



Complication Rate of Posterior Capsule Rupture during Cataract Surgery after COVID-19 Pandemic –A Hospital Based Study

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ABSTRACT

BACKGROUND

A common yet feared complication of cataract surgery -posterior capsular rent (PCR), is a breach in the posterior capsule of the lens during cataract surgery. This compromises the postoperative visual outcomes if not recognized early or managed appropriately. Thus, the study aims to determine the PCR complication rate, identify the risk factors and assess the visual outcome in cataract patients.

MATERIALS AND METHODS

This retrospective observational study was conducted on 109 patients who underwent cataract surgery in the Department of Ophthalmology at R. L. Jalappa Hospital, Kolar, Karnataka, India. After obtaining approval from the Institutional Ethics Committee, the medical records of cataract patients who underwent routine cataract surgery by all grades of surgeons from June 2021 to December 2022 was reviewed for age, visual acuity, intraoperative and postoperative complications and associated risk factors for further analysis. The continuous data is represented as percentages.

RESULTS

A total of 2315 patients operated in the study duration, out of which Posterior capsule rupture was noted in 109 eyes (4.7%), involving 60 (55%) males and 49 (45%) females with mean age 65.5 ± 9.1 years. The common risk factors of PCR were pseudoexfoliation in 27 (24.8%), floppy iris syndrome in 24 (22%), zonular dehiscence in 22 (20.1%), shallow anterior chamber in 19 (17.4%) and miosis in 17 (15.6%) cases. IOL was implanted in ciliary sulcus in 41 (37.6%) and in the capsular bag in 21 (19.3%) cases. Iris claw lenses were used in 33 (30.3%) and Anterior chamber intraocular lens in 14 (12.8%) cases. The post-operative visual acuity was in the range of 6/6 – 6/18 in 77 (70.64%) and 6/24 – 6/60 in 19 (17.43%) cases.

CONCLUSION

The study showed a higher rate of complications during cataract surgery after COVID-19 pandemic. The extensive breaks from surgery due to COVID-19 pandemic lead to attenuation of microsurgical skills and this calls for more emphasis on wet lab training and simulation based surgical



training to reduce PCR rate and associated complications following cataract surgery. This improves the quality of surgery and the post-operative visual outcome and safety of patients.

KEYWORDS: Cataract, Ciliary Sulcus, Posterior Capsular Rupture, Microsurgical Skill.

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INTRODUCTION

Cataract surgery, which consists of the removal of the opaque lens and subsequent implantation of an intraocular lens for visual rehabilitation, is the most commonly performed surgical procedure in Ophthalmology. Despite tremendous technical and technological advancements, posterior capsular rent (PCR) is the common potentially sight threatening intraoperative complication. The overall incidence of PCR reported in the literature varies from 0.2% to 14% and by experienced surgeons is 0.45 -3.6%.^[1]

The common predisposing factors can be patient related factors like old age, restlessness, deep set eyes, corneal opacities, band keratopathy or intraocular factors like small pupil, shallow anterior chamber, floppy iris, pseudoexfoliation, zonular dehiscence, intraoperative factors like miosis, small rhexis, rhexis-radial tear and surgeon related factors like experience of surgeons.^[2]

Patients screened for cataract surgery and counselled for cataract surgery were cancelled due to COVID-19 pandemic generating a global surgical backlog. Studies have shown that breaks from performing regular surgery leads to slow deterioration in fine motor skills and this has been attributed to stress, anxiety and loss of confidence compromising patient safety.^[3] Hence the aim of this study was to investigate the incidence, risk factors and surgical complications of PCR in all patients undergoing elective cataract surgery.

Objectives

1. To determine the posterior capsular rupture complication rate after elective cataract surgery.
2. To identify risk factors for posterior capsular rupture both pre operatively and intra operatively.

MATERIALS AND METHODS

This retrospective observational study was conducted on 109 patients who underwent manual small incision cataract surgery. After obtaining approval from the Institutional Ethics Committee (No.DMC/KLR/IEC/541/2022-23), the medical records of cataract patients who underwent routine cataract surgery by all grades of surgeons from February 2021 to January 2022 was reviewed for PCR and associated risk factors for further analysis. Pre-operative data included demographic data, detailed ophthalmological workup (grading of cataract, colour of iris, intraocular pressure, fundus examination and any other associated ocular disease) and any other associated conditions like pseudoexfoliation, miosis, shallow chamber, floppy iris syndrome and zonulopathy were assessed and documented. The standard preoperative regime included topical ciprofloxacin (0.3%), flubiprofen (0.03% w/v) two hours before surgery followed by pupillary dilatation using topical tropicamide (0.8%w/v) and phenylephrine (5%w/v). Routine small incision cataract surgery was performed in all patients under peribulbar block by consultants and residents under the supervision of experienced surgeons. Intraoperative notes were studied for the occurrence of PCR, its risk factors and further intraoperative complication because of PCR and visual outcome were noted for analysis.

Statistical Analysis

Data was analyzed using SPSS 22 version software (IBM SPSS Statistics, Somers NY, USA). Comparison of preoperative and postoperative visual outcome was done using paired t test and p value of ≤ 0.05 was considered as statistically significant and each complication both intraoperative and postoperatively were expressed in percentage.

RESULTS

A total of 2315 patients were operated in the study duration of June 2021 to December 2022, out of which 1033(45%) were males and 1282 (55%) were females. Posterior capsule rupture was noted in 109 eyes (4.7%) out of which 39 cases(36%) were operated by experienced surgeons and 70 cases(64%) by residents. Out of 109 eyes, 60 (55%) were males and 49 (45%) were females with mean age 65.5 ± 9.1 years (range 50 -80 years).

Table 1 shows the risk factors for PCR. Most common were found to be patient's restlessness in 28 cases (25.7%) and pseudoexfoliation in 27 (24.8%). Floppy iris syndrome in 24 (22%) and zonular dehiscence in 22 (20.1%). Other predisposing factors of PCR were found to be shallow anterior chamber in 19 (17.4%) and miosis in 17 cases(15.6%).

Risk Factors	Restlessness	PXF	Floppy IRIS	Zonular Dehiscence	Shallow Anterior Chamber	Miosis
N	28	27	24	22	19	17
%	25.7	24.8	22	20.1	17.4	15.6

PXF – Pseudoexfoliation,
Table 1: Distribution of risk factors

Table 2 shows the type of cataract in which PCR were noted among the 109 cases. Most common cataract type encountered in our study was nuclear sclerosis -2(35%) and nuclear sclerosis -3(22%) followed by senile mature cataract (20.1%). There were 12 cases (11%) each of nuclear sclerosis 4 and senile hypermature cataract.

Type of Cataract	NS grade 2	NS grade 3	SMC	NS Grade 4	SHMC	PPC
N	38	24	22	12	12	1
%	35	22	20.1	11	11	0.9

NS – Nuclear sclerosis, SMC – Senile mature cataract, SHMC – Senile hypermature cataract, PPC – posterior polar cataract
Table 2: Distribution of grades of cataract

Table 3 shows that in 41 cases(37.6%) IOL was implanted in ciliary sulcus whereas in 21 cases(19.3%) had in the bag implantation. In 33 cases (30.3%) Iris claw lenses were used while anterior chamber intraocular lens (ACIOL) was placed in 14 cases(12.8%).

Type of IOL	Anterior Chamber IOL	Sulcus Implanted	Iris Claw Lens	Capsular Bag
N	14	41	33	21
%	12.8	37.6	30.3	19.3

Table 3: Distribution of different types of IOL implanted

Table 4 gives the comparison of pre operative and post operative visual acuity in the PCR cases. This study shows that 45 cases (41.3%) achieved the Post operative visual acuity in the range of 6/6 – 6/18 and 49 cases(45%) had post operative visual acuity in the range of 6/24 – 6/60. Only 2 patients had post operative visual acuity less than hand movements.

BCVA (Snellen's)	Preoperative		Postoperative	
	N	%	N	%
6/6-6/18	7	6.4	77	70.64
6/24 – 6/60	24	22	19	17.43
CF 3 – 5m	55	50.5	8	7.33

CF 2m – HM	18	16.5	3	2.8
<HM	5	4.6	2	1.8
TOTAL	109	100	109	100

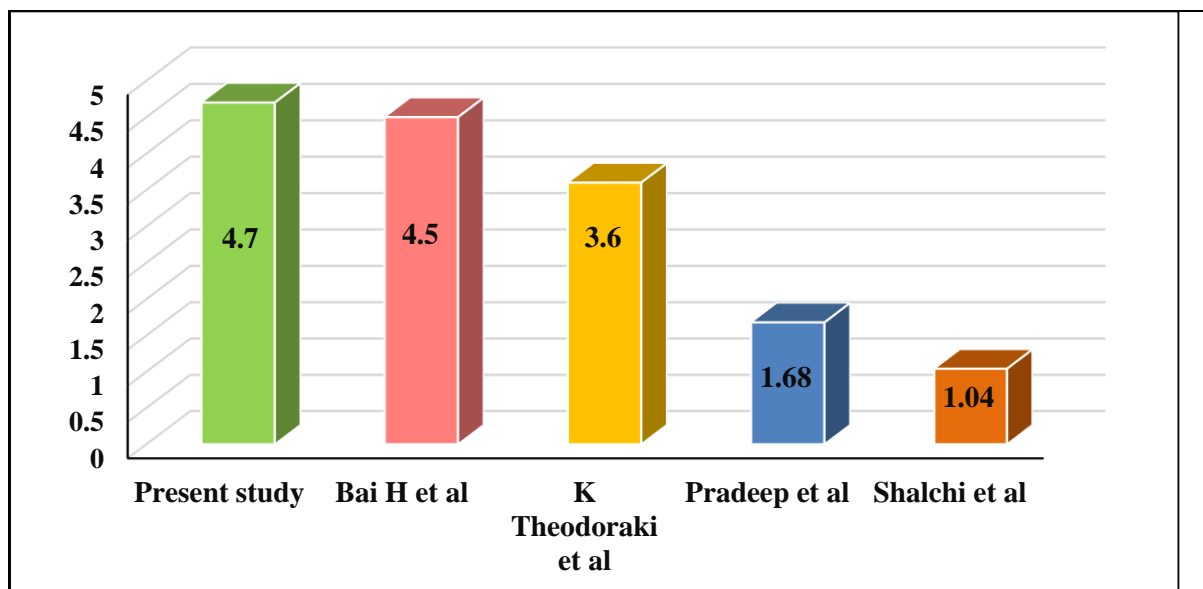
CF – Counting fingers, HM – hand movements
Table 4: Distribution of preoperative and postoperative visual acuity

Table 5 displays the post-operative complications, 43 (34.4%) had striate keratopathy, 19 (17.4%) raised IOP and oval pupil, 15 (13.8%) iritis, 11(10%) cystoid macular edema, 2 (1.8%) hyphema and 1 (0.9%) had persistent corneal edema.

Postoperative Complications	Hyphema	Striae Keratopathy	Oval Pupil	Raised IOP	Iritis	CME	Persistent Corneal Edema
N	2	43	19	19	15	9	1
%	1.8	39.4	17.4	17.4	13.8	8.2	0.9

Table 5: Post-operative complications

Graph 1 shows the comparison of PCR noticed in other studies, which showed higher incidence when compared to other studies but comparable with the rate noted by Bai H et al.



Graph 1: Comparison of PCR rate with other studies

DISCUSSION

In India, during the national COVID -19 lockdown periods, elective cataract surgeries were ceased as it was very challenging to deliver safe standards of elective care.As a result, the number of patients posted for cataract surgery were reduced. Thus COVID 19 pandemic had created a large scale disruption of healthcare and created a sizeable backlog not only in India but also in other parts of the world.^[4]Cataract surgery requires high levels of training for attaining microsurgical skill.

Many surgeons ceased undertaking routine micro-surgery for several months, while residents in training had no chance to improve their skills.

Such prolonged interruptions of cataract surgery might lead to an attenuation of micro surgical skills leading to an increase in operative and post operative complications. Longer waiting period due to lockdown had resulted in mature cataract which required more operating time resulting in postoperative CME.Our results indicated that



following the lockdown, PCR rate was more than compared to pre-pandemic levels comparable to other studies.^[5,6]

The most common sight threatening complication of cataract surgery is PCR followed by iris prolapse, iridodialysis, zonule dialysis, descemet's stripping, drop nucleus, suprachoroidal hemorrhage, hyphema, cystoid macular edema, IOL malposition, retinal detachment. The overall incidence of PCR in literature is 0.2% to 14%. The incidence of PCR performed by experienced surgeons is 0.45% - 3.6%.^[1]

In this hospitalbased study conducted on a total of 2315 patients with a mean age of 65.5 +/- 9.1 years from February 2021 to January 2022, posterior capsule rupture was noted in 109 eyes (4.7%) and out of them, 60 (55%) were males and 49 (45%) females. In this study, out of the 109 eyes which had posterior capsular rupture, 39 cases (36%) were performed by experienced surgeons and 70 cases (64%) were done by Residents under the supervision of experienced surgeons. In a study done by Melega MV, Pessoa Cavalcanti et al PCR rate was more in surgeries done by residents than experienced surgeons again proving the importance of microsurgical skill development and wet lab training.^[7]

Most common risk factors of PCR were found to be patient's restlessness in 28 cases (25.7%), pseudoexfoliation in 27 cases (24.8%), floppy iris syndrome 24 cases (22%), zonular dehiscence in 22 cases (20.1%), shallow anterior chamber in 19 (17.4%) and miosis in 17 cases (15.6%). (Table 1)

Chakrabarti A, Nazm N et al concluded that the common predisposing factors for PCR were old age, anxious patients, poor visibility due to corneal opacity, pterygium, thick arcus senilis, band keratopathy, small pupil, intraoperative miosis, shallow AC, pseudoexfoliation, floppy iris syndrome, zonulopathy, dense asteroid hyalosis, cataract type like dense cataract, posterior polar cataract, small capsulorhexis, rhexis radial tear and inexperience of surgeons.^[1] In another study done by Keles A, Sen E et al in 1302 eyes, the most common predisposing factors for PCR was found to be pseudoexfoliation

followed by strabismus, small pupil, phacodonesis, traumatic cataract, history of glaucoma, pterygium, cornea guttata, shallow anterior chamber and sunken globe.^[8] It is postulated that certain types of cataracts are at a higher risk for developing PCR like posterior polar cataract, Intumescent cataract, Brunescant cataract, traumatic cataract which was observed in our study as well which could be a mitigating factor in faded surgical skill.^[1]

Table 6 shows the comparison of rate of PCR between different studies. In our study, the PCR rate was found to be 4.8% (109 eyes). In a study conducted by K.Theodoraki et al, the PCR and cystoid macular edema were found to be 3.6% and 6.86% respectively which shows that post-operative complications had plummeted up in the post COVID era.^[5] In another study by Bai H, Yao L et al showed the PCR rate was 4.5% and in another study by PCR rate was found to be 1.68%.^[6,9]

In our study out of 109 PCR cases, IOL was implanted in ciliary sulcus in 41 cases (37.6%) whereas in 21 cases (19.3%) had in the bag implantation. In 33 cases (30.3%) Iris claw lenses were used while ACIOL was placed in 14 cases (12.8%). (Table 3). This is similar to the study conducted by Bai H, Yao L et al in which IOL were implanted in ciliary sulcus in 59 % of total PCR cases, in the capsular bag in 38.4% and IOL sutured at the ciliary sulcus in 2.6%.^[9]

Table 4 shows that in our study PCR was managed successfully to achieve BCVA of 6/6 – 6/18 in 77 (70.64%), 6/24 – 6/60 in 19 (17.43%) and 2 (1.8%) had less than hand movements. This was similar to the study conducted by Theodoraki K, Naderi K et al as it also showed significantly improved best corrected visual acuity in PCR cases since complications were managed well.^[5]

PCR rate can be taken as an objective marker of cataract surgery quality. Thus, reduction in cataract surgery due to COVID 19 led to significant rise in PCR rate indicating a regression in microsurgical skills which should be mitigated by simulation-based training and wet-lab and dry-lab training. Efforts should be taken to introduce effective surgical training programmes and to have well trained

surgeons to ensure the safety of patients.^[10] A study by Ferrara M, Romano V et al^[11] showed that there was reduced surgical activity by more than 75% for 74.6% of survey respondents. This emphasizes the need for formal surgical training both inside the and outside the operation theatre.

CONCLUSION

COVID- 19 pandemic has had a significant impact on all aspects of life and we continue to adjust our services accordingly. The reduction in elective cataract surgery due to COVID-19 pandemic was associated with higher rate of PCR and more complications, perhaps due to attenuation of microsurgical skills. Although this study identified risk factors for PCR that may assist in application of preventive measures to decrease the rates, there is increased need for time spent in wet labs and on surgical simulators.

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Conflicts of Interest: There are no conflicts of interest.

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