

Comparative analysis of non-absorbable 10-0 nylon sutures with absorbable 10-0 Vicryl sutures in pediatric cataract surgery

Jyoti Matalia, Pratibha Panmand, Pooja Ghalla

Purpose: The purpose of the study is to compare the efficiency as well as the rate and type of suture-related complications between 10-0 monofilament nylon (Aurolab Nylon Sutures, double arm, Aurolab) and 10-0 polyglactin 910 sutures (Vicryl, single arm, Aurolab) for pediatric cataract surgery. **Methods:** It is a prospective, comparative study performed in children who underwent surgery for congenital or developmental cataract from March 2013 to February 2016. Patients underwent suturing with either nylon or Vicryl in unilateral cases, but in most bilateral surgeries, one eye received Vicryl sutures while the other eye received nylon. The sutures were compared for their complications and the need for suture removal. **Results:** Forty-one children (72 eyes) were included in the study, of which 31 children (62 eyes) underwent bilateral surgery while 10 (10 eyes) underwent unilateral surgery. Sixty-four nylon sutures were placed in 32 children (34 eyes), of which 22 (34.4%) were removed due to suture-related complications, whereas 14 (19.7%) ($P = 0.03$) of the 71 Vicryl sutures placed in 32 children (38 eyes) needed suture removal at an average of 2.9 weeks with the earliest at 6 days postoperatively. The odds of Vicryl suture being removed was 0.42 times with respect to nylon. The most common reason encountered for suture removal in both the materials was sutures becoming loose (16.3%), followed by vascularization (14.1%), infiltration (1.5%), and opacification (4.4%). **Conclusion:** Absorbable suture such as 10-0 Vicryl is preferred over nonabsorbable suture 10-0 nylon for suturing incisions in pediatric cataract surgery, to avoid subjecting the child to repeated anesthesia.

Key words: Absorbable, nonabsorbable suture material, pediatric cataract surgery, sutures in pediatric cataract

Pediatric cataract surgery differs from adult cataract surgery in various ways, one important difference being that sutureless cataract surgery is inappropriate in children due to the presence of poor scleral rigidity which results in reduced wound integrity if left unsutured. In addition, children are at a higher risk of trauma to the eye^[1] and therefore have more chance of wound dehiscence, leading to complications such as shallowing of the anterior chamber, iris prolapse, anterior synechiae formation, intraocular lens extrusion or displacement, vitreous prolapse, glaucoma, and even infection, including endophthalmitis. There are various approaches for wound construction in pediatric cataract surgeries. Most surgeons prefer a clear corneal approach due to its ease and because it induces less astigmatism,^[2] while some prefer the pars plana or the pars plicata approach^[3] and few other have a preference for scleral tunnel incisions.^[4]

Irrespective of the approach, the options that are widely available for suturing the surgical wounds include 10-0 nylon and 10-0 Vicryl sutures. Nylon is a nonabsorbable, monofilament composed of polyamides, which has long-standing tensile strength and induces minimal cellular reaction, while Vicryl is a synthetic absorbable polyglactin suture (copolymer of glycolide and lactide) but induces more reaction. Nevertheless,

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the Vicryl suture gets absorbed within 56–70 days,^[5] eliminating the need for suture removal. Between the two sutures, the braided nature of the Vicryl suture makes it difficult to secure a good knot to seal the incision than the nonbraided nylon suture. However, there was still a dilemma regarding which of the two sutures would be a better option in children. To answer this simple question, we decided to study and compare the absorbable suture material that has a higher tendency to develop reaction with the nonabsorbable suture that is easy to apply but requiring suture removal under general anesthesia or sedation.

Methods

It is a prospective, comparative study performed at a tertiary eye care center in India after taking informed consent from the parents. Ethics committee approval was obtained. We included all infants and children ranging from 3 months to 7 years of age, who underwent surgery for congenital and developmental cataract at our center between March 2013 and February 2016, with a minimum follow-up of 6 weeks. All cataracts secondary to trauma and/or uveitis were excluded from the study.

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All surgeries were performed by one surgeon or under her supervision. In all children, two side ports were made, and for those under 2 years of age, all were sutured with the knots being buried through the corneal side [Fig. 1]. In older children, suturing was done depending on the wound integrity, and therefore, not all side ports were sutured. Fourteen eyes of 11 children (3 bilateral and rest unilateral) had a posterior chamber intraocular lens implanted in the bag, while the others were left aphakic. The corneal tunnel incision used for implanting the foldable IOL was sutured based on the integrity of the wound. The incisions were closed with either 10-0 monofilament nylon (Aurolab Nylon Sutures, double arm, Aurolab India) or 10-0 polyglactin 910 sutures (Vicryl, single arm, Aurolab India). The children, who underwent bilateral cataract surgery, underwent suturing with nylon for the first eye followed by Vicryl for the second eye. However, for six children in anticipation of poor compliance to follow-up after observation of the first eye surgery, we used Vicryl for both the eyes. Children with unilateral cataract surgery received nylon or Vicryl sutures depending on the discretion of the surgeon.

Postoperatively, the eyes were carefully examined at each follow-up visit (1 week, 2–3 weeks, 6–8 weeks, and 3 monthly) for suture-related complications. The sutures were evaluated at each visit using the handheld slit lamp.

We subjected the data to the statistical test, the odds ratio, and Chi-square test, to compare the two suture materials. $P < 0.05$ was considered as statically significant. All statistical analyses were performed in MedCalc version 17.4.2 (MedCalc Inc., Ostend, Belgium).

Outcome measure

Complications were defined and its association with each suture material was studied. Complications [Fig. 2] needing suture removal included loose suture, vascularization around the suture with localized congestion of the adjacent conjunctiva, mucus infiltration, or a combination. In nylon sutures, epithelized sutures were not removed. The mean duration of suture absorption for Vicryl suture was studied. Complications noted with both the suture materials were compared, including the need for suture removal in both the groups. The time of development of each complication

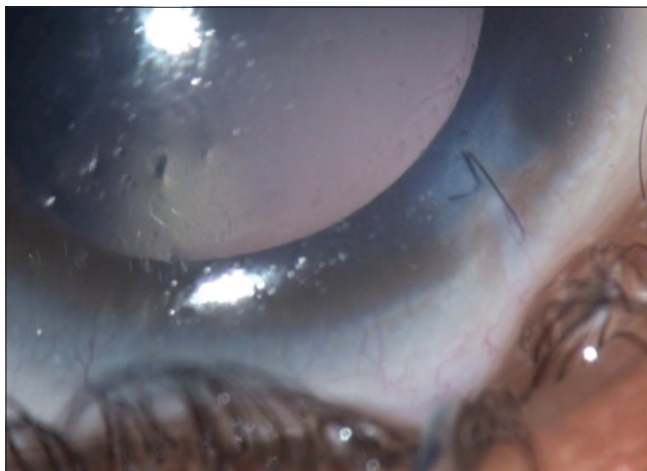


Figure 1: Normal suture, with knot buried and approximating the wound appropriately

from the surgery was noted. The duration of the earliest and the latest complication was also noted.

Results

The demographic data and distribution of the population are as shown in Table 1. There were a total of 42 children, but 1 child was excluded from the study as he traveled back to his country immediately after the second eye surgery. Of the 41 children included, 31 children (62 eyes) underwent bilateral cataract surgery and 10 children (10 eyes) underwent unilateral cataract surgery, with a resultant 72 eyes being a part of the study. Of the 31 children with bilateral surgery, 23 children were subjected to nylon sutures in one eye (23 eyes; 45 side port sutures and 1 main port suture) and Vicryl sutures in the other eyes (23 eyes; 46 sutures for 2 side ports per eye). Two children had nylon sutures in both eyes (4 eyes; 8 sutures) and six children had Vicryl sutures in both eyes (12 eyes; 22 sutures for the side ports and 2 side ports not sutured for older children). Among the unilateral surgeries, seven children (7 eyes; 10 sutures; 6 for the side ports and 4 for the main port incisions) underwent wound closure with nylon sutures and three children (3 eyes; 3 sutures for the one side port each and the other one not sutured as patient was older than 2 years) with Vicryl sutures. Therefore, our entire cohort consisted of 32 children (34 eyes; 64 sutures) who underwent wound closure with 10-0 nylon sutures and 32 children (38 eyes; 71 sutures) with 10-0 Vicryl sutures [Table 1].

The distribution of the suture materials and the associated complications needing removal of the sutures is also summarized in Table 1. Of the total 22 nylon sutures (34.4%) that were removed, 10 (15.6%) were loose, 7 (10.9%) were vascularized, 3 (4.7%) were loose and vascularized, and 2 (3.1%) had mucus infiltration. Similarly, of the 14 Vicryl sutures (19.7%) that were removed, 4 (5.6%) were loose, 3 (4.2%) were vascularized, 3 (4.2%) were vascularized and loose, and 4 (5.6%) had mucus infiltration with vascularization; the rest 57 (80.3%) Vicryl sutures were left *in situ* [Table 2].

On grouping them into those who needed early suture removal (<3 weeks) versus those who needed late suture removal (after 3 weeks), we found that 6 Vicryl sutures that were loose with vascularization and 2 nylon sutures that were loose needed early removal. Average time of suture removal for Vicryl was 2.9 weeks. In the group, which needed late suture removal of nylon sutures (after 3 weeks), we observed that vascularization and loose sutures were equally responsible. The average duration after the surgery when the Vicryl sutures were absorbed was 5.3 weeks and all sutures got absorbed by 8 weeks. The average follow-up was 20.9 months (range: 6 weeks to 52 months).

Discussion

To plan the surgery for congenital cataract appropriately, the surgeon needs to keep in mind certain differences with respect to an adult eye. Ocular dimensions continue to grow until adolescence.^[6] The sclera is thinner, more vascular, and elastic in children as compared to adults.^[4] Most of the cataract surgeries in children are done under general anesthesia, unlike local or topical anesthesia, which is frequently used for adults. Children are more vulnerable to complications of anesthesia than adults.^[7] Pediatric cataracts may be associated

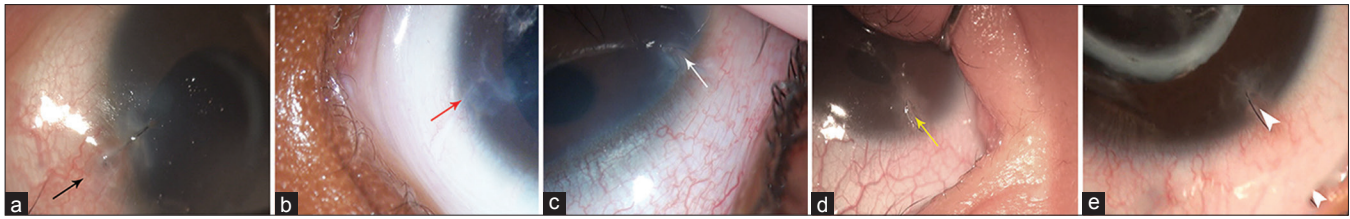


Figure 2: Suture-related complications (a) Vascularization (black arrow) needing suture removal, (b) Opacification (red arrow), suture getting absorbed, not removed, (c) Loose and vascularized (white arrow) suture, needing removal, (d) Loose suture with infiltration (yellow arrow), requiring removal, (e) Loose suture (white arrowhead)

Table 1: Demographic data with suture and complication distribution

	10-0 nylon	10-0 Vicryl
Age (range)	3 months to 7 years	3 months to 6 years
Median age (months)	8	7.5
Sex (male: female)	18:13	21:12
Total children with the sutures	32	32
Total number of eyes with the suture	34	38
Total number of sutures	64	71
Total sutures removed	22 (34.4%)	14 (19.7%) ($P=0.031$)
Most common complication needing removal	Loose	Loose
Earliest suture removal/cause	2 weeks/loose	6 days/loose
Latest suture removal/cause	32 months/loose with vascularization	NA
Left <i>in situ</i>	42	57 (all absorbed by 8 weeks)
Average follow-up	19.1 months (range: 1.5-42 months)	23.3 months (range: 1.5-45 months)

NA: Not applicable

Table 2: Chi-squared classification table

	Nylon (%)	Vicryl (%)
Sutures removed		
RT	61.1	38.9
CT	36.7	19.7
GT	16.8	10.7
Sutures not removed		
RT	40	60
CT	63.3	19.7
GT	16.8	43.5

RT: Row total, CT: Column total, GT: Grand total

with other systemic conditions which may complicate general anesthesia.^[6,8] Hence, it is better to avoid another general anesthesia only to remove a suture. Among our cases as well, we had several children who had associated congenital heart disease and Toxoplasma, Rubella, Cytomegalovirus and Herpes (TORCH) infections and were operated under high-risk consent due to their systemic diseases. A clear corneal sutureless approach (e.g., temporal) as performed in adults is less applicable in children because of the high rates of wound dehiscence and iris incarceration.^[9] Although this approach is easy and the induced astigmatism is low,^[2] the risk of trauma to the incision is higher and its consequences make it less attractive for children. To prevent complications as discussed above, we should prefer to close the incision. There are few studies that compare the types of suture material for surgical wound closure,^[10-12] however, not many comparing the same in children. We, therefore, compared

readily available suture materials: 10-0 nylon and 10-0 Vicryl for the surgical wound closure in children undergoing cataract surgery. We ensured adequacy of wound closure, suture tension, and the absence of leakage at the end of surgery. Bartholomew *et al.*^[13] have studied 8-0 Vicryl, 8-0 nylon, and silk sutures for closing surgical wounds during pediatric cataract surgery. They divided their complications into early and late (2 weeks after surgery), and their results showed higher early complications in the Vicryl group, and they attributed them to difficulty in knot tying, resulting in poor wound closure. They reported bleb formations secondary to leakage from the wounds due to inadequate wound closure or early dissolution of the sutures. Our children in either group did not have any bleb formation, indicating the absence of wound leak probably due to better wound apposition. However, sutures must never be overtightened to avoid the development of high astigmatism.

Bartholomew RS *et al* have suggested that, in a child with more congestion, the sutures tend to hydrolyze earlier.^[13] This would be of concern in complicated pediatric cataracts which tend to develop more postoperative reaction.^[10] In our study, the earliest absorption of 10-0 Vicryl was at 2 weeks after surgery. We had no case of a broken suture postoperatively that needed re-suturing. Only one suture from the Vicryl group was noted as loose at the 6th day follow-up which was removed without the need for suturing again.

10-0 nylon sutures have the advantage of having low antigenicity, high elasticity, and prolonged tensile strength.^[14] However, studies^[12,15] show that nylon sutures can cause several complications if left *in situ* such as vascularization,

astigmatism, becoming loose, accumulation of mucus, and breaking of sutures which can lead to giant papillary conjunctivitis, limbitis, conjunctivitis, and even suppurative keratitis when the knot were not buried. Both these studies^[12,15] recommend that nylon sutures should be removed within 6–12 months after surgery. In our cohort, two children needed 10–0 nylon suture removal as late as 36 months after surgery as the suture got vascularized. Nylon sutures, therefore, require a regular follow-up until they are removed. Such situations would require another anesthesia for suture removal, unlike Vicryl suture that's gets absorbed and is, therefore, a better option in this regard. However, we have noted that Vicryl sutures do cause an opacification of the suture tract unlike nylon sutures.

An interesting observation that we found during the course of this study was the difficulty in tying the Vicryl sutures as compared to the nylon sutures. We observed that tying of the knots took more time and multiple attempts to achieve adequate wound closure with Vicryl sutures than with nylon. However, since we did not have any quantitative scale to assess it, we will address this aspect in a subsequent study.

We do acknowledge the limitations in our study of a small sample size and the delay in the exact follow-up.

Conclusion

Vicryl, being an absorbable suture material, could be preferred over a nonabsorbable suture material like nylon as the latter has a higher chance of suture removal and relatively more complications, needing repeated anesthesia. However, one should ensure proper tying of the Vicryl suture to further reduce the chances of complications.

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Conflicts of interest

There are no conflicts of interest.

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