



Incidence of Acute Postoperative Endophthalmitis after Cataract Surgery

A Nationwide Study in France from 2005 to 2014

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Purpose: To report the incidence of acute postoperative endophthalmitis (POE) after cataract surgery from 2005 to 2014 in France.

Design: Cohort study.

Participants: Patients undergoing operation for cataract surgery by phacoemulsification and presenting acute POE.

Methods: We identified acute POE occurring within 6 weeks after phacoemulsification cataract surgery and the use of intracameral antibiotic injection during the surgical procedure by means of billing codes from a national database.

Main Outcome Measures: Incidence of acute POE.

Results: From January 2005 to December 2014, 6 371 242 eyes in 3 983 525 patients underwent phacoemulsification cataract surgery. The incidence of acute POE after phacoemulsification decreased from 0.145% to 0.053% during this 10-year period; the unadjusted incidence rate ratio (IRR) (95% confidence interval) was 0.37 (0.32–0.42; $P < 0.001$). In multivariate analysis, intracameral antibiotic injection was associated with a lower risk of acute POE 0.53 (0.50–0.57; $P < 0.001$), whereas intraoperative posterior capsule rupture, combined surgery, and gender (male) were associated with a higher risk of acute POE: 5.24 (4.11–6.68), 1.77 (1.53–2.05), and 1.48 (1.40–1.56) ($P < 0.001$), respectively.

Conclusions: Access to a national database allowed us to observe a decrease in acute POE after phacoemulsification cataract surgery from 2005 to 2014. Within the same period, the use of intracameral antibiotics during the surgical procedures increased. *Ophthalmology* 2016;■:1–7 © 2016 by the American Academy of Ophthalmology.

Acute postoperative endophthalmitis (POE) is a dreaded complication after cataract surgery. The incidence of acute POE varies from 0.04% to 0.26% according to recent reports.^{1–5} This incidence is declining over time throughout the world, with Sweden observing a decrease in acute POE incidence from 0.048% in 2002–2004 to 0.029% in 2005–2010, for example.⁶ A similar trend has been reported in the United States among Medicare beneficiaries.⁷

Prophylaxis against POE is of paramount importance because 34% of affected patients achieved a final visual acuity of 20/200 or worse.⁷ The most robust means to decrease POE is the use of povidone-iodine,⁸ which “appears to be nearly universal.”⁹ The publications of the results of the European Society of Cataract and Refractive Surgeons (ESCRS) Endophthalmitis study have shed new light on the prophylaxis of acute POE after cataract surgery, showing a 5-fold decrease of acute POE after an anterior chamber injection of 1 mg of cefuroxime.¹⁰ This study has been criticized and challenged, and the use of intracameral cefuroxime is not widely accepted.^{11,12} Various surveys have shown

low-to-moderate acceptance of this prophylaxis depending on the country.^{13,14} Although many European cataract surgeons have adopted this antibiotic prophylaxis,¹¹ in the United States the predominant antibiotic treatment for the prophylaxis of POE is based on fourth-generation fluoroquinolones.¹⁵

Most reports on POE have been based on data from 1 or several institutions or with the use of health insurance data,¹⁶ but few data exist for an entire country. The Swedish National Cataract Register is probably unique because it contains 98% of all cataract extractions performed in Sweden.⁶ Access to big data allows investigators to process large numbers of procedures and patients. The French national administrative database, Programme Médicalisé des Systèmes d’Information (PMSI), provides a huge amount of epidemiologic information concerning hospitalized patients in France.¹⁷ In this study, we sought to report the incidence of acute POE after cataract surgery by phacoemulsification in France from 2005 to 2014 and to evaluate the potential impact of intracameral antibiotic injection use on this incidence.

Methods

Data Source

The national administrative database (PMSI) was inspired by the American diagnosis-related group model. It was established in France in 1991 and extended in 1997 to the 1546 French healthcare facilities, both private and public. This coding system initially was designed to analyze hospital and clinic activity and to contribute to the elaboration of strategic healthcare plans. Since 2004, all public and private hospital budgets have depended on the medical activity described in a specific program, which compiles discharge abstracts related to all admissions (inpatient and outpatient settings) in all French public and private healthcare facilities. Information in these abstracts is anonymous and includes both medical and administrative data. Diagnoses identified during the hospital stay are coded according to the 10th edition of the International Classification of Diseases. All procedures performed during the hospitalization are coded according to the French Common Classification of Medical Procedures (CCAM). Each facility produces its own standardized anonymous data set, and these are then compiled at a national level. The fact that these national data are used for healthcare facilities' budget allocation encourages improvement in data quality in terms of coherence, accuracy, and exhaustiveness.

Data Extraction

This study is a retrospective study based on a nationwide PMSI database collected between 2005 and 2014. The use of this database was approved by the National Commission for Data Protection (CNIL No. 1576793), and this study adhered to the tenets of the Declaration of Helsinki. We included all patients who were admitted to healthcare facilities during this period for phacoemulsification cataract surgery. For each patient, cataract surgery was identified by the CCAM code BFGA004 corresponding to "cataract extraction performed by phacoemulsification with intraocular lens implantation in a capsular bag." We did not consider the codes for other modalities of cataract extraction, such as manual extracapsular or intracapsular extraction. Combined procedures (i.e., cataract extraction concomitant with glaucoma or corneal surgery or vitreoretinal procedures) were included. Sociodemographic variables including age and gender were recorded.

For patients admitted from 2005 to 2014 for cataract surgery, all hospitalizations within 42 days of cataract surgery¹⁸ with a billing code of endophthalmitis (10th edition of the International Classification of Diseases code H440 or H441) were selected. In France, endophthalmitis is treated only in hospitals, either public or private. The recommended treatment is intravitreal injections of antibiotics, and this is only performed during a hospitalization and never in the office for several reasons: The vitreous tap is performed in the operating room, and the preparation of intravitreal antibiotics requires the skills of a trained team. Moreover, because endophthalmitis is acknowledged as a nosocomial infection, lawsuits may occur if the treatment is not delivered according to the recommendations. All the procedures coded with the CCAM code BELB001, indicating an injection of an organic or inert substance in the anterior chamber of the eye (a surrogate for intracameral antibiotic injection) and concomitant to the BFGA004 procedure (cataract extraction performed using phacoemulsification), were identified. The intraoperative anterior vitrectomy associated with posterior capsule rupture was identified with the code BGFA008. Before extraction of the cohort, 0.76% of hospital stays for cataract surgery were not included because of patient identification errors.

Statistical Analysis

Incidence corresponded to the number of eyes presenting with acute endophthalmitis during a 42-day period after cataract surgery (recurrences during this period were excluded) divided by the number of operated eyes. No confidence intervals were estimated because we studied the entire French population. Each variable was included as the only explanatory variable in a Poisson regression analysis and tested for significance using log-likelihood ratio statistics. The number of cataracts was used as a population offset. We also studied factors that may be associated with endophthalmitis after cataract surgery. For each variable (intracameral antibiotic injection, intraoperative posterior capsule rupture, combined surgery, age ≥ 85 years, and gender), incidence rate ratios (IRRs) were estimated using Poisson regression. The 5 variables were included in a multivariate Poisson regression analysis to obtain the adjusted IRR to explain the incidence of acute POE after cataract surgery. Analyses were performed with the SAS 9.2 software for Windows (SAS Institute Inc., Cary, NC). All the tests were 2-sided and *P* values < 0.05 were considered significant.

Results

During the 2005–2014 period, 3 983 525 patients were identified in the national administrative database as being admitted to a healthcare facility for cataract surgery by phacoemulsification. These patients underwent a total of 6 371 242 procedures for cataract surgery. Table 1 shows the distribution of cataract surgery from 2005 to 2014 for the entire country, according to age and gender. Combined cataract surgery with glaucoma or corneal or vitreoretinal procedures accounted for 1.61% ($n = 102\,763$) of these 6 371 242 procedures during this 10-year period.

Cataract surgery by phacoemulsification increased by 52.9% from 2005 to 2014. Although the age of the patients undergoing operation statistically decreased from 2005 to 2014 (73.78 ± 10.01 years vs. 73.76 ± 9.82 years; $P < 0.001$), this difference was not clinically relevant. During this 10-year period, the proportion of men undergoing operation for cataract increased from 37.8% to 40.9% ($P < 0.001$). Among these cataract surgeries, 6668 were associated with endophthalmitis within a 6-week period after the surgical procedure (Table 2).

The mean incidence of acute POE from 2005 to 2014 was 0.105% (Table 2). This decrease in incidence was statistically significant from 2009 to 2014 when taking 2005 as the reference year in a Poisson regression analysis (Table 3).

The use of intracameral antibiotic injection at the end of cataract surgery (identified by the CCAM code BELB001) sharply increased in France from 0.60% in 2005 to 80.03% in 2014 (Table 2, Fig 1). In univariate and multivariate analyses, intracameral antibiotic injection was associated with a lower risk of acute POE after cataract surgery by phacoemulsification, whereas intraoperative posterior capsule rupture, combined surgery, and gender (male) were associated with a greater risk (Table 4). The time period of cataract surgery was associated with acute POE in univariate analysis, when comparing the 2008–2011 period with the 2005–2007 period (IRR, 0.83; 95% CI, 0.78–0.87; $P < 0.001$) and 2012–2014 with 2005–2007 (IRR, 0.45; 95% CI, 0.42–0.48; $P < 0.001$). Because of colinearity between the time period and the intracameral antibiotic injection, only the latter variable was introduced in the multivariate analysis.

Discussion

The 2 major findings of this study were the growing incidence of cataract surgery and the decreased incidence of

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