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Bacterial Contamination Evaluation in Anterior Chamber Aspirates: Contrasting Small Incision Cataract Surgery (SICS) and Phacoemulsification

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Abstract **Original Research Article**

Introduction*:** The rate of occurrence of endophthalmitis after cataract surgery has been reduced to a greater extent nowadays. Even then endophthalmitis related consequences are devastating. Several sources of infection, including contamination by air, solutions, surgical instruments, intraocular lenses, and wound leakage have been identified. ***Aim of the Study*:** The study aimed to evaluate the influence of two methods of surgical technique of cataract surgery in bacterial as well as comparison of contamination by these two techniques. ***Methods*:** This prospective observational study was conducted over 60 patients with age-related cataracts in the Department of Ophthalmology and Microbiology in Sir Salimullah Medical College and Mitford Hospital, Dhaka, Bangladesh, from 1st January 2009 to 30 June 2009. Patients were selected purposively based on specific selection criteria. Selected patients underwent detailed ophthalmic and systemic evaluation as well as relevant investigations. Cataract extraction followed by intraocular lens implantation was planned for all patients. The two techniques of cataract surgery such as SICS and Phacoemulsification were assigned to the patients randomly on a 1:1 basis. 1 ml of anterior chamber contents were aspirated through an aseptic technique by 26G needle from each patient pre- operatively, after capsulorhexis (early per-operative), and just before wound closure by stromal hydration (late per- operative). All samples were sent for 10% KOH staining and culture and sensitivity test after proper leveling. ***Results*:** Micro-biological examination shows no sample was positive for 10% KOH staining. In the SICS group, out of 30 samples, 3 were found culture positive, which were positive in 4 and 5 samples in early per-operative and late per-operative samples respectively, and in the Phacoemulsification group, it was 2, 3, 5 pre-operative, early per- operative and late per-operative sample respectively. The common organisms isolated were Coagulase positive Streptococcus, Corynebacterium species, Streptococcus viridans, and Staphylococcus aureus etc. Almost none of the patients showed clinical activity except a few cells and flares in the anterior chamber in the early postoperative period. ***Conclusion: The microbiological examination shows the incidence of microbial contamination of anterior chamber contents is very low after cataract surgery by both forms of technique, and there was no statistically significance difference in incidence between these two techniques.

Keywords*:* Microbial Contamination, Cataract Surgery, Phacoemulsification.

INTRODUCTION

Endophthalmitis after cataract surgery in all forms is a dreaded complication that often leads to permanent loss even after optimum treatment. The morbidity associated with the incidence of postoperative endophthalmitis has generally been decreasing over the last few years, but its associated complications continue to be devastating [1-3]. Several studies have identified different sources of infections, including trauma, eyelid margin, airborne contamination, solutions, surgical instruments, intraocular lenses, and wound leaks [1-5] Nevertheless, in most cases, the ultimate source of the infection could not be identified, and the indigenous flora harbored in the eyelids and ocular annexes have been proposed to be responsible for the onset of bacterial endophthalmitis [5-7]. Studies done in this issue show that bacterial contamination of the anterior chamber during cataract surgery occurs in 20% to 40% of cases [6- 11] There is no established relationship between the presence of bacterial microorganisms and the subsequent development of endophthalmitis, One study's findings suggest that there is a relationship between the indigenous flora and the infecting organism in patients with endophthalmitis [12]. Most of the postoperative intraocular infections are caused by an organism that is

introduced at the time of the surgery. The major source of intraocular contamination is the conjunctival flora. Organisms enter the anterior chamber (AC) either directly or indirectly by intraocular lenses [14]. The role of such contamination in the production of postoperative inflammation and infection is well recognized [15, 16]. It would therefore seem prudent to minimize bacterial entry into the AC during cataract surgery to reduce the risk of postoperative endophthalmitis. Careful preoperative preparation can greatly influence the rate of potential microbial contaminants. Attention to surgical technique can further reduce the intraocular delivery of micro-organisms. For example, an AC maintained at higher than atmospheric pressure might have a lower rate of bacterial contamination. This is thought theoretically that the number of micro-organisms entering the AC preoperatively might be reduced in phacoemulsification surgery, because of the constant infusion of fluid at greater than atmospheric pressure and the smaller incision. The aim of this study was to assess the effect of two different techniques of cataract extraction small incision cataract surgery (SICS) and phacoemulsification (phaco), on the rate of AC microbial contamination. The study findings may help the practicing cataract surgeon to make decisions about the modality of surgery as well as take extra measures during surgery and choice of antibiotics after surgery to prevent per-operative bacterial contamination of anterior chamber contents and postoperative endophthalmitis after cataract surgery.

OBJECTIVES

General Objective

- To assess and compare the contamination of anterior chamber aspirates in small incision cataract surgery and phacoemulsification

Specific Objectives

- To collect anterior chamber fluid just before surgery from the study subjects
- To collect anterior chamber fluid after capsulorhexis from the study subjects
- To collect anterior chamber fluid after wound closure from the study subjects
- To compare the level of contamination between two groups

METHODS

This prospective observational study was conducted at the Department of Ophthalmology, Sir Salimullah Medical College and Mitford Hospital, the study period spanned from January 1, 2009, to June 30, 2009. The study aimed to investigate patients with age-related cataracts who were attending the department for cataract surgery. The study population consisted of all patients meeting the inclusion criteria for age-related cataracts. The sample size included 60 patients, with 30 patients assigned to undergo small incision cataract surgery (group-A) and 30 patients assigned to undergo Phacoemulsification (group B). Non-random purposive sampling was employed to select the participants. Data collection involved enrolling patients based on specific selection criteria and conducting detailed ophthalmic and systemic clinical evaluations and relevant investigations. Cataract surgery was performed on all patients, and they were categorized into group-A or group B based on the assigned surgical procedure. Intraocular lens implantation was carried out for all patients. Prior to surgery, after capsulorhexis, and after wound closure, anterior chamber contents were collected using a 26 G needle and a 3cc syringe. These samples were then subjected to 10% KOH staining, gram staining, and culture in the microbiological laboratory. The findings were recorded on a pre-designed data collection sheet. Data analysis was conducted using the SPSS software version 20 for Windows.

Inclusion Criteria

- All patients of age-related cataract attending in the department of ophthalmology of Sir Salimullah Medical College and Mitford Hospital

Exclusion Criteria

- Patients suffering from other intra-ocular or ocular surface disease
- Patients having history of ocular surgery or trauma in the previous
- six months
- Patients suffering from active systemic infection.
- Patients taking steroid or other immunosuppressive drugs
- Patients enrolled in other study groups

RESULT

Table 1: Age distribution of the study subjects(N=60)

Age group (Years)	Frequency		P value
	Group A	Group B	
40-45	2	2	0.65
45-50	6	5	
50-55	7	8	
55-60	8	9	
60-65	7	6	

Table 1 presents the age distribution of 60 study subjects, categorized into two groups (Group A and Group B). The table outlines the frequency of subjects within specific age groups, ranging from 40 to 65 years. Notably, there is no significant difference between the two groups, as indicated by the calculated p-values, with p=0.65 for the 40-45 age group. The

distribution of subjects in the remaining age groups is also provided, reflecting comparable numbers in most categories for Group A and Group B.

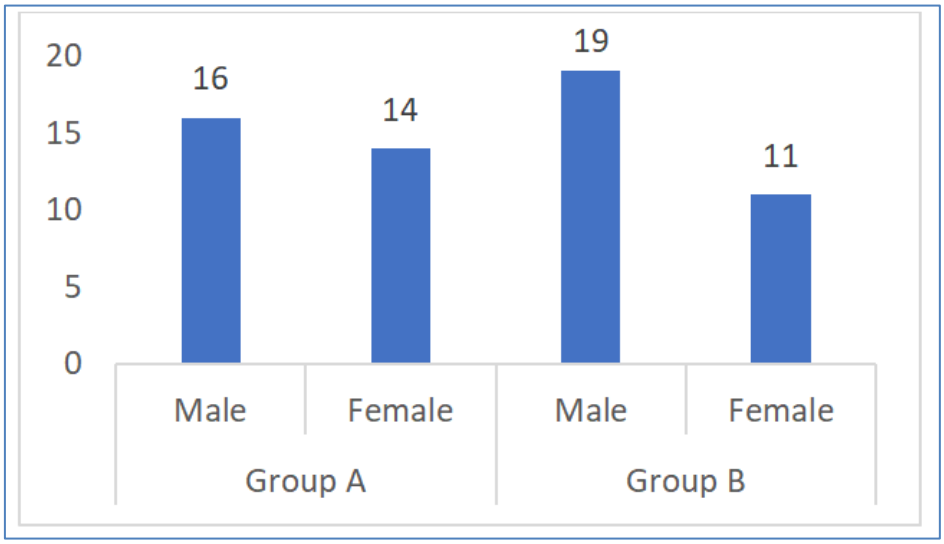

Figure 1: Bar diagram showing the gender distribution of the study subjects(N=60)

Among the cases, the number of males and females in each group (Group A and Group B). In Group A, there are 16 males and 14 females, while in Group B, there are 19 males and 11 females.

Table 2: Distribution of grading of cataracts of the study subjects(N=60)

Cataract grade	No. of patients		p-value
	Group A	Group B	
Grade-1	2(6.67%)	3(0%)	0.12
Grade-2	16(53.33%)	14(46.67%)	
Grade-3	12(40%)	13(43.33%)	
Total	30	30	

ns= non-significant, p-value obtained by unpaired t-test

The distribution of cataract grades among the study subjects was examined in Table 2. The table provided the number of patients in each group (Group A and Group B) for each cataract grade. The grades were categorized as Grade 1, Grade 2, and Grade 3. The results showed that Grade-2 cataracts were the most common in both groups, with 16 patients (53.33%) in Group A and 14 patients (46.67%) in Group B. There were no Grade-1 cataracts in Group B, while Group A had 2 patients (6.67%) in this category. Grade-3 cataracts were present in 12 patients (40%) in Group A and 13 patients (43.33%) in Group B. The p-value of 0.12 indicated that there was no significant difference in the distribution of cataract grades between the two groups.

Table 3: Distribution of culture-positive patients (N=60)

Time of sample collection	No of patients		P-value
	Group A	Group B	
Pre-operative	7	6	0.65
Early per-operative	6	4	
Late per-operative	4	3	

ns= non-significant, p-value obtained by unpaired t-test

Table 3 presents the distribution of culture-positive patients based on the time of sample collection. The table showed the number of patients in each group (Group A and Group B) for different time points: pre-operative, early per-operative, and late per-operative. The results indicated that there were no significant differences in the distribution of culture-positive patients between the two groups, as suggested by the p-value of 0.65. This suggests that the occurrence of culture-positive cases was similar in both groups across the different time points.

Table 4: Common organisms isolated during different times of surgery (N=60)

Name of organisms	Pre-operative	Post-operative
Coagulase-negative Staphylococci	5	7
Corynebacterium species	4	5
Streptococcus viridans	3	3
Streptococcus aureus	1	1

The table provides information on the number of organisms isolated both pre-operatively and post-operatively. Among the organisms identified, coagulase-negative Staphylococci were the most frequently isolated, with 5 cases observed pre-operatively and 7 cases post-operatively. Corynebacterium species were the second most common, with 4 cases pre-operatively and 5 cases post-operatively. Streptococcus viridans and Streptococcus aureus were less prevalent, each with 3 cases pre-operatively and 1 case post-operatively.

DISCUSSION

Cataract surgery is a widely performed ophthalmic procedure globally, and it has seen advancements in surgical techniques, particularly Small Incision Cataract Surgery (SICS) and Phacoemulsification. One critical aspect when assessing infection risk during cataract surgery is the age distribution of study subjects. This study indicates that both the Small Incision Cataract Surgery (SICS) and Phacoemulsification groups exhibit similar age distributions within the 40-65 age range. Notably, there is no statistically significant difference between the two groups, as evidenced by a calculated p-value of 0.65. This finding suggests that age does not act as a confounding factor in our study, as both groups are well-matched in terms of age. This observation aligns with the research conducted by Tan *et al.,* (2006), which similarly reported comparable age distributions in their cataract surgery cohorts [17]. The grading of cataracts is a crucial factor that can impact the complexity of the surgery and, consequently, the risk of infection. In our study, Grade-2 cataracts were the most prevalent in both the SICS and Phacoemulsification groups. In Group A (SICS), there were 16 patients (53.33%) with Grade-2 cataracts, while in Group B (Phacoemulsification), there were 14 patients (46.67%) with Grade-2 cataracts. Importantly, there was no statistically significant difference in the distribution of cataract grades between the two methods, with a p-value of 0.12. This finding suggests that the complexity of the cataracts being operated on is similar in both groups. Notably, Chung *et al.,* (2018) and Grag *et al.,* (2020) reported similar distributions of cataract grades in their study comparing different surgical techniques, reinforcing our results [18, 19] The presence of culture-positive patients serves as a direct indicator of bacterial contamination during surgery. Table 3 illustrates that there were no significant differences in the distribution of culture-positive patients between the two surgical groups at various time points (pre-operative, early per-operative, late per-operative). In both Group A (SICS) and Group B (Phacoemulsification), the occurrence of culture-positive cases was similar across the different time points. The p-value of 0.65 supports this finding, indicating that the risk of bacterial contamination during surgery is comparable between SICS and Phacoemulsification. This observation aligns with the results of studies by Ciulla *et al.,* (2002) and Sharma *et al.,* (2015), which also found no significant differences in culture-positive rates when comparing different cataract surgery methods [20, 21]. Identifying the common organisms responsible for contamination is crucial for infection control measures. In our study, coagulase-negative Staphylococci were the most frequently isolated organisms both pre-operatively and post-operatively in both SICS and Phacoemulsification groups. In the pre-operative phase, 5 cases were observed in Group A (SICS) and 7 cases in Group B (Phacoemulsification). Post-operatively, Group A had 5 cases, and Group B had 7 cases of coagulase-negative Staphylococci. Corynebacterium species were the second most common, with 4 cases pre-operatively and 5 cases post-operatively in Group A, and 4 cases pre-operatively and 5 cases post-operatively in Group B. These findings are consistent with those conducted by George *et al.,* (2018) and Grzybowski *et al.,* (2019), which reported similar patterns of microbial contamination in cataract surgery [22, 23]. This study provides valuable insights into bacterial contamination in anterior chamber aspirates during cataract surgery, comparing SICS and Phacoemulsification. The specific results from the tables support our overall conclusion that there are no significant differences in age distribution, cataract grading, distribution of culture-positive patients, or common organisms isolated between the two surgical methods. These results are in line with similar studies in the field, emphasizing the importance of infection control measures regardless of the surgical technique used.

Limitations of the Study

The study was conducted in a single center with a small sample size which may not represent the whole community.

CONCLUSION

The analytic result of the current study shows that the incidence of microbial contamination of the anterior chamber during manual sics and phacoemulsification of cataract surgery are very low and similar in both techniques.

RECOMMENDATION

To reduce the incidence of endophthalmitis in intraocular surgery, it is recommended to strictly adhere to aseptic techniques, use povidone-iodine for preoperative preparation, consider phacoemulsification instead of ECCE, prevent anterior chamber collapse during ECCE, continuously monitor and report endophthalmitis cases, and regularly update practices based on emerging research.

REFERENCES

1. Jindal, A., Moreker, M. R., Pathengay, A., Khera, M., Jalali, S., Majji, A., ... & Flynn, H. W. (2013). Polymicrobial endophthalmitis: prevalence, causative organisms, and visual outcomes. *Journal of ophthalmic inflammation and infection*, *3*, 1-6. doi: 10.1186/1869-5760-3-6.
2. Callegan, M. C., Engelbert, M., Parke, D. W., Jett, B. D., & Gilmore, M. S. (2002). Bacterial endophthalmitis: epidemiology, therapeutics, and bacterium-host interactions. *Clinical microbiology reviews*, *15*(1), 111-124.
3. Bhoomibunchoo, C., Ratanapakorn, T., Sinawat, S., Sanguansak, T., Moontawee, K., & Yospaiboon, Y. (2013). Infectious endophthalmitis: review of 420 cases. *Clinical Ophthalmology*, 247-252.
4. Schiff, F. S. (1990). The shouting surgeon as a possible source of endophthalmitis. *Ophthalmic Surgery, Lasers and Imaging Retina*, *21*(6), 438-440.
5. Wilson, F. M. (1987). Causes and prevention of endophthalmitis. *International ophthalmology clinics*, *27*(2), 67-73.
6. Mandelbaum, S., & Forster, R. K. (1987). Postoperative endophthalmitis. *International ophthalmology clinics*, *27*(2), 95-106.
7. Ariyasu, R. G., Nakamura, T., Trousdale, M. D., Smith, R. E., & Baum, J. (1993). Intraoperative Bacterial Contamination of the Aqueous Humor/COMMENTARY. *Ophthalmic Surgery, Lasers and Imaging Retina*, *24*(6), 367-374.
8. Durand, M. L. (2013). Endophthalmitis. Clin Microbiol *Infect. 19*:227-234.
9. Srinivasan, R., Gupta, A., Kaliaperumal, S., Babu, R. K., Thimmarayan, S. K., & Belgode, H. N. (2008). Efficacy of intraoperative vancomycin in irrigating solutions on aqueous contamination during phacoemulsification. *Indian journal of ophthalmology*, *56*(5), 399.
10. Bausz, M., Fodor, E., Resch, M. D., & Kristóf, K. (2006). Bacterial contamination in the anterior chamber after povidone–iodine application and the effect of the lens implantation device. *Journal of Cataract & Refractive Surgery*, *32*(10), 1691-1695.
11. Leong, J. K., Shah, R., McCluskey, P. J., Benn, R. A., & Taylor, R. F. (2002). Bacterial contamination of the anterior chamber during phacoemulsification cataract surgery. *Journal of Cataract & Refractive Surgery*, *28*(5), 826-833.
12. Speaker, M. G., Milch, F. A., Shah, M. K., Eisner, W., & Kreiswirth, B. N. (1991). Role of external bacterial flora in the pathogenesis of acute postoperative endophthalmitis. *Ophthalmology*, *98*(5), 639-650.
13. Sherwood, D. R., Rich, W. J., Jacob, J. S., Hart, R. J., & Fairchild, Y. L. (1989). Bacterial contamination of intraocular and extraocular fluids during extracapsular cataract extraction. *Eye*, *3*(3), 308-312.
14. Doyle, A., Beigi, B., Early, A., Blake, A., Eustace, P., & Hone, R. (1995). Adherence of bacteria to intraocular lenses: a prospective study. *British journal of ophthalmology*, *79*(4), 347-349.
15. Piest, K. L., Kincaid, M. C., Tetz, M. R., Apple, D. J., Roberts, W. A., & Price Jr, F. W. (1987). Localized endophthalmitis: a newly described cause of the so-called toxic lens syndrome. *Journal of Cataract & Refractive Surgery*, *13*(5), 498-510.
16. Meisler, D. M., Palestine, A. G., Vastine, D. W., Demartini, D. R., Murphy, B. F., Reinhart, W. J., ... & Cliffel, T. P. (1986). Chronic Propionibacterium endophthalmitis after extracapsular cataract extraction and intraocular lens implantation. *American journal of ophthalmology*, *102*(6), 733-739.
17. Tan, A. G., Wang, J. J., Rochtchina, E., & Mitchell, P. (2006). Comparison of age-specific cataract prevalence in two population-based surveys 6 years apart. *BMC ophthalmology*, *6*, 1-7.
18. Chung, J. K., Lee, H. K., Kim, M. K., Kim, H. K., Kim, S. W., Kim, E. C., & Kim, H. S. (2019). Cataract surgery practices in the Republic of Korea: a survey of the Korean Society of Cataract and Refractive Surgery 2018. *Korean Journal of Ophthalmology*, *33*(5), 451-457.
19. Garg, P., Gupta, A., Tandon, N., & Raj, P. (2020). Dry eye disease after cataract surgery: study of its determinants and risk factors. *Turkish journal of ophthalmology*, *50*(3), 133.
20. Ciulla, T. A., Starr, M. B., & Masket, S. (2002). Bacterial endophthalmitis prophylaxis for cataract surgery: an evidence-based update. *Ophthalmology*, *109*(1), 13-24.
21. Sharma, S., Sahu, S. K., Dhillon, V., Das, S., & Rath, S. (2015). Reevaluating intracameral cefuroxime as a prophylaxis against endophthalmitis after cataract surgery in India. *Journal of Cataract & Refractive Surgery*, *41*(2), 393-399.
22. George, N. K., & Stewart, M. W. (2018). The routine use of intracameral antibiotics to prevent endophthalmitis after cataract surgery: how good is the evidence?. *Ophthalmology and Therapy*, *7*(2), 233-245.
23. Grzybowski, A., Koerner, J. C., & George, M. J. (2019). Postoperative endophthalmitis after cataract surgery: A worldwide review of etiology, incidence and the most studied prophylaxis measures. *Expert Review of Ophthalmology*, *14*(4-5), 247-257.