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A study of the normal bacterial flora on the conjunctiva of patients undergoing cataract surgery to select the best pre-operative topical antibiotic

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Abstract

Cataract is the major cause for visual defects in developing countries like India, for which surgery is a main stay of treatment. This study was undertaken on 100 healthy patients at a tertiary health centre of Southern Karnataka, India between January 2010 and January 2011. The conjunctival swab and scrapings were subjected for microbiological investigation. The culture and sensitivity reports to chlaramphenicol, gentamicin, amikacin, tobramycin, ciprofloxacin were evaluated. Conjunctival Swab of 50% of patients was sterile, 21% showed presence of diphtheroids, 11% showed staphylococcus epidermidis, 10% had fungal growth and 6% had pseudomonas. This study emphasis the need for instillation of antibiotics into the conjunctival sac so has to prevent post-operative bacterial infection by the normal flora of the conjunctiva.

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1. Introduction

Cataract is the major cause for blindness in developing countries like India.¹ Cataract surgical rates have increased considerably over the past decade in India.² Being a common surgery does not make it a safe surgery. Post-operative endophthalmitis is one of the most dreaded complications of cataract surgery. Various studies done in the past have shown that the most common offender is the patient's own indigenous bacterial flora of the eyelids and conjunctiva.³ Previous studies and experience have shown that there is a wide variation in the pattern of the normal bacterial flora of the eye

depending on the climatic and geographical variations and there was a drastic reduction in the incidence of post-operative endophthalmitis in patients where pre operative topical antibiotics were used.⁴ It is a well known fact that the lid margins and the conjunctiva of individuals are usually unsterile. Soon after birth they are invaded by a host of bacteria and remain so throughout life.⁵ The present study has been aimed at identifying the normal organisms found in the conjunctiva of healthy eyes of patients undergoing cataract surgery at a tertiary care centre, to study the sensitivity of the microorganisms and suggest the most suitable pre-operative topical antibiotic.

2. Materials and methods

Hundred healthy patients attending the out patient department of our institute for cataract surgery between January 2010 to January 2011 were subjected to a conjunctival swab and scrapings for microbiological investigation. The culture results were tabulated and the sensitivity was determined. All patients with senile or presenile cataract and no signs of intraocular or extraocular infection were included in our study. Children less than 18 years of age and patients with signs of infection were excluded. Written informed consent was taken from all the patients. The conjunctival scrapings and swabs collected from the patients were immediately sent to the laboratory for investigations. The scrapings and swabs were subjected to Gram's staining, KOH staining and culture sensitivity. Sensitivity was done after the isolation of the bacteria. It was done by disc diffusion method using filter paper discs incorporated in different antibiotics in the nutrient agar plate. The antibiotics tested for sensitivity were chloramphenicol, gentamicin, amikacin, tobramycin, and ciprofloxacin. Patients were prescribed broad spectrum antibiotic (gentamicin, ciprofloxacin) eye drops as pre-operative prophylaxis before cataract surgery. Manual small incision cataract surgeries were performed under local anaesthesia peribulbar block. The patients were followed up on day 1, day 7, day 15 and day 30 post-surgery to rule out post-operative endophthalmitis. Antibiotic and steroid combination eye drops (ciprofloxacin 0.3% and dexamethasone 0.1%) and anti-inflammatory eye drops (flurbiprofen 0.03%) were prescribed.

3. Results

In the study there were 65% males and 35% females. 83% of the patients were in the age group of 60 to 70 years. Twenty five percent of the patients were hypertensives on medication and 10% were diabetics and the illness was brought

under control prior to the surgery. Eighty six percent had senile immature cataract, 8% had senile mature cataract, 4% had pre-senile cataract. One patient had lens induced glaucoma and one patient had complicated cataract. The conjunctival swab of 50% patients was sterile and showed no growth on the culture media. Twenty one percent showed the presence of diphtheroids, 11% showed Staphylococcus epidermidis, 10% had fungal growth, 6% had pseudomonas and citrobacter and Staphylococcus aureus were seen in one patient each. The bacteria isolated by the culture were subjected to chloramphenicol, gentamicin, amikacin, tobramycin and ciprofloxacin. The bacteria isolated were sensitive to all the above antibiotics. The sensitivity of the fungal growth was not done.

4. Discussion

This research was conducted to study the normal flora of the conjunctiva of the patients undergoing cataract surgery in a tertiary care centre. A microbiological study was conducted along with culture and sensitivity to prescribe the most effective pre-operative antibiotic to be used for the patients undergoing cataract surgery. The main parameters for this study included bacterial growth on the culture medium from the samples collected from the patients' conjunctiva and the sensitivity of the isolated bacteria to the antibiotics tested. The cultures showed growth of different bacteria in the hundred eyes tested among which Diphtheroids (*C. xerosis*) was the most common accounting for 21%. The other organisms were Staphylococcus epidermidis, Pseudomonas, Citrobacter, Staphylococcus aureus and fungus. The results of this study are similar to a study by Locatcher-Khorazo and Gutierrez.³ on 1,027 patients from 1952 to 1968 in the age group of 1 year to 90 years. The age of the patient and the growth of the bacteria did not show any correlation in our study as it did in the study conducted by Locatcher-Khorazo and

Gutierrez.³ Fahmy et al. have shown that anaerobes are rarely present in the normal eyes.^{6,7} Aerobic and anaerobic bacteria are commensals of the normal eye, while fungi (found in 3-20% of the populations) are due to random seeding from the environment.⁸ Most of the fungi recovered from the normal lids and conjunctiva are reflective of the common soil saprophytes of the area.⁸ Age does not appear to affect the anaerobic flora.⁹ Climate and geographic area are important determinants of ocular flora, as are general hygienic conditions.³ The flora changes to *Staphylococcus aureus* and/or gram-negative bacilli in hospitalized patients.¹⁰

The bacteria cultured from the eye usually are similar to those found on the skin and in the upper respiratory tract. Occasionally, gram-negative bacilli, more commonly found in the gastrointestinal tract, are isolated from the eye. In contrast, bacteria commonly found in the air are rarely recovered from the eye. This may be in part because of the high content of lysozyme present in tears. This agent, first described by Fleming in 1922 is an enzyme.¹¹ Glucosaminidase that brings about the lysis of *Micrococcus lysodeikticus*, *Sarcina lutea*, and some *Staphylococcus* by acting on a hexosamine bound in mucopolysaccharide fraction incorporated in the cell wall.¹² It may be that the skin of the face is an important source of contamination of the eye. *Staphylococcus epidermidis* and the diphtheroids enter the eyes from the skin. The nose and hands, however, also are potential areas from which the eyes may acquire bacteria.³ The importance of all these organisms is such that, when they are present in the eye of a patient awaiting surgery, all except *Corynebacterium xerosis* may become pathogenic at one time or another.¹³

The bacteria isolated were subjected to antibiotic sensitivity tests of five commonly used antibiotics namely chloramphenicol, gentamicin, amikacin, tobramycin and ciprofloxacin. The results showed that all the bacteria isolated were

sensitive to all antibiotics. Gentamicin, amikacin, tobramycin and ciprofloxacin were highly efficacious against the bacterial isolates. Some bacteria showed resistance to chloramphenicol, approximately three percent but were sensitive to all the other antibiotics. The decrease in the rate of post-operative bacterial infection from the early part of this century to the present is undoubtedly a result of the advent of improved aseptic technique in the ophthalmic surgery. In addition, the prophylactic and therapeutic role of antibiotics may be important. In some studies, endophthalmitis after cataract surgery shows a higher incidence when no antibiotics are used than when pre-operative topical antibiotics and subconjunctival antibiotics are used.³

The source of infection at the time of surgery include: the pre-ocular tear film or lids; the respiratory flora of the surgeon and assistants; surgical instruments and devices including intra ocular lenses; surgical instruments and medications, particularly intraocular irrigating solutions; and ambient air.¹⁴ Of this group, the most common sources of infection remain the preocular tear film, lacrimal sac, and skin, the normal adult preocular tear film is host to a number of different microorganisms. Although *Staphylococcus* and *Streptococcus* species are found there most commonly, approximately 10 percent of normal persons harbour gram negative rods in their preocular tear film.¹⁵ It has been well established that prophylactic topical antibiotic therapy can significantly decrease the number of organisms in the preocular tear film but can rarely (if ever) truly sterilize it. The ability of topical antibiotics to affect the conjunctival flora depends on the specific antibiotic, timing of dosages and frequency of administration.¹⁶ The value of prophylactic topical antibiotic therapy in decreasing the incidence of postsurgical endophthalmitis is not as clear. Although several case series seem to support the concept that prophylaxis is effective; there has been no randomized double blind study sufficiently large

to confirm this.¹⁶ The microorganisms responsible for immediate post-surgical endophthalmitis reflect the colonization of the precocular tear film and lid margin. As noted previously, these include *Staphylococcus aureus*, *Staphylococcus epidermidis*, multiple species of *Streptococcus*, and assorted gram negative rods.¹⁴

With the advent of modern antibiotics the incidence of post-operative endophthalmitis has sharply declined during the past 30 years. However, it still is one of the most catastrophic complications of cataract surgery.³

5. Conclusion

Instillation of antibiotics (gentamicin, ciprofloxacin, tobramycin) in to the conjunctival sac to make it sterile prior to surgery can prevent post-operative bacterial infection by the normal bacterial flora of the conjunctiva.

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