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Frequency of visual improvement after traumatic cataract surgery with intraocular lens implantation in patients having blunt ocular trauma.

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ABSTRACT

Background: The purpose of the study is the improvement of blunt ocular trauma after traumatic cataract surgery with intraocular lens implantation.

MATERIALS AND METHODS: 151 patients were selected from the ophthalmology department of Faisalabad Medical University Faisalabad on the basis of Non probability purposive sampling who full filled the inclusion and exclusion criteria. Data was analyzed by statistical package for social sciences (SPSS) software methods. Chi square test was used to see the effect of outcome variable & p value 0.05 was taken as significant.

RESULTS: The improvement of visual acuity, (Good visual acuity = 6/6-6/12) was found in 125 (82.8%) patients after traumatic cataract surgery with intra ocular lens implantation. Visual acuity did not improve up to level of Good visual acuity (6/6-6/12) in 26 (17.2%) patients. The majority of the patients (59.6%) were aged between 15-20 years and in which males were dominant showing that younger males were affected mostly with trauma.

CONCUSION: Patients with traumatic cataract can have improvement in visual outcome after cataract removal and IOL implantation, depending upon management and complications.

Keywords: *Visual improvement after traumatic cataract surgery, blunt ocular trauma*

INTRODUCTION:

Traumatic cataract is one of the common causes of blindness, and it is most common cause of unilateral, partial second or total loss of vision in all age groups.

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In United States, 6.8 per 1000 population suffered from ocular trauma, which required treatment.[1] From 1992 through 2001 the overall rate of eye injury ranged from 8.2-13.0 per thousand population.[4]

Ocular trauma can cause cataract and many other intraocular problems. Blunt trauma or penetrating trauma , both can cause traumatic cataract formation. Children and young adults especially boys are predisposed to trauma because of their playing activities and so have higher incidence of traumatic cataract[2]. Several studies have explored that early cataract extraction with IOL implantation[7] in traumatic cataract results in good vision.[3,5] . A number of treatment options can be used for intraocular lens implantation according to ocular condition for example capsular bag

intraocular lens implantation, anterior chamber lens implantation and scleral fixation however ciliary sulcus fixation is safe if the posterior capsule is compromised but zonular support is maintained[6].

Final visual outcome is found to vary according to morphology of the cataract[8] . White soft cataracts have a better prognosis and achieve significantly higher rates of positive outcome compared with other morphologies. A significant difference is found if final visual outcome is compared before and after treatment. A significant relationship exists between age and final visual outcome.

Cataract resulting from ocular blunt trauma is very common among patients presenting to our hospital.Most of these patients are young males who are active members of the society and need a better visual status in order to earn their livelihood or peruse their professional/educational demands .The cataract surgery with intraocular lens implantation in such patient is usually fruitful in terms of gain in visual acuity. The aim of the present study is therefore to find the frequency of visual improvements after traumatic cataract extraction in our population. This study was carried out at Bahawal victoria hospital Bahawalpur. Sample size calculated was 151 taken from the results of a recent study and a copy of its reference is attached along with it. As the data available about this topic is limited so I wanted to carry out this study and the results of my study are favorable for this surgical procedure that could be practiced by the ophthalmologists.

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MATERIALS AND METHODS:

STUDY DESIGN: cross sectional analytical study.
DURATION; 6months (November 2022 to May 2023)

SAMPLE SIZE:

Sample size was calculated by using the sample size calculation formula recommended by the WHO with 95% confidence level, 8% margin of error and taking expected percentage of visual improvement (as per operational definition) i.e. 50% .Results of a recent study is taken as a refence[7] .The sample size thus calculated was 151.

SAMPLING TECHNIQUE: Non probability purposive sampling.
INCLUSION CRITERIA

- Age: 15 – 30 years.
- Gender: male and female subjects will be included in this study.
- Patients having history of ocular blunt trauma and traumatic cataract of at least 3 months duration as assessed through slit lamp bio microscopy.

EXCLUSION CRITERIA

- Patients having posterior segment trauma of retina or optic nerve (assessed through indirect Ophthalmoscopy and B.scan ultrasonography.)
- Patients having pre operative corneal opacity due to trauma (slit lamp examination).
- Patients with hereditary retinal disorders like retinitis pigmentosa etc (indirect ophthalmoscopy)

DATA COLLECTION PROCEDURE

Permission for this study was taken from the institutional ethical committee of this hospital. Patients with history of blunt trauma presenting to Eye OPD of Faisalabad Medical university Faisalabad and fulfilling the inclusion & exclusion criteria were enrolled for this study.
Informed consent was taken from all the patient especially regarding surgical procedures.
A pre-designed proforma (Annexure-A) was filled along with demographics like name, age, gender and address.

Methodology
Examination,
All patients were undergon thorough complete ophthalmic examination

- Best corrected visual acuity (BCVA) using Snellen's visual acuity chart
- Pupillary light reflex and relative afferent papillary defect.
- Extraocular motility examination
- Intraocular pressure by Goldmann applanation tonometer
- Slit lamp biomicroscopy of anterior segment of eye,
- Distan direct of ophthalmoscopy,
- Fundus examination using direct ophthalmoscope,indirect fundus viewing lens (+90D),
- B SCAN ,If posterior segment was not visible B.Scan Ultrasonography was done to rule out any posterior segment pathology for example retinal detachment.

Complete systemic examination of every patient was done whenever needed concerned medical specialist was consulted.
Investigation

1. Blood complete examination.
2. Urine complete examination.
3. Blood sugar.
4. X-ray Chest
5. Viral marker i.e. Hepatitis B & C.

After completing ophthalmic examination every patient of my study was undergone traumatic cataract surgery.
The surgery was performed under retrobulbar anesthesia in adults. However, general anesthesia was may required for uncooperative patients

SURGICAL TECHNIQUE;

The lids and periocular area were painted with povidone iodine 5% solution twice and the patient draped. Once fully draped, the eye speculum was inserted, and then forth dose of proparacain 0.5% was poured on the exposed ocular surface.

All surgical procedures were performed by surgeon who had performed cataract surgery since 20, using a standardized clear corneal irrigation and aspiration of lens matter with intraocular lens implantation.

A clear corneal tunnel incision was made.The anterior chamber was reached with a 2.8 mm to 3.2 mm disposable keratome. Trypan blue was used to stain the capsule in white cataracts, which makes the procedure simple. Viscoelastic (2% hydroxy propyl methyl cellulose), was used to maintain the anterior chamber. Pre-existing posterior synechiae with a miotic pupil were released with visco-cannula. Capsulorrhexis was performed as in routine cataract surgery with a 26-gauge bent cystotome or rhexis forceps .If a pre-existing tear in the anterior capsule was present, one can follow the margin and complete it. .A sdie port was made with 11#blade at 40degree.

A Simcoe's cannula was used to aspirate soft cataracts thru side port and main corneal wound. However for thick cataracts. aspiration and vacuum settings of phacoemulsification was used.

Greate care was taken, especially in the performance of the capsulorrhexis and cortical removal steps, not to further weaken already compromised zonular support. If zonular dialysis was noted on the table, we can use capsular tension rings for stabilization.

In case of good capsular bag support, the IOL (foldable or 5.2mm PMMA IOL) was placed in the bag,otherwise ciliary sulcus-supported posterior chamber IOL (6.5mm PMMA) were placed.

Following IOL implantation and removal of the viscoelastic substance, the pupil was constricted with intracameral application of 0.01% carbachol (Miostat; Alcon Surgical, Ft Worth, Tex). All the patients required only one suture to close the wound. At the end of the surgery, all patients received an identical regimen , including 2 mg of dexamethasone acetate (Fortecortin; Merck, Cologne, Germany) and gentamycin (0.25 ml each) subconjunctival injection using 27guge needle with 1cc syring. Each eye was padded .

After 24hrs of surgery, the dressing was removed, eye was examined, and topical medications were started. During postoperative recovery, each patient received topical corticosteroid and moxifloxacin eyedrops at dose of 1hourly initially for 1week then 3 hourly thereafter, and a combination of a corticosteroid and antibiotic ointment at night, the dosage being rapidly reduced depending on the degree of postoperative inflammation over a period of 2 and half months..

The operated patients were re-examined after 1week, 2, and 6 weeks to enable refractive correction. At every follow-up examination, visual acuity was tested with Snellen's chart. The anterior segment was examined with a slit lamp, and the posterior segment, with an indirect ophthalmoscope..

After 6 weeks of surgery visual acuity was assessed by snellen visual acuity chart, eyes with vision = 6/6 – 6/12 (at 6 weeks) were defined as having a good visual visual acuity. All this information were recorded on a pre-designed Proforma (Annexure).

DATA ANALYSIS

Data was analyzed through SPSS version (10). Quantitative variables like age was calculated as mean ±SD. Qualitative variables like visual improvement (VA), gender were calculated as frequency and %age. Data was stratified for age, gender & baseline VA to address effect modifiers. Chi-square test was used for post stratification to see the effect of these on outcome variables. P-value of ≤0.05 was considered significant.

Table 1:

Distribution of patients according to age

(n= 151)

Age in years	No. of patients	Percentage
15-20	90	59.6%
21-25	39	25.8%
26-30	22	14.6%

Mean ± SD= 20.4± 4.2

Table 2:

Sex distribution of patients

Sex	No. of patients	Percentage
Male	101	66.9%
Female	50	33.1%

It shows male to female ratio 2:1

Table 3:

Stratification of patients according to initial visual acuity

Visual Acuity < 6/36		Visual acuity > 6/36	
Male	Female	Male	Female
80 (52%)	30 (19%)	21 (13%)	20 (13%)
Total = 110 (72%)		Total 41 (28%)	
Grand Total = 151 (100%)			

Table 4:

Visual acuity improvement after traumatic cataract surgery

(total patients n=151)

Good Visual acuity (6/6-6/12) after surgery	No. of patients			p- Value (Chi-square test)
	Male	Female	Total	
YES	86 (56.95%)	40 (26.49%)	126 (83.44%)	p<0.04231
NO	15 (9.93%)	10 (6.62%)	25 (16.55%)	
Total	101 (66.88%)	50 (33.11%)	**Grand Total** 151 (100%)	

RESULTS

A total of 151 traumatic cataract patients were operated at Eye Unit-II, BVH, Bahawalpur from November 2013 to May 2014. Among these patients, 101 (66.9%) were males and 50(33.1%) were females.(Table No. 2)

The age ranged between 15 to 30 years with mean age: 20.4± 4.2 years (table;1).

The improvement in visual acuity was observed in 126 (83.4%) patients (see Table#3) .

As can be observed from Table#3, the improvement of visual acuity was seen in 57% of the males participants and 6% of the females participants. It is also observed that good visual acuity was not observed after cataract surgery in about 25 (16.5%) patients.

In our study, posterior chamber intraocular lens was implanted in most of the patients (93%) and in only 7 (5%) patients Anterior chamber IOL was implanted and 7 (4.6%) patients were left aphakic due to inadequate capsular support. This is another reason for failure to improve visual acuity in some patients after cataract surgery.

The major postoperative complications encountered on first postoperative day were anterior uveitis almost in all patients and corneal oedema was seen in 10 (6.6%) patients which responded to medical therapy.

DISCUSSION

Most commonly performed Refractive procedure is cataract surgery. The primary purpose in managing a patient with cataract, as stated in the American Academy of Ophthalmology's, *Preferred Practice Pattern for Cataract in the Adult Eye*[9], is to improve functional vision and the quality of life. Currently, the only effective treatment of cataract is surgical removal with, in most cases, insertion of an intraocular lens to restore optical system of eye[10].

Traumatic cataract is one of the most common outcomes of ocular injuries and this cataract is one of the common causes of blindness, second most common cause of unilateral, partial or total loss of vision in all age groups. There is a 1-15% incidence of traumatic cataract in ocular injuries[7]. Trauma is the leading cause of 90% of acquired paediatric cataracts.[8]

Most of the ocular trauma occurs in children and in adults in the productive age group, a finding which was also seen in the this study that 60% patients were with age 15-20yrs. Thompson *et al*. observed that a majority of the ocular trauma in children occur at home due to lack of adult supervision.

Another considerable point is that 101 (66.9%) cases were males in my study showing that Males are more likely to sustain an eye trauma than females because they are more likely to be involved in hazardous sports and occupations[7]. Worldwide males are more commonly involved in traumatic cataract than females.

Most of the injuries were caused by flying pieces of wood, metal, glass, stone and Sporting balls such as cricket ball, lawn tennis ball, squash ball, shuttle cock (from Badminton). Fistfight was also causative factor in some cases.

Surgical interventions for traumatic cataract has variable outcome[11-17].Recent advances in surgical technique, equipment and intraocular lenses have significantly affected the way surgery is being performed. Most of surgical interventions are doing by procedure of phacoemulsification and then ECCE and irrigation aspiration[12].

For management of traumatic cataract[18-21] ,different treatment modalities can be used for surgery and intraocular lens implantation according to the type of cataract and extent of injury for example capsular bag intraocular lens implantation, anterior chamber lens

implantation and scleral fixation however ciliary sulcus fixation is safe if the posterior capsule is compromised but zonular support is main tained[6,22-23].

In our study ,a high percentage of patient showed improvement visual acuity which shows the importance of removal of cataract and early IOL implantation[28-30], providing an everlasting solution to aphakia and results in a good visual prognosis[5]. In blunt trauma and penetrating trauma catatact is most important and leading cause of decrease vision[22-25] and our results shows that if we removed cataract patients can return their primary good vision.

The improvement in visual acuity as seen our patient was not statically significant due to the fact that these patients did not seek early consultation for their ocular problem by an Ophthalmologist and it was observed after surgery on retinal examination that most of these patients had posterior segment pathologies i.e. traumatic optic neuropathy in 5(3.3%) patients, traumatic macular hole in 2 (1.3%) patients and macular scar in 3 (1.9%) patients.

Another important reasons for decreased vision in our study were primary posterior capsular opacification in 6% patients, corneal opacity ,high astigmatism, aphakia, glaucoma, vitreous hemorrhage, traumatic optic neuropathy, retinal detachment, maculer hole, epiretinal membrane (macular scar).

Patients of primary posterior capsular opacity were counselled properly for cause of their decrease vision and followed up for nd.YAG laser capsulotomy after duration of 6 months from time of surgery.

Implantation of intra ocular lens (IOL) in traumatized eyes after removal of traumatic cataract depends on availability of capsular support[28-33]. In capsular bag or Zonular support posterior chamber IOL was preferred if there was insufficient capsular or Zonular support patients were left aphakic. These aphakic patients were called after 3 months for anterior chamber IOL implantation.

The commonest postoperative complication in these traumatic cataractous eyes was anterior uveitis that was well controlled with topical therapy.

This study revealed that satisfactory visual outcome in majority of patients with traumatic cataract could be safely achieved after cataract removal and IOL implantation.

Zaman *et al*.10 and Cheema *et al*.20 reported visual acuity of 6/18 or better in 68.7% of patients[17]. Gain *et al*. concluded that postoperative visual acuity depends on complications[20] and findings of our study are consistent with these findings.

Blindness from ocular trauma can be avoided by imploying protective eye wears especially in high risk activities. Patient education in schools, baby day care centres and through media must be carried out to prevent ocular injuries in children. Once the injury has occurred, outcome depends on extent of injury to ocular and peri-orbital structures and immediate and professional approach must be taken to prevent blindness.

Limitations of this study were a small sample size and a fixed follow-up period. This study was conducted at a tertiary care hospital where large number of complicated cases were presented for management in which most of patients managed but not included in study due to falling in excluding criteria. It also affected the surgical success rates and outcome. A majority of the patients were from rural areas and seen by local doctors postoperatively for their convenience which limited the follow-up period.

CONCLUSION

Patients with traumatic cataract can have good visual outcome after cataract

removal and IOL implantation, depending upon early management and avoidance of complications. Young males are commonly affected. Taking protective measures in sports and work and patient education can avoid ocular trauma and traumatic cataract formation.

REFERENCES

1. Mc Gwin,Xie A,Ocusley C. The rate of eye injury in the United States. Arch Ophthalmol.2005;123:970-6.

2. Kuhn F, Morris R, Wither Spoon CD, Mann L. Epidemiology of blinding trauma in the United States eye injury registry.ophthalmic epidemiol 2006;13:209-16.

3. Guly CM, Guly HR, Bouamra O, et al. Ocular injuries in patients with major trauma. Emerg Med J. 2006;2:915-7.

4. Mc Gwin Jr, Hall TA, Xie A, Ocusley C. Trends of eye injury in the United States,1992-2001, Invest Ophthalmol Visci 2006; 47:521-7.

5. Mehul S, Shreya S, Shashank S, Vinay P, Avadh P. Visual recovery and predictor of visual prognosis after managing traumatic cataracts in 555 patients. Indian J Ophthalmol 2011;59(3):217-222.

6. Phillips PM, Shanie H,Chen ES, Terry MA. Transcleral sulcus fixationof a small diameteriris diaphragm intraocular lens in combined penetrating keratoplasty and cataract extraction for correction of traumatic cataract,aniridia and corneal scarring. J Cataract Refractive Surgery. 2008;34:2170-3.

7. Nisar A, Tariq A, Sharmeen A. Visual outcome after primary IOL implantation for traumatic cataract. Pak J Ophthalmol. 2011; 27:3.

8. Iqbal A, Jon S, Naeem Han MO, Ashraf MO. Spectrum of ocular injuries presenting at emergency department of Pakistan institute of medical sciences. Al Shifa J Ophthalmol. 2007;23(2):58-63.

9. American Academy of Ophthalmology: Cataract in the Adult Eye: Preferred Practice Pattern. San Francisco: American Academy of Ophthalmology, 2001.

10. Katz M, Kruger P: The human eye as an optical system. In Tasman W, Jaeger E (eds): Duane's Clinical Ophthalmology, Ch. 33. Vol 1. Philadelphia: Lippincott Williams & Wilkins, 2003.

11. Shah M, Shah S, Shah S, Prasad V, Parikh A. Visual recovery and predictors of visual prognosis after managing traumatic cataracts in 555 patients. Ind J Ophthalmol 2011;59:217-22.

12. Reddy AK, Ray R, Yen YG. Surgical intervention of traumatic cataracts in children: Epidemiology, complications and outcomes. J AAPOS 2009;13:170-4.

13. Cillino S, Cassiccio A, Di Pace F, et al. A five-year retrospective study of the epdemiological characteristics and visual outcomes of patients hospitalized for ocular trauma in a meditteranean area. BMC Ophthalmol. 2008; 22: 8:6.

14. Visual outcome of unilateral traumatic cataract Journal of the College of Physicians and

Surgeons Pakistan 2012, Vol. 22 (8): 497-500 499.

15. Bowman R, Joy K, Guy N, Wood M. Outcome of bilateral cataract surgery in Tanzanian children. Ophthalmology 2007;114:2287-92.

16. Mehul AS, Shreya MS, Shashank BS, Patel UA. Effect of interval between time of injury and timing of intervention on final visual outcome in cases of traumatic cataract. *Eur J Ophthalmol* 2011;21:760-5.

17. Zaman M, Sofia I, Muhammad DK. Frequency and visual outcome of traumatic cataract. *J Postgrad Med Inst* 2006; 20:330-4.

18. Mian ST, Azar DT, Colby K. Managment of traumatic cataracts. *Int Ophthalmol Clin* 2002; 42:23-31.

19. Krishnamachari M, Rathi V, Gupta S. Management of traumatic cataract in children. *J Cataract Refract Surg* 1997; 23:681-7.

20. Gain P, Thuret G, Maugery J. Management of traumatic cataracts (in French). *J Fr Ophthalmol* Agre, P., King, L.S., Yasui, M., Guggino, WmB., Ottersen, O.P., Fujiyoshi, Y., Engel, A. and Nielsen, S. (2002). Aquaporin water channels—From atomic structure to clinical medicine. J. Physiol. 5421, 3–16.

21. Wos M, Mirkiewicz-Sieradzka B. Traumatic cataract-treatment results. Klin Oczna 2004;106:31-4.

22. 11. Ashvini K, Robin R, Kimberly G. Surgical intervention for traumatic cataracts in children: epidemiology, complications and outcomes. *J AAPOS* 2009; 13:170-4.

23. Perucho-Martínez S, De-la-Cruz-Bertolo J, Tejada-Palacios P. Paediatric cataracts: epidemiology and diagnosis. Retrospective review of 79 cases. *Arch Soc Esp Ophthalmol* 2007; 82:37-42.

24. Thakur J, Reddy H, Wilson Jr ME, Paudyal G, Gurung R, Thapa S, *et al*. Pediatric cataract surgery in Nepal. J Cataract Refract Surg 2004;30:1629-35.

25. Khandekar R, Sudhan A, Jain BK, Shrivastav K, Sachan R. Pediatric cataract and surgery outcomes in central India: A hospital based study. Indian J Med Sci 2007;61:15-22.

26. Sminia ML, Odenthal MT, Wenniger-Prick LJ, Gortzak-Moorstein N, Völker-Dieben HJ. Traumatic paediatric cataract: a decade of follow-up after artisan aphakia intraocular lens implantation. *J AAPOS* 2007; 11:555-8. Epub 2007 Aug.

27. Brar GS, Ram J, Pandav SS, Reddy GS, Singh U, Gupta A. Postoperative complications and visual results in uniocular pediatric traumatic cataract. Ophthalmic Surg Lasers 2001;32:233-8.

28. Buckley EG. Hanging by a thread: The long-term efficacy and safety of transscleral sutured intraocular lenses in children (an American Ophthalmological Society thesis). *Trans Am Ophthalmol Soc* 2007; 105:294-311.

29. Gradin D, Yorston D. Intraocular lens implantation for traumatic cataract in children in East Africa.

J Cataract Refract Surg 2001;27:2017-25.

30. Verma N, Ram J, Sukhija S, Pandav SS, Gupta A. Outcome of in-the-bag implanted square-edge poly-methyl-methacrylate intraocular lens with and without primary posterior capsulotomy in pediatric traumatic cataract. Indian J Ophthalmol 2011;59:347-51.

31. Rastogi A, Monga S, Khurana C, Anand K. Comparison of epilenticular IOL implantation vs technique of anterior and primary posterior capsulorhexis with anterior vitrectomy in pediatric cataract surgery. Eye (Lond) 2007;21:1367-74.

32. Bienfait MF, Pameijer JH, Wildervanck DE, et al. Intraocular lens implantation in children with unilateral traumatic cataract. Int Ophthalmol. 1990; 14: 271-6.

33. Reddy AK, Ray R, Yen KG. Surgical intervention for traumatic cataracts in children: Epidemiology, complications, and outcomes. J AAPOS. 2009; 13:170-4.