Original Article

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Microbiological Profile and Visual Recovery in Various Clinical Types of Endophthalmitis at a Tertiary Eye Care Hospital of Tamil Nadu, India: A Retrospective Cohort Study

Ophthalmology Section

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ABSTRACT

Introduction: Endophthalmitis is a serious, sight-threatening purulent inflammation of the intraocular cavities of the eyeball. It greatly affects vision and can lead to severe complications such as panophthalmitis. The prevalence of endophthalmitis varies from one place to another.

Aim: To identify the various aetiological and predisposing factors that contribute to endophthalmitis and to assess the visual outcomes following medical intervention (intravitreal antibiotics only) and surgical intervention (both intravitreal antibiotics and pars plana vitrectomy).

Materials and Methods: The present study was conducted in the Department of Ophthalmology at Trichy SRM Medical College Hospital and Research Centre, Trichy, Tamil Nadu, India between January 2023 and February 2023. Demographic and clinical data of patients diagnosed with endophthalmitis over a two year period from October 2020 to September 2022 were collected from the Medical Records Department of the Institution for analysis. A total of 50 case records were selected using convenience sampling. Demographic details such as age, gender, predisposing risk factors, visual acuity, microbiological profiles, treatment modalities, and final visual acuity were collected from the present study. Quantitative data was presented as Mean and Standard Deviation (SD), while qualitative data was presented as frequencies and percentages. Summary statistics were analysed using Microsoft Excel version 2018.

Results: In present study, 29 (58%) were males and 21 (42%) were females, with the majority falling within the age group of 50-70 years. The mean age of the sample was 53.8±16.1 years. Postoperative causes accounted for 39 (78%) of the cases, with phacoemulsification surgery with foldable intraocular lens implantation being the leading cause in 23 (58.7%) cases. Culture positivity was observed in only 22 (44%) cases, with *Staphylococcus (Staph) epidermidis* as the major causative organism. The best visual acuity achieved was 6/12 for two patients.

Conclusion: Postoperative endophthalmitis remains the most common cause of endophthalmitis. Additionally, patients who presented with better visual acuity had a better visual outcome after treatment. Therefore, patients should be educated about the early signs of endophthalmitis to ensure prompt medical attention and improve visual recovery.

Keywords: Endogenous, Intravitreal, Postoperative, Vitrectomy

INTRODUCTION

Endophthalmitis is a serious, sight-threatening purulent inflammation of the intraocular cavities of the eyeball. It greatly affects vision, leading to dreadful complications. The prevalence of endophthalmitis varies widely, ranging from 0.04% to as high as 7.5%. It occurs due to infection or invasion by rapidly growing microorganisms into the eye [1]. Endophthalmitis can be classified based on its clinical course (acute or chronic), aetiology (infectious or non infectious), route of entry of the causative factor (endogenous or exogenous), and causative organisms (bacterial, fungal, parasitic, and rarely viral) [2]. Early intervention is crucial to preserve vision [3]. To prevent endophthalmitis, careful clinical evaluation of preoperative risk factors, proper surgical procedures, and preoperative and intraoperative antibiotic prophylaxis should be performed.

Despite meticulous work-up, infections can still occur. In such cases, prompt diagnosis and adequate treatment are necessary to restore vision [4]. Previous literature on endophthalmitis suggests that patients with only perception of light should undergo pars plana vitrectomy with intravitreal antibiotics, while other patients can be treated with intravitreal antibiotics alone [5]. It is disheartening that most endophthalmitis cases occur after cataract surgery [6]. Patients undergoing cataract surgery expect improved vision, but if, they develop endophthalmitis, they risk losing not only their vision but also the entire eye. Therefore, a comprehensive understanding of the disease is essential.

Since, there is limited literature available on endophthalmitis in the South Indian demography [7], the present study aimed to evaluate various aetiological factors, microbiological details, and treatment outcomes to benefit patients in the community. The study aimed to identify predisposing factors and patterns of microbiological growth in patients with endophthalmitis and assess improvements in visual outcomes after medical and surgical intervention, including intravitreal antibiotics and Pars Plana Vitrectomy.

MATERIALS AND METHODS

This retrospective cohort study was conducted between January 2023 and February 2023. The medical records of all cases of endophthalmitis who attended Outpatient Department (OPD) of Ophthalmology at Trichy SRM Medical College Hospital and Research Centre in Trichy, Tamil Nadu, India were reviewed over a period of two years, from October 2020 to September 2022. A total of 50 cases were selected using a convenient sampling method.

Inclusion and Exclusion criteria: Cases of all age groups diagnosed with endophthalmitis following any modes of infection were included in the study. Cases with associated choroidal and retinal detachment diagnosed with Ultrasonoud B (USG B)-scan were excluded.

Study Procedure

Endophthalmitis was diagnosed based on defective vision, lid oedema, conjunctival chemosis and congestion, circumcorneal congestion, corneal oedema, leucocornea, keratic precipitates, hypopyon in the anterior chamber, fibrinous exudates in the anterior chamber, exudates over the anterior surface of the crystalline lens or pseudophakic lens, vitreous exudates, and retinal oedema [3]. Demographic details and clinical data such as age, gender, predisposing risk factors, visual acuity, microbiological profiles, treatment modalities, and final visual acuity were collected from the medical record department of the institution for analysis. Aaetiological and predisposing factors, details about intraocular procedures performed, and the mode of ocular injuries were noted in detail from the available case records. The clinical diagnosis confirmed with Ultrasound B-scan was also recorded. Preoperative and postoperative examinations, investigations, and interventions were all collected and analysed.

Preoperative and postoperative best-corrected visual acuity, recorded using Snellen's chart, was noted for analysing the improvement. Microbiological profile data were obtained from smear, culture, and sensitivity reports of the vitreous tap samples [8]. Details about vitreous tapping, topical and systemic antimicrobials, intravitreal injections, pars plana vitrectomy, and evisceration were noted from the records. Visual outcomes after medical intervention (only intravitreal antibiotics) [9,10] and surgical intervention (both intravitreal antibiotics and pars plana vitrectomy) were also recorded [11,12].

STATISTICAL ANALYSIS

The collected data was studied and analysed. Quantitative data were presented as means and standard deviations. Qualitative data were presented as frequencies and percentages, and the summary statistics tabulated were analysed using Microsoft Excel version 2018.

RESULTS

A total of 50 patients, 29 (58%) males and 21 (42%) females, were included in present study. The number of males outnumbered the females. The mean age of the was 53.8±16.1 years. Most of the patients belonged to the age group of 50-70 years, which is the most common age range for cataract surgery [Table/Fig-1].

Age (years)	Endogenous n (%)	Perforated ulcer n (%)	Post-trauma n (%)	Postoperative n (%)
1-10	1 (2)	-	-	-
11-20	-	-	2 (4)	-
21-30	-	-	2 (4)	-
31-40	-	-	3 (6)	3 (6)
41-50	-	-	-	6 (12)
51-60	-	-	1 (2)	12 (24)
61-70	-	2 (4)	-	16 (32)
71-80	-	-	-	2 (4)

[Table/Fig-1]: Age distribution in various clinical types of endophthalmitis (N=50).

[Table/Fig-2] shows that most cases of endophthalmitis occurred postoperatively following intraocular surgeries. In the present study, out of eight cases of post-traumatic endophthalmitis, three cases occurred following an injury with a metal rod, two cases followed road traffic accidents, one case followed an injury with a stick, one with a card, and one case followed a fishhook injury.

Postoperative n (%)	Post-traumatic n (%)	Perforated ulcer n (%)	Endogenous n (%)
39 (78)	8 (16)	2 (4)	1 (2)

[Table/Fig-2]: Distribution of various aetiological and predisposing factors causing endophthalmitis.

[Table/Fig-3] shows that Phacoemulsification with foldable Intraocular Len (IOL) was the most common cause of postoperative endophthalmitis (n=39). Two cases were seen following intravitreal injection.

Post intravitreal injection n (%)	Small incision cataract surgery n (%)	Phacoemulsification n (%)	Anti-glaucoma surgery n (%)	Keratoplasty n (%)	Retinal surgery n (%)
2 (4)	9 (18)	23 (46)	3 (6)	1 (2)	1 (2)

[Table/Fig-3]: Distribution of types of postoperative endophthalmitis (n=39).

[Table/Fig-4] shows that most of the cases were Gram-positive cocci, and only one case of gram-positive bacilli was found in the smear report.

Sample	Grams Stain n (%)			Potassium hydrooxide (KOH) stain, n (%)
	Gram positive cocci	Gram negative bacilli	Gram positive bacilli	
Vitreous	8 (16)	2 (4)	1 (2)	4 (8)

[Table/Fig-4]: Microbiological growth patterns in patients with endophthalmitis: Smear report (n=15).

A total of 22 cases out of 50 showed positive culture results. *Staphylococcus (Staph) epidermidis* (50%) was the most commonly isolated organism. Bacillus species were isolated from one case [Table/Fig-5].

Sample	*Staph epidemidis* n (%)	*Staph aureus* n (%)	*Aspergillus* n (%)	*Pseudomonas* n (%)	*Bacillus cereus* n (%)
Vitreous	11 (22)	4 (8)	4 (8)	2 (4)	1 (2)

[Table/Fig-5]: Microbiological growth patterns in patients with endophthalmitis: Culture report (n=22).

A total of 12 (24%) cases of endophthalmitis presented with no perception of light, out of which three patients had uncontrolled spreading infection. So, the infected eyes were eviscerated in fear of complications like panophthalmitis. Infection was controlled in the remaining nine patients [Table/Fig-6].

VA at presentation	Total patients	Evisceration	Nil improvement
No PL	12	3	9
PL+	12	-	4
HM	11	-	2
CFCF-1/60	12	-	1
>1/60-6/60	3	-	-

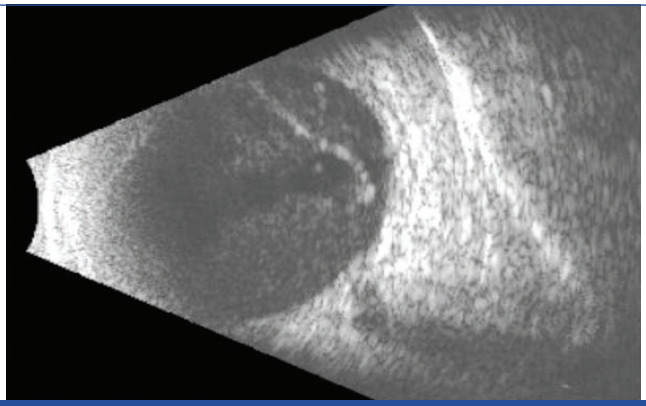
[Table/Fig-6]: Visual acquity at presentation.
No PL: No perception of light; PL+: perception of light present; HM: Hand movements; CFCF: Counting fingers close to face; VA: Visual acuity

Patients who presented with good initial visual acuity had good final visual acuity. The best visual acuity achieved was 6/12 for two patients [Table/Fig-7].

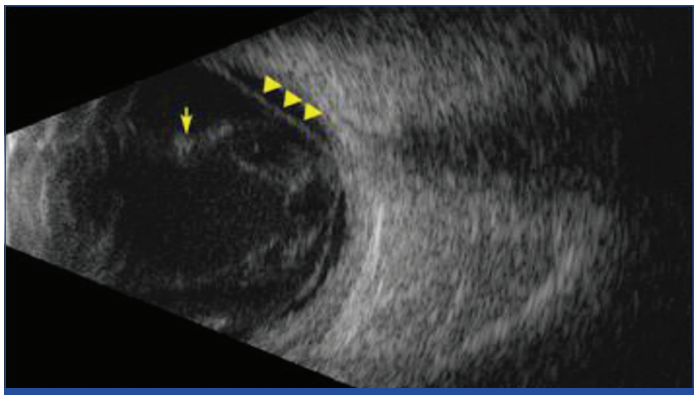
Visual acuity	Endogenous		Perforated ulcer		Postoperative		Post-traumatic		Total	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
No PL	1	1	1	-	6	5	4	3	12	9
PL+	-	-	1	1	9	2	2	1	12	4
HM	-	-	-	-	10	1	1	1	11	2
CFCF-1/60	-	-	-	-	11	7	1	2	12	9
>1/60-6/60	-	-	-	-	3	7	-	-	3	7
6/36-6/24	-	-	-	-	-	8	-	-	-	8
6/18-6/12	-	-	-	-	-	8	-	-	-	8

[Table/Fig-7]: Improvement in visual acuity among patients with endophthalmitis.
No PL: No perception of light; PL+: Perception of light present; HM: Hand movements; CFCF: Counting fingers close to face

USG B-scan echography showed vitreous opacities with membranes, typical of endophthalmitis [Table/Fig-8]. Dense hyper reflective echoes in the vitreous cavity was suggestive of exudates and membrane like echo in the scan was suggestive of retinal detachment [Table/Fig-9].



[Table/Fig-8]: USG B-scan echography showing vitreous opacities with membranes, typical of endophthalmitis.



[Table/Fig-9]: Ultrasound B-scan dense, hyper reflective echoes in the vitreous cavity suggestive of exudates (yellow arrow). The membrane-like echo in the scan marked by yellow triangles suggestive of retinal detachment.

DISCUSSION

Male patients, 29 (58%), outnumbered female patients, 21 (42%), which might be due to increased occupational exposure among males compared to females [13]. Most of the patients were in the age group of 50-70 years, which falls within a similar range as another study published by Wadbudhe AM et al., where articles from the years 2007 to 2022 were analysed [14].

In a study conducted by Lee A et al., culture positivity was found in 21 eyes (72.4%) of the intraocular sample [15]. In the present study, however, the culture positive result was only 22 (44%). Nobe JR et al., conducted a study between 1972-1985, where their culture positivity was 64%, and the most common causative organism was Staph epidermidis [16]. In present study as well, Staph epidermidis remains the most common organism. Additionally, a study conducted in central India showed *Staphylococcus (Staph) epidermidis* as the most common organism. A study conducted by Thapa R and Paudyal G, showed culture positivity in 13.6% of cases [17].

Authors noted a disparity in smear reports, with 15 (30%) positive smears, and culture reports, with 22 (44%) positive cultures, which was also observed in a study conducted by Ma WJ et al., on infectious endophthalmitis, where the smear positivity of vitreous samples was 11 (45.8%) and the culture positivity was 15 (62.5%) [18].

Negretti GS et al., conducted a study at Moorfields Eye Hospital over a five year period between 2013 and 2018, where the incidence of endogenous endophthalmitis was 18.1% [19]. In the present study, it was only 2%, which falls within the range reported in a review study published by Sadiq MA, where the incidence was reported as 2-8% [20]. Tamboli S et al., conducted a prospective observational and interventional study, where the incidence of postoperative endophthalmitis was found in 35 (45.5%) cases, post-traumatic endophthalmitis in 31 (40.3%) cases, and 11 (14.3%) cases of endogenous endophthalmitis [21]. In the present study, approximately 39 (78%) cases were postoperative, 8 (16%) cases were post-traumatic, and only 1 (2%) was endogenous. Dehghani AR et al., conducted a study where the overall incidence of post-traumatic endophthalmitis was 22 (2.1%), which was clearly less than the findings (3.3% to 17%). In the present study, the incidence was 8 (16%), which falls within the range [22].

Postoperative endophthalmitis outnumbers other causes of endophthalmitis due to the higher volume of cataract surgeries performed worldwide. This increase is attributed to improved healthcare facilities, even in remote areas. However, inadequate sterilisation techniques, intraoperative complications such as posterior capsular rent, vitreous loss, wound leaks, and improper postoperative care all contribute to the occurrence of endophthalmitis [23].

Ba'arah BT and Smiddy WE, reported an incidence rate of bleb-related endophthalmitis ranging from 0.2% to 1.3%. The use of antiproliferative agents increases the range to 3% [24]. In the present study, the incidence rate was 6%, which is significantly higher. In a study conducted by Jeong SH et al., at Kim's Eye Hospital between January 2008 and December 2015, a final visual acuity of ≥20/40 was achieved in 92 out of 164 cases (56.1%) after treatment [25].

Lee A et al., conducted a study where a final visual acuity of 6/12 or better was achieved in 19 (70.4%) eyes, and a visual acuity of 6/18 or better was achieved in 10 (37.0%) eyes out of 27. Two eyes had a final visual acuity of hand motion, one with light perception, and one with no light perception. None of the patients required evisceration or enucleation due to endophthalmitis [15]. In present study, only 6 (12%) eyes and 2 (4%) eyes out of 50 achieved good visual acuity of 6/18 and 6/12, respectively. Additionally, 16 (32%) eyes out of 50 had a visual acuity worse than 6/60. Three eyes required evisceration due to uncontrolled infection. This decreased visual outcome may be attributed to late presentation, possibly due to a lack of awareness of signs and symptoms. Soomro AR et al., published a study in which 19 (57.6%) patients had a final visual acuity of finger counting, 8 (24.2%) patients had hand movement, and 6 (18.2%) patients reported a visual acuity of 6/60 [26]. Authors achieved better visual outcomes, which might be attributed to early intervention with intraocular antibiotics and pars plana vitrectomy.

Limitation(s)

The present study had certain limitations. As it was a retrospective study, there was limited opportunity to delve deeper into the aetiological factors contributing to the outcomes.

CONCLUSION(S)

Postoperative endophthalmitis remains the most common cause of endophthalmitis. Additionally, patients who had better visual acuity at the time of presentation showed better visual outcomes after treatment. Therefore, it is crucial to adhere to the highest standard of sterilisation techniques, improve surgical techniques, and provide good postoperative care to minimise its occurrence. Furthermore, patients should be educated about the imminent signs of endophthalmitis to ensure early presentation. This way, they can benefit from early intervention and achieve better visual outcomes.

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