

An Evaluation of Intraoperative Complications and Visual Outcomes after Phacoemulsification for CataractMonika Agarwal¹, Pankaj Varshney², Dhananjay Kumar³¹Assistant Professor, Department of Ophthalmology, Icare Institute of Medical Sciences and Research, Dr. Bidhan Chandra Roy Hospital, Haldia, West Bengal, India²Assistant Professor, Department of Ophthalmology, Icare Institute of Medical Sciences and Research, Dr. Bidhan Chandra Roy Hospital, Haldia, West Bengal, India³Assistant Professor, Department of Ophthalmology, Icare Institute of Medical Sciences and Research, Dr. Bidhan Chandra Roy Hospital, Haldia, West Bengal, India

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Conflict of interest: Nil

Abstract**Aim:** The aim of the present study was to assess the intraoperative complications while phacoemulsification in cataract surgery and determine the visual outcomes after phacoemulsification for cataract.**Material & Methods:** A prospective observational study involving patients undergoing cataract surgery, conducted at Department of Ophthalmology. The study was conducted over a period of two years among 200 patients to study the intraoperative complications and visual outcome after phacoemulsification.**Results:** In terms of age, 2% patients were aged ≤ 40 years, 8% were 41–50 years, 40% were 51–60 years, 41% were 61–70 years, 8% were 71–80 years, and 1% of cases were older than 80 years. 52% were male and 55% had right eye involved. Majority patients had posterior capsular rent with vitreous disturbance, followed by iridodialysis, scleral tunnel with premature entry, descemet stripping, nucleus drop into the vitreous, zonular dialysis with vitreous disturbance, IOL drop, positive pressure, button holding of the flap and expulsive haemorrhage. According to the type of surgery done the number of patients having intraoperative complications were, one in conventional ECCE with PCIOL, one in phaco with foldable IOL, 12 in phaco with non-foldable IOL, 165 in MSICS with PCIOL, 20 in MSICS with ACIOL and 1 in MSICS+PCIOL+trabeculectomy.**Conclusion:** Although the risk of problems from cataract surgery using the phacoemulsification technique is lower, anticipating of these risks, as well as preparation and preventative measures, may help to reduce the risk of difficulties.**Keywords:** Phacoemulsification, Cataract, Intra-operative complications, post-operative complications.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Cataract is clouding of the lens in the eye that commonly occurs due to increasing age and is removed by a surgery. Unoperated cataract remains one of the most common causes of blindness responsible for around 50% of all global blindness. [1] It has been estimated that 3.8 million people develop blinding cataract every year in India as against 2.7 million cataract surgeries done every year. Cataract is a significant and increasing global problem with vast economic and social incriminations. More than 90% of cataract-associated blindness is found in low and middle-income countries. [2,3] In India, it is the principal cause of blindness accounting for 62.6%. [4]

Along with the increase in the number of cataract surgeries in past decade, surgical methods have

evolved from intra-capsular cataract extraction to extra-capsular cataract extraction to small incision cataract surgery and phaco emulsification. [5] Phacoemulsification was familiarized in 1967 by Charles Kelman, an American Ophthalmologist, as an alternative to the conventional ECCE. [6] The popularity of phaco-emulsification is because of the small corneal incision which increases the safety of cataract surgery, better postoperative visual quality, and faster recovery; however, the surgery is also associated with certain risks and complications. The advantages of the phacoemulsification procedure include small incision, minimal to no blood loss, good initial visual recovery postoperatively, with lesser rates of astigmatism. [7]

In experienced hands, the surgical procedure is very safe with minimal complications. However, no surgical technique is free of complications. Ravinder et al., from India reported 17% of patients with intraoperative complications of phacoemulsification. The most common complication was difficulty in emulsifying an unexpectedly hard nucleus with conversion to minor incision cataract surgery in 4% cases followed by posterior capsule rupture (3%), iris incarceration in to phaco probe (3%) and 2% each of running rhexis with incomplete continuous curvilinear capsulorhexis and tunnel related or premature entry. [7]

Achieving effective cataract surgery skills and the implementation of surgical programs are the most critical tools toward alleviating cataract blindness. It is important to assess cataract surgery outcomes in developing countries, where postoperative visual function following cataract surgery lag behind minimum international standards. [8]

Therefore, we planned this study to assess the intraoperative complications while phacoemulsification in cataract surgery and determine the visual outcomes after phacoemulsification for cataract.

Material & Methods

A prospective observational study involving patients undergoing cataract surgery, conducted at Department of Ophthalmology, at ICARE Institute of Medical Sciences and Research And Dr. Bidhan Chandra Roy Hospital, Haldia. The study was conducted over a period of two years among 200 patients to study the intraoperative complications and visual outcome after phacoemulsification.

Inclusion Criteria

- Age more than 40 years irrespective of gender, patients undergoing phacoemulsification cataract surgery with intraocular lens implantation and grade I, II and III cataracts were included in the present study.

Exclusion Criteria

- Patients with history of long term local or systemic steroid use as this would affect wound healing, Patients with corneal abnormalities such as dystrophies and degenerations where reliable keratometry is not possible and patients with ocular posterior segment pathology, that is hypertensive and diabetic retinopathy were excluded from the present study.

Methodology: The study was conducted on 200 patients presenting to the outpatient department of at ICARE Institute of Medical Sciences and Research And Dr. Bidhan Chandra Roy Hospital, Haldia. with

cataract. The patients were evaluated and those found to have cataract within the inclusion criteria were selected for the study. A detailed history was obtained from each patient followed by a complete ocular examination.

Pre-operative Examination

Best corrected visual acuity, Intraocular tension by Goldmann's applanation Tonometer, Slit lamp evaluation for Anterior Segment evaluation and type and Grading of cataract according to LOCS-III, Fundus examination by 78 D and Indirect ophthalmoscope to rule out any posterior segment pathology and A scan, Keratometry for IOL power calculation and Lacrimal Sac Syringing. Patients were subjected for blood investigations like CBC, Blood Sugar Fasting and Postprandial, Urine routine and microscopy HIV and HBsAg. Any significant past, family history, drug history was noted. The patients were advised to in still antibiotic drops one day before surgery. A tablet of Acetazolamide 250 mg was given a night prior to surgery and one in the morning on the day of surgery. Xylocaine sensitivity test was done a day prior to surgery. On the day of surgery, the eye to be operated upon was dilated with eye drops containing tropicamide (0.8%), phenylephrine (5%), one drop every 10-15 minutes starting one hour before surgery till full dilatation. One drop of Flurbiprofen (0.03%) was also be instilled after full dilatation to prevent intraoperative miosis.

Intraoperative Procedure

All surgeries were done under peribulbar anaesthesia. 2% Lignocaine was the local anaesthetic in combination with adrenaline 1:1000 along with Hyaluronidase to facilitate diffusion of the anaesthetic solution. About 5 ml of local anaesthetic was injected. Digital massage was given. After taking all aseptic precautions, eyelids were cleaned with povidone iodine 5% and draped. Wire speculum was placed, superior rectus bridle suture was passed and clamped on to the towel. Surgeries were done under Carl Zeiss Meditec AG operating Microscope. The phacoemulsification machine was OPTIKON 2000 S.p.A. minimal stress. This machine has a peristaltic type of pump. After a good peribulbar block, a 2.8 mm wide clear corneal incision was made with crescent blade. Side port incision was made in clear cornea at 9 O'clock position using a lance tip blade. Viscoelastic was put to maintain the anterior chamber. Capsulorrhesis was performed using a cystitome made by a bent 26G needle. In patients with poor red fundal reflex, trypan blue enhanced capsulorrhesis was done. The rhexis was approximately 5.5 to 6 mm in diameter. After hydrodissection and hydrodelineation, rotation of the nucleus within the bag was confirmed. The second side port incision was made using a lance

tip blade at 2 O'clock position. The technique of phacoemulsification used was stop and chop technique. Phacoemulsification machine tip was used to impale and emulsify the nucleus. The procedure was repeated until all quadrants were emulsified. Parameters for phacoemulsification, epinucleus removal and bimanual irrigation and aspiration were noted. Total Phacoemulsification time was recorded. A foldable intraocular lens was inserted. Intra operative complications that may have occurred during the procedure were noted. In cases of intraoperative complications such as posterior capsule rent, anterior vitrectomy was done and a three-piece intraocular lens was implanted. Other complications were noted and were managed appropriately. At the end of the procedure the anterior chamber was formed using ringer lactate and both the side ports hydrated. Subconjunctival injection of gentamicin and dexamethasone were given and the eye was

bandaged. Post-operative instillation of topical antibiotic steroid combination (prednisolone acetate 1% along with moxifloxacin 0.5%) was advised. Patients were examined on first postoperative day and discharged. They were advised regular follow-up at one week, 1st month and 3rd month following surgery and refraction was assessed. Postoperative refraction was given on 1 month follow up. All data was recorded in the structured proforma.

Statistical Analysis

Data from the case proforma was entered in to Microsoft excel 2016 (Microsoft Corporation, USA) and was analyzed with the same. Continuous variables were presented as mean and standard deviation. Categorical variables were presented as frequency and percentages.

Results

Table 1: Demographic characteristics of patients

Variables	No. of patients	Percentage
Age in years	≤40	4
	41-50	16
	51-60	80
	61-70	82
	71-80	16
	>80	2
Gender	Male	104
	Female	96
Eye	Right	110
	Left	90

In terms of age, 2% patients were aged ≤40 years, 8% were 41–50 years, 40% were 51–60 years, 41% were 61–70 years, 8% were 71–80 years, and 1% of cases were older than 80 years. 52% were male and 55% had right eye involved.

Table 2: Intraoperative complications

Intraoperative complications	No. of patients	Percentage
Descemet stripping	4	2
Iridodialysis	16	8
Nucleus drop into the vitreous	4	2
PC rent - vitreous disturbance	38	18
Scleral tunnel - premature entry	12	6
Zonular dialysis - vitreous disturbance	4	2
IOL drop	2	1
Positive pressure –wound	2	1
Button holding of the flap	1	0.5
Expulsive haemorrhage	1	0.5

Majority patients had posterior capsular rent with vitreous disturbance, followed by iridodialysis, scleral tunnel with premature entry, descemet stripping, nucleus drop into the vitreous, zonular dialysis with vitreous disturbance, IOL drop, positive pressure, button holding of the flap and expulsive haemorrhage.

Table 3: Type of surgery in the patients who have complications

Type of Surgery	Total	Percentage
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Conventional ECCEWith PCIOL	1	0.5
Phaco with foldablePCIOL	1	0.5
Phaco with non-foldablePCIOL	12	6
MSICS with PCIOL	165	82.5
MSICS with AC IOL	20	10
MSICS+PCIOL+TRAB	1	0.5

According to the type of surgery done the number of patients having intraoperative complications were, one in conventional ECCE with PCIOL, one in phaco with foldable IOL, 12 in phaco with non-foldable IOL, 165 in MSICS with PCIOL, 20 in MSICS with ACIOL and 1 in MSICS+ PCIOL +trabeculectomy.

Discussion

Cataract is the most common cause of curable blindness in India and worldwide. It has been estimated that 3.8 million people develop blinding cataract every year in India as against 2.7 million cataract surgeries done every year. Cataract is a significant and increasing global problem with vast economic and social incriminations. Along with the increase in the number of cataract surgeries in past decade, surgical methods have evolved from intra-capsular cataract extraction to extra-capsular cataract extraction to small incision cataract surgery and phaco emulsification. The commonest complication is posterior capsular rupture with prevalence rates ranging from 0.45–4.40%. [9] Phacoemulsification remains the preferred surgical approach for cataract removal since Charles Kelman introduced it in the 1960s. [10]

In terms of age, 2% patients were aged ≤ 40 years, 8% were 41–50 years, 40% were 51–60 years, 41% were 61–70 years, 8% were 71–80 years, and 1% of cases were older than 80 years. 52% were male and 55% had right eye involved. Our study was in accordance with Patil et al⁴ who reported the maximum number of patients 134 (53.6%) were in the 61 to 70-year age group in their study. Females and extremes of ages (below 40 years and above 80 years) had more complications by Thevi et al. [11] Cataract surgery is now the most common surgical procedure performed in the Western world. The only national survey of cataract surgery outcomes in the United Kingdom found that for 55,567 cases reported, there were no complications in more than 95 per cent of cases. Ninety-one percent of patients with no ocular comorbidities achieved a post-operative visual acuity of 6/12 or better, with 45.9 percent of all eyes achieving 6/6 or better. [12,13]

Majority patients had posterior capsular rent with vitreous disturbance, followed by iridodialysis, scleral tunnel with premature entry, descemet stripping, nucleus drop into the vitreous, zonular dialysis with vitreous disturbance, IOL drop, positive pressure, button holding of the flap and expulsive haemorrhage. Our findings were in accordance with Patil et al [4] who had performed manual small incision cataract surgery with PCIOL

implantation was the procedure performed in majority of the cases i.e 247 cases (98.8%). Posterior capsular tear occurred in 6 patients (2.4%) being the most common intraoperative complication in present study followed by iris prolapse in 5 patients (2%), premature entry in 3 patients (1.2%), descemet detachment in 3 patients (1.2%), capsular extension (0.8%), zonular dialysis (0.8%) & others, which included superior iridodialysis, a rare complication occurred in one case (0.4%). Khanna et al [14] evaluated 522 who underwent manual SICS and reported posterior capsular rent (PCR) followed by zonular dialysis as the most common intraoperative complication occurring in their study. PCR was seen in 36 eyes (6.9%) and zonular dialysis in 20 eyes (3.8%). Descemet detachment was seen in 7 cases (1.3%). Neekhra et al [15] analysed 1820 patients who underwent cataract surgery. Out of 1820, manual SICS was performed in 600. They found that the incidence of posterior capsular tear in patients who underwent SICS was 4.0% i.e. in 24 patients. Hennig et al [16] reported posterior capsular rent in 0.2% cases whereas Khan et al [17] reported 3.33%.

According to the type of surgery done the number of patients having intraoperative complications were, one in conventional ECCE with PCIOL, one in phaco with foldable IOL, 12 in phaco with non-foldable IOL, 165 in MSICS with PCIOL, 20 in MSICS with ACIOL and 1 in MSICS+ PCIOL +trabeculectomy. Advanced techniques, instrumentation, and technology have reduced PCR rate to 0.45%–5.2%. [18] The incidence of PCR in surgeries performed by experienced surgeons is placed at 0.45%–3.6%. [14] For surgeons converting from extra capsular cataract extraction (ECCE) to phacoemulsification, the PCR incidence is around 4.8%–11.0%. [19,20] The outcome of uncomplicated phacoemulsification in the present scenario is excellent. However, despite the advances in the field of cataract surgery, surgical complications still occur. Posterior capsular rent (PCR) is the most common potentially sight-threatening intraoperative complication during cataract surgery. [21]

Conclusion

Although the risk of problems from cataract surgery using the phacoemulsification technique is lower, anticipating of these risks, as well as preparation and preventative measures, may help to reduce the risk of difficulties. Complications of cataract surgery in India had a decreasing trend

during the last decade. However, results from our study indicate that cataract surgical complications still need to be focused on. The incidence of PCR can be decreased significantly by identifying the presence of predisposing factors and appropriate modification of the surgical plan. Early recognition of posterior capsular tear along with prompt management of capsular tear and vitreous prolapse is the key to the good surgical outcome.

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