

# Banded Technique for Ruptured Traumatic Paediatric Cataracts- The Early Results of A Novel Method in Bangladesh

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## Abstract

*This study features 12 eyes of 12 children between 5 and 12 years who had surgery for traumatic cataract utilizing the new banded technique. Sixteen percent of eyes had penetrating injuries and had previous surgery to repair the cornea. All preoperative Visual acuity were less than 6/60 vision in the affected eye. Average interval between injury and cataract extraction with IOL implantation was 5.2 days. Ten out of 12 eyes (84.6%) achieved vision better than 6/18 in the first 6 weeks and 100% by 3 months with normal IOPs, IOL stability with no cases of pupil capture. One eye experienced PCO by 3 months postoperatively.*

## Introduction

Trauma is a significant cause of paediatric cataracts. It was responsible for 29% of consecutive children presenting to an eye clinic in Southern India<sup>1</sup>. Similarly, another study found 29.7% of new cases in a lens clinic to be traumatic cataracts<sup>2</sup>. Injury may be blunt or penetrating in nature. The anterior lens capsule may be ruptured following trauma, although this is more commonly occurs with the posterior capsule<sup>3</sup>. Rupture of the anterior capsule may result from direct (coup) or indirect (contrecoup) mechanisms during blunt trauma<sup>3</sup>. Treatment requires cataract extraction with or without primary intraocular lens implantation. Where IOL is inserted, potential postoperative complications may include, but are not limited to IOL decentration or tilt with potential contact with iris, and in some cases, iris-lens capture. The tendency for iris contact and lens-iris capture is greater, the closer the IOL is to

the iris, both occurring more frequently with sulcus-inserted IOL as compared to in-the-bag insertion<sup>5</sup>. The incidence of iris-lens capture is from 26% to 41%<sup>1,6,7</sup>, occurring when the anterior capsulorhexis is larger in size than the IOL optic which is often the case with already ruptured anterior capsules; this may result in increased inflammation due to iris contact, as well as astigmatism post-operatively from the IOL tilt. Some authors have proposed IOL capture through the posterior capsulorhexis as an alternative way to prevent posterior capsule opacification and to keep IOL from decentering or being involved in lens-iris capture<sup>8</sup>, but this is not always feasible when the posterior capsule is ruptured following trauma, which is thought to be more common than anterior capsule rupture due its being comparably thinner than the anterior capsule<sup>4</sup>. Chowdhury and Nischal<sup>9</sup> proposed an alternative technique, the band technique which preserves a sleeve out of the ruptured anterior capsule to act as a band to

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keep the implanted IOL within the bag, increasing stability and reducing inflammation and iris-pupil capture. Reduced inflammation and IOL stability produce better visual results.

### Materials and Methods

A prospective observational study in which all eyes of children presenting with traumatic cataract between May 2019 and December 2021 with ruptured anterior capsules of the anterior lens capsule surface and had cataract extraction with IOL implantation using the banded technique, were enrolled.

Excluded from the study were those with rupture exceeding 50% of anterior lens capsule and those in which cataract was subluxated or dislocated.

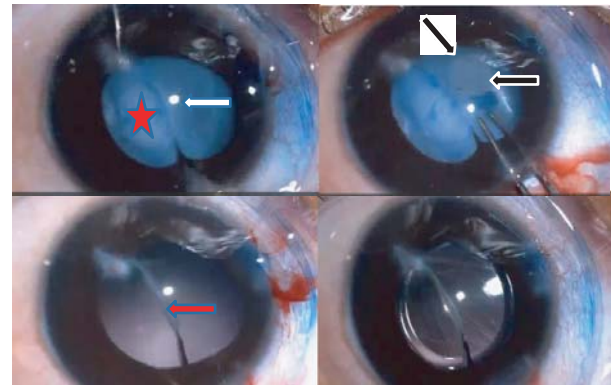
Demographic data were obtained from each patient along with significant historical facts on duration and agent of injury and previous surgical intervention.

Pre-operatively, Visual acuity was established, along with intra-ocular pressure, and detailed examination of injured and fellow eye. All patients had the same procedure (Irrigation and aspiration with intra-ocular lens implantation) by the same surgeon (the principal author).

**SURGICAL PROCEDURE :** A superior stab entry at 12 O'clock with a keratome 90degrees from a side port entry made using the 15degree lance blade. Trypan blue injected into anterior chamber to stain residual anterior capsule and then irrigated. Anterior chamber deepened with viscoelastic and capsulotomy done on larger residual portion of the ruptured anterior capsule with a small central flap raised and then cautious curvilinear capsulorrhexis done with capsulotomy forceps, leaving a band of residual capsule anteriorly.

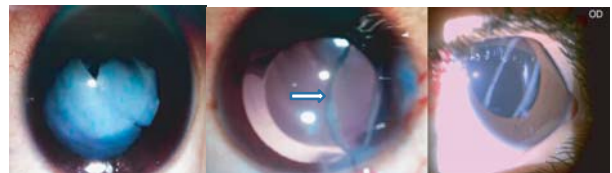
Soft lens matter irrigated and aspirated with Simcoe cannula and AC deepened with viscoelastic and foldable acrylic hydrophobic intra-ocular lens injected into capsular bag and

properly positioned in with a dialler. Residual viscoelastic is irrigated and aspirated. Both entry wounds are closed with a single suture of 10/0 Nylon with knots buried. Post-operative medication consisted of Moxifloxacin eyedrop instilled four times daily over a two week period; Dexamethasone eyedrop commenced 2hourly from day 1 and tailed off gradually over six to eight weeks; moxifloxacin-dexamethasone combination ointment instilled nightly over 3 weeks. Post-operative visits were on Day1, Day8, Day 16, 1month, 3months and 6months.

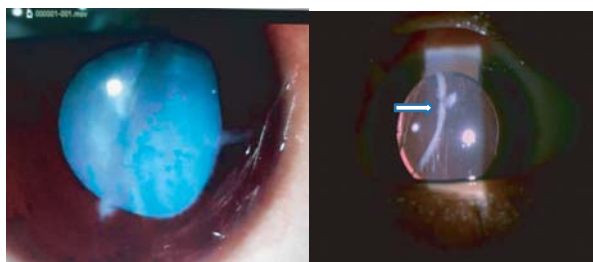


**Figure 1.**

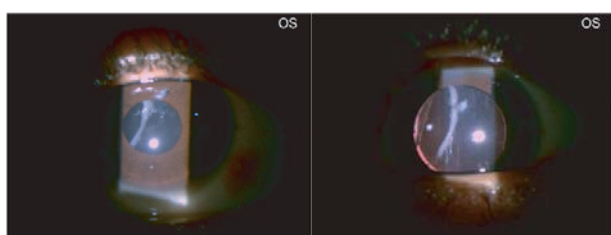
**Images before and after lens aspiration. Note the capsule rupture (red star), narrow band of anterior capsule (white arrows), borders of the anterior capsulorhexis (black arrow) not involving the site of rupture, and areas of the intact anterior capsule. Left: Before lens implantation. Right: After lens implantation. The red arrowheads show the edges of the traumatic rupture of the posterior capsule.**



**Figure 2 : A: Area of anterior capsule rupture with a total cataract . B: Narrow band of intact anterior capsule restraining the IOL (white arrows) and C: Band of anterior capsule holding the IOL in position not disturbing the visual axis.**



**Figure 3 : A: Area of anterior capsule rupture with a total cataract . B.Narrow band of intact anterior capsule restraining the IOL (white arrows) .**



**Figure 4 : Narrow band of anterior capsule with IOL A. before dilatation and B. after dilatation**



**Figure 5 : Shifting of the narrow anterior capsular band away from the visual axis after four months of surgery A. In retro illumination B. after dilatation.**

**Results**

Twelve eyes of 12 patients were included. Patients’ ages ranged between 5years and 12years, with an average of 7.5years. All patients except for one were males. Trauma was blunt in 83.3% and penetrating in 16.7% (Figure 6).

Ten out of 12 eyes had had a previous corneal repair before presentation (figure 7).

Interval between injury and surgery ranged between 2 and 14days. Pre-operatively, all eyes were severely visually-impaired with CF vision in 7 out of 12eyes and HM vision in the others. By the first post-operative day, 83.3% of eyes had moderate visual acuity (<6/18 to 6/60), while 16.7% had good visual acuity (>6/18 to 6/6). By the 6<sup>th</sup> post-operative week 91.6% had good BCVA while 100% had achieved good BCVA by the third month (Table 1).

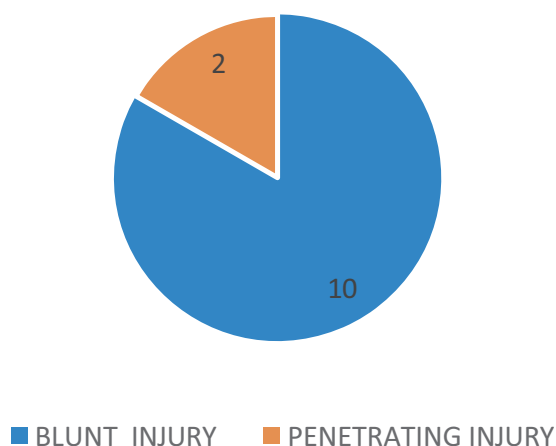
Intra-ocular pressures (IOP)by the 6<sup>th</sup> week ranged from 9mmHg to 14mmHg (mean IOP 11.25±2.25mmHg). No eye had required use of IOP-lowering medication at any stage. Refraction revealed

astigmatism in 10 out of 12 eyes, 60% of which were hyperopic astigmatism. Eighty percent of astigmatism (8eyes) was mild with cylindrical error 1.5D or less, whilst it was moderate with 2D of astigmatism in 2 eyes (Figure 8).

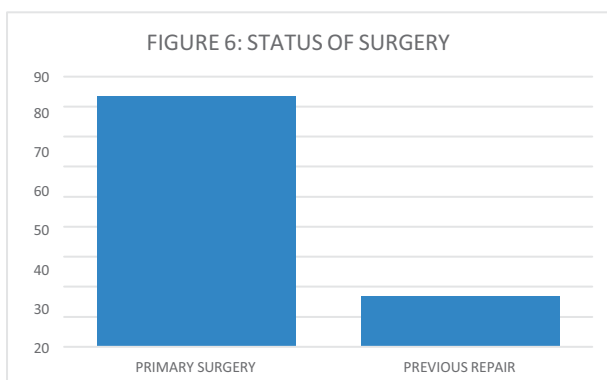
The mean spherical equivalent was 1.15D. There were no instances of IOL subluxation or lens-iris capture. One eye developed PCO at 3months after surgery.

**Tables and Figures- Figure 6 : Types of Injury**

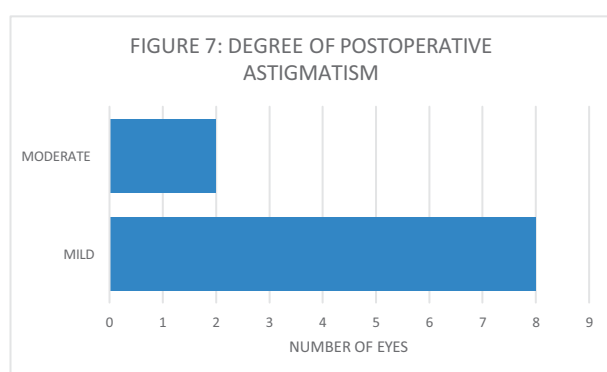
**FIGURE 5: TYPE OF INJURY**



**Figure 7: Status of Surgery**



**Figure 8: Degree of Postoperative Astigmatism**



**Table 1: Progression of Visual Acuity**

	PRESENTING ACUITY		POST-OPERATIVE ACUITY 1 <sup>ST</sup> DAY		POST-OPERATIVE ACUITY 6 <sup>TH</sup> WEEK		BEST CORRECTED ACUITY 3 <sup>RD</sup> MONTH	
	NO OF EYES	%	NO. OF EYES	%	NO. OF EYES	%	NO. OF EYES	%
GOOD(6/6-6/18)	0	0	2	16.7	11	91.7	12	100
MODERATE (<6/18-6/60)	0	0	10	83.3	1	8.3	0	0
POOR (<6/60)	12	100	0	0	0	0	0	0
TOTAL	12		12		12		12	

**Discussion**

The banded technique was a novel technique published by Chowdhary and Nischal resulting in good visual outcome with IOL stability and avoidance of iris-lens capture postoperatively<sup>9</sup>. We set out to adopt this new technique in our centre to see if our patients would benefit from reduced instances of IOL decentration and iris- lens capture post-operatively in cases of traumatic

cataract. Our main comparisons therefore will be with Chowdhary and Nischal’s, to the best of our knowledge, the only published work with the banded technique for traumatic cataracts seen in literature at this time. We adopted the same guidelines as did Chowdhary and Nischal, excluding cases in which the rupture involved more than half of the anterior lens capsule. However in this study, capsulorrhexis was done conventionally by raising a careful flap and cautiously doing a continuous curvilinear capsulorrhexis (CCC) with a microhexis forcep exerting a gentle centripetal pull, rather than with the two-incision push-and -pull (TIPP) technique adopted by Chowdhury and Nischal. In all cases, capsulorrhexis was successfully made to achieved a slim band of anterior lens capsule across the front of the capsular bag, which kept the inserted IOLs in the bag. None of the eyes experienced capsular tear either during manual CCC or in the process of intraocular manoeuvres with lens matter aspiration or IOL insertion. Contrary to this, Samer Hamada and colleagues’ 5year retrospective review of TIPP showed a capsule tear rate of 4.8% during rigid lens insertion<sup>10</sup>. Manoeuvring a narrow IOL injector with a foldable IOL into the bag (as was the case in this

study where no rigid lenses were inserted) demands less stretch of the capsular bag opening as compared to the wider diameter of a rigid IOL so the higher tear rate where PMMA lenses were used is understandable.

CCC may have been more successful avoiding tears in this study because the children are relatively older with the youngest being 5years, as suggested in studies which conclude that CCC is

better suited for children older than 6years because the lens capsule is less elastic, whereas it is more susceptible to tears in the much more elastic capsules of those less than 6years of age. It is noteworthy that more than half of the 68eyes reviewed by Hamada and colleagues were younger than 5years old, hence these tended to have more tears with manual capsulotomy. Wilson and colleagues conclude that vitrectorhexis is better for children less than 6years of age<sup>11</sup>. All capsule bands had successfully retracted by the third month after surgery, avoiding the need for YAG Laser capsulectomy, and clearing the visual axis, whilst having provided stability when it was critical in the early post-operative period as in the other study.

The average time period between injury and surgery was 14days- relatively shorter, half the time taken in Chowdhury's study. In spite of this however, inflammation was kept controlled successfully with no flare ups. This answers the question by Chowdhury and Nischal as to whether the band technique would turn out as well if done at primary surgery shortly after injury, as theirs took an average of 47days before intervention. Intervention after very brief application of topical steroids, for a week or less was adequate in this study to avoid a flare up of inflammation post operatively. Hence, it may be beneficial to undertake surgery with visual rehabilitation within a short time to avoid amblyopia, as traumatic cataracts are commonly uniocular and causes stimulus deprivation. Neither study reported cases of secondary glaucoma in the period under review. Proper preoperative control of inflammation by way of topical steroids, good clearance of soft lens matter intraocularly and adequate steroids postoperatively all play a role in avoiding secondary open angle glaucoma. In addition, the band of anterior capsule helps to keep the IOL well in the bag with low risk of pupil block or lens-iris capture which may risk pupil block glaucoma. Long-term follow up will reveal whether there will be any cases of angle-recession

glaucoma, which may result following ocular trauma.

Visual results as at the last follow up in this study appeared much better than Chowdhury and Nischal's study with good visual acuity (6/6 to 6/18) in all eyes by the third month. This study had proportionally fewer penetrating injuries (16.7%) compared to 80% in the compared study. Visual outcome is expectedly worse where there is concurrent corneal laceration. As with Chowdhury's study, there were no IOL decentrations or iris-lens capture, and it is our belief that this reflected in the low astigmatism in this study. This shows that the banded technique really does offer better outcomes as averred to in the previous study, although it made no mention of final refraction values. Neither study needed to have the band lasered off, as over time, they all retracted.

### Conclusion

The high rate of concurrence with results from these two studies adds weight to the conclusion that the band technique does improve visual outcome in the management of traumatic cataracts with ruptured anterior lens capsules in children.

### References

1. Eckstein M, Vijayalakshmi P, Killedar M, Gilbert C, Foster A. Aetiology of childhood cataracts in Southern India. *Br J Ophthalmol* 1996;Jul 80(7):628-632.
2. Khokar S, Agarwal T, Kumar G, Kushmesh R, Tejwani LK. Lenticular abnormalities in children. *J Paediatr Ophthalmol strab* 2012;49:32-7.
3. Banitt MR, Malta JB, Mian SI, Soong HK. Rupture of anterior lens capsule from blunt ocular injury. *J Cataract Refract Surg* 2009 May;35(5):943-5
4. Jjkkjfkj
5. Pandey SK, Ram J, Werner L, Brar GS, Jain AK, Gupta A, Apple DJ. Visual results and post operative complications of capsular bag and ciliary

- sulcus fixation of posterior chamber intraocular lenses in children with trauma. *J Cataract Refract Surg* 1999Dec;25(12):1576-84.
6. BenEzra D, Cohen E, Rose L. Traumatic cataract in children: correction of aphakia by contact lens or intraocular lens. *Am J Ophthalmol* 1997;123:773-782.
  7. Eckstein M, Vijayalakshmi P, Killedar M, Gilbert C, Foster A. Use of Intraocular lenses in children with traumatic cataract in southern India. *Br J Ophthalmol* 1998 Aug; 82(8):911-915.
  8. Ying-Bin Xie, Mei-Yu Ren, Qi Wang, Li Hua Wang. Intraocular lens capture in paediatric cataract surgery. *Int J Ophthalmol* 2018;11(8):1403-1410.
  9. Chowdhary S, Nischal KK. Band technique for paediatric traumatic cataract surgery. *J Cataract Refract Surg* 2019;45:8- 10.
  10. Samer Hamada, Sanoy Low, Bronwen C. Waters, Ken K Nischal. Five year experience of the two incision push and pull technique for anterior and posterior capsulorhexis in paediatric cataract surgery. *Ophthalmology* 2006; 113:1309-1314.
  11. Wilson ME, Trivedi RH, Bartholomew LR, Pershing S. Comparison of anterior vitrectorhexis and continuous curvilinear capsulorhexis in paediatric cataract and intraocular lens implantation surgery: A 10year analysis. *JAAPOS* 20.