Original article

Endophthalmitis after cataract surgery: epidemiology, clinical features and antibiotic prophylaxis

M.C. García-Sáenz, A. Arias-Puente, G. Rodríguez-Caravaca, Y. Andrés Alba, J. Bañuelos Bañuelos

A cross-sectional descriptive study was conducted on patients who underwent cataract surgery in a public hospital over an 11-year period. An ocular infection database was used to report endophthalmitis occurrences and to collect the clinical features. Qualitative variables are described with their frequency distribution and qualitative variables, with the mean and the standard deviation.

Results: From January 1999 to December 2009, 15,173 patients underwent cataract surgery. A total of 43 patients suffered from postoperative endophthalmitis, giving an overall infection rate of 0.28% (95% CI: 0.20-0.36%). Among the 43 cases, there were 19 men and 24 women with a mean age of 78.5. Other clinical parameters evaluated were as follows: 25.58% were diabetic, 44.18% had some degree of immunosuppression and there were complications with posterior capsular tears in 18.6%. As regards antibiotic prophylaxis, 2 groups were considered: the first one did not receive intracameral antibiotic (8,099 patients) and the second group received intracameral cefuroxime (7,074 patients). There were 39 endophthalmitis in the first group with an infection incidence of 0.48% and 4 endophthalmitis in the second group with an infection incidence of 0.056%. The relative risk (RR) after-before cefuroxime was 0.12 (0.04-0.33) with P<0.05.

Conclusions: The incidence of endophthalmitis after cataract surgery in a 11-year period was lower than 0.3%. Almost half of the patients had a higher systemic risk. Intracameral cefuroxime resulted in nearly a 9-fold reduction in the rate of infection.

© 2010 Sociedad Española de Oftalmología. Published by Elsevier España, S.L. All rights reserved.

*Corresponding author.
E-mail: mcgarcias@fhalcorcon.es (M.C. García-Sáenz.)

0365-6691/$ - see front matter © 2010 Sociedad Española de Oftalmología. Published by Elsevier España, S.L. All rights reserved.
Introduction

Post-operative endophthalmitis continues to be one of the most devastating cataract surgery complications. Studies show that the prevalence of post-operative infection after phakoemulsification is in the range of 0.06-0.3%. Regardless of this low prevalence, it remains an important public health problem, considering that every year millions of patients are intervened all over the world and that the progressive ageing of the population involves a higher number of cataract surgeries in the foreseeable future.

Endophthalmitis constitutes a serious problem due to the end results involving significant visual acuity reductions and in some cases the anatomical loss of the ocular globe. For these reasons, it is important to analyze epidemiological data and all the factors associated to the surgical infection in order to prevent its appearance and consequences.

In recent years, phakoemulsification surgical techniques have improved progressively with the use of topical anesthesia, micro-incisions, injectable lenses and the absence of sutures in surgical wounds. Even so, the most recent publications suggest that the prevalence of postsurgical endophthalmitis is higher than expected.

In 2005 the ESCRs made a randomized prospective multicentre study in 16,211 patients which demonstrated that the prevalence of endophthalmitis in the group that received treatment with intracameral cefuroxime was five times lower than another group which was not administered cefuroxime. This finding was a contributing factor for many ophthalmologists to adopt the use of intracameral cefuroxime as a part of the usual protocol of modern phakoemulsification surgery. Even so, the best antimicrobial regime and the best administration pathway for cataracts surgery are not yet established.

This study researches the prevalence and the clinical-epidemiological data of acute endophthalmitis after cataract surgery in a public hospital and analyses how these factors were influential within an 11-year period.

Subjects, material and methods

Patients of the University Hospital Fundación Alcorcón. Health Area Eight covers a reference population of about 200,000 inhabitants in southern Madrid.

Determination of cases

The Ophthalmology Service started working in 1998 and has a specific team for vitreoretinal surgery. The hospital has a 24-hour emergencies service and ophthalmological patients are requested to visit said service as soon as they exhibit post-surgical endophthalmitis symptoms. All cases with suspected infection are referred to the Ophthalmology Service. In general there is a protocol that includes taking microbiological samples and the immediate use of intravitreal injections of vancomycin (1mg in 0.1ml) and ceftazidime (2mg in 0.1ml) in accordance with the most standardized recommendations. Since 1999, data on infectious endophthalmitis began to be recorded prospectively. This record systematically includes...
data related to demography, clinic, intra-surgery actions and patient evolution. The database was regularly crossed with the hospital and the electronic Registry system in order to identify possible additional cases.

This study identified all the presumed cases of endophthalmitis after a cataract surgery since January 1999 up to December 2009. In over 90% of cases, phakoemulsification surgeries were performed in clear cornea with the main incision in superior location. The cases in which the culture was negative were reassessed retrospectively and considered as presumed infectious endophthalmitis when the clinical history and the ocular findings were suggested and other possible causes of intra-ocular inflammation had been discarded such as noninfectious uveitis or anterior segment toxic syndromes (ASTS).

**Antibiotic prophylactic protocol**

The Ophthalmology Service has an antibiotic protocol for cataract surgery that is followed by all ophthalmologists. Since January 1999 to September 2005, all patients received 5% povidone-iodine preoperatively as well as a topical antibiotic (0.3% ofloxacin eye drops) and a topical corticoid (dexamethasone 0.1% eye drops) post surgery. The cases in which retrobulbar anesthesia was applied, a subconjunctival aminoglycoside was added (20mg of gentamicin). No antibiotics were utilized in the irrigation solution. As of October 2005 up to the end of the study period and in accordance with the guidelines of the ESCRS study, the protocol was modified to add an intra-ocular antibiotic. Intracameral cefuroxime began to be used routinely at the end of cataract surgery in a dose of 1mg/0.1ml (or vancomycin 1mg/0.1ml in allergic patients).

**Statistical analysis**

The distribution of frequencies of qualitative variables and the mean and standard deviation of quantitative variables was studied. The effect of intracameral antibiotics was studied with relative risk (RR) and 95% confidence intervals.

**Results**

As from January 1999 up to December 2009, 15,173 patients were operated for cataract surgery with intraocular lens implant at the University Hospital Fundación Alcorcón. In this 11- year period 43 cases of presumed postsurgical bacterial endophthalmitis were detected, with a global prevalence of 0.28% (CI 95%: 0.20-0.36%).

The main clinical findings and its percentage values are summarized in table 1.

The mean age of said 43 patients was of 78.5 years (range 56-99). The surgically technique applied was phakoemulsification except one case of extracapsular surgery. Infections emerged with up to 15 different ophthalmologists. Eight cases exhibited intra-surgery complications with capsular rupture and vitreous hemorrhage.

Out of said 43 cases, 22 of the implanted lenses were injectable (51.16%), 20 were flexible (46.51%) and a single anterior chamber lens (2.32%).

In 2005 our Hospital systematically began to use intracameral cefuroxime (or vancomycin), two antibiotic prophylaxis groups were established:

1) from January 1999 up to September 2005, a first group of 8,099 patients who did not receive intra-cameral cefuroxime
2) as of October 2005 to December 2009, a second group of 7074 patients who did receive intra-cameral cefuroxime.

Of said 43 endophthalmitis cases, 39 were in the first group and four in the second, with which the infection prevalence was of 0.48% (CI 95%: 0.33-0.63%) in the first group and 0.056% (CI 95%: 0.002-0.11%) in the second group (table 2).

The RR after the before-after assessment of cefuroxime was of 0.12 (0.04-0.33) with a p value of p<0.05.

**Discussion**

The purpose of this study is to document our experience in what concerns prevalence, relevant clinical and surgical aspects, and the role of intra-cameral antibiotics in endophthalmitis after cataract surgery.

In our series, we found a global endophthalmitis prevalence of 0.28%, which matches the results of other authors.1-3 Despite the progress made in surgical techniques, the reduction of incision sizes and new intra-ocular lenses, the prevalence of infections remains at said percentages.

The intra-surgery complications, which have been described in nearly 20% of the total endophthalmitis cases of this study,
confirmed the importance of maintaining a posterior capsule intact and avoiding vitreous hemorrhages as they multiplied the possibility of post surgery infection.8-10 In addition, special attention must be paid to surgical wounds, avoiding irregular incisions with asymmetric edges or poorly valvulated.4,5,8,11

In this series we have also found that 25% of our patients with endophthalmitis had diabetes mellitus, which could indicate that diabetes could constitute in itself an additional risk factor, as discussed in other publications.4,12-14

On the other hand, we have reported that nearly 45% of all the cases of infection occurred in patients with some type of immunosuppression. It was already described that local or systemic immunodepression (ASA IV, ingestion of steroids, antimetabolites, etc.) increases the general risk of infection.15

The role of intraocular lenses is still controversial. In this study we have found infection with flexible as well as injectable lenses. In theory, injectable lenses should diminish the contact of the lens with the ocular surface and the edges of the wound16 but the adhesion capacity of lens materials also seems relevant. The ESCRs study found a significantly increased prevalence of endophthalmitis with silicone lenses.8 Other studies found greater bacterial adherence to hydrophobic lenses (silicone or hydrophobic acrylic) than to hydrophilic lenses (hydrogel, hydrophilic acrylic lenses).17,18

Even though the role of anti-microbials in surgical prophylaxis continues to be controversial, since the publication in 2006 of the ESCRs7 results which showed a significant reduction of endophthalmitis with the use of intracameral cefuroxime, this method started to be applied generally with favorable results.19-22 According to the RR, since the protocol in our centres was changed in late 2005 to include intracameral cefuroxime, we have obtained a significant reduction of the infection rate after cataract surgery. These data support the effectiveness of intracameral cefuroxime for the prevention of post surgery endophthalmitis, in accordance with the ESCRs results.

It must be pointed out that the limitations of our study include the fact of being based on clinical cases without randomization. It would have been better to have a control group in order to establish the most relevant risk factors. In addition, other surgery factors that could have changed in the course of time have not been analyzed (reduced incisions, topical anesthesia, absence of ocular occlusion, etc.) and which could have influenced in the progressive reduction of the number of infections.

In summary, this study provides data on the prevalence of endophthalmitis, epidemiology, clinical findings and the role of intra-cameral antibiotics after cataract surgery in a public hospital. Considering the severity of this ocular disease, the selection of the adequate antimicrobial and the best administration path thereof still represent a challenge. Although additional confirmation studies are required, our results indicate that intracameral cefuroxime at the end of the surgery is a safe and effective alternative that produces a significant reduction in the number of endophthalmitis cases.

Conflict of interest

The authors declare that they have no conflict of interest.

REFERENCES