



Brief report

Epidemiologic surveillance of postoperative endophthalmitis in a specialized ophthalmologic center in São Paulo, Brazil

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This article describes a postoperative endophthalmitis (POE) surveillance system in place in a specialized ophthalmologic center in São Paulo, Brazil. The study involved a review of medical records from 2004–2009, during which a total of 31,999 intraocular surgeries were performed. Nineteen of these cases fulfilled the criteria for POE, for an infection rate of 0.06%. The main etiologic agent causing POE was *Pseudomonas aeruginosa*, identified in 42.1% of the cases (8/19).

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The most serious surgical site infection (SSI) in ophthalmology is intraocular infection, also known as endophthalmitis, which can cause blindness.^{1–3} The incidence of endophthalmitis is normally low, ranging from 0.03% to 0.08% depending on the type of ocular surgery performed.^{1,4,5} Common etiologic agents are Gram-positive bacteria, including *Staphylococcus aureus*, coagulase-negative *Staphylococcus*, *Streptococcus pneumoniae*, and *Streptococcus viridans*. Gram-negative bacteria have a less important role in the causality of endophthalmitis; however, the prognosis tends to be worse when these bacteria, particularly *Pseudomonas aeruginosa*, are involved.^{1,2,4,6}

In this article we describe a surveillance system for POE and present epidemiologic data from a specialized ophthalmologic center in São Paulo, Brazil.

METHODS

Setting

This observational and descriptive study was carried out at a specialized ophthalmologic center in São Paulo, Brazil, the Center of Ophthalmology Tadeu Cvintal (COTC), a private nonprofit institution and teaching hospital that assists patients exclusively from the Brazilian public health care system. The average monthly number of clinical outpatients is 5,000, and 31,999 ophthalmologic surgeries were performed between 2004 and 2009.

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POE diagnostic criteria

POE was defined as an infection restricted to the ocular globe, with at least 3 of the following postsurgical signs and symptoms and clinical judgment by a retinologist: anterior chamber reaction, vitreous cloudiness, decreased or blurred vision, pain, hypopyon, fibrin formation, conjunctival redness, and eyelid edema. POE was classified as early (up to 6 weeks after surgery) or late (up to 1 year after surgery if intraocular lenses are present).^{7,8}

Final visual acuity

Final visual acuity (FVA) was evaluated for each case of POE. In the case of preserved vision, the Snellen test was applied, where 20/20 represents 100% central vision, 20/40 represents 85% central vision, 20/200 represents 20% central vision, and 20/400 represents 10% central vision. For <10% central vision, the following categories can be applied, from better to worse vision: counting fingers (CF; ie, the ability to count fingers at a given distance, reported in meters), hand motion, light perception, and no light perception. The worst situation is considered evisceration or enucleation.⁹

Epidemiologic evaluation

Before the development of a POE surveillance system, a retrospective evaluation of infection data from 2004 to 2006 was carried out in an effort to determine the baseline rates and obtain information to aid in system planning. Every medical record with information suspicious for endophthalmitis was scrupulously reviewed; such information included ocular surgeries, such as vitrectomy and

Table 1

Annual distribution of number of ophthalmologic surgeries, number of POEs, and POE incidence rates, Sao Paulo, Brazil, 2004-2009

Year	Number of surgeries	Number of POE cases	POE incidence rate, %
2004 [†]	4,920	1	0.02
2005 [*]	4,535	4	0.09
2006 [*]	4,990	2	0.04
2007 [†]	5,388	4	0.07
2008 [†]	5,992	2	0.03
2009 [†]	6,174	6	0.10
Total	31,999	19	0.06

*Retrospective data collection.

[†]Prospective data collection.

anterior chamber washout. A total of 584 ophthalmologic surgeries were evaluated with the aim of identifying SSI and providing an estimate of endemic infection rates. For the period 2007-2009, the data were collected prospectively through the surveillance system, described next.

POE surveillance system

The POE surveillance system was implemented in 2007. An infection control nurse (ICN) who also specialized in operating room care and infection control was placed in charge of pooling, analyzing, and reporting information to the surgical team. Monthly POE incidence rates were calculated and reported to the COTC's Board of Directors. Every diagnosed case was immediately reported to the assisting physician responsible for the surgery. The executive branches of the surveillance system were the ward coordinating nurse and the outpatient care coordinating nurse. Physicians who cared for surgical patients were also involved in the process. The development of the surveillance system involved both active and passive methods. The data sources were various units in the patient care line:

- Outpatient care (ambulatory). This unit was instructed to promptly report to the ICN any scheduled or emergency cases performed by the retina surgery team.
- Inpatient care (ward). This unit was instructed to promptly report to the ICN any cases of antibiotic intravitreal injection, anterior chamber washout, or posterior vitrectomy.

Table 2

Distribution of POE according to type of surgery, PCR, vitreal loss during the intraoperative period, number of days to POE, etiologic agent, and FVA, São Paulo, 2004-2009

Case code	Type of surgery	PCR	Vitreal loss	Days to presentation	Etiologic agent	FVA
1	Phacoemulsification	No	No	11	No growth	No light perception
2	Phacoemulsification	No	No	8	<i>S pneumoniae</i> + <i>Clostridium</i> spp	Light perception
3	Phacoemulsification	Yes	No	4	<i>P aeruginosa</i>	No light perception
4	Phacoemulsification + trabeculectomy	No	No	6	<i>P aeruginosa</i>	Light perception
5	Phacoemulsification	No	No	2	<i>P aeruginosa</i>	No light perception
6	Phacoemulsification	No	No	6	No growth	CF, 2 m
7	Phacoemulsification	No	No	1	No growth	CF, 0.5 m
8	Phacoemulsification	Yes	Yes	1	<i>S marcescens</i>	Evisceration
9	Phacoemulsification	Yes	Yes	103	No growth	CF 0.5 m
10	Phacoemulsification	Yes	Yes	39	<i>Streptococcus</i> spp	20/40
11	Extracapsular cataract extraction	No	No	73	<i>P aeruginosa</i>	Light perception
12	Phacoemulsification	No	No	3	<i>P aeruginosa</i>	Evisceration
13	Phacoemulsification	No	No	3	<i>P aeruginosa</i>	Evisceration
14	Phacoemulsification	No	No	71	No growth	20/40
15	Phacoemulsification	No	No	3	<i>P aeruginosa</i>	NPL
16	Phacoemulsification	No	No	20	No growth	20/200
17	Phacoemulsification	No	No	37	Coagulase-negative <i>Staphylococcus</i>	CF, 1 m
18	Phacoemulsification	No	No	2	<i>P aeruginosa</i>	Light perception
19	Phacoemulsification	No	No	1	No growth	20/200

- Passive notification of suspicious cases. Physicians were encouraged to report to the ICN any suspicious case of POE by means of a notification form.
- Surgery schedule revision. The daily surgery schedule was revised monthly by the ICN to search for surgeries or diagnoses suggestive of POE.
- Laboratory report. The clinical laboratory was instructed to send all microbiological culture results to the ICN.
- Active search of postdischarge cases. Whenever a case of POE was notified (suspected or confirmed), each patient whose surgery had been performed on the same day as the notified case was contacted by telephone. The telephone interview included questions aimed at identifying potential new cases by asking about signs and symptoms. Patients who gave any positive answer were requested to return as soon as possible to be seen by a physician at the outpatient care unit, where they were promptly examined for early detection of POE.

Prompt preventive measures

Although POE is very rare, its severity justifies the prompt application of measures to prevent other cases and outbreaks. A diagnosis of POE triggers a revision process aimed at identifying potential failures in the prevention chain. This includes revision of the work process, records of sterilization safety monitors, and autoclave engineering follow-up.

RESULTS

During the study period, 19 cases of POE were diagnosed, for an incidence rate of 0.06%. Three of these 19 cases were classified as late POE. Table 1 presents the annual distribution of the POE cases. All 19 cases were related to cataract surgery, most involving phacoemulsification. The mean patient age was 69 years, and 8 patients (44.4%) had diabetes (information on diabetes was not available for 1 case). Ten of the 19 patients (52.6%) were females.

The majority of the surgeries (78.9%; n = 15) occurred without posterior capsule rupture (PCR). *P aeruginosa* was the main etiologic agent, identified in 8 cases (42.1%); the etiologic agent was not identified in 7 cases (36.8%). The time interval between surgery and diagnosis of POE ranged from 1 day to 103 days. POE caused by *P aeruginosa* had earlier manifestation of signs and symptoms (mean, 20 days; median, 6 days) (Table 2).

In terms of clinical features of POEs, 11 patients (57.9%) had an FVA of light perception or worse, and 3 of these patients underwent eye evisceration. Eight patients had an FVA of CF or better.

DISCUSSION

The POE rates in our service can be considered low compared with those reported in the literature.^{1,4,5} The present study was not designed to identify risk factors, and thus our data regarding the role of PCR in the POE development are not conclusive, despite what has been suggested in the literature.¹⁰

The epidemiologic profile of our patients differs somewhat from reports in the literature, in which the majority of cases are caused by Gram-positive bacteria, mainly *Staphylococcus* spp.^{1,3,4,6} POE caused by *P aeruginosa* usually evolves to evisceration or enucleation of the ocular globe.^{8,11} A detailed study is currently underway to investigate why *P aeruginosa* is the main causative agent of POE in our health care service, with the aim of identifying specific preventive measures. Moreover, we have designed a surveillance system for the early detection of POE, to minimize the unfavorable results of late diagnosis in this kind of infection.

Regarding the ability for agent isolation, our proportion of POE cases with negative cultures is quite similar to that reported in the literature, which ranges from 11.7% to 61.0%.^{1,4,5}

In conclusion, the COTC POE surveillance system includes different components of the patient care line, potentially improving the ability to detect POE early through a combination of active surveillance and passive notification. However, due to the low number of cases in the present study, we cannot conclusively

define the role of such an improvement in reducing undesirable outcomes.

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