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ORIGINAL RESEARCH ARTICLE

A Study on the Outcomes in Post-operative Endophthalmitis

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ABSTRACT

Introduction: Post-operative endophthalmitis (POE) is a rare but serious complication of intraocular surgeries, associated with devastating visual outcomes if not promptly diagnosed and treated. This study aimed to evaluate the clinical profile, risk factors, treatment strategies, and outcomes of POE in a tertiary care center.

Material and Methods: A prospective observational study was conducted at SRMS Institute of Medical Sciences, Bareilly, from May 2023 to October 2024. Over 43 patients with infectious endophthalmitis following intraocular surgery were included. Data on demographics, prior ocular procedures, systemic comorbidities, microbiology, treatment, and visual outcomes were analyzed using descriptive statistics.

Results: The majority of patients were aged 51 to 70 years (76.8%), with a slight male predominance (55.8%). Cataract surgery (37.2%) was the most common preceding procedure, followed by trabeculectomy with cataract surgery (23.3%). Comorbidities included ischemic heart disease (27.9%) and renal disease (25.6%). Fungal growth was detected in 32.6% and bacterial growth in 44.2% of culture samples, with 81.4% showing mixed infections. Ciprofloxacin sensitivity was observed in 55.8% of isolates, while tobramycin showed the highest sensitivity (74.4%). Visual recovery was favorable: 79.1% achieved BCVA of 6/6 at one month, although this declined slightly to 58.1% at six months. Elevated IOP was noted in 62.8% at one week but reduced to 16.3% at six months.

Conclusion: Post-operative endophthalmitis remains a vision-threatening complication, most often following cataract or combined intraocular procedures. Early diagnosis, culture-based therapy, and vigilant follow-up are critical in optimizing outcomes. Despite initial severe impairment, most patients achieved significant visual improvement, underscoring the importance of prompt and tailored management.

Keywords: Post-operative endophthalmitis, Cataract surgery, Vitrectomy, Intraocular infection, Visual outcomes.

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INTRODUCTION

Post-operative endophthalmitis is a severe, vision-threatening complication that occurs following intraocular surgeries. It is characterized by intraocular inflammation caused by microbial infection and is considered an ophthalmic emergency requiring immediate diagnosis and treatment. Although advancements in surgical techniques and aseptic protocols have significantly reduced its incidence, post-operative endophthalmitis continues to be a critical concern in ophthalmology due to its potential to cause irreversible vision loss.[1]

The clinical significance of post-operative endophthalmitis lies in its devastating impact on visual function and quality of life. If untreated or inadequately managed, it can lead to long-term complications such as retinal detachment, corneal decompensation, secondary glaucoma, and phthisis bulbi (shrinkage of the eye).[2]

Prompt recognition and intervention are critical in managing post-operative endophthalmitis to prevent permanent visual damage. Diagnosis is primarily clinical, supported by microbiological analysis of intraocular fluid samples to identify the causative organism and its antibiotic susceptibility. Standard treatment typically involves intravitreal antibiotic injections, often accompanied by vitrectomy in severe cases. However, the prognosis is influenced by several factors, including the virulence of the infecting microorganism, the extent of intraocular damage, the patient's immune response, and the timing of treatment initiation.[3]

This study aims to evaluate the clinical profile, treatment approaches, and outcomes of post-operative endophthalmitis in a tertiary care setting, and to compare these with published literature. The aim is to study the outcomes in post-operative endophthalmitis in a tertiary care hospital in patients following intraocular surgery and study epidemiology, causative organisms associated with post-operative endophthalmitis, along with the occurrence of secondary complications. Endogenous or post-traumatic endophthalmitis cases without prior surgery, or follow-up <1 month were excluded.

MATERIAL AND METHODS

This prospective observational study included all patients diagnosed with post-operative endophthalmitis presenting to the Ophthalmology OPD and Casualty of SRMS Institute of Medical Sciences, Bareilly, from May 2023 to October 2024. Inclusion criteria were patients with infectious endophthalmitis following intraocular procedures. Patients with endophthalmitis without a history of prior intraocular surgery, endogenous or post-traumatic endophthalmitis, or inadequate follow-up for less than a month were excluded. Detailed demographic data, medical history, presenting symptoms, and prior ocular procedures were documented. Visual acuity was assessed with Snellen charts. Slit-lamp and fundus examination were performed, supported by B-scan ultrasonography where required. Microbiological confirmation was obtained from aqueous/vitreous taps. Treatment included intravitreal antibiotics with or without pars plana vitrectomy. Data were analyzed with SPSS using descriptive statistics.

RESULTS

A total of 43 patients were enrolled. The majority were aged 51 to 60 years (41.9%), followed by 61 to 70 years (34.9%). Males constituted 55.8% (n=24), while females were 44.2% (n=19). The left eye was more frequently affected (62.8%) compared to the right (37.2%).

Among the patients who experienced post-operative endophthalmitis, as shown in Table 1, the most common prior intraocular procedure was cataract surgery, performed in 16 cases (37.2%) followed by trabeculectomy combined with cataract surgery, observed in 10 cases (23.3%). Penetrating keratoplasty combined with cataract surgery was noted in 5 cases (11.6%), while penetrating keratoplasty alone accounted for 4 cases (9.3%). Glaucoma surgery and trabeculectomy with cataract surgery and vitrectomy were each reported in 3 cases (7.0%). The least common procedure was pars plana vitrectomy, performed in 2 cases (4.7%). More patients experienced post-operative endophthalmitis in the left eye, accounting for 62.8% (27 patients) of the cases, while 37.2% (16 patients) had the right eye affected.

In Table 2, 20.9% of patients had a history of steroid use or hypertension. Over 27.9% had IHD. Renal disease was reported in 25.6% (11 patients) and only 2.3% (1 patient) had any liver disease. In this study, 20.9% (9 patients) of the participants reported smoking and similarly, 20.9% (9 patients) of the participants consumed alcohol, and 79.1% (34 patients) did not use these substances. -t-test applied

Table 3 presents the intraocular pressure (IOP) measurements among patients who experienced post-operative endophthalmitis. The pre-operative IOP was 24 ± 5.0 mmHg, while the post-operative IOP decreased to 17 ± 3.4 mmHg, with a significant difference ($p < 0.001$*).

There was a significant reduction in IOP between pre-operative and post-operative measurements, and also between post-operative and on-examination IOP. However, there was no significant change between pre-operative IOP and on-examination IOP.

The study assessed the uncorrected visual acuity (UCVA) for distance vision (DV) at various stages post-surgery in patients with post-operative endophthalmitis. Table 4 shows that pre-operatively, the majority of patients had significantly reduced vision, with 58.1% having a UCVA of 6/60 or worse. Following surgery, there was a notable improvement in the proportion of patients achieving better visual acuity. At one month post-operation, 32.6% of patients had 6/6 vision, and 37.2% had 6/9 vision, indicating a significant improvement. These outcomes persisted over time, with 37.2% maintaining 6/6 vision at six months, and 23.3% achieving 6/9 vision.

Table 1: Prior intraocular procedures done among patients who experienced post-operative endophthalmitis

Procedure	*Count*	*Percentage (%)*
Cataract surgery	16	37.2
Glaucoma surgery	3	7.0
Pars plana vitrectomy	2	4.7
Penetrating keratoplasty	4	9.3
Penetrating keratoplasty and cataract surgery	5	11.6
Trabeculectomy and cataract surgery	10	23.3
Trabeculectomy and cataract surgery with vitrectomy	3	7.0

Table 2: Medical history among patients with post-operative endophthalmitis

Condition	*Present (n, %)*	*Absent (n, %)*
P/H/O steroid use	9 (20.9%)	34 (79.1%)
Hypertension (HTN)	9 (20.9%)	34 (79.1%)
Ischemic heart disease (IHD)	12 (27.9%)	31 (72.1%)
Renal disease	11 (25.6%)	32 (74.4%)
Any liver disease	1 (2.3%)	42 (97.7%)

Table 3: IOP among patients who experienced post-operative endophthalmitis

Parameter	*Mean ± SD*
Pre-op IOP	24 ± 5.0
Post-op IOP	17 ± 3.4
On examination IOP	23 ± 3.6
p-value (Comparison of Pre-op and Post-op IOP)	<0.001*
p-value (Comparison of Pre-op and On Examination IOP)	0.290
p-value (Comparison Post-op and on Examination IOP)	<0.001*

Table 4: UCVA for distance vision at different follow-up among patients who experienced post-operative endophthalmitis

UCVA for distance vision	*Pre-op (n=43)*	*Post-op (n=43)*	*1 Month (n=39)*	*2 Months (n=31)*	*6 Months (n=26)*
6/6	-	10 (23.3%)	14 (32.6%)	16 (37.2%)	16 (37.2%)
6/9	-	16 (37.2%)	15 (34.9%)	11 (25.6%)	9 (20.9%)
6/12	-	13 (30.2%)	8 (18.6%)	4 (9.3%)	1 (2.3%)
6/24	3 (7.0%)	3 (7.0%)	2 (4.7%)	-	-
6/36	4 (9.3%)	1 (2.3%)	-	-	-
6/60	25 (58.1%)	-	-	-	-
<6/60	11 (25.6%)	-	-	-	-

Table 5: Presentation of symptoms among patients experienced post-operative endophthalmitis

Symptom	*1 Week (n=43)*	*1 Month (n=39)*	*2 Months (n=31)*	*6 Months (n=26)*	*p-value*
Pain	29 (67.4%)	25 (64.1%)	18 (58.1%)	13 (50.0%)	0.504
Glare	14 (32.6%)	10 (25.6%)	5 (16.1%)	4 (15.4%)	0.270
Difficulty in driving at night	13 (30.2%)	11 (28.2%)	7 (22.6%)	5 (19.2%)	0.726
Swollen eyelids	20 (46.5%)	17 (43.6%)	12 (38.7%)	9 (34.6%)	0.772
Corneal edema	22 (51.2%)	17 (43.6%)	13 (41.9%)	7 (26.9%)	0.269
Reduced red reflex	10 (23.3%)	7 (17.9%)	4 (12.9%)	4 (15.4%)	0.688
Pan ophthalmitis	3 (7.0%)	2 (5.1%)	0 (0.0%)	0 (0.0%)	0.910
Glaucoma	30 (69.8%)	25 (64.1%)	14 (45.2%)	10 (38.5%)	0.026*
Orbital cellulitis	4 (9.3%)	3 (7.7%)	1 (3.2%)	1 (3.8%)	0.682
Intracranial spread	1 (2.3%)	1 (2.6%)	0 (0.0%)	0 (0.0%)	0.517
Septicaemia	6 (14.0%)	4 (10.3%)	2 (6.5%)	1 (3.8%)	0.503
Loss of vision	1 (2.3%)	-	-	-	
Phthisis	4 (9.3%)	-	-	-	
Hypotony	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Painful blind eye	1 (2.3%)	-	-	-	
Blurred vision	14 (32.6%)	10 (25.6%)	6 (19.4%)	3 (11.5%)	0.222

The proportion of patients with 6/12 or worse UCVA decreased steadily, dropping from 25.6% pre-operatively to just 2.3% at six months. Overall, the findings show a positive visual recovery trajectory in the majority of patients after surgery for post-operative endophthalmitis, with many achieving good or excellent distance vision within six months.

The microbiological culture results from the study on post-operative endophthalmitis revealed important findings regarding the presence of microbial growth. Fungal growth was absent in 48.8% of cases, while 32.6% of cases showed fungal growth, and 18.6% of cultures were not done. Bacterial growth was present in 44.2% of cases, with 34.9% showing no bacterial growth and 20.9% of cultures not being performed.

The study on post-operative symptoms following a surgical procedure in patients with endophthalmitis reveals a number of common complaints that gradually decreased over time. Table 5 shows that pain was reported by 67.4% of patients at 1 week, which dropped to 50.0% by 6 months. Glare and difficulty in driving at night were also common, affecting 32.6 and 30.2% of patients, respectively, at 1 week, with these symptoms reducing over the following months (15.4 and 19.2%, respectively, by 6 months).

Among the more serious complications, glaucoma was reported by 69.8% of patients at 1 week, and its incidence decreased to 38.5% by 6 months. Orbital cellulitis and intracranial spread were less frequent but still noted in some cases. Septicaemia was seen in 14.0% of patients at 1 week, which decreased to 3.8% by 6 months. Other complications, such as loss of vision, phthisis, and painful blind eye, were reported in very small percentages, typically early in the post-operative period. 3 patients had trabeculectomy and cataract surgery with vitrectomy; among them, all 3 had phthisis and one had painful blindness.

DISCUSSION

In our study, post-operative endophthalmitis was most prevalent in patients aged 51 to 70 years, with 41.9% of cases occurring in the 51 to 60 age group and 34.9% in the 61 to 70 age group. These findings align with previous research, which has consistently reported that older adults, particularly those undergoing cataract

surgery, are at higher risk of developing post-operative endophthalmitis. Panigrahi *et al*. documented a case of post-operative endophthalmitis in a 65-year-old male following an intravitreal injection, further supporting the association between older age and susceptibility to infection.[4]

In our study, post-operative endophthalmitis was observed slightly more frequently in males (55.8%) than in females (44.2%). This aligns with findings from Friling *et al*., who identified male gender as an independent risk factor for post-operative endophthalmitis in their large-scale analysis of over 1.4 million cataract surgeries. The possible reasons for this increased risk in males could include differences in ocular surface flora, hygiene practices, or occupational exposure to environmental contaminants.[5]

Cataract surgery was the most frequently associated intraocular procedure in patients who developed post-operative endophthalmitis, accounting for 37.2% of cases. This finding is consistent with previous research, including Kattan *et al*., who reported that cataract surgery, particularly extracapsular cataract extraction (ECCE) and intracapsular cataract extraction (ICCE), had the highest incidence rates of post-operative endophthalmitis, at 0.072 and 0.093%, respectively. The high frequency of cataract surgery as a preceding procedure is likely due to its widespread performance, making it the most common intraocular surgery globally.

In our study, 20.9% of patients with post-operative endophthalmitis reported a history of smoking and alcohol use. Smoking has been widely recognized as a risk factor for poor wound healing and impaired immune function, both of which could contribute to an increased susceptibility to post-operative infections, including endophthalmitis. Similarly, alcohol consumption has been associated with systemic immunosuppression and impaired wound healing. In other surgical fields, Nishimura *et al*. have demonstrated that patients with a history of alcohol use disorder experience higher rates of post-operative infections and prolonged hospital stays.[6]

Pain was one of the most prevalent symptoms across all time points in our study, and this is in agreement with previous studies. In a study by Keynan *et al*., 70 to 80% of patients with endophthalmitis presented with pain, which is slightly higher than our observed rate of 67.4% at one week, showing a relatively high incidence of pain in the acute phase of the disease.[7]

Swollen eyelids and corneal oedema were reported by 46.5 and 51.2% of patients, respectively, at one week. This decreased to 34.6 and 26.9%, respectively, by six months. These findings are consistent with a study by Hassan *et al*., reporting corneal edema in 51% of cases and swollen eyelids as a common presentation in endophthalmitis. Ho & Tolentino also emphasized that corneal edema could often be masked by the usual post-operative course, which may explain the transient nature of this symptom.[8,9]

In contrast, reduced red reflex, a crucial diagnostic indicator of endophthalmitis, was observed in 23.3% of patients at one week and decreased to 15.4% by six months. Guss *et al*., reported a 34% incidence of abnormal or lost red reflex in their study, underscoring its diagnostic significance. This finding aligns with our observations that reduced red reflex is an important symptom to monitor in suspected endophthalmitis cases.[10]

Regarding severe complications, panophthalmitis was rare in our cohort, reported by only 7.0% of patients at one week, with no cases observed beyond one month. This is in line with the findings of McLeod *et al*., who described panophthalmitis in severe cases of *Pseudomonas* infections following radial keratotomy surgery. The study by Chen *et al*., highlighted the severity of endogenous bacterial panophthalmitis, which may be less common in post-operative endophthalmitis cases, which are often caused by other pathogens such as *Staphylococcus aureus*.[11,12]

The occurrence of orbital cellulitis in our cohort was reported by 9.3% of patients at one week, with a decrease to 3.8% by six months. This is similar to the findings of Kronish *et al*., who reported orbital cellulitis as a complication in HIV patients with orbital infections. In the case series by McLeod *et al*., orbital cellulitis was described as a potential complication in the setting of panophthalmitis, further highlighting the severity of these complications in post-operative endophthalmitis.[13]

Loss of vision was reported in 2.3% of patients at one week, and phthisis bulbi was also observed in 9.3% of patients at one week, both significant outcomes that indicate the severity of endophthalmitis. Thorne *et al*., reported that the risk of vision loss to 20/50 or worse in endophthalmitis was 0.10/eye-year, with an even higher risk for severe visual impairment (20/200 or worse), emphasizing the importance of early intervention to prevent long-term visual loss.[14]

Our study similarly identifies both bacterial and fungal pathogens in patients with post-operative endophthalmitis. The presence of polymicrobial infections, including both bacterial and fungal growth, is consistent with findings from several studies, including those by Duan *et al*. and Sen *et al*., which highlight the importance of comprehensive microbiological evaluation in guiding treatment. Specifically, we found that fungal infections were present in 32.6% of our study population, slightly lower than the 48.8% absence rate observed in the study by Duan *et al*., which might reflect the different geographical and procedural contexts of both studies.[15]

CONCLUSION

This study provides valuable insights into the demographic distribution, clinical characteristics, and visual outcomes of patients who experienced post-operative endophthalmitis. The majority of patients were in the older age groups, with a slightly higher prevalence among males. Cataract surgery was the most frequently performed prior intraocular procedure among affected individuals. Additionally, a higher proportion of cases was observed in the left eye compared to the right.

The study also explored associations with substance use and comorbid medical conditions, highlighting the presence of systemic diseases such as ischemic heart disease, hypertension, and renal disease in a subset of patients. Intraocular pressure showed significant variations across different stages of treatment, with an initial reduction post-operatively followed by a slight increase upon examination.

Visual acuity assessments demonstrated substantial improvements over time. Both uncorrected and best-corrected distance vision showed marked enhancement following surgery, with a significant proportion of patients achieving good or excellent visual acuity by the six-month follow-up. Similarly, near vision exhibited a positive recovery trajectory, although some variability remained in the extent of improvement.

Overall, the findings show that timely intervention and appropriate management play a crucial role in visual recovery following post-operative endophthalmitis. Despite initial visual impairment, most patients experienced favorable long-term outcomes, reinforcing the importance of early detection, treatment, and post-operative monitoring in optimizing patient prognosis.

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