Rate of Endophthalmitis Following Cataract Surgery Using Intracameral Moxifloxacin without Postoperative Topical Antibiotics

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Research Article

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Abstract

Purpose

To report the recent rate of acute postoperative endophthalmitis following cataract surgery at the University of Kansas Medical Center (KUMC) where postoperative topical antibiotics were excluded.

Methods

This was a retrospective chart review of patients who underwent phacoemulsification with or without intraocular lens insertion as standalone surgery from February 2018 through August 2020. Those undergoing combination surgeries were excluded. All patients received intracameral moxifloxacin at the conclusion of cataract surgery but were not prescribed postoperative topical antibiotics. Acute postoperative endophthalmitis was defined as occurring within six weeks after surgery.

Results

There were 2,218 standalone cataract surgeries performed on 1,418 patients. Zero cases of acute postoperative endophthalmitis were identified (0%). There were no systemic adverse reactions to intracameral moxifloxacin administration in the 41 patients with a preexisting fluoroquinolone allergy.

Conclusion

The recent rate of acute postoperative endophthalmitis following cataract surgery at KUMC using intracameral moxifloxacin without postoperative topical antibiotics is 0%.

Declarations

Funding

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Conflicts of interest/Competing interests

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Introduction

Endophthalmitis can be a devastating consequence of cataract surgery. It has been reported that over one third of final visual outcomes from this infection after cataract surgery achieve a visual acuity of 20/200 or worse [1]. Multiple prophylactic antibiotic regimens have been studied and implemented to minimize this complication. Considered a landmark study, the 2007 European Society of Cataract and Refractive Surgeons (ESCRS) randomized prospective multicenter study showed an almost five-fold reduction in endophthalmitis rates after cataract surgery using intracameral cefuroxime compared with six days of postoperative levofloxacin eyedrops alone [2].

Since the ESCRS study, cataract surgeons are increasingly utilizing intracameral antibiotics for prophylaxis [3, 4]. This is evident in the ensuing literature on intracameral antibiotic efficacy, which has corroborated the ESCRS's findings [5-16]. Despite the trend of employing intracameral agents, it remains common practice to prescribe postoperative patient-administered topical antibiotics even after giving them intracamerally [4, 17]. Notably, the ESCRS study requested all study participants to use postoperative topical antibiotics, including the intracameral treatment groups [2]. It has been reported that omitting postoperative topical antibiotics is safe in this setting, but few studies with large sample sizes have reported rates of post-cataract surgery endophthalmitis when using intracameral antibiotics without postoperative topical antibiotics [18]. We identified three studies that were not able to find increased efficacy of intracameral antibiotics plus postoperative topical antibiotics compared to intracameral agents alone [15, 17, 19].

Based on the aforementioned literature and potential for cost savings, our academic center implemented a prophylactic regimen for standalone cataract surgery in February 2018 involving undiluted intracameral moxifloxacin without the addition of postoperative topical antibiotics. Seeing that few studies have

reported post-cataract surgery endophthalmitis rates with the omission of postoperative topical antibiotics, we retrospectively reviewed our institution's cataract surgeries to report our rate of acute postoperative endophthalmitis since this implementation. We also assessed for systemic adverse reactions to undiluted intracameral moxifloxacin in those with a preexisting fluoroquinolone allergy.

Methods

Identification of patients and surgeries with inclusion and exclusion parameters

Institutional Review Board approval was obtained from the University of Kansas Medical Center (KUMC) prior to the study. The study was performed in agreement with the tenets of the Declaration of Helsinki. The i2b2-based Healthcare Enterprise Repository for Ontological Narration (HERON) was used to identify patients from KUMC who underwent phacoemulsification with or without intraocular lens insertion from February 1, 2018 through August 10, 2020 [20, 21]. Current Procedural Terminology codes 66982 and 66984 were used to define cataract surgeries. Raw data returned from HERON was managed and analyzed with Research Electronic Data Capture (REDCap) [22, 23]. Cataract surgeries performed in combination with any other ophthalmic surgery on the same day were excluded because these patients received postoperative topical antibiotics due to surgical complexity. Patients who did not receive intracameral moxifloxacin were also excluded.

Identification of endophthalmitis

Potential cases of endophthalmitis were identified using International Classification of Diseases 9th edition (ICD-9) codes 360.0, 360.1 and 10th edition (ICD-10) codes h44.0, h44.1. The HERON search engine recognized these ICD-9 and ICD-10 codes as broad identifiers and searched for more specific modifiers (for example, searching h44.0 also accounted for h44.01, among others). These potential cases were individually reviewed in the electronic medical record (EMR) by a board-certified ophthalmologist to confirm a true diagnosis of acute postoperative endophthalmitis. Only cases occurring within six weeks after surgery were considered a true diagnosis.

Description of surgical cases

Cataract surgeries were performed as standalone phacoemulsification with or without intraocular lens insertion. Surgeries were performed at either KUMC hospital or its associated ambulatory surgery center by six different ophthalmologists or by a resident under their direct supervision. All patients received a preoperative topical antibiotic, either ciprofloxacin 0.3% or moxifloxacin 0.5%. Preoperative topical mydriatics included either cyclopentolate 1% or tropicamide 1% along with phenylephrine 2.5%. Additionally, preoperative topical ketorolac 0.5% and either lidocaine 2% or tetracaine 0.5% was administered. Topical povidone-iodine 5% was applied over the surface of the eye before surgery. At the conclusion of surgery, 0.1 ml of 0.5% preservative-free intracameral moxifloxacin was administered. Patients did not receive postoperative topical antibiotics. Patients received postoperative topical

prednisolone acetate 1% and ketorolac 0.5% four times per day for one week followed by a steroid taper and completion of the ketorolac bottle.

Description of outcomes

The primary outcome was the percentage of standalone cataract surgeries resulting in a diagnosis of acute postoperative endophthalmitis. Secondary outcomes included the description of systemic adverse reactions patients historically had to fluoroquinolone antibiotics as documented in the EMR and whether or not these reactions occurred with intracameral moxifloxacin administration during cataract surgery.

Results

There were 2,218 standalone cataract surgeries performed on 1,418 patients over the study period (February 1, 2018 – August 10, 2020). Patient demographics are listed in Table 1. Zero cases of acute postoperative endophthalmitis were identified after these surgical cases (0%).

The study cohort included 69 surgeries on 41 patients with a preexisting fluoroquinolone allergy listed in the EMR. No systemic adverse reactions from intracameral moxifloxacin administration were documented in these patients. Historical reactions to fluoroquinolones in this group are listed in Table 2, none of which were reported following intracameral moxifloxacin administration during cataract surgery.

Table 1. Demographics of patients who underwent standalone phacoemulsification using intracameral moxifloxacin without postoperative topical antibiotics during the study period.

Mean age at surgery ± SD (years)	68.0 ± 10.1
Gender	Number of Patients, n (%)
	N=1,418
Female	859 (60.6)
Male	559 (39.4)
Race	
White	954 (67.3)
Black	251 (17.7)
Hispanic or Latino	146 (10.3)
Asian	37 (2.6)
Declined	17 (1.2)
American Indian	5 (0.4)
Two races	3 (0.2)
Pacific Islander	2 (0.1)
Other	3 (0.2)

Table 2. Historical reactions to fluoroquinolone antibiotics in patients listed with a preexisting fluoroquinolone allergy prior to cataract surgery who still received intracameral moxifloxacin.^a

Historical Reactions	Number of Patients with History of Reaction
	N=41 ^b
rash or itching	14
nausea, vomiting, diarrhea	12
tendon rupture or tendonitis	5
anxiety or insomnia	4
muscle or joint pain	4
edema	2
dizziness	1
dyspnea	1
headache	1
hypotension	1
phlebitis	1
tachycardia	1

^a None of the listed adverse reactions were reported with intracameral moxifloxacin administration in these patients.

^b Column sum is greater than 41 because some patients had a history of more than one reaction type.

Discussion

A report from the Intelligent Research in Sight Registry of more than eight million cataract surgeries performed in the United States from 2013 to 2017 revealed a postoperative endophthalmitis rate of 0.04% (1 in 2,500 surgeries) [24]. Because of the rarity of endophthalmitis after cataract surgery, our result is not unexpected; however, we still consider it notable that excluding postoperative topical antibiotics when using intracameral moxifloxacin did not result in a rate of endophthalmitis that is many-fold larger than what is reported in the literature. Although we did not perform a direct comparison of regimens, we draw attention to studies that have found no significant difference in endophthalmitis rates after cataract surgery using intracameral agents with and without postoperative topical antibiotics [15, 17, 19].

We found no systemic adverse reactions to intracameral moxifloxacin in those with a preexisting fluoroquinolone allergy. We postulate that low bioavailability of intracameral administration may be responsible; however, we are unable to find literature concerning the bioavailability of intracameral pharmaceuticals.

The main limitations of this study include its retrospective nature, small sample size, multiple surgeons with varying levels of experience, and involvement of two separate surgical centers (hospital and ambulatory surgery center).

Declarations

Acknowledgements

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Conflicts of interest/Competing interests

The authors have no conflicts of interest to declare that are relevant to the content of this article.

Availability of data and material

The datasets generated during and/or analyzed during the current study are not publicly available because they contain identifiable health information, but de-identified data may be made available from the corresponding author on reasonable request.

Code availability

Not applicable.

Authors' contributions

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Justin Riffel and Anjulie Quick. The first draft of the manuscript was written by Justin Riffel and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Additional declarations for articles in life science journals that report the results of studies involving humans and/or animals

This article does not contain any studies with active human participants or animals performed by any of the authors.

Ethics approval

Institutional Review Board approval was obtained from the University of Kansas Medical Center (KUMC) prior to the study (STUDY00146509).

Consent to participate and consent for publication

The Institutional Review Board determined that informed consent was not necessary given the retrospective, observational nature of the study and reporting of de-identified data.

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