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Comparative Effectiveness of Antibiotic Prophylaxis in Cataract Surgery

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Purpose: Intracameral injection is an effective method for preventing infection, but no controlled study has been published in the United States.

Design: We conducted an observational, longitudinal cohort study to examine the effect of topical and injected antibiotics on risk of endophthalmitis.

Participants: We identified 315 246 eligible cataract procedures in 204 515 members of Kaiser Permanente, California, 2005–2012.

Methods: The study used information from the membership, medical, pharmacy, and surgical records from the electronic health record.

Main Outcome Measures: The adjusted odds ratio (OR) and 95% confidence interval (CI) for the association of antibiotic prophylaxis (route and agent) with risk of endophthalmitis was estimated using logistic regression analysis.

Results: We confirmed 215 cases of endophthalmitis (0.07% or 0.7/1000). Posterior capsular rupture was associated with a 3.68-fold increased risk of endophthalmitis (CI, 1.89–7.20). Intracameral antibiotic was more effective than topical agent alone (OR, 0.58; CI, 0.38–0.91). Combining topical gatifloxacin or ofloxacin with intracameral agent was not more effective than using an intracameral agent alone (compared with intracameral only: intracameral plus topical, OR, 1.63; CI, 0.48–5.47). Compared with topical gatifloxacin, prophylaxis using topical aminoglycoside was ineffective (OR, 1.97; CI, 1.17–3.31).

Conclusions: Surgical complication remains a key risk factor for endophthalmitis. Intracameral antibiotic was more effective for preventing post-cataract extraction endophthalmitis than topical antibiotic alone. Topical antibiotic was not shown to add to the effectiveness of an intracameral regimen. *Ophthalmology 2015;■:1–8 © 2015 by the American Academy of Ophthalmology.*

Endophthalmitis is a rare surgical site infection after cataract surgery with the potential for devastating loss of vision.[1,2] There is no current single standard for prophylaxis in the United States or Canada.[3,4] We conducted an observational comparative-effectiveness study, using the practice variation present in the Kaiser Permanente California program, to identify the most effective prophylaxis regimen from among those used in our system. The aims of the study were to assess the effectiveness of intracameral antibiotic injection with cefuroxime or moxifloxacin, as well as patient-instilled topical administration of gatifloxacin, ofloxacin, polymyxin-trimethoprim, moxifloxacin, or aminoglycoside (neomycin, gentamicin, tobramycin).

Methods

The study was approved by the local institutional review board of the Kaiser Foundation Research Institute.

Setting

Clear cornea phacoemulsification is performed in 21 surgical centers in Northern California and in 17 surgical centers in Southern California. Surgeons have autonomy in choosing their prophylactic route and agent, but a uniform practice included the topical application of povidone-iodine as a prep just before surgery. The health plan stores detailed information on office visits, pharmacy, surgery, and laboratory information in an electronic health record.

Study Population

The present study included eyes from members with at least 6 months of health-plan enrollment before phacoemulsification between January 1, 2005, and December 31, 2012. We included procedures performed in a hospital, outpatient surgery center, or ophthalmology department procedure center. The study included phacoemulsifications assigned Current Procedural Terminology (CPT) code 66984 or International Classification of Diseases, 9th Edition (ICD-9) codes 13.41 or 13.71. These codes are assigned to procedures that were planned in advance to be simple, including procedures that ultimately were complicated by posterior capsular rupture (PCR). The study excluded phacoemulsification in <5% of procedures that were assigned CPT code 66982, defined in advance of surgery to be complex, because these procedures were too few in number to enable the more resource-intensive data validation that would have been required. We also excluded eyes with a diagnosis of endophthalmitis (ICD-9 codes: 360.00, 360.01, 360.03, 360.13, 360.19, 098.42) recorded before the first eligible procedure (Fig 1),

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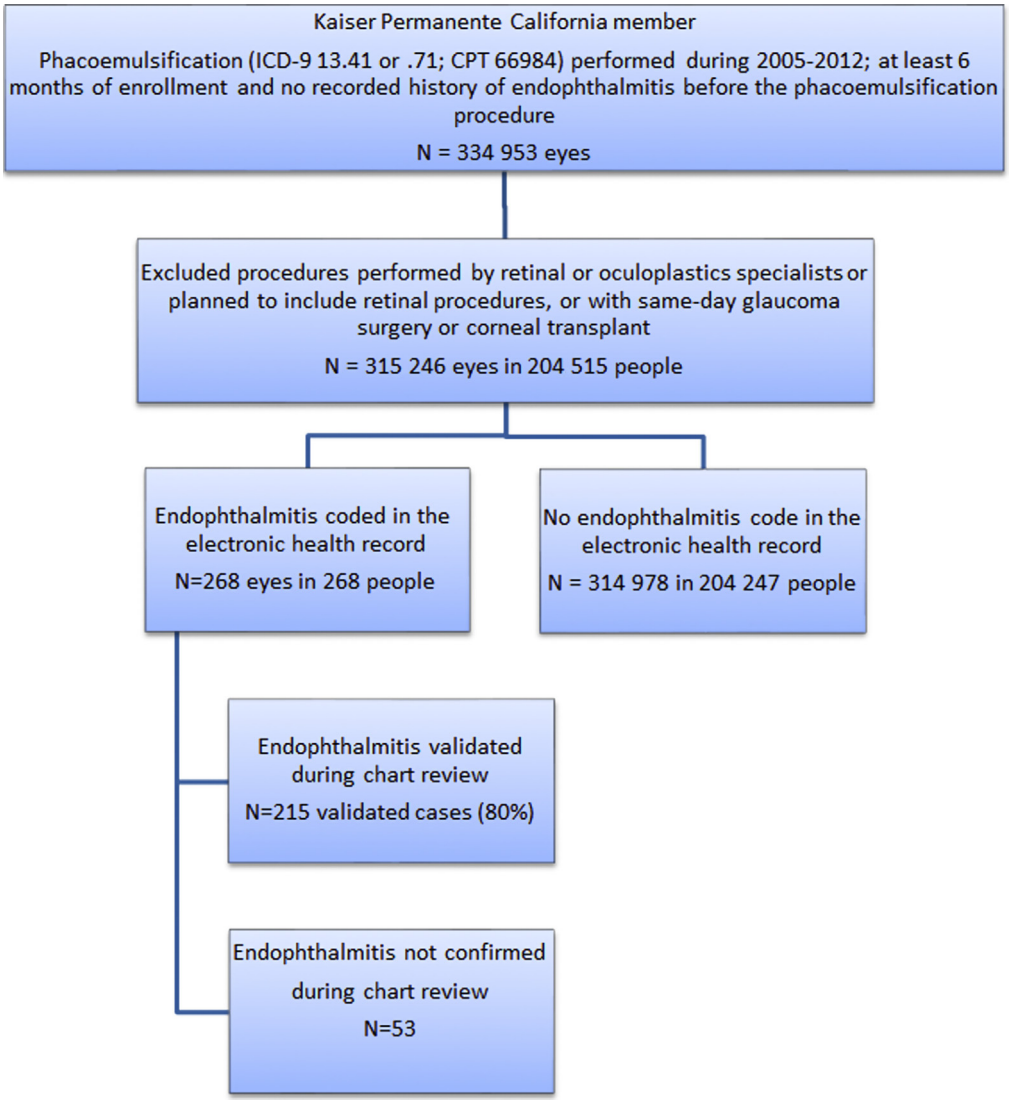

Figure 1. Study population. CPT = Current Procedural Terminology; ICD-9 = International Classification of Diseases, 9th revision.

procedures performed by retinal or oculoplastic specialists or involving planned retinal procedures, and procedures combined with corneal transplant (ICD-9 11.6) or glaucoma surgery (ICD-9 12.1–12.7).

Data Collection

Acute, postoperative, infectious endophthalmitis was defined as occurring after the first postoperative day through the 90th day after phacoemulsification. Preliminary endophthalmitis was defined as having 1 or more ICD-9 diagnosis codes of 360.00, 360.01, 360.03, 360.13, 360.19, or 098.42, or having an aqueous or vitreous specimen submitted to microbiology within 90 days of phacoemulsification. Validated endophthalmitis was based on detailed medical record review by a trained medical record abstractor or ophthalmologist, including review of the operative report, first follow-up visit, visits to retinologists, microbiology results, and other pertinent information. We confirmed postoperative, infectious endophthalmitis when the diagnosis was recorded by a retina specialist within 90 days of surgery and treatment included injection of intravitreal antibiotics. We did not require microbiological confirmation, although positive cultures were noted and will be reported separately.

Topical antibiotic orders and dispensings were obtained from the computerized pharmacy information management system, from which we obtained details of the following ophthalmic antibiotic preparations: gatifloxacin, ofloxacin, polymyxin-trimethoprim, gentamicin, or tobramycin. Topical moxifloxacin was not on the formulary. We included medications dispensed up to 90 days before phacoemulsification. The intracameral agent was captured using natural language processing with validation by a manual review of the operative report; the positive predictive value was 99.9% (95% confidence intervals [CIs], 99.4–100); the negative predictive value was 99.9% (95% CI, 99.4–100).

Potential Confounding Factors

Patient age, sex, and race/ethnicity were obtained from membership data. Posterior capsular rupture was ascertained using natural language processing of the operative report; the positive predictive value of the algorithm was 94.4% (95% CI, 92.6–95.9), and the negative predictive value was 99.9% (95% CI, 99.3–100.0).