


Research Article

Evaluation of Posterior Capsular Integrity using a Posterior Segment Optical Coherence Tomography (OCT) with a+20 Diopter Lens

Puspa Kumari¹, Sarojini Murmu², Marianus Deepak Lakra^{3*}

Abstract

Aim: The objective of this study was to present the surgical and visual outcomes, as well as evaluate the risk factors associated with posterior capsular rupture in cases of posterior polar cataracts.

Methods: The objective of this study was to present the surgical and visual outcomes, as well as evaluate the risk factors associated with posterior capsular rupture in cases of posterior polar cataracts.

Results: The average age at which symptoms manifested was 47 years, with a majority of patients falling below the age of 50 years. The study population consisted of individuals ranging in age from 20 to 70 years. There was no observed sexual predilection in the overall population, with males comprising 48% and females comprising 52% of the sample. The prevailing symptom observed among the younger age group of patients was the presence of glare and challenges associated with night driving. Among a cohort of 100 patients, it was observed that Posterior polar cataract exhibited comorbidity with Posterior subcapsular cataract in 4% of cases. Additionally, 23% of cases showed an association with nuclear sclerosis, while 2% of cases were found to have pre-existing posterior capsular dehiscence. In our study, 41% of the cases were treated with small incision cataract surgery, while the remaining 59% of patients underwent phacoemulsification. The most prevalent intraoperative complication observed was posterior capsular rupture, which accounted for approximately 8% of the cases. This phenomenon can be ascribed to the altered surgical methodology and heightened cognizance of the vulnerable posterior capsule. A prevalence of 4% was observed in cases where residual posterior capsular plaque was detected. To address this, Nd-Yag capsulotomy was performed as a postoperative management strategy. The postoperative visual acuity demonstrated a significant improvement in comparison to the baseline visual acuity (p -value < 0.001), with the exception of one case that exhibited no change due to the presence of marked amblyopia.

Conclusion: Although the management of posterior polar cataract presents a formidable challenge even for seasoned surgeons, selecting a closed chamber surgical approach, attaining a well-executed capsulorhexis, implementing specific modified surgical techniques that minimise strain on the zonules and posterior capsule, meticulously removing the central epinuclear shell as the final step of cortical clean up, abstaining from nucleus rotation, and performing posterior capsule polishing can lead to a favourable surgical outcome.

Keywords: Anterior segment optical coherence tomography and cataract; Cataract; Anterior segment optical coherence tomography.

Affiliation:

¹Department of Eye, Senior Resident, RIO, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand, India

²Department of Eye, Senior Resident, RIO, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand, India

³Department of Eye, Associate Professor, RIO, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand, India

Corresponding author:

Marianus Deepak Lakra. Department of Eye, Associate Professor, RIO, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand, India.

Citation: Puspa Kumari, Sarojini Murmu, Marianus Deepak Lakra. Evaluation of Posterior Capsular Integrity using a Posterior Segment Optical Coherence Tomography (OCT) with a+20 Diopter Lens Journal of Ophthalmology and Research. 6 (2023): 45-49.

Received: July 06, 2023

Accepted: July 12, 2023

Published: July 17, 2023

Introduction

Over the course of recent decades, the remarkable progress in the field of cataract surgery has proven to be both extraordinary and rewarding for both the medical practitioners involved and the individuals undergoing the procedure. Cataract surgeries are currently being conducted at earlier stages, which has led to heightened patient awareness in comparison to previous periods [1, 2]. Due to increased awareness, a growing number of patients are being identified as potential candidates for posterior polar cataract. Posterior polar cataract constitutes approximately 0.5% to 1% of the total cases of cataracts, representing a relatively infrequent manifestation of this ocular condition [3]. Posterior capsular rupture during surgery poses a unique challenge for surgeons when dealing with patients affected by posterior polar cataract (PPC), as these eyes have a predisposition to such complications [4]. The prevalence of capsular weakness at the location of polar opacity renders it increasingly susceptible to surgical complications. While earlier research has documented a prevalence of posterior capsular rupture ranging from 26-36% [2, 5], more recent studies indicate a lower incidence rate of 7.1 to 16.7% [6, 7]. This decline can be attributed to heightened awareness and the implementation of modified surgical techniques.

Optical coherence tomography (OCT) has become an essential tool in the field of ophthalmology, enabling rapid assessment of ocular biometry, morphological characteristics, and cross-sectional alterations. Ultrasonography (USG) and ultrasound biomicroscopy (UBM) are additional diagnostic modalities that have demonstrated their indispensable utility in ocular imaging [8]. Nevertheless, due to its non-contact and non-invasive capabilities, coupled with continuous advancements in the field of technology, optical coherence tomography (OCT) continues to be widely regarded as the most favoured instrument. In addition to the preoperative and postoperative responsibilities, intraoperative real-time evaluation of diverse surgical events can also be achieved using Optical Coherence Tomography (OCT). Anterior segment optical coherence tomography (ASOCT) is a medical imaging technique that offers comprehensive cross-sectional visualisation of ocular tissues, spanning from the corneal surface to the anterior hyaloid face [9]. Utilising this advanced medical technology, we are capable of visualising the intricate tissue structures at the micrometre scale, while maintaining a high level of clinical reproducibility [10]. The benefits of Anterior Segment Optical Coherence Tomography (ASOCT) in assessing corneal and anterior chamber angles have frequently been emphasised in medical literature. Nevertheless, the utilisation of Anterior Segment Optical Coherence Tomography (ASOCT) in the context of cataract surgery is a recent development. Consequently, comprehending its pivotal significance in the treatment of lens-associated disorders holds great prominence [11]. To the best

of our current understanding, there is a lack of comprehensive literature reviews that consolidate the information derived from Anterior Segment Optical Coherence Tomography (ASOCT) specifically for cataract surgeons. Hence, drawing upon prior research pertaining to diverse facets of Anterior Segment Optical Coherence Tomography (ASOCT), the primary objective of this investigation was to present the surgical and visual outcomes, while also evaluating the potential risk factors associated with posterior capsular rupture in cases of posterior polar cataracts.

Methods:

Study Design

A Prospective study of 100 individual eyes, who presented to Department of Eye, Rajendra Institute of Medical Sciences, Ranchi with posterior polar cataract.

Study Period

January 2022 to June 2022

Inclusion Criteria

- Eyes with typical posterior polar cataract
- Posterior polar cataract associated with nuclear sclerosis, posterior subcapsular cataract

Exclusion Criteria

- Any combined procedures
- Eyes with Corneal opacity
- Eyes with glaucomatous damage
- Any coexisting retinal pathology
- Paediatric cataract
- Any ocular pathology impairing vision other than cataract

The retrospective analysis encompassed the clinical data of individuals who were clinically diagnosed with posterior polar cataract and subsequently underwent surgical intervention at the Department of Ophthalmology, Rajendra Institute of Medical Sciences, Ranchi, during the period spanning from January 2022 to June 2022. These pertinent medical records were meticulously examined and incorporated into the present investigation. A total of 100 ocular specimens were meticulously identified and carefully chosen based on the predetermined inclusion criteria.

Statistical Analysis

The statistical analysis was conducted using STATA 11.0 and Microsoft Excel spreadsheet software. All the variables were inputted, and frequency and percentage were computed. The analysis of intraoperative complications was conducted using the chi-square test. Visual acuity was assessed using the Logarithm of the Minimum Angle of Resolution (Log MAR)

scale. The Wilcoxon signed rank sum test was employed to compare the pre and post measurements, while the Mann-Whitney U test was used to compare the measurements between different groups. The Fisher's exact test was employed to analyse the visual status. A p-value less than 0.05 was deemed to be statistically significant in this study.

Results

Among the cohort of 100 patients, a majority of 85 individuals were observed to fall within the age range of 30 to 60 years. Conversely, a smaller subset of 11 cases were identified in the age group exceeding 60 years. There were a total of four patients in the study who were below the age of 30. The study population consisted of individuals ranging in age from 20 to 70 years. The gender distribution exhibited a near equal representation of male and female individuals among the patient population (Table 1).

The patients in our study exhibited a nearly equal distribution of ocular involvement, with 52% presenting with right eye manifestations and 48% presenting with left eye manifestations. Among a cohort of 100 cases, it was observed that Posterior polar cataract exhibited comorbidity with Posterior subcapsular cataract in 4% of cases. Additionally, 23% of cases demonstrated a coexistence of nuclear sclerosis, while 2% of cases were found to have preexisting posterior capsular dehiscence. The surgical modalities encompassed in the field of ophthalmology consist of phacoemulsification and manual small incision cataract surgery techniques. In the study, 41% of the patients underwent small incision surgery, while the remaining 59% of patients received alternative treatment methods. The procedure of phacoemulsification was performed, as indicated in Table 2.

Table 1: Age and sex distribution

Age category	n	%
<30	4	4
30 – 60	85	85
>60	11	11
Sex	n	%
Female	52	52
Male	48	48

Table 2: Distribution of- Laterality, Axial length, posterior polar cataract types, and surgery types

Laterality		
Eye	Frequency	Percentage
Right	52	52
Left	48	48
Axial Length		
Length	n	%
<=24	72	72

Type	Frequency	Percentage
PPC	71	71
PSCC with PPC	4	4
NS with PPC	23	23
PPC with PCD	2	2
Surgery Types		
Phaco	59	59
SICS	41	41

Discussion

The management of posterior polar cataract poses significant challenges for surgeons specialising in the anterior segment. Due to its inherent propensity to induce posterior capsular rupture and associated complications such as nucleus drop, it is imperative to explore alternative surgical techniques. Posterior polar cataract is characterised as a form of congenital cataract that can have an early impact on visual acuity in comparison to other forms of cataracts [12]. In this study, the age range of the participants spanned from 20 to 65 years, with a predominant proportion of individuals falling within the age bracket of 30 to 60 years (85%). This observation suggests that posterior polar cataract primarily affects individuals in the younger age demographic. Patients in their early years of life frequently exhibit symptoms such as glare, sensitivity to light, and challenges with night vision. As the condition progresses, visual acuity is significantly compromised, particularly when posterior polar cataract (PPC) is accompanied by posterior subcapsular opacity or nuclear sclerosis. Another contributing factor for the early manifestation of polar cataract is the heightened level of patient awareness [13]. There is no discernible sexual predilection observed in relation to posterior polar cataract in the general population. This study additionally demonstrates a nearly equivalent distribution of male and female patients. In this research, a total of 100 ocular units were included, wherein 59 ocular units underwent phacoemulsification while the remaining 41 ocular units underwent small incision cataract surgery. The utilisation of the closed chamber technique is widely favoured over the conventional method. The utilisation of extra capsular extraction for nucleus delivery can result in significant trauma during the procedure. Additionally, if a rent were to occur, there would be no intact capsulorhexis available for the placement of the intraocular lens [14]. The prevailing intraoperative complication observed in this study is posterior capsular rupture, constituting approximately 8% of the overall 100 cases. Among the cohort, a total of 3% of individuals underwent phacoemulsification, while the remaining 5% of participants underwent small incision

cataract surgery. Out of the total of 8 cases observed, 2 cases (2%) were found to have preexisting posterior capsular dehiscence. In the phacoemulsification cohort, the occurrence of capsular rupture was predominantly observed during the emulsification of the nucleus. Similarly, in the small incision cataract surgery (SICS) group, capsular rupture was noted. In 60% of the cases, the occurrence of rent was observed during the removal of the epinucleus, which was subsequently identified following the delivery of the nucleus. In 40% of the cases, a rupture was observed during the aspiration of the cortex in two instances.

A total of four cases (4%) in this study exhibited residual posterior capsular opacity. Although in the majority of instances, the posterior opacity exhibited facile separation, these four cases presented with posterior plaque that displayed robust adherence to the posterior capsule. Additional manipulation was not pursued due to concerns regarding the potential for capsular rupture and associated complications. Therefore, the remaining posterior plaque was intentionally retained intraoperatively in all of these cases, and a Nd-Yag capsulotomy procedure was subsequently performed during the 6-month follow-up period. The patients were provided with comprehensive information regarding the anticipated delay in visual recovery and received professional counselling regarding the specific procedure [15]. Posterior capsular rupture in cases of posterior polar cataracts has been consistently identified as the predominant complication across various studies conducted to date. The prevalence has been documented as high as 36%, as reported by Vasavada et al [3], 26% by Osher et al [2], and other studies have similarly reported similar findings. On the contrary, the occurrence of capsular rupture in this study was determined to be 8%. The lower incidence observed may be attributed to several factors.

Conclusion

In this prospective study examining posterior polar cataracts, the average age of onset was found to be 47 years, with a significant proportion of patients falling below the age of 50 years. The prevailing symptom observed among the younger age group of patients was the experience of glare and challenges associated with night driving. The prevailing intraoperative complication observed was Posterior capsular rupture, which constituted approximately 8% of the cases. This phenomenon can be ascribed to the altered surgical methodology and heightened cognizance of the compromised posterior capsule. A prevalence of 4% was observed in cases where residual posterior capsular plaque was present, necessitating the implementation of Nd-Yag capsulotomy as a postoperative management strategy. The postoperative visual acuity demonstrated a notable improvement in comparison to the initial baseline visual acuity, with the exception of one case that remained unchanged due to the presence of severe amblyopia. Preoperative counselling of the patient

and providing comprehensive explanations regarding the anticipated complications is an essential requirement in the medical field. In the event of any complication or breach in the posterior capsule, it is imperative to ensure appropriate follow-up of the patients.

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