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ORIGINAL ARTICLE

Antibiotic resistance patterns of ocular surface bacterial flora

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ABSTRACT

Background: Post operative intraocular infection (endophthalmitis) is a rare but devastating complication. The present study aimed to determine the antibiotic susceptibility pattern of ocular surface bacterial flora isolated preoperatively from patients undergoing intraocular surgery.

Materials and methods: In a prospective study, 269 patients scheduled for anterior segment surgeries, were enrolled, for whom lid and conjunctival cultures were obtained on the day of surgery before application of povidone – iodine or antibiotic drops. Bacterial isolates were identified and tested for antibiotics susceptibility using Kirby-Bauer disc-diffusion technique.

Results: Of 269 studied eyes, 127(47.2%) were male. In 101 (37.5%) cases bacterial growth was positive. Isolated bacteria in order of frequency were coagulase negative staphylococci (CNS) (90.0%), coagulase positive staphylococci (CPS) (4%), diphteroid (3%), gram negative bacillus (2%) and streptococci (1%). Totally, 95% of coagulase negative staphylococci were susceptible to vancomycin, amikacin and gentamicin. Less than 70% of isolated CNS were sensitive to ceftriaxon, tetracyelin, erythromycin, oxacillin, cotrimaxazole, and penicillin.

Conclusion: Preoperative ocular surface isolates of CNS seems to be most sensitive to vancomycin, amikacin and gentamicin. Thus, preoperative application of these medications into ocular surface is suggested.

Keywords: *Ocular bacteria flora, Antibiotic resistance, Endophthalmitis.*

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INTRODUCTION

The Post operative intraocular infection (endophthalmitis) is a rare but devastating complication that usually leads to severe loss of vision or blindness. The reported incidence varies depending on the type of surgery ranging from 0.05 to 0.37% (1). Previous studies have shown that preoperative prophylactic antibiotic use significantly reduces the number of conjunctivial bacteria at the time of surgery (2,3).

Results of such studies influenced practice patterns of eye surgeons for using preoperative topical antibiotics or povidone-iodine (4).

The optimal choice of preoperative topical antibiotics depends on many factors, including the isolated bacteria, their antibiotic sensitivity and resistance patterns, rapidity of action, rate of penetration and their toxicity (4).

The most common organisms causing bacterial postoperative endophthalmitis are gram- positive

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cocci, especially coagulase negative staphylococci (CNS).

Recent changing resistance patterns and new multiresistant strains of ocular surface organisms especially to topical Floroquinolone and aminoglycosides necessitates further investigations about antibiotic susceptibility of isolated bacteria from patients undergoing intraocular surgery. Therefore, the present study was conducted with the aim of determining the antibiotic resistance patterns of ocular surface bacterial flora in a group of Iranian patients.

PATIENTS and METHODS

A total of 269 consecutive patients scheduled for intraocular surgery at Matini hospital affiliated to Kashan University of Medical Sciences, during a 6-month period were enrolled. The following exclusion criteria were applied at baseline: using topical antibiotic, recent ocular surgery, any systemic disease affecting immune response such as diabetes mellitus.

Lower lid margin and inferior fornix conjunctival cultures were obtained from the scheduled eye before application of topical anesthetic, antibiotic or povidone-iodine. The patient was asked to look up, then lower lid margin and inferior cul-de-sac were swabbed using a moistened sterile swab. Culture sample were immediately inoculated into blood agar and chocolate, EMB (Eosine-Methylen Blue) plates. All culture media were incubated at 37ºC for at least 10 days, after which, bacterial colonies isolated and identified by standard methods.

The isolated organisms were then transferred to TSB (Triptico-Soy-Broth) media in order to increase the number of colonies, then inoculated in Muller–Hilton disc diffusion test. Antibiotic susceptibility testing was performed on all bacterial isolates using Kirby-Bauer disc diffusion technique (4). The results of susceptibility testing with each of the 12 studied antibiotics were interpreted and recoded according to National Committee For Clinical Laboratory standards guideline (NCCL) (5).

All patients were requested to complete an informed consent. Data were analyzed by EPI software with chi-square test. For all tests, significance was defined as $p<0.05$.

RESULTS

The study population included 127(47.2%) males and 142(52.8%) females with a mean age (± standard deviation) of 66±17 years (a range, 5-86 years).

Of 269 cultured specimen, 101(37.5%) showed bacterial growth. Indeed, a total of 5 bacterial strains were isolated from 101 eyes. Coagulase negative staphylococci (CNS) were the most commonly cultured organisms accounting for 90% of positive cultures. Other isolated organisms included Staphylococcous aureus (4%), diphteroid (3%), gram-negative bacillus (2%), and streptococci (1%).

Table 1 summarizes characterization of patients according to their culture results. Figure1 summarizes CNS antibiotic susceptibility pattern of our patients. These organisms were highly resistant to penicillins, erythromicin and tetracycline. They were relatively more sensitive to ciprofloxacin, ceftriaxon, chloramphenicol and doxycyclin.

Table 1. *Characteristic of patients underwent intraocular surgery according to their culture results*

	Number of eyes	Positive culture (%)	Negative culture (%)
Age (years)			
<30	11	3 (27.3)	8 (72.7)
31 – 60	43	10 (23.3)	33 (76.6)
>60	215	88 (31)	127 (59)
Gender			
Male	127	54 (42.5)	73 (57.5)
Female	142	47 (33.1)	95 (66.9)
Eye			
Right	142	54 (38)	88 (62)
Left	127	47 (37)	80 (63)

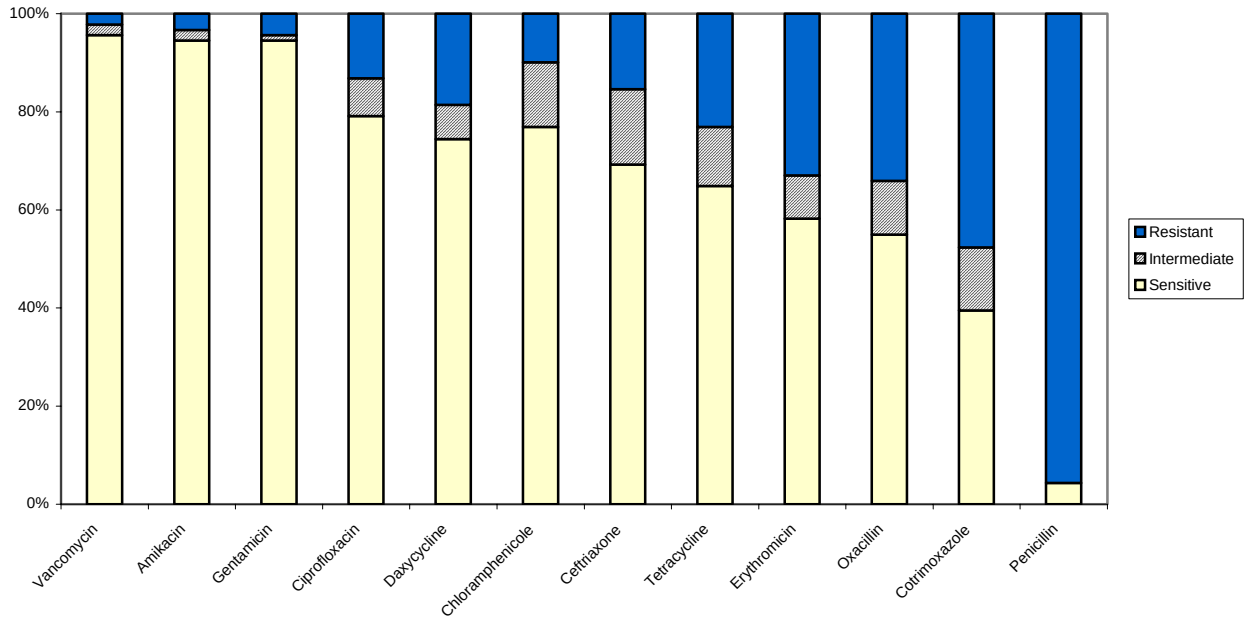

Figure1. *Antibiotic susceptibility pattern of coagulase negative staphylococci (CNS)*

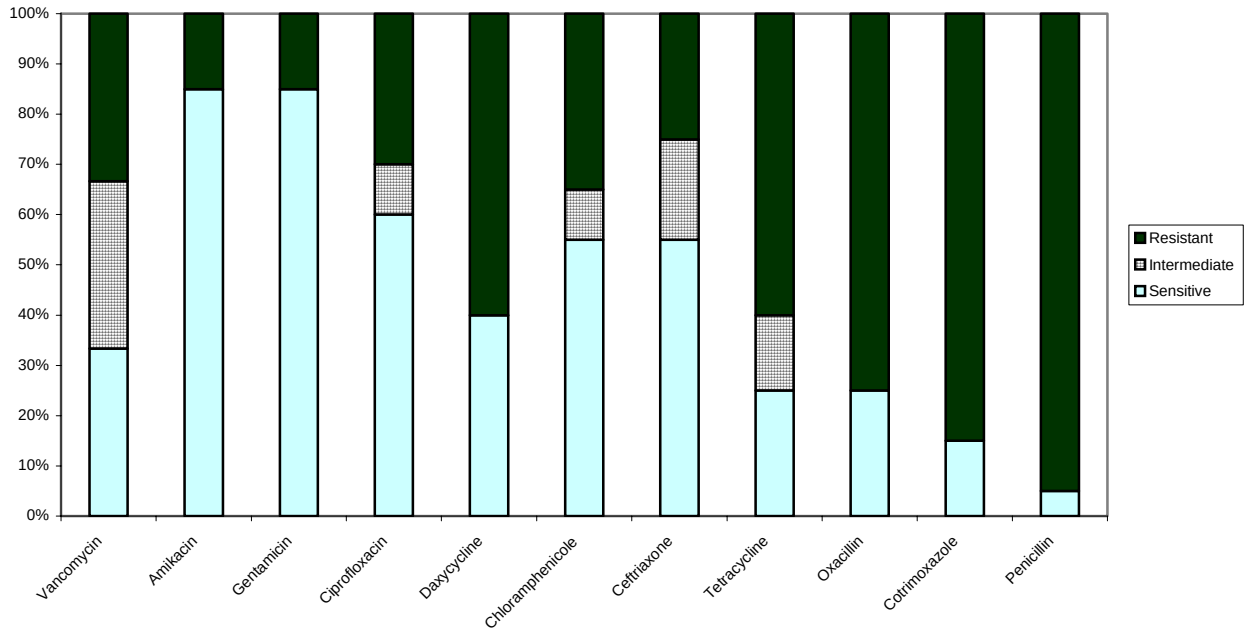

Figure 2. *Antibiotic susceptibility pattern of multi-resistant coagulase-negative staphylococci (No.20)*

Figure 2 shows the corresponding percentages of CNS that were resistant to multiple antibiotics. Of 91 CNS isolates, 20 (22%) were resistant to at least 5 of the 12 tested antibiotics (figure 2).

DISCUSSION

The major route of postoperative endophthalmitis is lid and conjunctional bacterial flora entrance at the time of operation (5,6). Thus, one of the goals of reducing the rate of postoperative endophthalmitis is eliminating bacterial surface organism. It has been shown that preoperative application of both topical povidone-iodine or antimicrobial agent is effective in reducing the incidence of ocular contamination as measured by the growth of bacterial colonies (3,4,6).

Some surgeons use intraoperative subconjunctival or intraocular infusion of optimal antibiotics (4,7). For selection of optimal antibiotics give before, during or even after operation for reducing ocular surface bacterial colonies, it is important to characterize their nature and determine their antibiotic susceptibility patterns in patients undergoing intraocular surgeries. This is very important due to new emergence of bacterial resistance that has resulted from widespread and prolonged use of antimicrobial agents.

This study showed that the most common organisms colonizing the ocular surface were CNS that is compatible with other previous studies (8,9). Our results showed that they are most sensitive to vancomycin and aminoglycosides (70-95%) and most resistant to penicillins (95.6%). Totally, 22.5% of isolated organisms were multi-resistant. This relatively high rate of multi-resistant organisms isolated from ocular surface is compatible with previous studies demonstrating resistant organisms cause of post operative endophthalmitis (10,11). Isolated CNS had intermediate sensitivity to cephalosporine (15.5%). Sensitivity of isolated CNS to tetracycline and erythromycin, the two commonly used topical ointments, was 65% and 58%, respectively.

Flouroquinolones (ciprofloxacin), are a group of broad-spectrum bactericidal agents that are used most frequently pre- and post-operatively. Seventy-nine percent of isolated CNS were sensitive to ciprofloxacin.

Our results show that 22.5% of isolated organisms from normal surface are multi-resistant. One study (12) showed that 29% of CNS isolates from infected eyes were resistant to 3 or more antibiotics. Our multi-resistant organisms were sensitive to vancomycin, amikacin and gentamicin. Prior investigators have proposed the following factors to affect the antibacterial efficacy: frequency, concentration of topical or subconjunctival application, minimal inhibitory concentration (MIC) of the drug, bioavailability and rate of its elimination from the tear. Till now, in vitro antibiotic susceptibility testing is the most commonly cited standard and will continue to guide the clinician in antibiotic selection (13,14).

Chosen antibiotics for prophylaxis of post-operative endophthalmitis should have most effectiveness against bacteria in vitro.

There is a large controversy about prophylactic effect in reducing the rate of post-operative endophthacmitis, but the use of peri-operative prophylactic antibiotics in intraocular surgery is based on the assumption of reducing ocular surface normal flora (15, 16).

In conclusion, the isolated CNS from ocular surface of patients scheduled for intraocular surgery are more sensitive to vancomycin, amikacin and gentamicin.

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