

Original Article

Visual outcomes in patients undergoing cataract surgeries in complex situations

Hiteshi Bhardwaj¹, Ram Lal Sharma¹, Kalpana Sharma¹

¹Department of Ophthalmology, Indira Gandhi Medical College and Hospital, Shimla, Himachal Pradesh, India.

ABSTRACT

Objectives: Cataract is a leading cause of avoidable blindness worldwide. Complicated cataract cases such as those associated with pseudoexfoliation (PEX) syndrome, uveitis and traumatic cataract present significant surgical challenges and variability in visual outcomes. While standard cataract surgeries are well-studied, data on complicated cases remain limited. This study was undertaken to evaluate visual outcomes and assess complications in patients undergoing complicated cataract surgery.

Materials and Methods: A prospective observational study was conducted at present involving 93 patients undergoing complicated cataract surgery. Patients with PEX, uveitis, traumatic cataract or other intraoperative risk factors were included. Pre-operative evaluation, phacoemulsification or manual small incision cataract surgery (MSICS) and follow-ups at 1 week, 1 month and 3 months postoperatively were performed. Visual acuity, intraocular pressure (IOP) and post-operative complications were assessed.

Results: Phacoemulsification was performed in 80.6% and MSICS in 16.1% of cases. PEX syndrome was the most common risk factor (50.5%), followed by uveitis (22.5%) and traumatic cataracts (16.1%). Intraoperative complications occurred in 10.8% of cases, most frequently posterior capsular rupture. Post-operative complications included corneal oedema (20.4%), raised IOP (4.3%), toxic anterior segment syndrome (4.3%) and pseudophakic macular oedema (3.2%). At 12 weeks postoperatively, 40.8% of patients achieved visual acuity of 6/6–6/9, with significant improvement observed across the cohort.

Conclusion: Despite increased complexity and complication risks, favourable visual outcomes can be achieved in complicated cataract surgeries with proper pre-operative assessment, surgical planning and post-operative care. This study highlights the need for tailored strategies in managing high-risk cataract patients to optimise visual recovery.

Keywords: Complex situations, Complicated cataract surgery, Surgical complications, Visual outcomes

INTRODUCTION

Cataract remains the leading cause of avoidable blindness globally, accounting for a significant proportion of visual disability, particularly in developing countries like India.^[1] Advances in surgical techniques – especially phacoemulsification and manual small incision cataract surgery (MSICS) – have made cataract surgery one of the most successful ophthalmic interventions. However, when cataracts are associated with complicating factors such as pseudoexfoliation (PEX) syndrome, uveitis, trauma or hypermature lens, the surgical procedure becomes significantly more challenging.^[2] These complicated cases are often marked by poor pupillary dilation, zonular instability, synechiae and increased risk of intraoperative and post-operative complications such as posterior capsular rupture,

vitreous loss, corneal oedema or intraocular lens (IOL) subluxation. Such complexities can adversely affect visual prognosis, even when surgery is performed with precision. While routine cataract surgeries have been extensively studied, there is limited literature focusing specifically on visual outcomes in complicated cataract cases.^[3] This study aims to evaluate the visual outcomes following complicated cataract surgeries, identify the most common intraoperative challenges and assess the effectiveness of modern surgical techniques in restoring useful vision in these high-risk eyes.^[4]

Aims and objectives

The primary objective of this study was to evaluate the visual outcomes in patients undergoing complicated cataract surgeries, to study the types of complications that occur

*Corresponding author: Kalpana Sharma, Department of Ophthalmology, Indira Gandhi Medical College and Hospital, Shimla, Himachal Pradesh, India. doctorkalpana.84@gmail.com

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during or after cataract surgery in selected patients, to compare visual acuity before and after surgery in patients with complicated cataracts and to observe post-operative changes in the eye, including healing response and any further complications affecting vision.

MATERIALS AND METHODS

This prospective observational descriptive study was conducted in tertiary care hospital in IGMC Shimla in the Department of Ophthalmology over a duration of 1 year. The aim was to evaluate visual outcomes in patients undergoing cataract surgery with associated complex situations in the Himalayan region. A sample size of 93 patients was calculated using Epi Info software (version 7.2.5.0), considering a 95% confidence level, 7% margin of error and an expected frequency of 78% for best-corrected visual acuity (BCVA). Patients with cataracts associated with PEX syndrome, uveitis, traumatic cataract, hypermature cataract, small pupil and poor pupillary dilation were included. Patients with significant maculopathy, glaucomatous optic neuropathy, retinal detachment or dense corneal opacity precluding fundus view were excluded to rule out apparent cause of decreased visual acuity. All patients underwent a comprehensive pre-operative ophthalmic examination: visual acuity assessment (distance using Snellen chart, near using Jaeger chart), slit-lamp biomicroscopy to assess the anterior segment and grade the cataract, intraocular pressure (IOP) measured with Goldman applanation tonometer (gat), fundus examination using direct ophthalmoscope, indirect ophthalmoscope and +90D Volk lens, gonioscopy using 4 mirror goniolens in required cases, Biometry using A-scan ultrasound and keratometry (Grand Seiko GR-3300K) with IOL power calculation via Sanders–Retzlaff–Kraff formula. Patients underwent either phacoemulsification or MSICS depending on lens hardness, anterior chamber stability and zonular integrity. Pre-operative steroids and antibiotics were started 3 days before surgery along with adequate patient counselling and informed consent.

Intraoperatively use of trypan blue for capsular visualisation, careful capsulorrhexis, controlled hydrodissection, nucleus manipulation and sphincterotomy were employed, especially in PEX and uveitic eyes, timely conversion of surgical technique and safe IOL implantation.

Surgeries were performed under topical anaesthesia (proparacaine drops/lidocaine gel) or peribulbar anaesthesia (2% lignocaine + adrenaline + hyaluronidase). Pupil dilation was achieved with tropicamide and phenylephrine; cyclopentolate and non-steroidal anti-inflammatory drug drops were used as adjuncts.

The primary outcome was improvement in BCVA postoperatively. Secondary outcomes included incidence of intraoperative/post-operative complications such as

posterior capsular rupture, toxic anterior segment syndrome (TASS), corneal oedema, macular oedema and posterior capsule opacification (PCO). Data were entered in Microsoft Excel and analysed using Epi Info version 7.2.5.0. Categorical data were represented as frequencies and percentages; quantitative data as mean \pm standard deviation.

The study was approved by the Institutional Ethics Committee. Informed written consent was obtained from all patients in their local language, ensuring confidentiality and the right to withdraw from the study at any point.

RESULTS

This study included 93 patients with complicated cataracts. The age range was 26–95 years, with the majority (50.5%) aged between 56 and 75 years. At presentation, 46.2% of patients had BCVA worse than 6/60 and another 46.2% had BCVA between 6/36 and 6/60, indicating severe visual impairment at baseline. Phacoemulsification was performed in 75 eyes (80.6%), MSICS in 15 eyes (16.1%) and 8 cases initially planned for phacoemulsification were converted to MSICS due to intraoperative complications. Topical anaesthesia was used in 83.8% of patients, while 16.1% required peribulbar anaesthesia. PEX syndrome was the most common risk factor, observed in 50.5% of cases. Other risk factors included uveitis (22.5%), traumatic cataract (16.1%) due to mechanical trauma (open globe and closed globe injury) and advanced nuclear sclerosis or hypermature cataracts [Figure 1], as shown in Graph 1. Most surgeries (89.2%) were completed without complication. However, 5.4% experienced posterior capsule rupture, 2.2% lens subluxation, 1% each of zonular dialysis, anterior capsule tear and corneal abrasion, as shown in Table 1. At 1–4 weeks: 29% achieved 6/9 vision, 12.9% had 6/6P and 31.2% had 6/9P. At 4–6 weeks: 39.8% achieved 6/9 vision, 23.7% had 6/6P. At 6–12 weeks (final outcome): 11.8% achieved 6/6, 29% had 6/6P, 25.8% had 6/9 and another 25.8% had 6/9P. This indicates that 66.6% of patients achieved BCVA of 6/9 or better at 12 weeks, despite the complexity of cases as shown in Graph 2.

Table 1: Intraoperative complications.

Sr no.	Complications	Disease association	No.of patients(%)
1.	Posterior capsule rupture	Pseudoexfoliation	5 (5.37)
2.	Zonular dehiscence	Pseudoexfoliation	1 (1.07)
3.	Lens subluxation	Hypermature cataract	2 (2.15)
4.	Anterior capsule tear	Traumatic cataract	1 (1.07)
5.	Corneal abrasion	Drug (Topical anaesthesia) induced keratopathy	1 (1.07)
	Total		10 (10.7)



Figure 1: Subluxated lens in hypermature senile cataract.

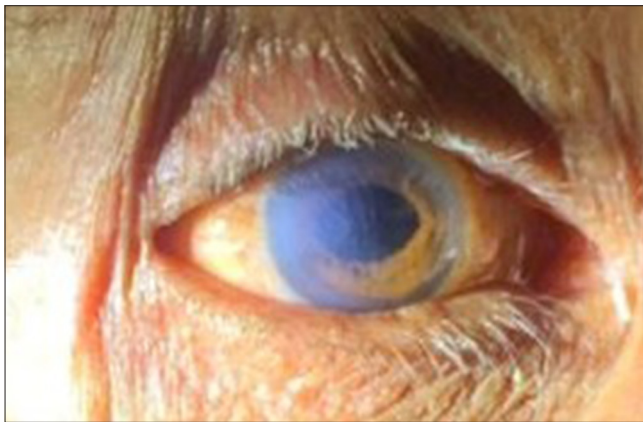
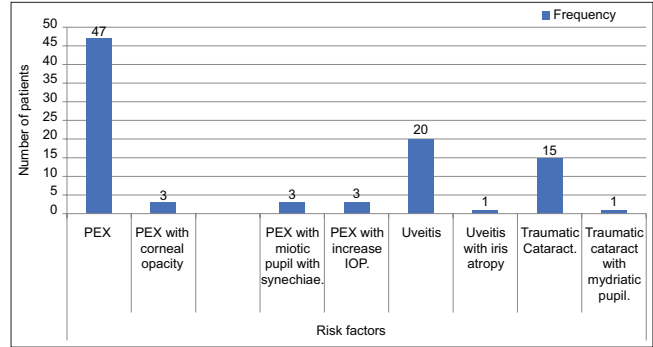
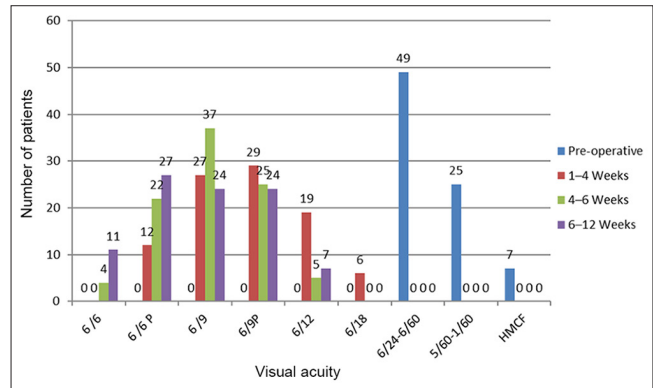


Figure 2: Striate keratopathy.



Graph 1: Risk factors for surgery.



Graph 2: Postoperative visual outcome .

Table 2: Post operative complications.

Post operative complications	Associated factor	1-4 Weeks (%)	4-6 Weeks (%)	6-12 Weeks (%)
Raised IOP	Uveitis	4 (4.3)	2 (2.2)	-
Corneal oedema	Advanced nuclear sclerosis	16 (20.4)	8 (0.08)	-
TASS	-	4 (4.3)	-	-
Retained Lens Matter	Surgery related	2 (2.2)	-	-
Subluxated IOL	Pseudoexfoliation	1 (1.1)	-	-
Post Capsule Opacification	Diabetes	-	-	5 (5.4)
Iris Prolapse	Related to surgery	2 (2.1)	-	-
Pseudophakic Macular edema	Uveitis	-	-	3 (3.2)
Total		29 (31.1)	10 (10.7)	8 (8.60)

IOP: Intraocular pressure, IOL: Intraocular lens, TASS: Toxic anterior segment syndrome

Postoperatively, corneal oedema [Figure 2], 20.4% at 1 week; resolved in most by 6 weeks. Raised IOP was present in 4.3% of patients in early post-operative period which resolved with treatment, TASS was present in 4.3% of patients which resolved with steroids, PCO was noted in 5.4% of patients at 3 months, pseudophakic macular oedema (PME) was noted in 3.2% patients at final follow up as depicted in Table 2 and were managed accordingly. The rate of intraoperative complications

was 10.7% and that of post-operative complications was 31.1% in the early post-operative period, and most of the complications disappeared by 6–12 weeks, except 10.7% at 4–6 weeks and 8.06% at 6–12 weeks.

DISCUSSION

Cataract remains one of the leading causes of blindness globally. While modern surgical techniques such as

phacoemulsification and MSICS have improved, complicated cataract cases such as those associated with PEX syndrome, traumatic cataract and uveitis pose higher surgical risks and variable post-operative results.^[5]

This study was conducted to evaluate visual outcomes, especially in complicated cataract cases. It included 93 patients assessed thoroughly through pre-, intra- and post-operative evaluations over a follow-up period of upto 12 weeks. Most patients were older (56–75 years) with mean age of aligning with global cataract trends. Slightly more females (52.7%) than males were included, consistent with demographic patterns seen in previous study by Anand *et al.* (2000), who reported the mean cataract surgery age of 61.7 years.^[6]

Aging naturally predisposes the lens to opacification, explaining the demographic skew. Preoperatively, 92.4% patients have visual acuity worse than 6/12. Postoperatively improvement was significant by 6–12 weeks 40.8% patients achieved good vision of 6/6 or 6/6 P and rest of the patients have fair vision outcome of upto 6/12.

Phacoemulsification was preferred (80.6%) due to its faster recovery and reduced complications with a small requiring conversion to MSICS due to intraoperative complications. The preference is supported by Wilczyński *et al.* (2009), who found that phacoemulsification was effective even in complicated scenerios when performed by experienced hands.^[7] Topical anaesthesia was used in 83.8% of cases and was well tolerated, although peribulbar anaesthesia was used in anxious or uncooperative patients.

PEX was the most common complication associated risk factor (50.5%), often leading to zonular instability and poor dilation. The findings are very similar to those reported by Rajendran *et al.* (2022), who also observed that cataract surgeries in patients with PEX were more complex due to poor pupil dilation and the risk of the lens moving during surgery.^[8]

Uveitis-related cataracts were present in 22.5% of patients. Uveitis is an inflammatory condition inside the eye that can cause the lens to become cloudy and stick to nearby tissues, making surgery more challenging. This also increases the risk of inflammation after surgery. The results match the findings of Okhravi *et al.* (1999), who emphasised that post-operative inflammation is a major issue in patients with uveitic cataracts, and it can seriously affect the final visual outcome if not managed properly.^[9]

In addition to PEX and uveitis, traumatic cataracts due to mechanical trauma leading to open and closed globe injury were found in 16.1% of our cases. These cataracts are caused by injury to the eye and can be more unpredictable during surgery. This rate is consistent with the results of Ho *et al.* (2018) showed that even in the presence of corneal opacity,

phacoemulsification could provide acceptable visual outcomes, which the present study supports.^[10]

During the surgeries, about 10.8% of patients experienced some kind of complication. The most common issue was posterior capsule rupture (5.4%), where the thin back wall of the lens capsule tears during surgery. This complication makes it harder to implant the IOL and may require extra surgical steps to fix. This finding is supported by Wilczyński *et al.* (2009),^[7] who also found that polymerase chain reaction (PCR) was one of the most frequent complications during phacoemulsification surgeries. According to their research, PCR can negatively affect vision after surgery, although good best corrected visual acuity can still be achieved with appropriate management.

The improvement in visual acuity after surgery was one of the strongest outcomes of the present study. By the end of the follow-up period (6–12 weeks), large number of patients achieved good vision (6/9 or better), which shows that complicated cataract surgeries can still give excellent results when done carefully. This result is very encouraging and is similar to what Olawoye *et al.* (2011) reported.^[11] In their study, the majority of patients also had significant visual improvement after cataract surgery, even if they started with poor vision. Post-operative complications include corneal oedema (20.4%), transient increased IOP and a small incidence of TASS and PME.

Striate keratopathy (20.4%) and TASS (4.3%) were most common early post-operative complications. Rajappa and Bhatt (2022) emphasised the importance of endothelial health and surgical precision to reduce striate keratopathy.^[12] Jun and Chung (2010) documented as similar case where antiseptic contamination was the cause for TASS.^[13] In the present study, the cause of TASS remained idiopathic but resolved with topical therapy.

PCO and PME were noted in 5.4% and 3.2 %, respectively. This incidence is slightly lower than that reported by Colin *et al.* (2016) where PME and PCO were more prevalent in diabetic and complicated cases.^[14] The study concludes that modern surgical methods, like phacoemulsification, combined with good post-operative care, can restore vision effectively – even in complicated cases.

Limitations

The limitations of the study were limited sample size, which limited the generability of the results to the wider population of patients. Furthermore, the study was conducted in a single tertiary care centre, which reflected the institutional practice and surgeon expertise, which might differ from other centres.

CONCLUSION

The present study highlights that complicated cataract surgeries, though challenging, can result in favourable

visual outcomes with proper surgical planning and management. The most common risk factors encountered were PEX syndrome, uveitis and traumatic cataract, all of which significantly affect intraoperative ease and post-operative recovery. Most patients presented with poor pre-operative visual acuity, yet significant improvement was noted postoperatively, with many achieving 6/6–6/9 within 6–12 weeks. Intraoperative complications were minimal, with posterior capsule rupture being the most common. The rate of intraoperative complications were 10.7% and that of post-operative complications was 31.1% in the early post-operative period, and most of the complications disappeared by 6–12 weeks.

Complex cases can be managed by trained surgeons at different levels, provided there is proper case selection, adequate supervision and readiness to manage complications. However, cases with high risk of intraoperative complications are best handled by experienced surgeons to ensure optimal visual outcomes.

Overall, this study concludes that excellent visual recovery is possible in complicated cataract cases through individualised surgical approaches, meticulous technique and close follow-up. Surgeon expertise and timely intervention remain pivotal in optimising outcomes.

Ethical approval: The research/study was approved by the Institutional Review Board at Indira Gandhi Medical College, Shimla, number EC/NEW/INST/2023/HP/0304, dated 07 December, 2024.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given consent for their images and other clinical information to be reported in the journal. The patient understands that the patient's names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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