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Efficacy of Perioperative Oral Antibiotics in the Prevention of Acute Infective Endophthalmitis after SICS

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Abstract

***Objective*:** The objective of this study to evaluate the efficacy of perioperative oral antibiotics in the prevention of acute infective endophthalmitis (IE) after cataract surgery. ***Methods*:** This prospective study of patients undergoing uncomplicated SICS was conducted. Group A was given post-op oral ciprofloxacin for five days, whereas Group B was not. Both groups received 5% povidone-iodine (PVI) preparation for three minutes in the conjunctival cul-de-sac preoperatively as prophylaxis. The minimum post-operative follow-up period was six weeks. ***Results*:** Out of 1856 patients, 896 (48.27%) were included in Group A, and 960 (51.72%) were included in Group B. No significant difference in anterior chamber (AC) reaction was found on day 1 ($p = 0.69$), day 14 ($p = 0.06$), or day 42 ($p = 0.1$). One patient developed acute post-operative infective endophthalmitis (0.04%) and one patients developed toxic anterior segment syndrome (TASS) from Group A. The non-oral antibiotic group had no serious complications. ***Conclusions*:** Perioperative oral antibiotic use in routine clinical practice is not recommended for the prevention of acute post-operative infective endophthalmitis. Pre-operative conjunctival PVI 5% for five minute was proven to be effective prophylactic measures in our study.

Keywords: Infectious endophthalmitis, post-operative complications, SICS, cataract extraction, antibiotic prophylaxis.

INTRODUCTION

Cataracts are a major cause of global blindness, and cataract extraction is one of the most commonly performed surgical procedures in ophthalmic clinical settings. Post-cataract surgery endophthalmitis is a rare complication with an incidence of 0.03–0.2% [1]. Although rare, is a serious and sight-threatening complication that frequently leads to poor vision (usually less than 20/200) or even loss of the eye [2, 3]. The incidence of IE after cataract surgery is low but varies substantially in the literature from 0.012% to 0.56%, with a large meta-analysis reporting it to be 0.134% (n = 6,686,169) on average [4-6].

Multiple factors can increase the risk of post-op IE [7]. Ocular pathologies like blepharitis, ectropion, conditions involving an increased number of ocular bacteria, and temporal and clear corneal incisions are some of the well-known risk factors [3]. Patients on immunosuppressants, older patients, and those with wound dehiscence are also at a higher risk for this condition [7].

Prophylaxis against post-op IE can be achieved with topical, intracameral (IC), or systemic antibiotics. Standard international recommendations mainly include povidone-iodine (PVI) as the antiseptic agent of choice for the preparation of ocular and periocular surfaces [3]. In our setup, povidone-iodine (PVI) as the antiseptic agent is used for the preparation of ocular and periocular surfaces. Oral ciprofloxacin, a second-generation fluoroquinolone, is also being prescribed as an adjunct for three to five days post-op.

The intraocular penetration of some broad-spectrum antibiotics, e.g., fluoroquinolones such as moxifloxacin and ciprofloxacin, is well-documented in the literature, but the most serious consequence of their routine prophylactic use is the potential threat of more virulent drug-resistant bacterial strains [8, 9]. The role of oral antibiotics in preventing cataract surgery-related IE, even though routinely prescribed in most high-volume setups, is still controversial and not well-established in the literature.

It is of paramount importance for cataract surgeons to adopt the most effective and proven measures to prevent post-op IE. The purpose of our study is to establish the role of perioperative oral antibiotics in reducing the risk of IE after uncomplicated cataract surgery. This will provide us with a better understanding of the most effective prophylactic measures against this vision-threatening complication.

MATERIALS AND METHODS

We conducted a prospective cohort study of all the patients >18 years who underwent uncomplicated SICS with intraocular lens implantation between 1st January 2023 to 31st December 2023, in the Ophthalmology Department of Pabna Medical college, Pabna & Rajshahi Medical College, Rajshahi. The approval of the Institutional Review Committee was obtained.

Inclusion Criteria

1. All patients above the age of 18 years who underwent uncomplicated SICS during our study period were included. Patients with mature and immature senile cataracts were included.

Exclusion Criteria

1. Patients with severe mental illness and developmental disabilities.
2. Eyes with coexisting blepharitis, dacryocystitis, and active ocular inflammation.
3. Post-traumatic eyes, complicated cataracts, and patients with intraoperative complications like posterior capsular rent or vitreous loss.

Noted data variables include age, gender, laterality, cataract density and systemic use of antibiotics. Patients were followed for six weeks, and thorough slit-lamp examinations for anterior chamber (AC) reactions on post-op day 1, day 14, and day 42 were carried out. AC activity was graded using the conventional Standardization of Uveitis Nomenclature (SUN) grading system [10]. Acute post-op IE was defined as an inflammation of the inner coats of the eye resulting from intraocular colonization of infectious agents within six weeks of surgery [10].

Surgical Technique

Two surgeons performed SICS. The surgical steps were nearly consistent with peribulbar anesthesia. In all cases, sclero-corneal tunnel was done with frown incisions with no or minimal use of cautery. Both foldable and PMMA in-the-bag intraocular lenses were implanted and wounds were hydrated. There were minor variations in technique and expertise among surgeons. All surgeons had performed at least 500+ SICS prior to this study and the surgical duration varied from 10 to 20 minutes.

Endophthalmitis prophylaxis

Patients were randomly divided into two groups. Both of our hospital we had 2 operation day in a week patient underwent SICS in 1st OT day were included in group A and patient underwent SICS in 2nd OT day were included in group B. Groups A and B were both similar in all perioperative endophthalmitis prophylaxis measures except for the administration of prophylactic oral antibiotics starting a day before surgery and continuing for 4 days post-op. Group A received post-op oral ciprofloxacin 500 mg BD for five days, whereas Group B did not. All patients were draped and prepared with a meticulous aseptic technique. Local skin disinfection with 10% PVI was performed, followed by instillation of 5% PVI in the conjunctiva cul-de-sac for three minutes. No topical antibiotics were administered preoperatively, and the balanced salt solution did not include antibiotics. Topical antibiotic prophylaxis was commenced on 1st postoperative day with 1) moxifloxacin two hourly, 2) 1% prednisolone acetate two hourly, and 3) tobramycin-dexamethasone eye ointment OD at night, prescribed for the first week. At one week follow-up, the moxifloxacin 4 times daily and 1% prednisolone acetate 4 hourly and tobramycin-dexamethasone eye ointment OD at night were prescribed for another four weeks.

All the above-mentioned antibiotics were used in our study since they are most frequently practiced in our country Bangladesh. Oral ciprofloxacin has good ocular penetration, is cost-effective and easily available in our region.

Statistical Analysis

Statistical Package for Social Sciences (SPSS) Version 21.0 was used for data analysis. For quantitative data, mean and standard deviation were used (mean ± SD) whereas percentages were used for qualitative data. An independent sample t-test was used to compare AC reactions between the two groups. A p-value of <0.05 was taken as statistically significant.

RESULTS

A total of 1856 patients were included in our study after fulfilling the inclusion criteria. The mean age in our data was 58.3 ± 14.8 (mean ± SD) years with a majority of females (n = 1033, 55.66 %), Males (n = 823, 44.34 %). Among patients right eye involvement (n = 987, 53.18%) & left eye involvement (n = 869, 46.82%), whereas surgeries were predominantly done for visually significant immature cataracts (n = 1608, 86.64%). Demographics are given in Table 1.

Table 1: Demographic features

Variable	Frequency (n)	Percentage (%)
Group		
Group A	896	48.28
Group B	960	51.72
Gender		
Male	823	46.82
Female	1033	53.18
Laterality		
Right	987	53.18
Left	869	46.82
Cataract density		
Immature	1508	81.25
Mature	348	18.75

Out of 1856 patients, n = 896 (48.28%) were included in Group A (antibiotic group), while n = 960 (51.72%) were in Group B (no antibiotic group). No significant difference in AC reactions between the two groups was noted on day 1 (p = 0.66). Our results show one cases of toxic anterior segment syndrome (TASS) from Group A, who presented on days 5. That was treated with intensive topical steroids (1 hourly prednisolone acetate) with close observation and responded very well. There were 51(In group A 30 patients & in group B 21patients) lost to follow-up on day 14. Among the remaining patients (n = 1805), no significant difference in AC reactions between the two groups (Group A = 866, Group B =939) was noted on day 14 either (p = 0.06).

Among 1805 patients, we report one case of post-op IE (0.06%) from Group A (n = 866, 0.12%) who presented on day 14 with visual acuity of counting fingers, 0.2 mm hypopyon, pupillary membrane, and dense vitritis. The patient was immediately admitted and started on oral moxifloxacin 400 mg OD, topical prednisolone acetate, and moxifloxacin 2 hourly along with a cycloplegic. A same-day vitreous tap was performed, and conventional intravitreal antibiotics ceftazidime 2.25/0.10 mL and vancomycin 1 mg/0.10 mL were injected. The same antibiotics were repeated after 48 hours; however, due to declining vision (hand movements), the patient was referred to a vitreoretina surgeon for an early pars plana vitrectomy with a silicon oil tamponade. On day 42, 142 patients were lost to follow-up. No statistically significant difference (p = 0.1) was found in AC reactions between the two groups (Group A; n = 768, Group B; n = 895) among the remaining 1663 patients.

DISCUSSION

Post-op IE is one of the worst potential complications following routine cataract surgery. Prevention practices vary considerably around the world, and no clear consensus exists to date regarding optimal strategies to reduce its incidence [10]. One of the reasons lies in the striking variations in its epidemiology across the globe, and all existing literature unequivocally emphasizes the importance of prophylactic measures in incidence reduction.

Our study focuses on the role of perioperative oral antibiotics in the prevention of IE after routine uncomplicated SICS. Our results suggest no benefit of oral ciprofloxacin in the reduction of post-op IE rates. Similarly, a retrospective study in Japan found no evidence in favor of perioperative systemic cefdinir and levofloxacin administration in phaco [11]. Instead, it reported increased systemic side effects, including abdominal pain and diarrhea. Another study conducted by Zafar A *et al*., also suggest no benefit of oral ciprofloxacin in the reduction of post-op IE rates [12]. A clinical trial by the Endophthalmitis Vitrectomy Study Group recommended the omission of systemic antibiotic treatment to reduce toxic effects, costs, and length of hospital stays in the prevention or treatment of postoperative endophthalmitis [13]. Thus, oral antibiotics not only have no benefit in reducing IE but, in fact, may have a negative impact.

Post-op IE affects the anterior as well as posterior segments of the eye, usually secondary to an exogenous infectious organism that gains ocular access during surgery. For the anterior segment, topical antibiotic penetration in the aqueous humor is sufficient, while for the vitreous humor, topical and systemic routes do not achieve desirable concentrations except for linezolid and fluoroquinolones, which have excellent vitreous penetration [14, 15].

A local study from Agha Khan Hospital regarding microbiologic profiles of post-op endophthalmitis reported that among gram-positive bacteria, coagulase-negative Staphylococcus was the principal isolate (17%), and among gram-negative bacteria, it was Pseudomonas species (18.8%) [16]. Systemic levofloxacin and moxifloxacin have superior coverage and high intraocular bioavailability in the uninflamed eye [8, 9]. Ciprofloxacin in our set-up has good coverage of *Pseudomonas aeruginosa*, but its coverage against coagulase-negative staphylococci is doubtful. Even with high intraocular penetration and suitable Pseudomonas coverage, our results do not

support its benefit as a systemic prophylactic agent against post-op IE.

To date, a wide range of guidelines have been established for prophylaxis against post-op IE at different times. A few commonly practiced guidelines are topical and systemic antibiotics, irrigation with PVI solution, injection of local antibiotics, and antibiotics in irrigating solution [17]. Annual clinical audits are regularly conducted in worldwide setups for review and revision of protocols. Unfortunately, in our country, practice protocols to prevent IE are not well defined nationally with wide variations in practice in both public and private sectors.

PVI is the single most important preventive measure, especially in poor lid-hygiene conditions and low socioeconomic populations because of its low cost and rapid bactericidal action without the promotion of antimicrobial resistance and because of strongly supportive data [18, 19]. Our results also favor the use of PVI antisepsis comprising lid skin disinfection with 10% PVI and a diluted 5% solution for instillation in the conjunctival sac, as previously described [20].

Surveys show that nearly all surgeons prescribe prophylactic topical antibiotics, with most surgeons favoring the latest generation of fluoroquinolones, but no proof supporting their contribution has been reported [21, 22]. We also prescribed topical moxifloxacin for all our subjects for at least one month post-operatively, supporting its use in IE prophylaxis.

The strength of our study lies in the prospective and clear comparative nature of its design. Also, the inclusion of a uniform surgical technique and meticulous sampling of patients with a stringent application of our inclusion and exclusion criteria. Limitations of our study lie in the limited sample size, the inclusion of uncomplicated surgeries only and of surgeries by different surgeons. Nationwide, multicenter studies and regular clinical audits involving both urban and rural areas are needed to assess the risk factors and incidence rates of endophthalmitis. Microbiologic profiles and antibiotic susceptibility studies should also be considered along with our findings to ascertain the most common culprits. We also suggest the importance of forming an endophthalmitis task force to formulate standard national practice guidelines for the prevention of endophthalmitis outbreaks.

CONCLUSIONS

This prospective study analyzed the real-world data of consecutive cataract surgeries by different surgeons and showed that there is no significant difference in the rate of post-op IE, irrespective of the use of systemic antibiotics. Our study showed no benefit of using post-op oral ciprofloxacin in the presence of other prophylactic measures like preoperative conjunctival 5% PVI for five minutes. Furthermore, studies with more power and different kinds of antibiotics are needed to establish stronger evidence for or against the use of oral antibiotics as a prophylactic measure for cataract surgery in routine practice.

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