

# Anterior Chamber Contamination at the Conclusion of Phacoemulsification

Mohammad-Reza Soleimani, MD<sup>1</sup>; Bahram Einollahi, MD<sup>2</sup>; Mohammad-Ali Javadi MD<sup>2</sup>; Peyman Torbati MD<sup>2</sup>; Mohammad-Reza Jafarinasab, MD<sup>2</sup>; Farid Karimian, MD<sup>2</sup>; Mohammad Zare, MD<sup>2</sup>; Ali Sharifi, MD<sup>3</sup>; Mehran Nikkhoo, MD<sup>2</sup>

<sup>1</sup>Rafsanjan Medical University, Rafsanjan, Iran; <sup>2</sup>Shaheed Beheshti Medical University, Tehran, Iran;

<sup>3</sup>Kerman Medical University, Kerman, Iran

**Purpose:** To evaluate anterior chamber aspirates at the conclusion of phacoemulsification and intraocular lens implantation (PE+IOL) for bacterial and fungal contamination.

**Methods:** We prospectively evaluated 80 eyes of 80 patients undergoing routine PE+IOL by performing bacterial and fungal culture on aspirates obtained from the anterior chamber at the end of the surgery.

**Results:** Anterior chamber fluid aspirates were positive for bacteria in 5 eyes (6.33%) with coagulase-negative staphylococcus being the most common organism (three eyes). No instance of positive fungus culture was observed. One of the culture-positive eyes developed postoperative uveitis which resolved during a week of treatment with topical corticosteroids and antibiotics. None of the eyes developed endophthalmitis.

**Conclusion:** In the current series, the rate of anterior chamber contamination by bacteria at the end of phacoemulsification was in the lower range reported by previous studies.

*Iran J Ophthalmic Res* 2007; 2 (1): 19-22.

**Correspondence to:** Mohammad Reza Soleimani, MD. Assistant Professor of Ophthalmology; Rafsanjan Medical University, Morady Hospital, Tel: +98 391 5230080, e-mail: mohammad240@yahoo.com

## INTRODUCTION

The majority of instances of postoperative endophthalmitis are presumed to be due to introduction of microorganisms during surgery. The major sources of intraocular contamination are the conjunctival and lid margin flora.<sup>1-3</sup> DNA analysis techniques have also demonstrated that organisms causing endophthalmitis are commonly the same as the patient's own ocular bacterial flora.<sup>4-8</sup> Organisms may enter the anterior chamber (AC) directly or indirectly via intraocular lenses (IOLs), intraocular instruments and irrigation solutions.<sup>2</sup> The role of such contamination in development of postoperative endophthalmitis is well recognized.<sup>1-3,9</sup> The rate

of AC contamination during cataract surgery varies widely from 2% to 46.25% in different studies.<sup>10-12</sup> The purpose of the current study was to evaluate AC contamination during phacoemulsification and intraocular lens implantation (PE+IOL) at our center.

## METHODS

This prospective study included 80 eyes of 80 patients undergoing standard PE+IOL at Labafinejad Medical Center, a tertiary referral ophthalmology center in Tehran, Iran. Patients with history or evidence of previous ocular surgery or penetrating injury, presence of significant systemic or local infection at the

time of surgery and systemic or topical antibiotic therapy two weeks prior to surgery were excluded.

All procedures were performed by attending physicians under retrobulbar or general anesthesia. After dilating the pupil with cyclopentolate 1% and eyelash trimming, the eyelids, eyebrow, cheek, forehead and nose, were prepared with povidone iodine 10%; the lid margins and conjunctival fornices were additionally scrubbed with cotton tipped applicators. The patient's head was draped with a sterile cloth towel and sterile linen drapes were placed over the body. The eyelids were irrigated with 10-20 ml of sterile 0.9% saline solution. Standard PE through a 3.2 mm clear cornea or scleral tunnel incision was performed and an IOL (Centra 55 domilens and Akrosfil, Boosch&Lomb) was placed into the capsular bag in all cases. A single 10-0 nylon suture was placed after insertion of the IOL, if needed. Intraocular fluids and viscoelastic material included sterile balanced salt solution, 1:10,000 adrenaline and hydroxypropyl methylcellulose. The viscoelastic material was removed at the end of the procedure and 0.2 ml of AC fluid was aspirated using a 27-gauge cannula attached to an insulin syringe through the stab wound.

The aspirates were transferred to the microbiology laboratory and cultured onto blood agar, chocolate agar, Sabouraud agar, MacConkey agar and thioglycolate. The plates were incubated at 25 to 30 °C, aerobically and anaerobically for three days and for fungi for 14 days. The organisms were identified based on colony characteristics, gram stain, direct smear, morphology and standard biochemical tests.<sup>13-16</sup>

## RESULTS

Overall 80 patients including 47 male (58.8%) and 33 female (41.2%) subjects with mean age of 66.8±12.2 years were included. Mean surgical time was 31±12 minutes. Mild to moderate meibomian gland dysfunction and diabetes mellitus were present in 11.3% and

7.5% of subjects, respectively. Bacterial cultures of AC aspirates were positive in five eyes (6.3%) including three cases of coagulase-negative Staphylococcus, one mixed growth of Actinomycetes and Klebsiella pneumonia and one case of Corynebacterium. No culture was positive for fungi. Colony counts in positive bacterial specimens were less than 40 cfu/ml in all cases (considered as small inocula).

None of the culture-positive eyes belonged to diabetic patients. None of the eyes developed postoperative endophthalmitis. One of the eyes with coagulase-negative Staphylococcus developed postoperative uveitis which resolved with administration of topical corticosteroids and antibiotics after one week.

## DISCUSSION

Postoperative endophthalmitis is the most serious complication of intraocular surgery. The reported incidence of postoperative endophthalmitis after cataract surgery is less than 1% (0.5% to 1%),<sup>7,8</sup> however AC contamination has been reported from 2% to 46.25% during PE<sup>10-12</sup> and from 22.5% to 43% during uncomplicated extracapsular cataract extraction (ECCE)<sup>12,17</sup>. Our study disclosed a contamination rate of 6.3% after PE+IOL in which coagulase-negative Staphylococcus was the most common organism which is consistent with other studies. There is evidence that coagulase-negative staphylococci is responsible for 38-60% of cases of culture-positive endophthalmitis after cataract surgery.<sup>2,3,18,19</sup>

Despite the high rate of positive AC fluid cultures, the rate of endophthalmitis is much lower. Possible factors accounting for this discrepancy include low grade contamination, low organism virulence, presence of an intact posterior capsule and clearance of microorganisms from the anterior chamber. In the current series, only one of the five cases with positive microbial culture developed significant postoperative uveitis which was successfully treated with topical corticosteroids and antibiotics after one week. This case may also have represented a low grade infection.

Surgical technique can influence micro-organism access to the AC and vitreous cavity. The incidence of endophthalmitis is higher after intracapsular cataract extraction compared to ECCE<sup>20</sup> and also higher in cases complicated by posterior capsule rupture.<sup>21</sup> AC collapse and shallowing during the aspiration phase of ECCE can introduce organisms into the AC by producing lower than atmospheric pressures.<sup>22</sup> This has been the basis for the speculation that PE, by using a small incision and better maintaining AC depth throughout the operation, can reduce the rate of contamination. However, disadvantages of PE include more introduction of instruments and a greater fluid volume and turnover in the AC which may offset the advantages of a closed chamber and small incision. Moreover, in the event of hypotony, fluid influx is greater with PE than ECCC.<sup>23,24</sup>

Bacteria may enter the AC via irrigating solutions, instruments, IOLs or ocular surface fluid influx. Contaminated irrigation solutions have caused epidemic outbreaks of endophthalmitis.<sup>25-32</sup> Polypropylene IOL haptics have been reported as a risk factor for bacterial adherence.<sup>33</sup> Episodes of low to undetectable intraocular pressure (IOP) with or without AC collapse can result in surface fluid influx. Small incision PE has been correlated with better IOP control and fewer episodes of AC collapse resulting in reduced influx of surface fluid and organisms into the eye.<sup>34</sup>

IOLs have been shown to become contaminated by the ocular surface and operating theater air, however, the effect of intraocular instruments has not been studied yet. Instrumentation time may be increased in phacoemulsification which can offset the benefits of the small self sealing wound. Further studies should be performed on contamination of instruments and IOLs focusing on episodes of contact with the external ocular surface. Contamination of multidose topical medication used preoperatively could also be a potential source of infection. Contamination rates of topically used medications have been reported up to 30%.<sup>34-36</sup> Contamination may also occur

during the process of obtaining and culturing intraocular samples.<sup>35,36</sup>

In summary, PE+IOL was associated with a low rate of bacterial AC contamination in our study. This low rate may be due to adherence to proper preparation of the surgical field, meticulous technique, standard sterilization protocols and advantages inherent in the technique of phacoemulsification.

#### REFERENCES

1. Sherwood DR, Rich WJ, Jacob JS, Hart RJ, Fairchild YL. Bacterial contamination of intraocular and extraocular fluids during extracapsular cataract extraction. *Eye* 1989;3:308-312.
2. Dickey JB, Thompson KD, Jay WM. Intraocular gentamicin sulfate and postcataract anterior chamber aspirate cultures. *J Cataract Refract Surg* 1994; 20:373-377.
3. Ariyasu RG, Nakamura T, Trousdale MD, Smith RE. Intraoperative bacterial contamination of the aqueous humor. *Ophthalmic Surg* 1993;24:367-373; discussion 373-374.
4. Speaker MG, Milch FA, Shah MK, Eisner W, Kreiswirth BN. Role of external bacterial flora in the pathogenesis of acute postoperative endophthalmitis. *Ophthalmology* 1991;98:639-649.
5. Shockley RK, Jay WM, Fishman PH, Aziz MZ, Rissing JP. Effect of inoculum size on the induction of endophthalmitis in aphakic rabbit eyes. *Acta Ophthalmol (Copenh)* 1985;63:35-38.
6. Beyer TL, O'Donnell FE, Goncalves V, Singh R. Role of the posterior capsule in the prevention of postoperative bacterial endophthalmitis: experimental primate studies and clinical implications. *Br J Ophthalmol* 1985;69:841-846.
7. Srinivasan R, Reddy RA, Rene S, Kanungo R, Natarajan MK. Bacterial contamination of anterior chamber during IOL surgery. *Indian J Ophthalmol* 1999;47:185-189.
8. Ram J. Reducing cataract surgery-related complications. *Indian J Ophthalmol* 1999;47:153-154.
9. Pospisil A, Pospisil F, Dupont MJ, Delbosc B, Montard M. Bacterial contamination of the anterior chamber and cataract surgery. *J Fr Ophthalmol* 1993;16:10-13.
10. Srinivasan R, Tiroumal S, Kanungo R, Natarajan MK. Microbial contamination of the anterior chamber during phacoemulsification. *J Cataract Refract Surg* 2002Dec;28:2173-2176.
11. Manners TD, Chitkara DK, Marsh PJ, Stoddart MG. Anterior chamber aspirate cultures in small incision cataract surgery. *Br J Ophthalmol* 1995;79:878-880.

12. Beigi B, Westlake W, Mangelschots E, Chang B, Rich W, Riordan T. Peroperative microbial contamination of anterior chamber aspirates during extracapsular cataract extraction and phacoemulsification. *Br J Ophthalmol* 1997;81:953-955.
13. Duerden BI, Collee JG, Brown R, Deacon AG, Holbrook WP. A scheme for the identification of clinical isolates of Gram-negative anaerobic bacilli by conventional bacteriological tests. *J Med Microbiol* 1980;13:231-245.
14. Barrow GL, Feltham RK, eds. Cowan and Steels manual of for the identification bacteria. 3rd ed. Cambridge: Cambridge University Press; 1993.
15. Wills AT, ed. Anaerobic bacteriology: clinical and laboratory practice. 3rd ed. Boston: MA, Butterworth; 1997.
16. Suture VL, ed. Wadsworth anaerobic bacteriology manual. 4th ed. Belmont, CA: Star publishing; 1986.
17. Egger SF, Huber-Spitzy V, Scholda C, Schneider B, Grabner G. Bacterial contamination during extracapsular cataract extraction: prospective study on 200 consecutive patients. *Ophthalmologica* 1994;208:77-81.
18. Driebe WT Jr, Mandelbaum S, Forster RK, Schwartz LK, Culbertson WW. Pseudophakic endophthalmitis: diagnosis and management. *Ophthalmology* 1986;93:442-448.
19. Puliafito CA, Baker AS, Haaf J, Foster CS. Infectious endophthalmitis: review of 36 cases. *Ophthalmology* 1982;89:921-929.
20. Javitt JC, Vitale S, Canner JK, Street DA, Krakauer H, McBean AM, et al. National outcomes of cataract extraction: endophthalmitis following inpatient surgery. *Arch Ophthalmol* 1991;109:1085-1089.
21. Jager GV, Brinkman CJ, van Tilburg CJ, Beekhuis WH, Joosse MV. Pseudophakic endophthalmitis. *Doc Ophthalmol* 1992;82:109-114.
22. Doyle A, Beigi B, Early A, Blake A, Eustace P, Hone R. Adherence of bacteria to intraocular lenses: a prospective study. *Br J Ophthalmol* 1995;79:347-349.
23. Beigi B, Westlake W, Mangelschots E, Chang B, Rich W, Riordan T. Peroperative microbial contamination of anterior chamber aspirates during extracapsular cataract extraction and phacoemulsification. *Br J Ophthalmol* 1997;81:953-955.
24. Koc F, Akcam Z, Kuruoglu S, Oge I, Gunaydin M. Does surgical technique influence cataract surgery contamination? *Eur J Ophthalmol* 2001;11:31-36.
25. Kattan HM, Flynn HW Jr, Pflugfelder SC, Robertson C, Forster RK. Nosocomial endophthalmitis survey. Current incidence of infection after intraocular surgery. *Ophthalmology* 1991;98:227-238.
26. Meisler DM, Palestine AG, Vastine DW, Demartini DR, Murphy BF, Reinhart WJ, et al. Chronic Propionibacterium endophthalmitis after extracapsular cataract extraction and intraocular lens implantation. *Am J Ophthalmol* 1986;102:733-739.
27. Beatty RF, Robin JB, Trousdale MD, Smith RE. Anaerobic endophthalmitis caused by Propionibacterium acnes. *Am J Ophthalmol* 1986;101:114-116.
28. Roussel TJ, Culbertson WW, Jaffe NS. Chronic postoperative endophthalmitis associated with Propionibacterium acnes. *Arch Ophthalmol* 1987;105:1199-1201.
29. Menikoff JA, Speaker MG, Marmor M, Raskin EM. A case-control study of risk factors for postoperative endophthalmitis. *Ophthalmology* 1991;98:1761-1768.
30. Records RE, Iwen PC. Experimental bacterial endophthalmitis following extracapsular lens extraction. *Exp Eye Res* 1989;49:729-737.
31. Dickey JB, Thompson KD, Jay WM. Anterior chamber aspirate cultures after uncomplicated cataract surgery. *Am J Ophthalmol* 1991;112:278-282.
32. McCray E, Rampell N, Solomon SL, Bond WW, Martone WJ, O'Day D. Outbreak of Candida parapsilosis endophthalmitis after cataract extraction and intraocular lens implantation. *J Clin Microbiol* 1986;24:625.
33. Dilly PN, Sellors PJ. Bacterial adhesion to intraocular lenses. *J Cataract Refract Surg* 1989;15:317-320.
34. Vafidis GC, Marsh RJ, Stacey AR. Bacterial contamination of intraocular lens surgery. *Br J Ophthalmol* 1984;68:520-523.
35. Schein OD, Hibberd PL, Starck T, Baker AS, Kenyon KR. Microbial contamination of in-use ocular medications. *Arch Ophthalmol* 1992;110:82-85.
36. Breland W, Burberry P. Microbial status of part used eye drops from a hospital eye clinic. *J Hosp Pharm* 1991;11:273-276.