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Incidence of Endophthalmitis, Then and Now

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ABSTRACT

Purpose: Report the frequency of differing etiologies of endophthalmitis at the Upstate Medical University, and compare these results to previously reported data.

Methods: A retrospective study was conducted based on the medical records of all patients diagnosed with endophthalmitis at the Upstate Medical University in Syracuse, New York between January 2014 to December 2019. Variables recorded included source of infection, microbial profiles, comorbidities, visual acuity and survival.

Results: The study identified 62 patients who were diagnosed with endophthalmitis at the Upstate Medical University from January 2014 to December 2019. The most common etiology was endogenous endophthalmitis with 40 cases (64.5%), of these patients, 13 (32.5%) were culture positive. The remaining 22 cases (35.5%) were due to exogenous endophthalmitis. The mean age of patients with endogenous endophthalmitis was 51.4 years with 65.0% as male. The mean age of patients with exogenous endophthalmitis was 59.5 years with 59.1% as male. The most common identifiable risk factor associated with endogenous endophthalmitis was a history of intravenous drug use seen in 47.5%.

Conclusion: Endogenous source was established as the most common etiology in patients diagnosed with endophthalmitis. These results, however, do not parallel with any of the previously reported data where endogenous etiology was identified as one of least common causes. The significance of demonstrating this increase in incidence of endogenous endophthalmitis is to illustrate a shift in paradigm and create awareness among ophthalmologists to avoid overlooking a possible life-threatening condition.

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Introduction

The definition of endophthalmitis is intraocular inflammation secondary to infection that involves the anterior and posterior segments of the eye. Clinically, endophthalmitis is a rare yet severe and vision-threatening intraocular inflammation which is classified into endogenous and exogenous types based on the source of infection. Endogenous endophthalmitis is a result of hematogenous spread of an infection from a distant source which then leads to intraocular inoculation via blood-ocular barrier compromise [1-4]. Risk factors associated with endogenous endophthalmitis are chronic metabolic diseases, malignancy, intravenous drug abuse, long term presence of an intracorporal foreign body, invasive surgery, endocarditis, sickle cell anemia, autoimmune disease, human immunodeficiency virus infection/acquired immunodeficiency syndrome (HIV/AIDS), immunomodulatory therapy, chemotherapy, long hospital stays and/or intensive care unit admission, pneumonia, urinary tract infection, bacterial meningitis, and liver abscess [5-8]. On the other hand, exogenous endophthalmitis is a result of direct inoculation from intraocular surgery, penetrating trauma, or contiguous spread from adjacent tissues [2,9]. All reported cases in the English literature thus far have found exogenous endophthalmitis to be more common than endogenous endophthalmitis, even though the incidence of endogenous endophthalmitis has shown a wide range from 2% to 41%. This is the first study to report a higher incidence of endogenous endophthalmitis than exogenous endophthalmitis [10-16].

Methods

From January 2014 to December 2019, this study identified 62 patients who were diagnosed with endophthalmitis at the Upstate Medical University. The patient data recorded included age, sex, ocular exam, past medical history of any risk factors for endogenous endophthalmitis, previous ocular injuries, previous ocular surgeries, previous ocular history, duration of symptoms and response to treatment. The ocular examination included the affected side, visual acuity, intraocular pressure, pupil exam, anterior chamber reaction, presence of hypopyon, vitreous haze, status of retina, and presence of intraocular foreign bodies. Intraocular samples for culture and smear were obtained from anterior chamber and/or vitreous tapping. Broad-spectrum intravitreal antibiotics were administered at the time of anterior chamber and/or vitreous tapping. If an intraocular sample was obtained from a vitrectomy, the material was suctioned and collected in a sterile manner. Snellen visual acuity was recorded in the affected eyes. Initial visual acuity before treatment and final best-corrected vision were compared.

Results

A total of 62 patients with endophthalmitis were included in this study. There were 39 (59.1%) male and 23 (40.9%) female patients. The median age was 53 years. 32 (47.8%) left eyes and 35 (52.2%) right eyes were affected. There were 5 patients (8.1%)

with both eyes affected. Types of endophthalmitis in this study are demonstrated in Figure 1. Endogenous endophthalmitis was diagnosed in 45 eyes (67.2%), exogenous endophthalmitis was diagnosed in 22 eyes (32.8%). 32 (80%) individuals survived with endogenous endophthalmitis compared to 22 (100%) of patients with exogenous endophthalmitis. Episodes of ocular trauma occurred before the infection in 7 of 67 eyes (10.4%). These included 5 (7.5%) eyes related to penetrating injury and 1 eye (1.5%) with an intraocular foreign body. Endophthalmitis developed after intraocular surgery in 10 eyes (14.9%). The data also demonstrated 5 (7.5%) eyes developed endophthalmitis after intravitreal injection. On initial presentation, 29 (43.3%) eyes had visual acuity hand motion (HM) or less, 28 (41.8%) eyes had visual acuity 20/200 to count fingers, 9 (13.4%) eyes had visual acuity better than 20/200, and 1 (1.5%) eye where visual acuity was unable to be measured

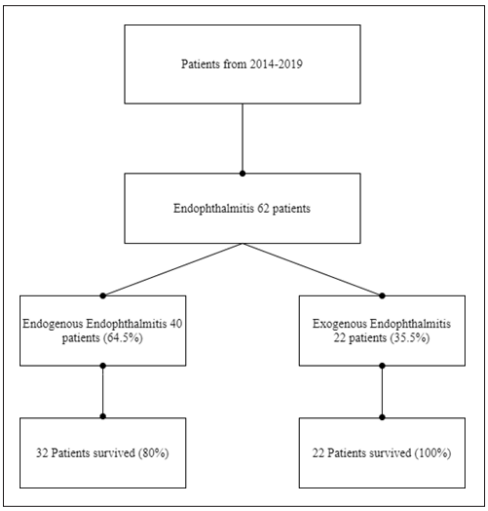

Figure 1

Positive culture from either anterior chamber paracentesis or vitreous tapping or both were found in 13 (19.4%) eyes. Of these patients, bacteria was isolated in 8 eyes (11.9%) and fungi in 5 eyes (7.5%). There were 6 eyes (9.0%) of which were Gram-positive and 2 eyes (3.0%) of which were Gram-negative. The most common bacteria cultured was Staphylococcus Aureus accounting for 44.0% of all bacterial cases. Other causative bacteria in order of frequency were Streptococcus Agalactiae (12.0%), Streptococcus Mitis (12.0%), and Staphylococcus Epidermidis (8.0%) of all bacterial cases. The most common fungus was Candida Albicans found in 70% of all fungal cases. The data on specific causative microorganisms verified by ocular and/or systemic cultures is summarized in Table 1.

Table 1: Causative Organisms Verified by Ocular and/or Systemic Cultures in All Types of Endophthalmitis

Types	Patients, n (% of total patients)
Total gram positive n (%)	**22 (32.8)**
Gram positive confirmed by ocular culture	6 (9.0)
Staphylococcus Aureus	11 (16.4)
Streptococcus Agalactiae	3 (4.5)
Streptococcus mitis	3 (4.5)
Staphylococcus epidermidis	2 (3.0)
Corynebacterium Diphtheriae	1 (1.5)
Streptococcus dysgalactiae	1 (1.5)
Clostridium perfringens	1 (1.5)
Total gram negative n (%)	**3 (4.5)**
Gram negative confirmed by ocular culture	2 (3.0)
Citrobacter Koseri	1 (1.5)
Haemophilus Influenzae	1 (1.5)
Pasteurella Multocida	1 (1.5)
Total fungal n (%)	**9 (13.4)**
Fungal confirmed by ocular culture	5 (7.5)
Candida Albicans	7 (10.4
Aspergillus Fumigatus	1 (1.5)
Microascaceae Scedosporium	1 (1.5)

Among patients with endogenous endophthalmitis, Table 2 presents the different associated comorbidities. The most common comorbidities identified were systemic infection and intravenous drug use. All patients received broad-spectrum intravitreal antibiotics. 29 (43.3%) eyes received antifungal intravitreal therapy, of which 17 (25.4%) received amphotericin, 9 (13.4%) received voriconazole and 3 (4.5%) received both. Out of 29 eyes that received antifungal intravitreal therapy, 17 eyes had a history of intravenous (IVDU) drug use and remaining eyes had high suspicion for fungal etiology based on history or clinical findings. The most commonly used intravitreal antibacterial medications were vancomycin and ceftazidime (with or without other meds) and 33 (49.2%) patients received these drugs. 12 (17.9%) patients received vancomycin, ceftazidime and an antifungal. 18 (26.9%) received vancomycin and ceftazidime without other antimicrobial coverage. 2 (3.0%) received vancomycin, ceftazidime, and dexamethasone. 1 (1.5%) received vancomycin, ceftazidime and foscarnet. 1 (1.5%) patient received vancomycin, an antifungal agent, and foscarnet, and 1 (1.5%) received vancomycin and an antifungal. 2 (3.0%) received vancomycin only. 1 (1.5%) patient received vancomycin and clindamycin, and 1 (1.5%) received vancomycin and amikacin.

Table 2: Risk Factors for Endogenous Endophthalmitis and Types of Exogenous Endophthalmitis

Types	Patients, n (%)
Endogenous endophthalmitis	
Systemic infection only	15 (37.5)
Intravenous (IV) drug use only	15 (37.5)
Systemic infection and IV drug use	4 (10)
None	6 (15)
Exogenous Endophthalmitis	
Post-Operative	11 (50.0)
Cataract surgery	6 (27.3)
Pars plana vitrectomy	2 (9.1)
Membrane peel	1 (4.5)
Ahmed valve	2 (9.0)
Trauma	6 (27.3)
Penetrating injury	5 (22.7)
Retained foreign body	1 (4.5)
Intravitreal injection	5 (22.7)

Combined vitrectomy and intravitreal antibiotics were performed in 18 eyes (26.9%), whereas 49 eyes (73.1%) were treated with intravitreal antibiotics alone. Enucleation was performed in 2

eyes (3.0%) and evisceration was performed in 3 (4.5%) eyes. One out of the three eyes who had an evisceration had exogenous endophthalmitis while all the eyes that were enucleated and two eyes that were eviscerated had endogenous endophthalmitis.

Discussion

After a retrospective review of 62 patients with endophthalmitis, it was noted that majority of the cases were due to endogenous etiology, which is contradictory to previous reports in which exogenous endophthalmitis from various causes was the predominant culprit. In this study, the most common comorbidity identified among patients with endogenous endophthalmitis was intravenous drug use [10-16]. This study is the first to report endogenous endophthalmitis as the most common cause of endophthalmitis. Furthermore, the mortality rate was higher among patients with endogenous endophthalmitis when compared to patients with exogenous endophthalmitis; where 20% of patients with endogenous endophthalmitis died versus 0% of patients with exogenous endophthalmitis died. Further subdividing these patients into drug paraphernalia induced versus other causes of endogenous endophthalmitis results in a much higher mortality rate for patients with a systemic infection. Among all the deceased patients, systemic infection was the only common identifiable risk factor. Although this study is limited by its retrospective nature and cases from a single institution, it provides a novel viewpoint on endophthalmitis and raises awareness among providers treating this vision and life-threatening condition. Endophthalmitis is shown to be an increasingly common diagnosis. Differentiating exogenous from endogenous results in a significant difference in mortality rate. As such, identification of underlying etiology and risk factors is of the utmost importance for mortality risk stratification.

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