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# Anterior Chamber Aspirate Cultures After Uncomplicated Cataract Surgery With or Without Intraocular Lens Implantation

KEYWORDS: Extracapsular cataract surgery, aqueous cultures, antibiotic sensitivity.

| * Dr. Parvez Ahmad Handoo | Prof. S. S. Sudan | Masarat Nowshad |
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| Assistant Professor, Department of Ophthalmology, Government Medical College, Srinagar * Corresponding author | Professor, Department of Ophthalmology, Government Medical College, Jammu | Medical Officer, Jammu and Kashmir Health Services |

**ABSTRACT** *We cultured anterior chamber aspirate of 100 patients who underwent uncomplicated extra capsular cataract extraction with or without intraocular lens implantation. The aspirate was obtained at the time of wound closure. Of 100 patients, 29 (29%) had culture positive anterior chamber aspirate. Incidence of culture positive anterior chamber aspirate was significantly higher (□2 = 4.3 of IP less than 0.5%) in eyes with intraocular lens implanted (42%) than those without intraocular lens implantation (22.38%). Staphylococcus was the commonest organism isolated (58.62%) followed by corynebacterium (20.60%). None of the cases in which positive anterior chamber aspirate was obtained, developed any unusual inflammation postoperatively. Antibiotic sensitivity pattern revealed ciprofloxacin to be 100% effective drug against bacterial flora. This study suggests that in the humans, the anterior chamber is capable of clearing a low inoculums of bacteria after cataract surgery without the development of endophthalmitis.*

## INTRODUCTION

In 1972, Constantoras, Metzger and Frenkel[1] concluded that the anterior chamber remained sterile after intra capsular cataract surgery. More recently, Sherwood and associates[2] suggested that the fluid from the conjuctival sac contaminated with bacteria, routinely entered the anterior chamber during extra capsular cataract extraction. Sherwood found a 29% bacterial contamination rate of the anterior chamber after extra capsular cataract extraction. Contamination of irrigation fluid, drugs used locally and of the intra ocular lenses have been reported as a cause of culture positive anterior chamber aspirates in a number of cases.[3] The threat of contamination of anterior chamber from surgeon's hands, sutures and instruments used during surgery is ever present.

The proposition that intraocular lenses play a part in the pathogenesis of intra ocular infection and thus anterior chamber contamination is supported by the fact that electrostatic forces of intraocular lenses allow the bacteria to adhere to implant surface as it passes across the eyelid margin or through the external aspect of the wound. Vafidis[29] studied 100 intra ocular lenses and found bacterial contamination rate of intra ocular lenses as 26%. Dickey[4] and Walter[5] in their respective studies found aqueous fluid culture positive in 43% and 7% of cases during cataract surgery.

This study was designed to assess relative frequencies of species from the anterior chamber at the conclusion of cataract surgery and to know whether intraocular lenses play a part in the contamination of anterior chamber fluid.

## MATERIAL AND METHODS

We studied 100 patients who met the following inclusion criteria:

No history of objective evidence of previous surgery or penetrating injury of the eye.

No local or systemic infection at the time of surgery.

No evidence of posterior lens capsule rupture at the time of surgery.

No additional procedures combined with the uncomplicated cataract extraction, except for intraocular lens implantation.

Patients were hospitalized one day before surgery, their eyelashes were trimmed on the day of admission and the Framycetin eye drops were started 6 hourly in the eye to be operated. Cases were taken at random irrespective of age and sex. The eyes were dilated with 1.0% cyclopentolate. All medications used before surgery were sterile. In the operating room, peribulbar block was given. The eyelids, nose, cheek, eyebrow and forehead were cleaned with 5% povidone iodine solution in concentric rings outward from the eye with a cotton tipped applicator. The eye was then irrigated with sterile 0.9% saline solution. The head was draped with sterile cloth towels in the manner described by King and Wadsworth.[6] Uncomplicated cataract extraction was then performed by an extra capsular technique. A posterior chamber intra ocular lens was placed in 33 patients. All surgeries were performed using a fornix based conjunctival flap. In addition to surgical instruments, sterile balanced salt solution and sterile sodium hyaluronate were placed in the anterior chamber during surgery. Anterior chamber aspirate for bacterial and fungal culture were taken from each patient at the end of operation, before final corneascleral suture placement with the help of irrigation aspiration cannula and disposable 1 c.c. syringe. The contents of the syringe were quickly and equally put on three sterile swabs. Nutrient broth and thioglycolate broth were used for transportation of these swabs to the department of Microbiology subconjunctival injection of gentamycin 20mgs and dexamethasone 2mgs were given at the end of the surgery.

For acrobic culture sheep blood agar, chocolate agar and Mac-conckey agar were used as culture medias where as for anacrobic growth Robertson's cooked meat medium. Blood agar and concentrated blood agar were used, and for fungal isolation sabouraud's glucose agar medium was

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used. On the basis of colony characteristics, hemolytic properties and biochemical reactions, various gram positive and gram negative bacteria were identified. Cultures were grown at least for a period of 6 weeks and weekly check-up was done for the appearance of any growth. The inoculated slant's showing no growth were discarded after 6 weeks. Whenever necessary, subcultures were done. Sensitivity to various antibiotics was tested using control strains of staphylococcus NCTC 6571 and E. coli NCTC-10418 by stoke's disc agar diffusion method which was incubated at $37^0$C for 18-24 hours.

**RESULTS**

These cases of cataract ranged in age from 26 years to 82 years. Of 100 eyes, 29 (29%) had positive anterior chamber aspirate cultures. The pattern of bacteria isolated are shown in table 1.

Acrobes constituted the majority of the organisms isolated (93.10%) Staph. Epidermidis was the commonest organism isolated (58.62%) followed by corynebacterium (20.6%) and propiono bacterium acnes (6.89%). Propionobacterium was the only anacrobe isolated.

Of 100 extra capsular cataract extractions posterior chamber intraocular lens implant was placed in 33 patients. Incidence of positive bacterial cultures of anterior chamber aspirates of patients with intra ocular lens implantation was significantly higher than in those without intraocular lens implantation (table 2).

Table 1: Species of organism isolated

| Micro-Organism | No. of positive bacterial cultures | %age |
|---|---|---|
| Aerobas | 27 | 93.10 |
| Gram positive cocci staphylococcus sp. | 17 | 58.62 |
| Staphylococcus aureus | 1 | 3.44 |
| Strept viridians | 1 | 3.44 |
| Gram positive bacilli Coryne bacterium sp. | 6 | 20.6 |
| Bascilus Sp. | 1 | 3.44 |
| Gram negative bacilli Moraxella Sp. | 1 | 3.44 |
| Anaerobes | 2 | 6.89 |
| Gram positive bacilli Proprionobacterium Sp. | 2 | 6.89 |

Table 2

| Total No. of Cases | Incidence of positive culture | %age |
|---|---|---|
| 33 (with IOL) | 14 | 42.42 |
| 67 (without IOL) | 15 | 22.38 |

The pattern of bacteria isolated in patients with posterior chamber intra ocular lens implantation was the same as in patients without intra ocular lens implantation (Table 3).

Table 3

| Type of Micro Organism | No. of Positive Bacterial Culture | %age |
|---|---|---|
| Aerobes | 13 | 92.85 |
| Gram positive cocci Staph. Epidermidis | 10 | 71.42 |
| Strep. Viridans | 1 | 7.14 |
| Gram positive bacilli Corynecbacterium Sp. | 2 | 14.28 |
| Anaerobes | 1 | 7.14 |
| Gram positive bacilli priono bacterium acnes | 1 | 7.14 |

No fungus was found in any of 100 samples. Age, sex, and right or left eye did not significantly affect the patients of bacteria isolated.

Ciprofloxacin was 100% effective antibiotic in Vitro. Kanamycin was the most effective drug (92.29%) followed by gentamicin (92.59%) and chloramphenicol (85.18%).

Gram stained smears were available from all the 100 anterior chamber aspirates. The presence of gram positive cocci and bacilli and gram negative bacilli correlated very well with the isolation of organisms in culture.

**DISCUSSION**

Aqueous samples in our study have been demonstrated to be culture positive in 29% of cases. This is in contrast with the study of Dickey[1] and Walter[5] who have reported in their respective studies, a contamination of 43% and 7% respectively. On the other hand, our anterior chamber aqueous contamination rate was similar to the study of Sherwood[2] who demonstrated that fluid on the external ocular surface entered anterior chamber during extra capsular cataract surgery. Of 101 patients who underwent extra capsular cataract extraction, 29 had, organism recoverable from their anterior chamber fluid at the conclusion of cataract surgery. 90 of these same patients had organisms grown from pre operative conjunctival drain samples. Sherwood, did not delineate the organism species or the frequencies with which the species were recovered from anterior chamber aspirate. Rather, the anterior chamber fluid isolated were grouped indistinguishably with isolates from external ocular drain in their final analysis.

Frankel[7] performed intra capsular cataract extraction without intraocular lens implantation and demonstrated one positive anterior chamber aspirte culture out of 100 eye studied. This one culture grew staphylococcus epidermidis and was considered a contaminant. It was conclusion of this study that aqueous humour remains sterile throughout routine intra capsular cataract extraction. Cataract surgery in these patients was performed using a corneo sclera limbus based conjunctival flap. They opined that this approach could allow for a less direct path of entry for organisms in the anterior chamber from the ocular adnexa than would be the fornix based conjunctival flap used in our study. Our study included only cases with an intact posterior capsule, we were able to aspirate up to 0.20 of fluid to facilitate organism recovery. Constraints, Metzger and Frankel[7] based their conclusion on one drop of anterior chamber aspirate per patient.

Volume : 6 | Issue : 9 | September 2016 | ISSN - 2249-555X | IF : 3.919 | IC Value : 74.50

Of these 29 culture positive anterior chamber aspirates, aerobes, comprised 27 cultures (93, 10%). The finding is similar to the findings of Dickey and associates[4] and Walter and associates[5] who recovered the aerobic organism from 94.44% and 100% cases respectively.

Propiono batrium acnes was the only anerobe isolated in 6.89% of cases. None developed toxic lens syndrome. The organism isolated in this condition has usually been priono bacterium species.[8] It may be that the bacterial load was insufficient or the host defences were sufficient to eliminate the organism.

Our results are consistent with the previous studies that document the presence of organisms capable of causing endophthalmitis on the cataract operative field.[9,10,11,12] Numerous investigations from other surgical disciplines have documented a substantial rate of bacterial contamination in many types of surgical wounds.[13,14,15,16] Organisms gaining access to the surgical wounds are predominantly those same organisms that constitute common skin flora (Coagulase negative staph. Sp. Propionobacterium sp. and other diphtheroids).

Staphylococcus epidermidis is recognized as the leading cause of endophthalmitis after cataract surgery, with staphylococcus aureus, gram negative roads and streptococcus species constituting most of the remainder causes.[17,18,19] The frequency of coagulase negative staph. Sp. as a percentage of total isolates in our study (58.62%) was similar to the incidence that this organism is a cause of culture positive endophthalmitis after cataract extraction (38 to 60%).[17,18] The eyes with anterior chamber aspirate positive for micro-organisms did not develop endophthalmitis in our study. We believe that organism virulence, inoculums size and the integrity of posterior capsule are factors that influence the progression or non-progression to endophthalmitis. Also, we suggest that the aqueous humour possesses antimicrobial properties. Immunoglobulins and complement components have been demonstrated in the aqueous humor of patients undergoing cataract surgery.[20,21] Mechanical filtration through the trabecular mesh work may also reduce the intraocular bacterial load.[21]

Organisms of higher virulence cause endophthalmitis at a rate higher than that cultured in our anterior chamber aspirates. Staphylococcus aureus is found to be cause of endophthalmitis with a much higher frequency (21-26%)[17,18] that its presence in the anterior chamber would predict. Conversely, corynebacterium species and other diphtheroids, seed into the anterior chamber with a much higher frequency that they are a cause for infection (0%-1%).[17,18] The diphtheroid group have long been identified as an organism of low virulence that rarely causes ocular infection.[23]

Preservation of posterior capsule augments the anterior chamber's ability for sterilization by forming a barrier to prevent organisms from seeding in to the vitreous humour.[24,25]

In this study of 100 patients 33 had polymethylmethaacrylate (PMMA) posterior chamber lens implantation and 67 underwent simple extra capsular cataract extraction, the percentage of positive anterior chamber aspirate was higher in eyes which underwent intraocular lens implantation (42.42%) than those which do not (22.38%). This difference was found to be statistically significant as observed c2 (4.3%) is greater than the corresponding table value (3.84) at 5% level of significant (c2 4.3 of 1p less than 0.5 significant). Foster[3] in his study also observed a higher percentage of culture positive anterior chamber aspirates in eyes which underwent intraocular lens implantation (75%) than those which do not (50%). In contradiction, Driebe[17] reported that implant does not significantly affect the microbiology of anterior chamber. Vafidis and Spencer[26] have both shown organisms especially staph epidermidis on the surface of PMMA intra ocular lenses prior to the implantation. Griffith[27] reported that staph epidermidis has the ability to adhere to plastic surfaces by means of polysaccharide glycocalyx which also confers resistance to antibiotics and host defences. Vifidis[29] have demonstrated that bacteria may adhere to IOL perhaps due to electrostatic charges when the intra ocular lens touches the ocular surface.

This study showed that the microbiological spectrum is similar in both pseudophakic and aphakic eyes with the exception of a slight higher percentage of gram positive organism in the pseudophakos (100%) as compared to 93.2% in eyes with IOL implantation. This difference is statistically insignificant as observed c2 value (1.12) is less than corresponding table value (3.84) at 5% level of significance. This observation coincided with those of previous reports.[17,3]

All the isolates were sensitive to ciprofloxacin (100%) followed by Kanamycin (96.29%), gentamicin (96.59%) and chloramphenicol (85.10%). Gram stained smears correlated well with the isolation of organisms in culture. By virtue of its simplicity, Wincesslous[28] has highly recommended gram stained smears in developing countries.

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Volume : 6 | Issue : 9 | September 2016 | ISSN - 2249-555X | IF : 3.919 | IC Value : 74.50

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