+0.16	0.03 <sup>^</sup>
Mean follow up (months)	21.83+5.95	25.3+15.49	0.00 <sup>^</sup>

**Note:** <sup>^</sup>all values in mean+standard deviation, M: Males; F: Females; R: Right; L: Left; PHPV: Persistent Hyper plastic Primary Vitreous; D: Diopter; IOP: Intraocular Pressure; IOL: Intraocular lens; S.E: Spherical Equivalent (with subtracted predicted error for age), <sup>^</sup> significant p values.

**Table 1:** Preoperative and surgical parameters of the two groups.

The various complications encountered in both the groups are given in Table 2. On the first postoperative day, 1 eye in group 2 had shallow anterior chamber which was well formed on the third day follow up.

	Group 1	Group 2	P value
Vascularisation at port site	6	0	0.02 <sup>^</sup>
IOL decentration	0	1	1
Pigments on IOL	8	8	1
Shallow anterior chamber	0	1	0.11
Iridocapsular adhesions	12	2	0.004 <sup>^</sup>
Synechiae at side port	4	2	0.667
Hyphema	8	1	0.023 <sup>^</sup>
Membranectomy	5	7	0.747
Endophthalmitis	0	0	-

**Note:** IOL: Intraocular Lens, <sup>^</sup> significant p values,

**Table 2:** No of patients with various intraoperative and post-operative complications of the two groups.

Complications encountered were significantly more in children <12 months (Table 3). At 3 months follow up; mean spherical equivalent was 2.20 DS + 1.213 D in group 1 and 2.32+1.337 D in group 2 (p=0.723). At one year follow up mean spherical equivalent was 0.66 DS + 0.434 D in group 1 and 0.93+0.16 D in group 2 (p=0.68). No patient in both groups had raised IOP till one year of follow up. In the children who cooperated for visual acuity testing (n=10); the mean logMAR acuity was not different between the two groups at one year (Group 1: 0.2 ± 0.1 and Group 2: 0.21 ± 0.3; p=0.89).

	Hyphema		Side port synechiae		Iridocapsular adhesions		Shallow chamber		Pigments on IOL		IOL decentration		Vascularisation		Total %
	Group 1	Group 2	Group 1	Group 2	Group 1	Group 2	Group 1	Group 2	Group 1	Group 2	Group 1	Group 2	Group 1	Group 2	
0-6 Months	5	0	3	1	5	0	0	1	3	2	0	0	3	0	24(42.8)
7-12 Months	1	0	1	0	6	2	0	0	5	5	0	1	3	0	26(46.4)
13-24 Months	1	0	0	0	1	0	0	0	0	1	0	0	0	0	3(5.35)
>24 Months	1	1	0	1	0	0	0	0	0	0	0	0	0	0	3(5.35)
	8	1	4	2	12	2	0	1	8	8	0	1	6	0	56

**Table 3:** No of patients with various intraoperative and post-operative complications of the two groups according to age.

## Discussion

Several studies have investigated suture related problems after cataract surgery in adults [4,5]. The recommendation is to remove non absorbable nylon sutures after cataract surgery in fear of the suture related complications like broken sutures, exposure, recurrent conjunctivitis and infection [4]. Suture removal cannot be an office procedure in children. It requires an operating room with facilities for anaesthesia. Suture ‘material’ also has a crucial role to play while discussing these problems. Nylon sutures degrade and hence have a high incidence of complications. Monofilament (Vicryl) sutures on the other hand get absorbed and hence are not a real threat for long term suture related problems [6]. In children the incisions have to be secured as cataract extraction is combined with an anterior vitrectomy, which collapses the sclera, making the already relatively elastic sclera of children even less rigid.

With this aim in mind we thought of securing the entry wounds with 1.4% Sodium Hyaluronate, a technique which keeps the pediatric wounds plugged without the need for suturing. Self-retaining high molecular weight viscoelastic substance plugs the wounds posing as a mechanical barrier (t1/2=72 h). In adults architectural analysis of wounds after phacoemulsification show no epithelial gaping after postoperative day 1 by optical coherence tomography [7]. The technique was successful as far as the chamber stability was concerned. In only one eye we observed a shallow anterior chamber which formed by the third postoperative day. This child was 5 months of age. We hypothesize that children below 1 year of age have greater chances of complications after viscoplugging. All the children above 1 year did well with this technique.

There were no cases of corneal vascularisation and only two with synechiae at side port as compared to the sutured group. The rate of developing iridocapsular adhesions was also less in the sutureless group. We believe that suturing leads to frequent eye rubbing and more inflammation due to the constant irritation. Our results concur with the previous studies which report high incidence of inflammation and corneal vascularisation with sutures [8]. In line with previous studies [9,10], the complications encountered were more in children less than 12 months of age in both groups (~90%). This can be explained by the greater tissue reactivity in infants leading to greater surgical

complications in this cohort. A high incidence of hyphaema was observed in group 1. This occurred from seepage from the sideports while passing sutures. This trickle led to blood in the anterior chamber causing more inflammation. Hyphaema was seen on only one eye in group 2.

There exists a possibility of rise in intraocular pressure with use of high molecular weight viscoelastic. We did regular examinations under anesthesia to document intraocular pressure. We believe that such a minuscule of sodium hyaluronate has no effect on raising IOP. The half-life of sodium hyaluronate is only 72 h [11], which is sufficient to plug the wound and not cause any significant problems.

Leaving the wound unsutured is also not without problems. Within the same cornea, sutured and unsutured wounds show opposite patterns of healing. Studies on wound healing have shown that sutured wounds initially heal slowly, but obtain ‘pseudolamellar’ continuity over time. In contrast, healing of unsutured wounds is characterised by an ineffective reorganisation of the scar [5]. Epithelial ingrowth and incarceration of Bowman's layer and/or Descemet's membrane in unsutured wounds appears to disrupt wound healing [12]. All these factors combined may be responsible for the greater refractive error (although not significant) we found in our group 2 patients. It is well proven that early postoperative astigmatism after sutured wounds in congenital cataract surgery spontaneously decreases during the first few months [13].

Most of the complications with suturing occur between 3 weeks and 5 months post operatively necessitating frequent examinations under anesthesia in children [2]. In children, the indication for suture removal is mainly local reaction to the suture material, not high postoperative astigmatism as the astigmatism itself decreases over time [13].

Other wound closure products include cyanoacrylate, fibrin, polyethylene and glycol-based adhesives [14]. These products, some of which have been used on the ocular surface in children have never been tested intraocularly in children and there are concerns of toxicity, cost, and whether they are completely bacteriostatic or not. These sealant products may last as long as seven days in the eye [14]. Viscosealing on the other hand uses a non-toxic, inert product which is already a part of the surgical procedure. Viscoplugging obviates the

need for repeated anesthesia in children. No vascularization of wounds and minimal inflammation are the merits of the technique. Although with this technique there is a small risk of high early postoperative astigmatism that has a potential amblyogenic effect, it offers the advantages of a sutureless surgery. We recommend this technique in children more than one year of age to do away with suture related complications.

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