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Studying the Efficacy of Gatifloxacin 0.5% Eye Drops Preoperatively in Decreasing the Colony Forming Units (CFU) in Conjunctival Cultures

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Abstract

Aim: To study the efficacy of gatifloxacin 0.5% eyedrops preoperatively in decreasing the CFU in conjunctival cultures in patients undergoing phacoemulsification cataract surgery.

Settings and design: Cross sectional, interventional, single blind, comparative study.

Material and methods: 40 eyes of 40 patients between the age group of 50-80 years were included in the study after simple randomization. Each eye was treated with one drop of 0.5 % gatifloxacin eye drops for 5 times at an interval of 30 minutes prior to surgery. Pre-antibiotic treatment conjunctival cultures were taken and other post-treatment conjunctival cultures were obtained half an hour after instillation of last drop of antibiotic. The number of CFU was recorded.

Results: The organisms isolated were coagulase-negative Staphylococcus (CoNS)- *Staphylococcus epidermidis* (72.5%), *Corynebacterium diphtheriae* (22.5%), *Haemophilus influenzae* (10%), *Staphylococcus aureus* (10%), *Propionibacterium acnes* (10%), *Streptococcus pneumoniae* (5%). All the eyes showed significant reduction in the CFU ($p<0.05$) in the conjunctival cultures after treating with 0.5% gatifloxacin eye drops.

Conclusions: Using 0.5% gatifloxacin eye drops preoperatively on the day of surgery alone is a valuable treatment for decreasing the conjunctival bacterial load in patients undergoing cataract surgery.

Introduction

Post-operative endophthalmitis is a dreaded complication after cataract surgery with an incidence of 0.05%-0.35% [1]. The most common organisms responsible are the conjunctival flora and ocular adnexal organisms like *Staphylococcus epidermidis*, *Staphylococcus aureus*, *Haemophilus influenzae*, *Propionibacterium acnes* [2,3]. Contaminated instruments or formulations are responsible in a very few cases. Though clear corneal phacoemulsification is a closed chamber technique, still, architectural integrity of the corneal wound is important. Microleaks may exist and are responsible for percolation of fluids and tears contaminated with the flora to enter the eye postoperatively [4,5]. Many prophylactic measures like cleaning the surgical field with povidone iodine, proper eye draping, pre-operative use of antibiotic eyedrops (E/D) for 2-3 days, perioperative intracameral antibiotics and subconjunctival injection of antibiotics are implemented by various ophthalmologists [6]. Toxicity of intracameral antibiotics to the corneal endothelium has been debated [7-9]. Pre-operative antibiotic E/D therapy for 2-3 days is cumbersome and patient dependent [10,11]. The fourth generation fluoroquinolone antibiotic-gatifloxacin is effective against gram-positive and gram-negative organisms with activity against anaerobes [12]. Though povidone iodine is a well-known and widely used prophylactic antiseptic measure used before surgery, an attempt to reduce the microbial load before its application may be additive to its efficacy in reducing post-operative infective complications. The goal of this study was to assess the efficacy of pre-operative gatifloxacin E/D therapy commenced few hours before surgery in reducing the ocular adnexal microbial load measured in terms of conjunctival colony forming units (CFU).

Material and Methods

Forty eyes of forty patients between age group of 50 years-80 years undergoing clear corneal phacoemulsification cataract surgery were enrolled in this study after obtaining approval from institutional review board and ethical committee. An informed consent was obtained from all patients. Patients with ocular surface disease such as meibomitis, blepharitis, dry eyes, chronic dacryocystitis and those with history of antibiotic or steroid E/D usage 48 hours before surgery were excluded from the study. Each study eye was treated with one drop of Zymaxid (gatifloxacin 0.5% [5 mg/ml], Allergan Las, Irvine, CA) E/D for 5 times at an interval of 30 minutes pre-operatively. Two conjunctival swabs, one prior to instillation of antibiotic and the other 30 minutes after instillation of the last antibiotic drop, were taken from the lower conjunctival fornix with sterilized loop without touching the eyelids. The sample was inoculated aseptically by "C"-shaped streaking onto blood agar and chocolate agar media at the bedside. The plates were then incubated at 37°C for 48 hours under standard aerobic conditions [13]. The sample was also inoculated in enriched thioglycollate broth. Any positive bacterial growth was further identified and CFU were counted. Susceptibility testing was done by Kirby-Bauer disk diffusion method using standard Clinical and Laboratory Standards Institute (CLSI) guidelines at 2 days and at

the end of 4 weeks [14]. The pre-treatment and post-antibiotic treatment colony counts in terms of CFU and culture results are shown in (Table 1). Data obtained were subjected to statistical analysis by using Mann-Whitney U Test. Povidone iodine 10% was used to prepare the periocular area and the eyes were flushed with povidone iodine before starting the surgery.

Serial No.	Pre-antibiotic culture colony forming units CFU × 10^6 /ml	Post-antibiotic culture colony forming units CFU × 10^6 /ml	Organisms isolated
1	14	4	CoNS, SA
2	10	2	CoNS, SA
3	12	4	CoNS, SA
4	10	4	CoNS, SA, PA
5	16	4	CoNS, CD
6	10	1	CD
7	2	No Growth	CD
8	10	2	CoNS, CD, PA
9	8	2	CoNS, CD, PA
10	12	2	CoNS, CD, PA
11	10	2	CoNS, HI
12	12	2	CoNS, HI
13	14	No Growth	CoNS
14	10	No Growth	CoNS
15	14	No Growth	CoNS
16	12	10	CoNS, HI
17	11	4	CoNS
18	10	4	CoNS
19	No Growth	No Growth	No Growth
20	No Growth	No Growth	No Growth
21	14	4	CoNS
22	11	4	CoNS
23	11	4	CoNS, HI
24	10	2	CoNS
25	16	2	CoNS
26	8	1	CD
27	10	4	CoNS
28	4	1	CD
29	12	8	CoNS
30	10	2	SP
31	11	2	SP
32	14	2	CoNS
33	11	2	CoNS

34	14	4	CoNS
35	No Growth	No Growth	No Growth
36	No Growth	No Growth	No Growth
37	10	2	CoNS
38	10	2	CoNS
39	12	4	CoNS
40	8	1	CD

CoNS: Coagulase negative Staphylococcus-*Staphylococcus epidermidis*; CD: *Corynebacterium diphtheria*; SA: *Staphylococcus aureus*; HI: *Haemophilus influenza*; PA: *Propionibacterium acnes*; SP: *Streptococcus pneumoniae*

Table 1: CFU and organisms isolated in pre- and post-antibiotic treatment conjunctival cultures.

Results

40 eyes of 40 patients (15 males, 25 females-mean age 56 ± 3.43 years) undergoing clear corneal phacoemulsification cataract surgery were studied. The pre-antibiotic cultures of the 40 eyes revealed no bacterial growth in 4 eyes (10%) while 36 eyes (90%) showed bacterial growth (Table 1). The organisms isolated were coagulase-negative Staphylococcus (CoNS)-*Staphylococcus epidermidis* (72.5%), *Corynebacterium diphtheriae* (22.5%), *Haemophilus influenzae* (10%), *Staphylococcus aureus* (10%), *Propionibacterium acnes* (10%), *Streptococcus pneumoniae* (5%) (Figure 1). As regards the sensitivity pattern in case of all isolates, the organisms showed high sensitivity to Ciprofloxacin, Vancomycin, Linezolid, Ampicillin, Ofloxacin and Gatifloxacin and high resistance to Penicillin, Ampicillin. As regards the sensitivity pattern in case of coagulase-negative Staphylococci, the organisms were most susceptible to vancomycin. After treating with gatifloxacin E/D (0.5%), 8 eyes (20%) showed no bacterial growth on culture. Post-antibiotic treatment conjunctival cultures (mean of 2.45 ± 2.12 CFU × 10^6/ml) showed a significant decrease in the CFU compared with the pre-treatment conjunctival cultures (mean of 9.825 ± 4.26) ($p<0.05$) (Tables 2 and 3).

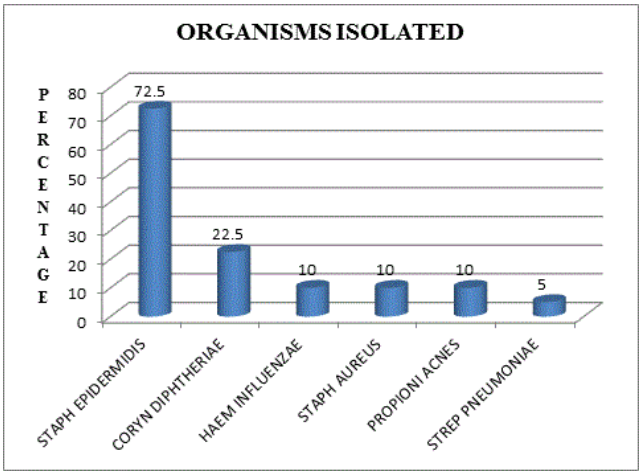

Figure 1: Organisms isolated in pre-antibiotic conjunctival culture. STAPH: *Staphylococcus*; CORYN: *Corynebacterium*; HAEM: *Haemophilus*; STREP: *Streptococcus*; PROPIONI: *Propionibacterium*.

Mean Pre-Antibiotic Treatment colony forming units CFU × 10^6/ml	Mean Post-Antibiotic Treatment colony forming units CFU × 10^6/ml	Z-score	U-value*	P value
9.825 ± 4.26	2.45 ± 2.12	5.9275	183.5	<0.05

*Mann-Whitney U Value Test

Table 2: Showing mean ± standard deviation CFU values pre-and post-antibiotic treatment.

By Meta Numerics	U-Value	1449
	P-Value (left probability)	1
	P-Value (right probability)	0
By ALGLIB	P-Value (combined)	0.0001

Table 3: Showing the values of U and P calculated using algorithms supplied by the Meta Numerics and ALGLIB statistical libraries.

Discussion

The normal conjunctival flora as a potential source of infection responsible for post-operative endophthalmitis has long been documented [1-3,15,16]. The organisms commonly causing endophthalmitis like the coagulase negative *Staphylococcus epidermidis*, *Haemophilus influenzae*, *Staphylococcus aureus* and *Propionibacterium acnes* are abundant in the normal flora of the ocular adnexa [1-3,15,16]. Poor wound architecture or improper stromal hydration of ports after surgery may serve as a portal of entry

for these organisms abundant in the tear fluid to gain entry into the eye [4,5]. Under septic conditions and in the presence of local or systemic immunodeficiency, it can be hazardous enough to induce intraocular inflammation and cause toxic anterior segment syndrome or the most dreaded complication-endophthalmitis. Povidone iodine has been proved to be efficient in reducing the ocular adnexal flora perioperativley. Li et al. [17] in their randomized controlled trial studied the efficacy of povidone iodine 1.0%, 5.0%, and 10.0% in combination with topical levofloxacin 0.3%-a third generation fuoroquinolone, in reducing the preoperative conjunctival bacterial load before cataract surgery. They found povidone iodine 10.0% more effective than povidone iodine 1.0% and 5.0% in decreasing the conjunctival bacterial load before surgery. Panahibazaz et al. [18] compared the effect of subconjunctival injection of cefazolin with pouring a drop of povidone iodine on the conjunctiva bacterial CFU in phacoemulsification cataract surgery and found pouring a drop of povidone iodine 10% seemed to be a simple and acceptable method to reduce the growth of microorganisms of the conjunctiva. Li et al. [19] in their prospective randomized study evaluated the efficacy of combination antibiotic eyedrops therapy given 1 hour vs 1 day prior to surgery in addition to perioperative povidone iodine disinfection. They used four applications of topical 3,500 IU/ml of neomycin sulfate, 6,000 IU/ml of polymyxin B sulfate plus 1 mg/ml of dexamethasone and 0.04 mg/ml of benzalkonium chloride eye drops 1 hour or 1 day before surgery. They found both prophylactic regimens equally effective in reducing part of the conjunctival bacterial flora (aerobic and microaerophilic conjunctival flora). A case-control study in Western Australia [20] found that preoperative antiseptic preparation reduced the risk of endophthalmitis [odds ratio (OR), 0.19]. Montan et al. [21] reported a significant reduction in bacterial flora after rinsing the conjunctiva with 10 mL chlorhexidine 0.05%. Barkana et al. [22] in their study compared the efficacy of preoperative povidone iodine 4%, ofloxacin 0.3% and chlorhexidine 0.05% and found no difference in the reduction of conjunctival bacterial flora among the three solutions.

We assessed the use of gatifloxacin 0.5% E/D few hours before surgery and found it to significantly reduce the conjunctival microbial load. It is less cumbersome and a simple and effective means of subtracting the potential bacterial load before subjecting the eye to the standard povidone iodine disinfection method followed universally. Arantes et al. [23] studied the preoperative use of ciprofloxacin 0.3% and gatifloxacin 0.3% antibiotics 1 hour before and 14 days after surgery along with povidone iodine and found a significant reduction in the positivity of the cultures in the gatifloxacin group. Carron et al. [24] found that the administration of 0.3% ciprofloxacin eyedrops starting 1 day prior to surgery reduces conjunctival bacterial load in the pre-operative period. However, they found that it was unable to eradicate the bacteria completely and that the administration of povidone iodine reduced conjunctival biota in 50%-70% of patients undergoing cataract surgery.

In our study, we found that gatifloxacin eyedrops 0.5% instillation few hours before surgery shows significant reduction in bacterial count, especially in coagulase negative *Staphylococcus*, as well as for *Streptococcus pneumoniae* and *Corynebacterium diphtheriae*. Pre-surgical use of gatifloxacin eyedrops just few hours before surgery serves as a simple, patient-friendly and cost-effective means to reduce the conjunctival microbial load and thus may add to the efficacy of povidone iodine used perioperatively. Thus we can conclude that using gatifloxacin 0.5% eye drops pre-operatively on the day of surgery alone is a valuable treatment for decreasing the conjunctival bacterial load in the patient.

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