Original Article

Clinical Profile and Treatment Outcome of Endogenous Endophthalmitis

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Abstract

Background: *Endogenous Endophthalmitis is a sight threatening intraocular infection resulting from hematogenous spread of pathogens from distant foci.*

Objective: *To find out the source, risk factors, microbiological profile, visual and anatomical outcome of management of Endogenous endophthalmitis.*

Materials and Methods: *A retrospective study was done from medical records of diagnosed case of Endogenous Endophthalmitis at Vision Eye Hospital, Dhaka. Data collection was done on demographic factors, medical and surgical history, infectious data, BCVA throughout the clinical course and complications. Visual outcome and anatomical outcome were measured and compared.*

Results: *20 Eyes of 18 patients were diagnosed as Endogenous Endophthalmitis where 88.9% were unilateral and 11.1% were bilateral. Known foci of infection were found in 27.8% of cases and infective foci were not found on 33.3%. 44.4% were culture positive where the commonest organism was Pseudomonas followed by Klebsiella. 70% patients were treated by PPV and 30% were treated conservatively. Among 18 patients 6 had normal eyeball, 7 had formed eyeball, 3 developed phthisis bulbi and 1 needed enucleation. Finally, VA improved at 44.4% patients, remain unchanged at 22.2% patients and deteriorated at 33.3% patients.*

Conclusion: *The prognosis of endogenous endophthalmitis is often poor despite treatment. A high index of suspicion, early diagnosis and prompt treatment are crucial to salvage vision and eye.*

Key words: *Endophthalmitis, Endogenous, Visual acuity, Vitrectomy.*

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Introduction

Endophthalmitis is a sight threatening condition. It is classified as exogenous or endogenous depending on the route of entry of organism. Endogenous endophthalmitis is a rare but severe disease which is also known as metastatic endophthalmitis. Endogenous endophthalmitis accounts for 2-8% of all causes of endophthalmitis.[1,2] Endogenous endophthalmitis (EE) is most often associated with an underlying systemic source of infection or risk factor for infection including recent hospitalization, DM, UTI, liver abscess , renal failure , cancer , indwelling lines, systemic surgery, organ transplantation, HIV/AIDS , intravenous drug abuse, immunosuppression therapy.[3,4] Iatrogenic source e.g., dental surgery , contaminated IV fluid also cause EE.[5,6] In most cases diagnosis is done on clinical basis and treatment is initiated empirically while awaiting for result of specific sample culture or intraocular fluid culture. Prompt diagnosis and management is essential to preserve useful vision. Historically visual outcome following endogenous endophthalmitis have been poor among East Asian people particularly due liver abscess with Klebsiella species[7,8] The purpose of the study is to document the source or risk factor, microbiological profile, visual and anatomical outcome of management of endogenous endophthalmitis.

Materials and Methods

The medical records of all diagnosed cases of EE treated at Vision Eye Hospital, Dhaka, a tertiary referral center, from 2018-2023 were retrospectively reviewed. EE was diagnosed clinically in the presence of significant vitreous inflammation associated with sepsis and/or presence of other concomitant infection. Non-infectious causes of vitritis were ruled out. Data collected on patients with endogenous endophthalmitis included

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demographic factors (age and sex), identifiable risk factors (immunosuppression status, chronic metabolic disease, diabetes, intravenous drug use, cancer and surgery), medical history, presenting symptoms, infectious data (source of infection, organisms and antimicrobial susceptibility of organisms), best-corrected visual acuity (BCVA) throughout the clinical course and complications (glaucoma, retinal detachments, cataracts, enucleation and phthisis bulbi). Patients with history of ocular surgery or ocular trauma within one year of the onset of infection, corneal ulcer related endophthalmitis, glaucoma filtering surgery related endophthalmitis and uveitis were excluded.

At the time of patient presentation all cases were investigated with blood culture, urine culture and extensive work up including imaging whatever indicated aiming at finding the primary source of infection and general management of the patient were performed . Vitreous biopsy, culture and sensitivity, intravitreal and systemic broad-spectrum antibiotics were administered for all the patients. Intravitreal antibacterial used were Vancomycin (2 mg in 0.1 ml) and Ceftazidime (2 in 0.1 ml). Patients were reviewed daily after intravitreal injections. If the vision deteriorated/vitritis increased after 48 hours of intravitreal injection Pars Plana Vitrectomy (PPV) was performed. PPV was also performed in patients with presenting visual acuity ≤ hand movement. Silicon oil injection was given in cases depending on the retinal condition on surgeon's discretion during surgery. None of the patients underwent repeat vitrectomy.

VA was recorded using Snellen's visual acuity chart. VA pre-treatment and post-treatment were collected and categorized into three groups: (1) improved, (2) stable, and (3) deteriorated. A gain or loss of ≥ one line of Snellen VA was defined as an improvement or deterioration respectively, where subjects were within Snellen acuity range. And for those presenting with very poor visual acuity, which couldn't be assessed with Snellen VA chart (Beyond Snellen), increase or decrease of one measured step or more was defined as an improvement or deterioration. (for example, from HM to CF or HM to PL respectively). 'Culture positive' was defined as isolation of any microorganism from vitreous sample. Snellen visual acuity was converted to logMAR vision for statistical analysis. Converted logMAR visual acuity 9 of No perception of light (NO PL): 3.00, perception of light (PL): 2.7, hand movement (HM): 2.3,. counting finger 1" (CF 1") : 2.1, counting figure 2" (CF2"): 2.0. The statistical analysis was conducted using SPSS (Statistical Package for the Social Science) version 26 statistical software. The findings of the study were presented by frequency, percentage in tables. Median with interquartile range for continuous variables and frequency distributions for categorical variables were used to describe the characteristics of the total sample. Association of continuous data were reviled by Wilcoxon Sign ranked test. A p-value less than 0.05 was considered statistically significant in two tailed test.

Results

20 eyes of 18 patients were diagnosed as endogenous endophthalmitis.

Table I: Baseline characteristics of the patients (n=18)

Baseline criteria	Frequency (percentage)
Female gender	12 (66.7%)
Age (in years) [Median (IQR)]	27.5 (23.7, 53.5)
Pre-existing medical condition	4 (22.2%)

IQR: interquartile range, Pre-existing medical condition: Diabetes mellitus (n=2), Hypertension (n=2), Chronic kidney disease (n=1), Ischemic heart disease (n=1)

Among the 18 patients, 66.7% were female and 33.3% were male. The median age of the patients was 27.5 years. Approximately, one fifth of the patients had comorbidities which included Diabetes mellitus, Hypertension, Chronic kidney disease and Ischemic heart disease (table I).

Table II: Clinical manifestation of the patients (n=18)

Criteria	Frequency (%)
Eye involvement	
Unilateral	16 (88.9%)
Bilateral	2 (11.1%)
Source of infection	
Unknown	6 (33.3%)
Known foci of infection	5 (27.8%)
Post-surgical with wound infection	3 (16.7%)
Post-surgical without wound infection	4 (22.2%)

Out of the 18 patients, 88.9% patients had unilateral eye involvement. Known foci of infection was found in 27.8 % of patients. 7(38.9%) patients developed endophthalmitis following general and gynecological surgery where 3 patients had wound infection.

Table III: Microbiological Profile of the patients (n=18)

Criteria	Frequency (%)
Positive culture	8(44.4%)
Organism identified	
Pseudomonas	3(16.7%)
Klebsiella	2(11.1%)
Mycobacterium tuberculosis	1(5.6%)
Staphylococcus aureus	1(5.6%)
E. Coli	1 (5.6%)

Culture was positive for 44.4% patients. Pseudomonas (16.7%) and Klebsiella (11.1%) were the most common organism identified (table II).

Table IV: Treatment modalities of the eyes (n=20)

Treatment modalities	Frequency (percentage)
Pars plana vitrectomy with silicone oil	11 (55.0%)
Conservative management	6 (30.0%)
Pars plana vitrectomy	3 (15.0%)

The most common method of treatment was pars plana vitrectomy with silicone oil (55.0%). Infection was controlled by conservative management in 30.0% eyes (table IV).

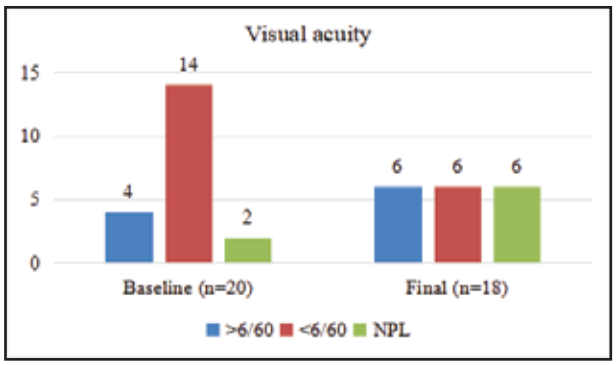

Figure 1: Distribution of visual acuity at baseline and at 6th month

At baseline, majority (70.0%) patients had visual acuity of <6/60 while one fifth (20.0%) had >6/60 and 2 (10.0%) had NPL. At final follow up, one third (33.3%) patients had visual acuity of >6/60 and another one third (33.3%) had <6/60. However, 6 (33.3%) had NPL (figure I). One patient with bilateral EE lost to follow up.

Table V: Comparison of visual acuity of the patients

Visual acuity	Visual acuity (in logMAR)	p value
Baseline (n=20)	2.3 [1.2 , 2.3]	0.660*
Final (n=18)	2.3 [0.4, 3.0]	

*Wilcoxon Sign ranked test

No significant difference was observed between baseline and final visual acuity (p=0.660) (table V).

Table VI: Distribution of anatomical outcome of patients (n=18)

Anatomical outcome	Frequency (n=18)
Normal eyeball	6 (33.3%)
Formed eye ball	7 (38.9%)
Phthisis bulbi	3 (16.7%)
Enucleation	2 (11.1%)

Among the 18 eyes, 6 (33.3%) had normal eyeball (p=0.660). Another 7 (38.9%) had formed eye ball. 3 (16.7%) developed phthisis bulbi and 2 (11.1%) needed enucleation (table VI).

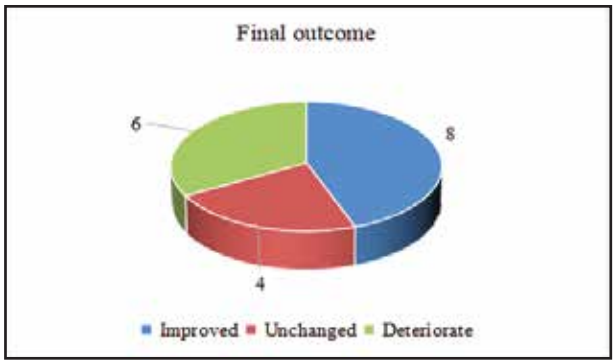

Figure 2: Final outcome

At final follow up, the visual acuity was improved in 8 (44.4%) patients and remained unchanged in 4 (22.2%) patients. However, in 6 (33.3%) patients, it deteriorated (figure 2).

Discussion

Endogenous endophthalmitis occurs due to breakdown of blood ocular barrier and causes severe intraocular inflammation. Diagnosis and treatment of endogenous endophthalmitis is a challenge for ophthalmologist. It can occur at any age and in any either sex. EE is commonly associated with systemic condition that can cause a relatively immunocompromised state.[4] This study looked at the risk factors, etiological organism, visual and anatomical outcome of endogenous endophthalmitis. Bilateral eye involvement was found in 11.1% of our patients. Among the culture positive cases both Gram positive and Gram-negative bacteria were identified. There was no fungal positive case. Pseudomonas was isolated from one patient with bilateral endophthalmitis who got intravenous antivenom and saline but was otherwise healthy. No organism could be isolated from another one who developed bilateral EE following hemodialysis. There are reports of bilateral cases of EE demonstrated with bacteria such as Clostridium.[10,11] Series published by Essman et al., Okada et al. and Schiedler et al. have reported that bilateral cases are more common among fungi than bacteria.[12-14]

In our study, 22.2% of the patients had at least one systemic

co-morbid condition, most common being diabetes mellitus. In a review by Jackson et al. among bacterial EE, 56% of patients had systemic condition that predispose to infection.[15] Connell et al. found an identifiable risk factor in 78.1% and Pillai et al. found 90.24% patient had at least one comorbid condition; diabetes mellitus was commonest one.[13,16]

Identifiable foci of infection was found in 27.8% cases. In a series by Zenith et al. an infective focus was identified in most of the patients with EE and urinary tract was the commonest source.[17] Chung et al. reported that 22.2% had pneumonia and 16.7% had liver abscess as the infective foci.[18] Wong et al. reported hepatobiliary tract as the commonest foci of infection in 48% of cases, whereas intravenous drug use was the commonest in the West.[3,17,19] In our series source of infection was unknown in 33.3% and 38.9% EE developed following minor or major surgery.

In our study, culture positive organism was isolated from vitreous among 44.4% of eyes. Many other authors have reported varied culture positivity rate from intraocular specimens ranged from 56 -87%. [4,15,16,20] Majority of the patients in our study were already receiving systemic antibiotics at diagnosis of EE before taking vitreous biopsy. This could probably be the reason for lower culture positivity in our study. Polymerase chain reaction testing can be used to identify organisms from intraocular specimens in endophthalmitis cases and could be a valuable tool especially in culture negative cases. However, in the present study, we did not perform PCR in any of our cases. Jackson et al. and Ness et al. reported blood culture positivity rate of 56% and 33% respectively.[15,20] In contrast, no organism could be isolated from blood in any case of our study.

Among bacterial EE, Gram-positive organisms were more prevalent in North America and Europe, while Gram-negative organisms were more common in East Asia.[21] In East Asia, Klebsiella pneumoniae has been attributed to majority of cases and hepatobiliary infections has been frequently associated with it.[7] In our study, among the bacteria majority were Gram-negative organism.

One case of our series developed EE by MTB confirmed by enucleation for progressive uncontrolled inflammation following PPV for endogenous bacterial endophthalmitis. Mycobacterium tuberculosis (MTB) related EE can present in any age group, and is usually seen in immunocompetent patients. Poor prognosis in these cases is often due to initial misdiagnosis. In most cases, the diagnosis is made on histopathology after enucleation of the affected eye.[22]

Pediatric EE accounts for 0.1% to 4% of all cases of EE. The highest number of patients recorded are from India and the lowest from the USA. In a recent case series from India, the pathogen profile was as follows: gram-positive organisms (36.7%), gram-negative organisms (23.3%), Toxocara (26.7%), fungi (6%), and Cysticercus (3.3%). [23] In our study population paediatric EE was 11.1 % but no organism could be identified.

The aims of treatment are to prevent mortality and systemic morbidity, minimize ocular damage and salvage visual capacity. With this aim treatment for EE should include empirical therapy usually with prompt intravitreal injection of antimicrobials, repeated as needed and systemic therapy. The aggressiveness of therapy is guided by the extent of ocular involvement and the response to treatment with empirical agents. Currently, no clear guidelines on the management of this condition, in particular the role of vitrectomy in its management, exist. In cases where significant vitreous involvement is present, pars plana vitrectomy (PPV) can be considered and in extreme cases, even evisceration or enucleation might be necessary. In cases of bacterial EE, vitrectomy is generally performed when there is no response to intravitreal antibiotics within 48 h or when the eye condition continues to decline or with a worse grade of RAPD.[24]

Vitrectomy rate was 70% in our study. Connell et al., Pilli et al. and Han Woong Lim et al. reported vitrectomy rate of 57%, 53.7% and 43.1 % respectively, in their study.[3,16,25] In an Australian series, PPV was performed in 57.1% of the eyes. 38% of the eyes which underwent PPV had functional improvement in visual acuity of better than 20/90. On the contrary, 50% of eyes treated with tap and inject had to undergo enucleation.[26] In a Chinese series, 60.9% of the eyes underwent PPV, of which 64.3% had a visual gain better than 20/400.[27] In our series there was no significant improvement of vision among cases underwent PPV. High rate of PPV in our cases is due to poor vision at presentation.

A major review of EE in 2001 found very poor visual prognosis which does appear to have improved since 2001.[28] More specifically, 41% of eyes achieved a visual acuity of 6/60 VA or better, 35% had VA worse than 6/60, and 19% required enucleation or evisceration. Corresponding rates prior to 2001 were 29%, 47% and 25%.15 In our study 33.3% had 6/60 or better and 33.3 % had VA worse than 6/60 and 11.1 % required enucleation and 16.7 % developed phthisis bulbi. In extreme cases, even evisceration or enucleation might be necessary as high as 60%. .[26,29] Zenith et al. reported that the eyes with bacterial EE had a worse outcome with more patients requiring enucleation or evisceration compared to patients with fungal EE. 17 Overall visual results in EE have been reported to be poor and similar results were noted in our study.[15,16] Poor presenting visual acuity has already been reported as a poor prognostic factor by Sallam et al.[30]

This study has certain limitations. Small sample size, retrospective nature of the study are the inborn limitation of the study. Patients from only private hospital includes conscious patients sample and devoid of less privileged patients' sample. Our study Patient pool from only specialized eye hospital also failed to incorporate more patients who develop EE in immunocompromised conditions, mostly managed by eye department of a multidisciplinary hospital.

Conclusion

EE does not have a favorable prognosis because of associated co-morbid conditions and late presentation which results in complete vision loss. EE is a difficult to diagnose clinically and therefore treatment is delayed. PPV has a diagnostic as well as therapeutic role in the management of EE. Vitrectomy may be

strongly considered as a treatment option if there is no response to systemic or local therapy within 24–48 h of presentation or if the patient has possible worsening. However, future studies will be needed to ascertain the role of primary vitrectomy in the management of these complex cases. Visual symptoms following major or minor surgical procedure should be sought cautiously for early diagnosis and therefore early intervention.

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