ORIGINAL ARTICLE

Clinical-epidemiological study of endogenous endophthalmitis in Villa Clara

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ABSTRACT

Introduction: endogenous endophthalmitis is not frequent but a severe form of ocular inflammation. The source of pathogens is located inside the body, and infection spreads hematogenously.
Objective: to determine the clinical behavior and endogenous endophthalmitis frequency.
Methods: a cross-sectional descriptive observational study. Universe understood by 57 eyes with endophthalmitis, 12 of them with endogenous endophthalmitis in "Arnaldo Milián Castro" Hospital from January 2015 to December 2021.
Results: the endogenous endophthalmitis represented 21.1% among all endophthalmitis cases. Male gender prevailed; mean age was 68.3 years. 58.3% of patients had best corrected visual acuity of movement of hands at diagnosis. The 58.3% and 33.3% presented diabetes and renal chronic illness respectively. The most common infection sources were catheter infections and pneumonia. The causative agents were predominantly gram positive bacteria and the most common specie was *Staphylococcus aureus* (33.3%). The control infection was achieved in 10 patients, while the great majority had same or worse best corrected visual acuity at infection resolution than the initial.
Conclusions: globally, the proportion of endogenous endophthalmitis among all the cases of endophthalmitis shows a tendency toward the increment in the last years. It is presented with poor visual acuity and the more common infection source was catheter infections. The most common isolated specie was *Staphylococcus aureus*.
Key words: endogenous endophthalmitis; proportion; germs

RESUMEN

Introducción: la endoftalmitis endógena es una causa poco frecuente de infección intraocular. La fuente de infección se encuentra dentro del propio organismo y se extiende hacia el globo ocular por vía hematógena.

Objetivo: describir aspectos clínico epidemiológicos de la endoftalmitis endógena.
Métodos: estudio observacional, descriptivo, de corte transversal. El universo estuvo comprendido por 57 ojos con diagnóstico de endoftalmitis infecciosa y la muestra conformada por 12 ojos con endoftalmitis endógena en el Hospital "Arnaldo Milián Castro" entre enero de 2015 y diciembre de 2021.
Resultados: la endoftalmitis endógena representó el 21,1% entre todas las endoftalmitis. Los hombres fueron los más afectados y la edad media fue de 68,3 años. El 58,3% de los pacientes tuvo agudeza visual de movimiento de manos al diagnóstico. El 58,3% padecían diabetes y el 33,3% enfermedad renal crónica. Las fuentes de infección más frecuentes fueron la sepsis del catéter y la neumonía. Los gérmenes aislados con más frecuencia fueron las bacterias Gram positivas -el *Staphylococcus aureus* fue el más común (33,3%)-. El control de la infección se logró en 10 pacientes, mientras la gran mayoría tuvo una agudeza visual mejor corregida a la resolución de la infección igual o peor que la inicial.
Conclusiones: la proporción de endoftalmitis endógena entre todos los casos de endoftalmitis muestra una tendencia hacia el incremento en los últimos años en el mundo. Se presenta con pobre agudeza visual y el foco de infección primario en el medio más común es la sepsis del catéter. Los gérmenes Gram positivos, específicamente el *Staphylococcus aureus*, fueron los microorganismos aislados con más frecuencia.
Palabras clave: endoftalmitis endógena; proporción; gérmenes

INTRODUCTION

The endogenous endophthalmitis (EE) is a rare but very serious cause of intraocular infection. The source of infection is within the body itself and spreads to the eyeball by hematogenous route.[1] It has been associated with potentially life-threatening diseases and immunosuppressed states: deep venous catheter, intravenous drug use, advanced age, cancer, chronic kidney disease, and diabetes mellitus.[2]
The endogenous endophthalmitis is much less common than exogenous endophthalmitis. Recent studies[3,4] indicate that it accounts for 13.2% to 30.9% of all cases of endophthalmitis and has a frequency of 1.6 per 100,000 population per year.[5] Bacteria and fungi are the most common pathogens causing EE.
Bacteria and fungi are the pathogens that most often cause EE and the results of microbiological studies vary in different geographic areas.[6,7] Timely treatment with appropriate use of pharmacologic and surgical therapy is the golden rule for infection control and preserving visual function.[8]
Although it is a rare disease, its effects can be devastating to the organ of vision. The aim of this paper is to describe clinical epidemiological aspects of endogenous endophthalmitis.

METHODS

An observational, descriptive, cross-sectional study was carried out. The universe was comprised by 57 eyes (57 patients) with diagnosis of infectious endophthalmitis in the "Arnaldo Milián Castro" Surgical Clinical University Hospital

of Santa Clara City, Villa Clara Province, in the period of time from January 1, 2015 to December 31, 2021. The sample consisted of 12 eyes (12 patients) with a diagnosis of endogenous endophthalmitis.

For data collection, the medical record (code H44.0) and the Microbiology Laboratory reports of each patient were reviewed. The proportion of endogenous endophthalmitis among all cases of infectious endophthalmitis was calculated and the germs isolated according to the study performed were recorded.

The variables studied were age, sex and best corrected visual acuity (BCVA) at diagnosis of infection. The conditions capable of inducing immunosuppression present in each patient, the location of the primary septic process (focus of infection) and microbiological studies were recorded: blood culture and microbial growth in vitreous humor. The effectiveness of the treatment used was described: whether or not infection control was achieved and whether the BCVA at the time of resolution improved, remained the same or worsened with respect to that shown at the beginning of the attack.

The data were collected in a spreadsheet specially designed for the investigation. SPSS v15 was used for data processing and the creation of tables and graphs. Descriptive statistical techniques were used to summarize quantitative variables (averages and standard deviation) and absolute and relative frequencies (by hundreds) were used for qualitative variables.

From the ethical point of view, the research was justified because it was carried out in accordance with the provisions of the National Health System and the provisions of Law No. 41 of Public Health and in accordance with the Declaration of Helsinki.

RESULTS

Endogenous endophthalmitis accounted for 21.1% (95% CI: 19.9-22.3%) among all endophthalmitis (Table 1).

Table 1. Proportion of endogenous endophthalmitis among all cases of infectious endophthalmitis

Infectious endophthalmitis	**No.**	**%**
Postoperative	25	43.9
Post-traumatic	13	22.8
Endogenous endophthalmitis	**12**	**21.1**
Secondary to corneal ulceration	7	12.2
Total	**57**	**100**

The average age was 68.3±10.5 years (mean±standard deviation), with a range between 46 and 78 years. Males were more affected than females, for 58.3%. All patients presented with an AVMC at diagnosis of finger count or worse and 58.3% had hand motion. Diabetes, chronic kidney disease and cancer were present in 58.3%, 33.3% and 25% of patients, respectively, while the most frequent sources of infection were catheter sepsis (33.3%) and pneumonia (25%)-Table 2.

Table 2. Demographic variables and general data at diagnosis

Age (years old)	
Range	46 a 78
Mean (standard deviation)	[68.3±10.5]
Gender [No. (%)]	
Feminine	5 (41.7)
Masculine	7 (58.3)
BCVA at the beginning of the diagnosis [No. (%)]	
No light perception	2 (16.7)
Light perception	2 (16.7)
Hand movement	7 (58.3)
Finger counting	1 (8.3)
Conditions that induce immunosuppression [No. (%)]	
Diabetes	7 (58.3)
Cancer	3 (25)
Alcoholism	1 (8.3)
Chronic kidney disease	4 (33.3)
Source of infection [No. (%)]	
Catheter sepsis	4 (33.3)
Pneumonia	3 (25)
Osteomyelitis	1 (8.3)
Lymphangitis	1 (8.3)
Urinary tract infection	1 (8.3)
Anthrax	2 (16.7)

In 10 patients a vitreous humor sample was taken and in two patients a blood culture was performed for microbiological studies. Fifty percent of the vitreous samples had no microbiological growth, while the two blood cultures showed growth. Gram-positive bacteria were the most common and Staphylococcus aureus the most frequent germ (33.3%). In two vitreous samples growth was reported with duality of germs: coagulase-negative Staphylococcus-Escherichia coli and Proteus mirabilis-Candida albicans (Table 3).

Table 3. Microbiological studies

Microbiology	**Vitreous Humor[a] No. (%)**	**Blood culture No. (%)**	**Total No. (%)**
Sample	10 (83.3**)	2 (16.7**)	12 (100**)
No growth	5 (50*)	0	5 (41.7**)
Staphylococcus aureus	2 (20*)	2 (100***)	4 (33.3**)
Coagulase negative Staphylococcus	2 (20*)	0	2 (16.7**)
Escherichia coli	1 (10*)	0	1 (8.3**)
Pseudomonas spp non-aeruginosa	1 (10*)	0	1 (8.3**)
Proteus mirabilis	1 (10*)	0	1 (8.3**)
Candida albicans	1 (10*)	0	1 (8.3**)

[a] microbiological accretion in vitreous humor; *% related to total vitreous humor specimens; **% related to total; ***% related to total blood cultures

The infection was controlled with medical treatment in 10 patients, but not in two: one died and the other underwent evisceration. Eight patients maintained

the AVMC they had at the time of diagnosis of the infection, in three patients it worsened and only in one an improvement was observed (Figure 1).

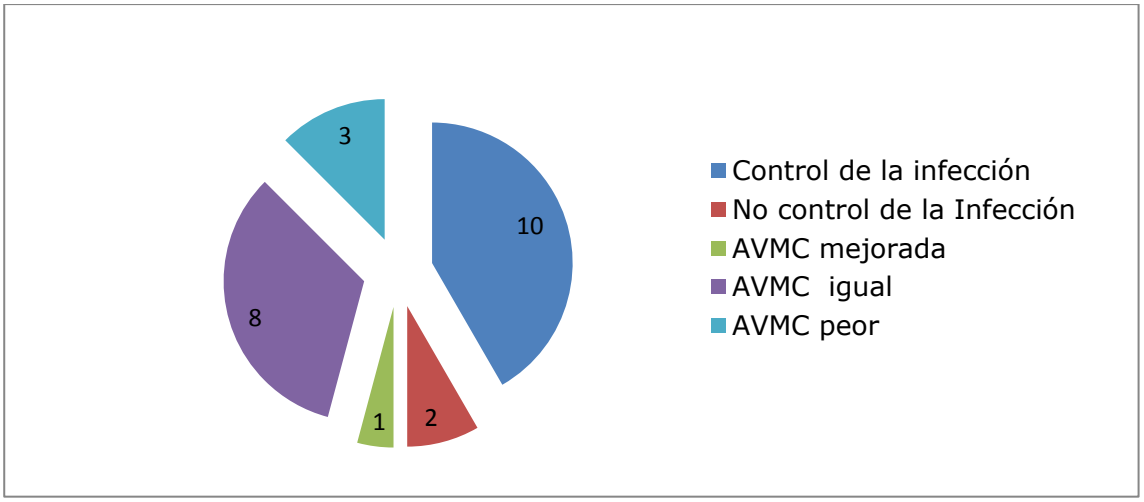

Figure 1. Post-treatment results

DISCUSSION

The pathogenesis of endogenous endophthalmitis is based on hematogenous dissemination from a distant septic focus to the eyeball. In theory, the choroidal space is first affected due to the large blood flow characteristic of the choroid, and subsequently spreads to the retina and vitreous.[9] The proportion of endogenous endophthalmitis among all cases of endophthalmitis has undergone a change in recent years, with a tendency to increase; several studies[3,4,10,11] and this research support this.

Endogenous endophthalmitis is an important cause of visual acuity impairment.[8] In one series it was found that more than half of the eyes presented with minor hand movement AVMC.[11] In one study it was reported that 27% and 15.6% of the cases presented with hand movement and light perception AVMC, respectively.[12] In this series the totality of the cases presented with poor AVMC at diagnosis.

Conditions capable of generating immunosuppression such as diabetes mellitus, cancer or chemotherapy increase the risk of endogenous endophthalmitis. These are associated with a higher incidence of infections in a patient with reduced defenses and are a potential focus for its development.[13] Current research[14,15,16,17] indicates that diabetes mellitus, intravenous drug use and chronic kidney disease are the systemic conditions most frequently found in patients diagnosed with endogenous endophthalmitis. This study concurs with these authors except for intravenous drug use. Fortunately, thanks to the policies implemented in Cuba, this is not a common practice.

Identifying the primary focus of infection could be beneficial in the management of these patients. The germ responsible for the infection could be predicted with a high percentage of accuracy, allowing early initiation of antimicrobial therapy with

a high probability of efficacy pending microbiology studies. A wide range of primary sources of infection responsible for endogenous endophthalmitis have been reported:[6,7] urinary tract infection, pneumonia and infections of fistulas or venous catheters are the most frequent. One study[5] in Western Australia identified urinary tract infection, endocarditis and pneumonia as the most frequent primary foci of infection; another reported[18] liver abscess and urinary tract infections as the most common. In this investigation, catheter sepsis predominated as the primary focus of infection.

The positivity of microbiology studies of vitreous samples in the patients studied with endogenous endophthalmitis is approximately 50%, while in blood cultures it rises to 70%.[4,7,12] Based on this evidence, it is recommended to increase the use (rationalized and efficient) of blood cultures in the hospital and to design a solid study that allows comparing the positivity of vitreous humor versus blood culture to support an action protocol.

It is estimated that Gram-positive bacteria are responsible for the majority of cases, specifically staphylococci and streptococci species. These estimates vary across geographic areas.[2] Studies[11,18,19,20] in Asian and Eurasian populations report that Gram-negative bacteria, specifically Klebsiella pneumoniae and Candida species are the most common pathogens in these patients.

In this series we found a singular fact in Microbiology studies: the duality of germs in two vitreous cultures, something that has not been reported in other investigations.

Treatment should be instituted as soon as possible. An aggressive combination therapy with broad-spectrum antibiotics against Gram-positive and Gram-negative germs, topical, intravitreal and intravenous, is recommended considering that the infection spreads hematogenously. Pars plana vitrectomy is a recommended surgical option; enucleation and evisceration are sometimes necessary in more complex cases.[2,13] Despite timely, first-line treatment, even with surgical intervention, functional results may be poor and disappointing.[11,19,21] In this series, all patients were treated with broad-spectrum antibiotic therapy (topical, intravitreal and systemic) associated with the use of topical and systemic steroids 24 to 48 hours after starting antimicrobial therapy. Not having the necessary technology for early vitrectomy makes the management of patients with endogenous endophthalmitis somewhat complex, especially from the surgical point of view. Generally, these patients present an unfavorable general condition, which hinders and delays their possible transfer to a tertiary center, so proper clinical practice and the choice of broad-spectrum antimicrobials based on clinical and microbiological data are of vital importance in this scenario.

Not being able to offer an early surgical treatment is not the main cause of the poor BCVA to the resolution of the infection, but it is a consequence of the marked inflammatory process generated in the eyeball and the immunosuppressed state of these patients.

CONCLUSIONS

The proportion of endogenous endophthalmitis among all cases of endophthalmitis shows an increasing trend worldwide in recent years. It occurs with poor best-corrected visual acuity at diagnosis and in patients with immunosuppressed states caused mainly by diabetes mellitus, chronic kidney disease and cancer. Catheter sepsis and pneumonia are common sources of primary infection in the setting. Gram-positive germs, specifically Staphylococcus aureus, are the most frequently isolated microorganisms in this geographical area. Despite broad-spectrum antibiotic treatment, best-corrected visual acuity at resolution of the attack is poor in most patients.

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CONFLICT OF INTEREST

Authors declare that there is no conflict of interest.

CONTRIBUTION OF THE AUTHORS

LCG: conceptualization, methodology, project management, validation, visualization, writing (review and editing).
AMF: conceptualization, data curation, methodology, validation, visualization, writing (review and editing).
CELL: conceptualization, writing (proofreading and editing).
NPM, YIL: research, writing of the original draft.