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A Study on the Effect of Antibiotics on the Normal Flora of the Eye.

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Abstract

The eye flora was studied in 50 cases before and after receiving local antibiotics as a preoperative preparation for ocular surgery. Cultures from inner canthus, upper and lower fornices were done before and after receiving antibiotics for 24 hours. *Staph. epidermidis* was found to be the most predominant type of bacteria comprising the eye flora (66%). Comparing bacterial flora in different sites of the eye revealed that the upper fornix is the most sterile site of the eye, while the inner canthus was the least sterile. As a preoperative preparation for ocular surgery, the three antibiotic regimens used succeeded in eradicating or reducing bacterial flora. The most efficient antibiotic regiment used was mephenicol eye drops with polymyxin-B sulphate ointment.

Introduction

THE eye harbours bacteria from the time of birth throughout life [1]. The presence of microorganisms in the normal human conjunctiva was established in the 19th century [2]. Since that time the normal aerobic flora of the adult human conjunctiva has been studied by numerous authors from various countries. These bacterial flora include *Staphylococcus epidermidis, Streptococcus viridans, Corynebacterium sp., Haemophilus sp. and Neisseria sp.* [1].

Postoperative bacterial endophthalmitis is one of the most feared complications of intraocular surgery as it seriously compromises vision [4]. Today the most common infecting organism is *Staphylococcus epidermidis* [5, 6, 7]. The source of infecting bacteria is often unknown in postoperative endophthalmitis. Many workers

presume that the infecting staphylococci originate from the patient's own external flora [8]. Therefore, attention should be directed toward the external tissues and their microbial flora in the prophylaxis and prevention of postoperative bacterial endophthalmitis [9].

To minimize the risk of postoperative infections prophylactic topical antimicrobial therapy is usually administered prior to intraocular surgery [10].

This work was planned to isolate and study the eye flora present in inner canthus, upper and lower fornices. The effect of topical preoperative antibiotics on the flora was also studied comparing the eye flora before and after administration of antibiotics.

Material and Methods

Patients :

Fifty patients from Ophthalmology Department of Kasr El-Aini Hospital of different age and sex were studied. They received topical antibiotics for 24 hours before intraocular surgery according to the regimens used in the ophthalmology department. The antibiotic regimens used were mephenicol eye drops 4 times for 24 hours (36 cases), mephenicol eye drops with polymyxin-B sulphate (9 cases) and polymyxin B-sulphate, bacitracin and neomycin solution 3 times for 24 hours (5 cases).

Specimens:

Specimens were taken by sterile broth moistened cotton swabs from inner canthus, upper and lower fornices twice from each patient. The first on admission of the patient to hospital before receiving antibiotics and the second after administration of local antibiotics and just before surgery.

Methodology:

Swabs were cultured aerobically on blood agar and nutrient agar media for 24-48 hours at 37°C. To identify the organisms, Gram stained films from cultures were done and if they revealed: (i) Staphylococci: coagulase, fermentation of trehalose, mannitol and sucrose were done. (ii) Gram negative bacilli: motility, growth on MacConkey's medium, sugar fermentation tests, oxidase, gelatinase, indole, nitrate reduction tests were done. API system was used in some cases that could not be identified by these tests. (iv) Gram positive bacilli: Oxidase, catalase, gelatinase, urease and sugar fermentation tests were done.

Results

The bacterial flora that were isolated from inner canthus, upper and lower fornices of 50 cases before receiving antibiotics are summarized in table (1).

The upper fornix was found to be sterile in 25 (50%) cases, contained one organism in 20 (40%) cases and more than one organism in 5 (10%) cases. The lower fornix was found to be sterile in 12 (24%) cases, contained one organism in 33 (66%) cases and more than one organism in 5 (10%) cases. While inner canthus was

sterile in 8 (16%) cases, contained one organism in 31 (62%) cases and more than one organism in 11 (22%) cases.

Different groups of bacteria isolated from the eye are shown in table (2). The most common organism present as eye flora was *Staph. epidermidis* (66%). The other organisms less commonly present are summarized in table (2).

Table (1): Comparison between Bacterial Flora Flora in Inner Canthus, Upper and Lower Fornices before Antibiotic Administration.

Site	Sterile		One Organism		More than One Organism	
	No.	%	No.	%	No.	%
Upper fornix	25	50	20	40	20	40
Lower fornix	12	24	33	66	33	66
Inner canthus	8	16	31	62	31	62

Table (2): Different Groups of Bacteria Isolated from the Eye.

Type of organism	Number of Patients	%
Staph. epidermidis	33	66
Staph. aureus	3	6
Staph. capitus	2	4
Staph. saprophyticus	3	6
Staph. haemolyticus	2	4
Staph. viridans	6	12
Corynebacterium hofmanii	4	8
Pseudomonas paucimobilis	5	10
Pseudomonas maltophilia	1	2
Moraxella	2	4
Acinetobacter	2	4
Neisseria pharyngis	3	6

Different types of bacteria of eye flora isolated from children and adult eyes are compared in table (3). *Staph. epidermidis* was the dominant organism of bacterial flora of the eye both in children and adults.

Table (3): Types of Organisms of the Eye Flora in Children and Adults.

Type of organism	Children (up to 15 years)	Adults (> 15 years)
Total cases	9	41
Staph.		
epidermidis	7	26
aureus		2
capitus		2
saprophyticus	1	3
haemolyticus	2	
Strept. viridans		6
C.hofmanii		5
PS. Paucimobilis		5
PS. maltophilia		1
Moraxella		2
Acinetobacter		1
N. pharyngis		3

The effect of three antibiotic regimens used on eye flora is shown in table (4). The most common antibiotic regimen used was mephenicol eye drops four times for 24 hours (36 cases). It could sterilize 11 cases and reduce growth of 17 cases. While mephenicol eye drops and polymyxin-B sulphate ointment could eradicate bacteria in 7 out of 9 cases and decrease the count in 2 cases. Polymyxin-B sulphate, bacitracin and neomycin solution used 3 times for 24 hours used in 5 patients could eradicate bacteria from 3 cases and reduce counts in two.

The effect of different antibiotic regimens on staphylococci which are the most commonly isolated organisms was also studied (Table 5). Mephenicol eye drops alone could eradicate coagulase negative staphylococci from 7 out of 21 cases and decrease bacterial growth of coagulase positive staphylococci in one case.

Mephenicol eye drops with polymyxin-B-sulphate ointment could eradicate coagulase-negative staphylococci from 8 out of 9 cases and decrease bacterial growth in the other. However, polymyxin B sulphate, bacitracin and neomycin were able to eradicate coagulase negative staphylococi from one case out of three.

Discussion

The normal eye flora was studied in 50 subjects awaiting ocular surgery. Six percent of conjunctivae of the tested eyes were found to be sterile.

Table (4) : the Effect of Different Antibiotic Regimens on Eye Flora.

Type of antibiotic regimen used	Total No. of patients	No. of patients with + ve culture before antibiotic	No. of patients becoming sterile	%	No. of patients showing decreased growth	No. of patients showing no change
1. Mephenicol eye drops 4 times for 24 hours.	36	33	11	33.3	17	5
2. Mephenicol eye drops every 4 hours for 24 hr. + polymyxin B sulphate ointment	9	9	7	77.7	2	
3. Polymyxin B sulphate, bacitracin and neomycin solution 3 times for 24 hr.	5	5	3	60	2	

Table (5) : The Effect of Different Antibiotic Reginens on Staphylococci.

Type of antibiotic regimen	Type of org.	No. of isolates	Patients becoming sterile No.	%	Patients showing decreased growth
1. Mephenicol eye drops	Coagulase -ve staph	21	7	33.3	14
	Coagulase + ve staph		1		1
2. Mephenicol eye drops + polymyxin B sulphate ointment	Coagulase -ve staph	9	8	88.8	1
	Coagulase + ve staph	2	1	50	1
3. Polymyxin B sulphate, bacitracin and neomycin	Coagulase -ve staph	3	1	33.3	2

Comparing culture results of specimens obtained from different sites of the eye revealed that the upper fornix was the most sterile site (50%), followed by the lower fornix (24%) whereas the inner canthus was shown to be the least sterile (16%).

Staph. epidermidis was the most common organism isolated (66%). Similar results were obtained by Perkins et al. [11], Seal et al., [12] and Taylor et al. [10] who isolated *Staph. epidermidis* from 69.8%, 57% and 55% of normal eyes respectively. Other organisms which were less commonly isolated were *Staph. viridans* (12%) *Pseudomonas* species (12%), *Staph aureus* (6%), *Moraxella* (4%) and *Acinetobacter* (4%). Most of these organisms were also isolated by Mahajan [13] Taylor et al. [10] and Jawetz et al. [11] with more or less the same percentages.

When eye florae were compared in different ages, it was found that some species e.g *Strept. viridans, C.hofmanii, Staph. aureus* and *Pseudomonas* species were only isolated from adult conjunctivae. The same finding was reported by Singer et al. [15], who isolated more number of species from the adult conjunctivae than from children. On the other hand, Locatcher-Khorazo and Seegal [1] reported that bacterial flora was not modified by age except for a rise in incidence of diphteroids in those over 50 years.

To evaluate the effect of different antibiotic regimens on eye flora, three antibiotic

regimens were studied for their effectiveness in decreasing or eradicating flora of the eye before surgery. All the three schedules reduced bacterial growth of almost all cases when compared with cultures before the use of antibiotics in the same eye. drops with polymyxin-B sulphate ointement were more effective (88.8%) against coagulase negative staphylococci than mephenicol eye drops alone (33.3%). However, Whitney et al. [14] fount that 99%of coagulase negative and positive staphylococci were sensitive to gentamicin.

Considering the fact that *Staph. aureus* was isolated from only three cases, the effect of antibiotics on this important pathogen could not be properly evaluated.

It can be conculded from this study that the inner canthus is the most contaminated site of the eye. *Staph. epidermidis* is the most common organism of the eye flora which may represent an important cause of post operative endophthalmitis. Preoperative administration of local antibiotics e.g. mephenicol eye drops with polymyxin-B-sulphate-ointment can eradicate or reduce eye flora and minimze the risk of post-operative endophthalmitis.

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