Efficacy and Side Effects of Intracameral Moxifloxacin as Prophylaxis after Cataract Surgery

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Authors’ contributions

This work was carried out in collaboration between both authors. Author BPC designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors BPT and BPC managed the analyses of the study. Author BPT managed the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

Purpose: To determine the efficacy of intracameral moxifloxacin at the end of cataract surgery.

Methods: Retrospective record based study. Study was based on a consecutive case series of patients who had cataract surgery during 2009 through 2019 in the Department of Ophthalmology at Maharishi Vashishth State Medical College, Basti (India). Intracameral preservative free moxifloxacin injection was given at the conclusion of surgery to most patients. Standardized operating room and sterilization protocols were used. All the medical records were reviewed for the 8 weeks after surgery. Post-operative endophthalmitis rate was computed using the number of cases of postoperative endophthalmitis as the numerator and the number of cataract surgeries as the denominator.

Results: Of the 10,108 surgeries performed during study period, 2012 (19.9%) involved intracameral moxifloxacin injection. No adverse drug reactions were reported from administration of intracameral antibiotics during the study period. The post-operative endophthalmitis rate in patients who had not received intracameral antibiotic injection was 0.06%. There was no endophthalmitis case reported in patients who had received intracameral moxifloxacin injection as prophylaxis.

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**Conclusion:** The results of this study support the use if intracameral moxifloxacin as a routine prophylaxis for endophthalmitis after cataract surgery. Especially in rural setting as the patients postoperative instruction compliance is poor and many patients are lost to follow-ups due to different reasons.

**Keywords:** Moxifloxacin; intracameral; endophthalmitis; cataract; prophylaxis.

**1. INTRODUCTION**

Endophthalmitis is an inflammatory condition of the intraocular cavities (ie, the aqueous and/or vitreous humor), usually caused by infection. Postoperative endophthalmitis is defined as severe inflammation involving both the anterior and posterior segments of the eye after intraocular surgery. It is one of the most serious, sight-threatening complications of ocular surgery which can lead to poor visual outcome and impaired quality of life. Clark A. et al., Schmier JK. et al., Gower EW et al. Miller JJ. et al., [1,2,3,4]. Reported worldwide incidence of postoperative endophthalmitis ranged from 0.04% to 4% and the post-cataract surgery incidence is 0.265%. Fintelmann RE et al. [5,6]. Reported endophthalmitis rates in India have ranged between 0.04%–0.15% during the past two decades. Lalitha P et al. [7] Acute post-cataract endophthalmitis occurs between 1 day and 4 weeks after surgery, presenting as a sudden, severe visual loss. Since cataract surgery is age related and most of the older age population need cataract surgery. To reduce the burden of avoidable blindness there has been an increase in cataract surgery rate all over the world. In past increase in endophthalmitis rates with time was reported. Taban M et al, West ES et al. Lundstrom M et al. [8,9,10]. Looking at the current scenario post-operative endophthalmitis is a public health concern.

The use of intracameral cefuroxime at the end of cataract surgery was first reported by the European Society of Cataract and Refractive Surgeons Endophthalmitis Study Group in 2006 [11]. Previous study reported a decreased rate of endophthalmitis with adoption of intracameral antibiotic injection [12]. Barry P reported that 70% of European ophthalmic surgeon participated in his study were using intracameral antibiotics [13]. Kelkar et al. from India reported that 38% of the respondents using routine intracameral antibiotic prophylaxis and 91% of these respondents adopted this practice within the past 2 years [14]. The use of routine intracameral antibiotic prophylaxis has been increasing in many countries [15,16]. Although there has been growing evidence to support the efficacy of intracameral antibiotics, the effectiveness of intracameral antibiotics in lowering rates of endophthalmitis in association with cataract surgery has been debated frequently. There is long-standing disagreement among ophthalmologist regarding its use to prevent postoperative endophthalmitis. It remains controversial due to increased cost and individual risk [16,17]. This study was conducted to assess the rates of post-operative endophthalmitis after the use of intracameral antibiotics as prophylaxis after cataract surgery.

**2. METHODS**

This is a retrospective, medical record based study. Study was based on a consecutive case series of patients who had cataract surgery with or without IC moxifloxacin during 2009 through 2019 in the Department of Ophthalmology at Maharishi Vashishth State Medical College, Basti (India). Intracameral preservative free moxifloxacin injection was given at the conclusion of surgery. It was ready to use, with no mixing or dilution required, available in a 1-ml vial, with each milliliter containing 5 mg of moxifloxacin. The dosing given was 0.5 mg/0.1 ml injected in the anterior chamber at the end of surgery. Standardized operating room and sterilization protocols were used. Povidone–iodine 5% was administered for at least 3 minutes before eyelid preparation to all patients without a history of allergy to topical iodine. Information on perioperative antibiotic dispensing was obtained from the medical records. All cataract surgeries were performed by either phacoemulsification, SICS, or manual large-incision extracapsular cataract extraction. All patients with cataract received topical antibiotics eye drops according to a standardized regimen. All endophthalmitis cases were manually reviewed to confirm the diagnosis and obtain additional details for each case, including risk factors for endophthalmitis such as surgical complications, demographics, notes about antimicrobial therapy, and microbiological testing of aqueous or vitreous samples. All The medical
records were reviewed for the 8 weeks after surgery.

2.1 Statistical Analysis

Post-operative endophthalmitis rate was computed using the number of cases of postoperative endophthalmitis as the numerator and the number of cataract surgeries as the denominator. Exact 95% confidence intervals (CIs) and P values were estimated assuming a Poisson distribution.

3. RESULTS

The study evaluated 10,108 consecutive cataract surgeries performed during the study period. The median patient age was 64 years. SICS was performed in 6773 eyes, phacoemulsification in 3032 eyes and manual large-incision extracapsular cataract extraction in 303 eyes (Fig. 1). of the 10,108 surgeries, 2012 (19.9%) involved intracameral moxifloxacin injection. No adverse drug reactions were reported from administration of intracameral antibiotics during the study period. The post-operative endophthalmitis rate in patient who had not received intracameral antibiotic injection was 0.06%. There was no endophthalmitis case reported in patients who had received intracameral moxifloxacin injection as prophylaxis (Fig. 2). The distribution of operated cases are presented in Table 1.

Table 1. The distribution of operated cases

<table>
<thead>
<tr>
<th>Technique</th>
<th>Surgeries, (n)</th>
<th>Endophthalmitis rate, n (%)</th>
<th>Surgeries, (n)</th>
<th>Endophthalmitis rate, n (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>SICS</td>
<td>6290</td>
<td>4 (0.06)</td>
<td>1483</td>
<td>0 (0.00)</td>
<td>7773</td>
</tr>
<tr>
<td>Phacoemulsification</td>
<td>1581</td>
<td>1 (0.04)</td>
<td>451</td>
<td>0 (0.00)</td>
<td>2032</td>
</tr>
<tr>
<td>ECCE</td>
<td>225</td>
<td>0 (0.0)</td>
<td>78</td>
<td>0 (0.00)</td>
<td>303</td>
</tr>
<tr>
<td>Total</td>
<td>8096</td>
<td>5 (0.06)</td>
<td>2012</td>
<td>0 (0.00)</td>
<td>10108</td>
</tr>
</tbody>
</table>

Fig. 1. Distribution of type of surgeries
Fig. 2. Postoperative endophthalmitis rate among type of surgeries performed

4. DISCUSSION

Use of intracameral moxifloxacin as prophylaxis has been reported to reduce the risk of post operated endophthalmitis in patients undergoing cataract surgery [18]. It covers most bacteria that causing endophthalmitis [19]. Moxifloxacin is a preservative free eye drop with approximately neutral pH. It has been reported safe for ocular use [20]. Its in vitro efficacy has been confirmed by Libre et al. [21] Haripriya et al. reported 3.5 fold reduction in postoperative endophthalmitis rate after using intracameral moxifloxacin [22]. Similarly, in a meta-analysis by Bowen et al. reported 4.2 fold postoperative endophthalmitis rate reduction after using intracameral moxifloxacin [23]. In a recent study Melega et al. also reported significantly lower endophthalmitis rate in IC moxifloxacin group as compared to without IC moxifloxacin group [18].

In our study, 100% reduction of endophthalmitis rate is reported with the use of intracameral moxifloxacin. We have use intracameral moxifloxacin as prophylaxis for postoperative endophthalmitis. One advantage of using moxifloxacin is that it covers both gram positive as well as gram negative organism. Other antibiotic such as cefazolin and vancomycin covers gram positive bacteria only. Unlike other countries, moxifloxacin is easily available in India even in remote area like Basti district of Uttar Pradesh. Postoperatively the volume expansion of the anterior chamber caused rapid decrease in antibiotic concentration while using intracameral route [24]. Moxifloxacin has an advantage over cefuroxime, as it is dose dependent and higher concentration of moxifloxacin can be achieved in a shorter time period [24].

In our study, the rate of postoperative endophthalmitis was lower in cases, where intracameral moxifloxacin was used as prophylaxis. In our study SICS without IC moxifloxacin reported the maximum number of endophthalmitis cases followed by phacoemulsification. No endophthalmitis case has been reported in ECCE group without moxifloxacin. This is probably due to the lower number of operated case in this particular group. This is similar to the previously reported studies. There was no case of endophthalmitis reported in patients with intracameral moxifloxacin. Although the number of cases in our study is very less as compared to other studies reported from India. Results of our study also support that intracameral antibiotics should be used as prophylaxis of postoperative endophthalmitis. Growing resistance to antibiotics can be of concern while using them as prophylaxis. Antibiotic Resistance Monitoring in Ocular Microorganisms Surveillance Study conducted in United States reported growing resistant in Staphylococcus aureus [25] the most common
bacteria causing endophthalmitis [26]. Although
the resistant rate has been lower in the ocular
use of antibiotics. Naseri et al. reported that use
to one dose of antibiotic injected is unlikely to
promote bacterial resistance [27].

There are disagreement on the routine use of
intracameral antibiotic as the post-operative
endophthalmitis rate is very low even in patients
where it has not been used. The worsening of
health related quality of life after endophthalmitis
is high, as the visual outcome of this is often
worse. Clark et al assessed quality of life after
postoperative endophthalmitis using National
Eye Institute VFQ-25 (VFQ-25) [1]. They
reported that VFQ-25 score was 13.5% lower in
endophthalmitis cases as compared to
uncomplicated cataract surgery [1]. Additionally
the direct medical cost of treatment for
endophthalmitis is 156% higher than
uncomplicated cataract [28]. Effective
intracameral antibiotic prophylaxis can reduce
this significant costs associated with treating
endophthalmitis. Many studies comparing cost
effectiveness among prophylactic treatments
have been published in past [29,30,31]. Sharifi et
al. reported the cost-effectiveness ratio for
intracameral cefuroxime is $1403 per case of
postoperative endophthalmitis prevented [31].
The cost effectiveness of intracameral
Moxifloxacin has not been reported. A systemic
review by Linertova et al. using cost-
effectiveness model of intracameral cefuroxime
reported that the cost effectiveness of
intracameral moxifloxacin would have to be
almost five times more effective than cefuroxime
[29]. Although this calculation has been based
on authors assumptions of some parameters.

This study has some limitations. The sample
of patients undergone cataract surgeries with
intracameral moxifloxacin injection is less as
compared to published literature from India. The
year wise trend analysis of endophthalmitis rate
has not been done. The individual
endophthalmitis rate of different cataract
surgeries was not compared due to less sample
size. There was data loss of approximately 20%
patients due to lost to follow-up after cataract
surgery.

5. CONCLUSION

In conclusion, the results of this study support
the use if intracameral moxifloxacin as a routine
prophylaxis for endophthalmitis after cataract
surgery. Especially in rural setting as the patients
postoperative instruction compliance is poor and
many patients are lost to follow-ups sue to
different reasons. A prospective long term
parallel double arm cohort study should be
conducted to report the long term safety and
efficacy of using intracameral moxifloxacin. Also
there is a need for calculating cost-effectiveness
of intracameral moxifloxacin as prophylaxis.

CONSENT

Informed and written consent were obtained from
the patients.

ETHICAL APPROVAL

This study was approved by institutional
ethics committee, conducted according to the
principles described in the Declaration of
Helsinki.

COMPETING INTERESTS

Authors have declared that no competing
interests exist.

REFERENCES

1. Clark A, Ng JQ, Morlet N. et al. Quality of
life after postoperative endophthalmitis. ClinExp
2. Schmier JK, Hulme-Lowe CK, Covert DW,
Lau EC. An updated estimate of costs of
endophthalmitis following cataract surgery
Characteristics of endophthalmitis after
cataract surgery in the United States
Medicare population. Ophthalmology.
Acute-onset endophthalmitis after cataract
settings, and visual acuity outcomes after
treatment. Am J Ophthalmol. 2005;139:
983–987.
5. Results of the endophthalmitis vitrectomy
study. A randomized trial of immediate
vitrectomy and of intravenous antibiotics
for the treatment of postoperative bacterial
endophthalmitis. Endophthalmitis
1995;113:1479-96.
6. Fintelmann RE, Naseri A. Prophylaxis of
postoperative endophthalmitis following


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