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Favorable Outcome in Recalcitrant Klebsiella pneumoniae Endogenous Endophthalmitis: A Case Report

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Abstract

Endogenous endophthalmitis is an aggressive intraocular infection with a characteristically poor visual prognosis. We present a 55-year-old Malay woman with suboptimally controlled diabetes mellitus who developed sepsis from a liver abscess. Following the isolation of *Klebsiella pneumoniae* from the abscess drainage, which demonstrated susceptibility to gentamicin and trimethoprim-sulfamethoxazole, she was commenced on targeted systemic antimicrobial therapy. During her admission, she reported a sudden visual decline in her left eye, with visual acuity decreasing to 6/21. Clinical examination of the left eye revealed anterior chamber inflammation with a hypopyon, alongside pronounced vitritis and retinitis, while the right eye remained entirely unaffected. Recognizing this as *Klebsiella pneumoniae* endogenous endophthalmitis, we immediately performed a vitreous tap and injected intravitreal vancomycin and ceftazidime, proceeding to a trans pars plana vitrectomy (TPPV) with repeat intravitreal antibiotics the following day. Although her vitreous fluid cultures returned negative, the infection resolved on a postoperative regimen of topical 0.5% moxifloxacin, systemic ciprofloxacin, and trimethoprim-sulfamethoxazole, which improved her left eye visual acuity to 6/7.5. Ten weeks later, however, she developed a recurrence of endophthalmitis with a reduction in her vision to 6/18. This was managed promptly with a repeat TPPV, further intravitreal antibiotics, and a silicone oil tamponade. Postoperatively, the patient was started on topical moxifloxacin, along with systemic trimethoprim-sulfamethoxazole and ciprofloxacin. She responded well to this secondary intervention, achieving complete inflammatory resolution and recovering a final pinhole visual acuity of 6/9. This case presents a rare but favorable outcome of *Klebsiella pneumoniae* endogenous endophthalmitis, which characteristically has a poor prognosis. The prompt, intensive medical and surgical management utilized in this case was a key factor in achieving clinical success.

Categories: Ophthalmology
Keywords: diabetes mellitus, endogenous endophthalmitis, klebsiella pneumonia, liver abscess, recurrent endophthalmitis, vitrectomy

Introduction

Endogenous endophthalmitis is a challenging condition to manage and is characterized by a severe visual prognosis [1]. It is caused by the hematogenous spread of infectious organisms into the eye, resulting in severe inflammation of the vitreous and aqueous humors. While *Staphylococcus aureus* and *Streptococcus* species are the most common causative organisms in Western countries, *Klebsiella pneumoniae* remains the most frequently isolated pathogen in East and Southeast Asia [2]. This is primarily driven by the endemicity of pyogenic liver abscesses and the circulation of hypervirulent capsular serotypes (primarily K1 and K2), which readily establish metastatic intraocular infections in highly susceptible patients, particularly those with underlying diabetes mellitus [1]. Despite aggressive medical therapy, including intravenous antibiotics and immediate intravitreal injections, visual outcomes typically remain poor, frequently progressing to irreversible visual loss, phthisis bulbi, or the need for evisceration. While acute presentations are well documented, delayed recurrences following initial surgical resolution are rare in the literature. The purpose of this report is to describe a novel case of *Klebsiella pneumoniae* endogenous endophthalmitis featuring a delayed 10-week recurrence, demonstrating that prompt repeat vitrectomy can successfully preserve the eye and achieve a favorable visual outcome.

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Case Presentation

A 55-year-old Malay woman with a history of suboptimally controlled diabetes mellitus (HbA1c 7.5%) presented with a one-week history of left upper quadrant abdominal pain and generalized malaise. She was hemodynamically unstable and had metabolic acidosis. Her laboratory investigations revealed a leukocytosis (white blood cell count 16.8×10^9/L) with neutrophil predominance (76.3%). Liver function tests demonstrated liver enzyme elevation: aspartate aminotransferase (AST) 49 U/L, alanine aminotransferase (ALT) 84 U/L, markedly elevated alkaline phosphatase (ALP) 520 U/L, and conjugated (direct)

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hyperbilirubinemia (24.2 µmol/L). Serology for hepatitis B, hepatitis C, and HIV was negative. A computed tomography scan of the abdomen revealed a liver abscess measuring 4.7x5.7x6.6 cm. She was admitted to the intensive care unit (ICU) for septic shock secondary to this intra-abdominal source, which necessitated emergent percutaneous drainage. Fluid obtained from the percutaneous liver abscess drainage yielded *Klebsiella pneumoniae*, which demonstrated susceptibility to gentamicin and trimethoprim-sulfamethoxazole. Notably, despite the profound septic shock, concurrent peripheral blood cultures obtained upon admission showed no microbial growth. For her systemic infection, she was treated with intravenous trimethoprim-sulfamethoxazole (160 mg/800 mg twice daily) with a planned six-week course of systemic antibiotic therapy.

Her premorbid vision was subjectively normal. One week into her ICU admission, she complained of reduced vision in the left eye with eye redness. Ophthalmic examination of the left eye revealed marked anterior segment inflammation with hypopyon, raised intraocular pressure of 30 mmHg, and a mild posterior subcapsular cataract (2+). Visual acuity of the left eye was 6/21 unaided and did not improve with pinhole testing. No relative afferent pupillary defect (RAPD) was observed. Fundus examination demonstrated dense vitritis obscuring the optic disc details, alongside multifocal retinitis located at the posterior pole (Figure *1A*). B-scan ultrasonography revealed vitreous clumping without serous retinal detachment or other lesions. The examination of the right eye was unremarkable.

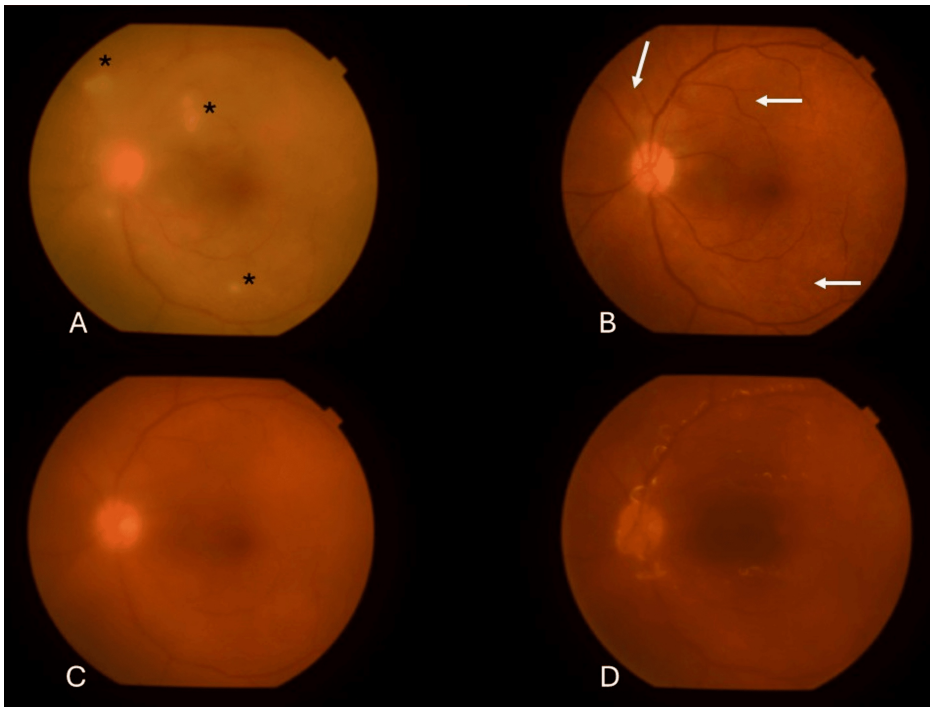


FIGURE 1: Sequential fundus photographs of the left eye tracking the clinical course of Klebsiella pneumoniae endogenous endophthalmitis.

(A) Initial presentation demonstrating marked vitritis and active retinitis (asterisks). (B) One-month post-treatment showing complete resolution of vitritis and resolved retinal infiltrates (arrows). (C) Clinical recurrence of endophthalmitis characterized by vitritis. (D) Postoperative trans pars plana vitrectomy with clear media and resolution of vitritis.

While she was recovering systemically in the ICU, as evidenced by her afebrile status and normalized white cell count, the clinical picture in her left eye demonstrated a severe, active infection. The diagnosis of left endogenous *Klebsiella pneumoniae* endophthalmitis was made. Immediate vitreous tapping for pathogen identification, microbial sensitivity testing, and intravitreal injection of vancomycin (1 mg/0.1 mL) and ceftazidime (2.25 mg/0.1 mL) were performed. TPPV, vitreous washout, and intravitreal injection of vancomycin and ceftazidime were performed the next day (within 24 hours). Intraoperative evaluation revealed dense vitritis, a pale optic disc, and widespread flame-shaped hemorrhages across a fully attached retina.

The vitreous fluid sample was negative for bacterial and fungal growth, and repeated aerobic and anaerobic blood cultures were also negative. Postoperatively, the patient continued receiving intravenous trimethoprim-sulfamethoxazole for one week before switching to oral dosing (240/1200 mg twice daily) to complete a six-week regimen. Concurrently, oral ciprofloxacin (750 mg twice daily) was continued for two weeks, while topical moxifloxacin (0.5%) and dexamethasone (0.1%) were initiated every two hours and

gradually tapered over two months. Systemically, the liver abscess responded well to the continued antimicrobial therapy, requiring no further surgical intervention, and the patient was subsequently discharged. At the one-month follow-up, ophthalmological examination revealed complete resolution of the vitritis and retinitis (Figure *1B*), corresponding to an improvement in left eye visual acuity to 6/9 unaided and improved to 6/7.5 with pinhole testing.

Ten weeks later, she developed recurrent endophthalmitis, presenting with left eye redness. Her left eye visual acuity was 6/18 unaided and did not improve with pinhole testing. There was no RAPD observed. Anterior segment inflammation was seen, with 4+ cells, intraocular pressure of 18 mmHg, posterior synechiae, and posterior subcapsular cataract (2+). Fundus examination demonstrated vitritis obscuring the optic disc details (Figure *1C*). Immediate vitreous tapping for microbial testing and intravitreal injection of vancomycin and ceftazidime were performed. A repeated TPPV, anterior chamber washout, and intravitreal injection of vancomycin, ceftazidime, and amphotericin B (5 µg/0.1 mL) with silicone oil tamponade were performed the next day. Intraoperative findings revealed retinitis with a retinal abscess and a localized exudative retinal detachment. Additionally, a mass was identified at the vitreous base, which was subsequently trimmed and treated with cryotherapy. Vitreous fluid samples for microbial tests and blood cultures revealed no growth. Postoperatively, the patient was treated with oral trimethoprim-sulfamethoxazole for six weeks and oral ciprofloxacin for one month. Concurrently, she received topical moxifloxacin and prednisolone every two hours, which were tapered over two months. Following intensive treatment, she had resolution of intraocular inflammation and a flat retina (Figure *1D*).

Eighteen months later, she underwent phacoemulsification and removal of silicone oil in the left eye. Her preoperative visual acuity was 6/60 unaided, with no improvement on pinhole testing. Intraoperative evaluation revealed a pale optic disc, a flat retina with a temporal cryopexy scar, and dense posterior capsular opacification. At a subsequent follow-up visit, a neodymium-doped yttrium aluminium garnet (Nd:YAG) laser capsulotomy was performed, after which she achieved a final unaided visual acuity of 6/9.

Discussion

Endogenous endophthalmitis is known for its poor prognosis in terms of visual function, anatomical outcome, and mortality. Generally, successful visual acuity is defined as better than 6/60, which is only achieved in a minority of cases, with reported outcomes ranging from 4.5% to 64% [3]. Retinal detachment and phthisis bulbi have also been observed in up to 60% of affected eyes [3]. However, *Klebsiella pneumoniae* endogenous endophthalmitis is associated with significantly worse outcomes. A 12-year review specifically on *Klebsiella* cases showed 81.3% having vision worse than 6/60 and a mean final visual acuity of only counting fingers, with 18.8% of eyes requiring evisceration [1]. The mortality rate of *Klebsiella pneumoniae* endogenous endophthalmitis is as high as 14.3%, primarily driven by systemic complications such as septic shock, multi-organ failure, and severe metastatic infections [1]. This reinforces the aggressive nature of *Klebsiella* infections and their profound impact on ocular and systemic health [1,3,4].

Dedieu et al. concluded that initial visual acuity is the primary parameter determining visual and structural outcomes [4]. Specifically, positive prognostic factors for favorable visual outcome are initial visual acuity better than counting fingers, performing pars plana vitrectomy (PPV), and administration of intravitreal injection within 24 hours of clinical diagnosis [3,4]. Conversely, poor initial visual acuity (light perception or worse), infection by highly virulent pathogens such as *Klebsiella pneumoniae*, underlying diabetes mellitus, and severe ocular inflammation (e.g., hypopyon, panophthalmitis, corneal edema, and increased intraocular pressure) serve as negative prognostic indicators [5,6]. Primary systemic sources of hematogenous seeding classically include liver abscess, urinary tract infection, pneumonia, and central nervous system infection [4,7,8]. In our case, the patient presented with negative prognostic factors, including *Klebsiella pneumoniae* liver abscess and septicemia, underlying diabetes mellitus, hypopyon, and elevated intraocular pressure on presentation, which are well documented to carry a rapidly progressive clinical course and a poor visual prognosis if intervention is delayed. Early clinical referral and prompt surgical intervention with TPPV successfully preserved her visual acuity, improving from a baseline of 6/21 to a final visual acuity of 6/9.

Blood cultures identified the causative organism in 53% of endogenous endophthalmitis cases, demonstrating a greater diagnostic yield than ocular fluid culture, which yields a positive result in only 27% of cases [4]. This discrepancy reflects the disease's pathophysiology, which is a systemic infection that secondarily seeds the ocular structure via the bloodstream. Identifying the causative organism remains a challenge, as between 19% and 36% of cases have unidentified pathogens [3]. In our case, vitreous samples obtained via both vitreous tap and TPPV yielded no bacterial growth during either the initial presentation or the recurrence. Furthermore, both the initial peripheral blood cultures drawn upon hospital admission and the repeated cultures taken on the day of the ophthalmic diagnosis also returned negative. The initial sterile cultures from peripheral blood, despite the patient presenting in septic shock, likely reflect the transient and intermittent nature of bacteremia, where peripheral blood draws may miss sporadic bacterial showers. The subsequently sterile blood and vitreous samples are highly likely attributable to the prompt initiation of targeted systemic antibiotics and definitive source control (liver abscess drainage) prior to the onset of ocular symptoms. Nevertheless, clinical resolution was achieved following combined intravitreal and systemic antibiotic therapy, tailored to the susceptibility profile of the *Klebsiella pneumoniae* liver isolate.

Currently, there is no consensus regarding the optimal management of endogenous endophthalmitis. The Endophthalmitis Vitrectomy Study (EVS) recommends immediate vitrectomy for postoperative endophthalmitis in patients presenting with light perception vision only [9], while the Complete and Early Vitrectomy for Endophthalmitis (CEVE) protocol advocates early vitrectomy based on poor retinal visibility rather than visual acuity alone [10]. Notably, neither study specifically addresses endogenous endophthalmitis, and the role of early vitrectomy in this context remains debatable, particularly given that many patients with endogenous endophthalmitis are systemically unstable and poor surgical candidates. Nevertheless, several studies have suggested that early vitrectomy improves visual outcomes in endogenous endophthalmitis [11-13]. The proposed benefits are multifactorial: vitrectomy facilitates the removal of bacterial load and inflammatory mediators, thereby mitigating retinal toxicity; reduces the purulent vitreous burden, which enhances intravitreal antibiotic diffusion and therapeutic efficacy; and may lower the overall intraocular bacterial and inflammatory burden more rapidly than medical therapy alone [6,13]. In the present case, vitrectomy was performed within 24 hours of presentation in a patient with an initial visual acuity of 6/21, which likely contributed to the favorable visual outcome observed. Potential complications following vitrectomy include elevated intraocular pressure, cataract formation, and suprachoroidal hemorrhage. However, advances in surgical technique, including smaller-gauge instrumentation, higher cut rates, and improved illumination, and optimized fluidics have substantially reduced the incidence of such complications [14]. These technical improvements may partly explain the growing trend toward early surgical intervention in endogenous endophthalmitis. Despite this, endogenous endophthalmitis typically occurs in the context of systemic sepsis, often necessitating intensive care and multidisciplinary management. Consequently, many patients may not be fit for general anesthesia required for vitrectomy, posing a persistent clinical challenge for treating ophthalmologists in balancing systemic stability with the potential visual benefits of early surgical intervention.

While the use of topical corticosteroids in endogenous endophthalmitis remains controversial, they are a crucial adjunct for suppressing severe inflammation and preventing irreversible tissue damage. However, as highlighted by Tsai et al., prolonged steroid therapy necessitates close clinical monitoring due to the risk of delayed relapses [15]. In our case, this localized risk was likely compounded by the patient's uncontrolled diabetes and systemic immunosuppression, contributing to the delayed recurrence following an extended latency period. To prevent similar sight-threatening relapses, management must extend beyond standard infection control. This necessitates the cautious, closely monitored tapering of topical corticosteroids, strict optimization of the patient's glycemic control, and extended follow-up well beyond the initial clinical resolution.

Conclusions

This case exhibits a rare and favorable outcome of presumed *Klebsiella pneumoniae* endogenous endophthalmitis, overcoming its typically poor prognosis. This clinical success was likely facilitated by a combination of good initial unaided visual acuity, rapid clinical recognition, and early intervention with systemic and intravitreal antibiotics alongside a vitrectomy within 24 hours of presentation. This patient required a second vitrectomy within 10 weeks, demonstrating the persistent nature of *Klebsiella pneumoniae* endogenous endophthalmitis. This case emphasizes that early, rigorous medical and surgical management can be a contributing factor in optimizing visual outcomes, provided the patient is systemically stable to undergo surgery. These findings highlight a potential therapeutic approach; however, because this is a single case observation, larger studies are required to establish a consensus on optimal management.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Wei Jun Liaw, Aidila Jesmin Jabbari, Abdul Hadi Rosli

Acquisition, analysis, or interpretation of data: Wei Jun Liaw, Aidila Jesmin Jabbari, Abdul Hadi Rosli

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Disclosures

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