Original Article

CONJUNCTIVAL BACTERIAL FLORA AND ANTIBIOTIC RESISTANCE PATTERN IN PATIENTS UNDERGOING CATARACT SURGERY

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ABSTRACT

Objectives: The purpose of this study was to evaluate the conjunctival bacterial flora and its antibiotic susceptibility pattern in eyes of patients undergoing cataract surgery.

Methodology: Conjunctival soap was obtained on the day of surgery before the application of topical anesthetic, antibiotic or povidone-iodine. Culture and antibiotic susceptibility tests were performed. The data was analyseed with X^2 and T tests.

Results: Of the 170 patients 89 cases (52.4%) had positive cultures in the eyes. In 79 eyes (88.8%) found coagulase-negative *Staphylococcus* (CoNS). Eighty two cases (95.3%) of isolated *Staphylococcus* were susceptible to Amikacin, 86 (100%) sensitive to Ciprofloxacin and 42 (48.8%) sensitive to Ceftazidime. Average susceptibility and resistancy to antibiotics was 2.6 (±1.8) antibiotics in women and 1.6(±1.4) in men (P= 0.009).

Conclusions: This study showed that the bacterium most frequently found in the conjunctival flora of the patients undergoing cataract surgery was CoNS. Isolates of this bacterium had low CoNS susceptibility rates to Caftazidime and Vancomycin and high susceptibility to Ciprofloxacin and Amikacin.

KEY-WORDS: Bacterial flora, Drug resistance, Cataract, Endophthalmitis, Coagulase-negative staphylococcus.

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INTRODUCTION

One of the most feared complications of cataract surgery is endophthalmitis that, although infrequent, leads to high visual morbidity even with appropriate treatment. For this reason, ophthalmologists adopt several measures for its prophylaxis.[1] Postoperative endophthalmitis reflects in part quality and safety aspects of cataract surgery.[2]

Bacteria are the most common group of causative agents of endophthalmitis and gram-positive pathogens are responsible for 60 to 80% of acute infections.[2] Previous studies have shown that most bacteria responsible for postoperative ocular infection are part of the normal

microbial flora of the conjunctiva and eyelids of the patient.[3,4] The culture is positive in 50 to 85% of the vitreous aspirates and the coagulase-negative *Staphylococcus* (CoNS) is the most frequently isolated pathogen, followed by S. *aureus* and *Streptococcus* spp; gram-negative organisms are responsible for 20% of the infections.[5] Despite being important ocular pathogens, CoNS have so far received little attention in ophthalmology.[6]

Once superficial flora enters the eye during the cataract surgery,[7,8] several prophylactic measures are applied to suppress or limit the growth of these microorganisms, which could lead to endophthalmitis. However, not many studies evaluate the effect of topical antibiotics on the endophthalmitis incidence, so the use of these drugs before surgery is considered as probably relevant for infection prophylaxis, but not definitely related to clinical outcome.[1]

The choice for the prophylactic topical antibiotic is influenced by factors such as spectrum of bacteria covered, the rapidity with which the antibiotic eliminates bacteria from the conjunctival surface, the duration of action, the penetration and toxicity of the antibiotic, the antibiotic susceptibility pattern and the cost.[9-11] Fluoroquinolones are commonly used agents for endophthalmitis prophylaxis, although there is the possibility that the resistance of the ocular bacterial flora to these antibiotics is increasing.[9-11]

The purpose of this study was to evaluate the conjunctival bacterial flora and its antibiotic susceptibility pattern in eyes of patients undergoing cataract surgery.

METHODOLOGY

From 2004 to 2005, 160 patients undergoing cataract surgery in the Ophthalmology department of Kermanshah University of medical sciences were prospectively evaluated. All patients underwent ophthalmologic evaluation and patients with signs of ocular infection, external foreign body, or use of systemic or local antibiotic in the past week were excluded. Conjunctival soap was obtained on the day of surgery before the application of topical anesthetic, antibiotic or povidone-iodine. The inferior conjunctival fornix was swabbed, without touching eyelid or lashes, the swab was then stored in Triptycasein Soy Broth. Then the samples were cultured in blood agar, eosin methylene blue and also Sabouraud agar plates for the culture of fungus.

The material collected by the swab was rolled in a Petri plate with solid culture medium and spread with a platinum wire in lines, covering all surface of the plate. This procedure allowed the isolated growth of the colonies. Later, the plates were incubated at 36±1°C for 24 to 48 hours and if the culture was positive the antibiotic susceptibility tests were carried out.

Antibiotic susceptibility tests: The sensitivity of the isolated microorganisms was determined by the disc-diffusion method. The reading was made measuring the inhibition halo surrounding the disc.

Statistical analysis was performed by SPSS 12 software and using T- test.

RESULTS

Of the 170 patients participating in this study, 88 (51.8%) were left eyes and 82 (48.2%) were right. ninty cases (52.9%) were males and 80 (47.1%) females, the mean age was 64.02±15.8 years. The cultures were positive in 89 cases (52.4%) of the eyes.

The most frequently isolated bacterium was the coagulase-negative *Staphylococcus* (CNS), found in 79 eyes (88.8%). *Staphylococcus aureus* was isolated from 7 eyes (7.9%), *proteus spp.* from two eyes (2.2%) and *Citrobacter freundii* from 1 eye (1.1%). In this study 82 cases (95.3%) of isolated *Staphylococcus* were sensitive to Amikacin, 86 (100%) sensitive to Ciprofloxacin and 41 (47.7%) sensitive to Ceftazidime. (Table-I)

Eleven isolates (12.4%) were sensitive to all antibiotics. Twenty three (25.8%) did not show any resistance to antibiotics. Among the isolated *Staphylococcus* colonies for which antibiotic susceptibility tests were carried out, 7 cases (8.1%) showed resistance to several antibiotics (three or more), and 30 cases (34.9%) were resistant or intermediate susceptible to several

Table-I: Antibiotics susceptibility testing of CoNS and *Staphylococcus aureus*

Species	*Coagulase-negative N(%)*			*Staphylococcus aureus N(%)*			*Total N(%)*		
	S	I	R	S	I	R	S	I	R
Amikacin	76 (96.2)	2 (2.5)	1 (1.3)	6 (85.7)	1 (14.3)	0	82 (95.3)	3 (3.5)	1 (1.2)
Ciprofloxacin	79 (100)	0	0	7 (100)	0	0	86 (100)	0	0
Gentamicin	71 (89.9)	5 (6.3)	3 (3.8)	6 (85.7)	1 (14.3)	0	77 (89.5)	6 (7)	3 (3.5)
Cefteriaxone	62 (78.5)	11 (13.9)	6 (7.6)	7 (100)	0	0	69 (80.2)	11 (12.8)	6 (7)
Vancomycin	46 (58.2)	26 (32.9)	7 (8.9)	2 (28.6)	4 (57.1)	1 (14.3)	48 (55.8)	30 (34.9)	8 (9.3)
Ceftazidime	36 (45.6)	3 (3.8)	40 (50.6)	5 (71.4)	0	2 (28.6)	41 (47.7)	3 (3.5)	42 (48.8)
Trimethoprim	23 (29.1)	22 (27.8)	34 (43)	2 (28.6)	0	5 (71.4)	28 (32.6)	22 (25.6)	36 (41.9)
Ceftizoxime	68 (86.1)	5 (6.3)	6 (7.6)	6 (85.7)	1 (14.3)	0	74 (86)	6 (7)	6 (7)

S= Sensitive I= Intermediate R= Resistance

antibiotics (Table-II). One of the isolated proteus was resistant to trimethoprim and intermediate susceptible to Vancomycin. The isolated *Citrobacter freundii* was susceptible to all of antibiotics. The mean of susceptibility and resistancy to antibiotics was 2.6 (±1.8) in women and 1.6(±1.4) in men (F: 7.115, df: 1, p: 0.009)

DISCUSSION

The choice of antimicrobial agent to treat ocular pathogens, like most other infectious diseases, is made empirically. The optimum antimicrobial agent for eye infections would be expected to have proven activity against the relevant pathogens.[13]

The resistance rates to antibiotics are growing with the dissemination and prolonged use of antimicrobial agents. Based on this, the characterization of bacterial ocular flora and its susceptibility pattern is highly justified, as it gives the surgeon a powerful tool to help in the choice of the most appropriate antibiotic to be used in the prophylaxis of his ocular surgeries.[9]

It is known that the use of prophylactic antibiotics in cataract surgery reduces the number of organisms in the conjunctiva and eyelids.[1,3] Other desirable characteristics are good bioavailability, broad-spectrum coverage and favorable susceptibility patterns.[9-11]

In this study, the most frequently found organism was the CoNS, as shown in other studies,[9, 4-17] this organism is related to approximately 70% of the cases of post-surgical endophthalmitis.[18]

There was a low susceptibility rate to Vancomycine and Ceftazidime only 55.8% and 47.7% of the isolates were sensitive to those antibiotics. In Arantes study 86.0% had positive cultures and more than 90% of the isolates of these bacterium were susceptible to vancomycin.[17]

Table-II: Multiple antibiotic resistance of CoNS and *Staphylococcus aureus*

Resistance to	*Intermediate No. (%) of isolates*	*Resistant No. (%) of isolates*	*Total Resistant No. (%) of isolates*
No Resistance	38 (44.2)	21 (24.4)	11 (12.8)
1 Antibiotic	27 (31.4)	39 (45.3)	28 (32.6)
2 Antibiotics	13 (15.1)	19 (22.1)	17 (19.8)
3 Antibiotics	6 (7)	4 (4.7)	15 (17.4)
4 Antibiotics	0	2 (2.3)	4 (4.6)
≥ 5 Antibiotics	2 (2.3)	1 (1.2)	11 (12.8)

In other studies antibiotic resistancy might be due to indiscriminate and prolonged use of the drugs and the common practice of self-medication[17] but those antibiotics which are not used frequently in Iran and the causes of this, low susceptibility rate to Vancomycin and Ceftazidime is unknown.

The number of CoNS isolates resistant to three or more antibiotics (8.2%) was lower than the 39% described by Ta[9] and 29% by Pinna,[6] which is similar to another study (9.0%)[19] and Arantes et al (10.5%).[17] Multiple antibiotic resistances of CoNS are a well recognised problem, especially in nosocomial infections.[20-26] Our results imply low rates of ocular colonization with multi-resistant bacteria and demographic differences in the resistance pattern of the ocular bacterial flora. Females had a larger mean of resistance to antibiotic than men (p=0.009) that has not been described in other studies.

There was more susceptibility rate to Ciprofloxacin (100%) but other stories[6,17] found a reduction in the susceptibility rates to this antibiotic (70 to 90%). The CoNS in this research was equal or more susceptible to Gentamicin than described in a previous study 57% to 90%.[1,6,13,17,27]

Another point to be considered is that our tests of antibiotic sensitivity were performed in vitro and might not reflect the real efficiency of these antibiotics in vivo. In addition, the disc-diffusion sensitivity test technique is based on the serum concentration of the antibiotics that might be different from the concentration in the conjunctiva with the topical use of eye drops.[9] This suggests that our study can be used by the ophthalmologists in Iran as an orientation tool when choosing a prophylactic antibiotic to be used in their surgeries but our results should be confirmed by in vivo tests.

CONCLUSION

This study showed that the bacterium most frequently found in the conjunctival flora of the patients undergoing cataract surgery was the CoNS. Isolates of this bacterium had low susceptibility rates to Caftazidime and Vancomycin and high susceptibility to Ciprofloxacin and Amikacin. Nowadays, with the considerable increase of bacterial resistance to antibiotics, the understanding of the sensitivity of the conjunctival bacterial flora to antibiotics is of fundamental importance. Additionally, these studies can guide the ophthalmologists when choosing a prophylactic antibiotic to be used in their surgeries in Iran.

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