

Evaluation of bacterial contamination rate of the anterior chamber during phacoemulsification surgery using an automated microbial detection system

Ibrahim Kocak¹, Funda Kocak², Bahri Teker¹, Ali Aydın^{1,3}, Faruk Kaya¹, Hakan Baybora¹

¹Nisa Hospital, Fatih cad, Cobancesme mah, Bahcelievler, Istanbul 34196, Turkey

²Clinical Microbiology and Infectious Diseases, Basaksehir state hospital, Basaksehir, Istanbul 34306, Turkey

³Department of Ophthalmology, Medipol University Hospital, Bagcilar, Istanbul 34214, Turkey

Correspondence to: Ibrahim Kocak. Nisa Hastanesi, Fatih cad, Cobancesme mah, Bahcelievler, Istanbul 34196, Turkey. ibrahimkocak@msn.com

Received: 2013-07-06

Accepted: 2013-09-09

Abstract

• **AIM:** To assess the incidence of anterior chamber bacterial contamination during phacoemulsification surgery using an automated microbial detection system (BacT/Alert).

• **METHODS:** Sixty–nine eyes of 60 patients who had uneventful phacoemulsification surgery, enrolled in this prospective study. No prophylactic topical or systemic antibiotics were used before surgery. After antiseptis with povidone–iodine, two intraoperative anterior chamber aqueous samples were obtained, the first whilst entering anterior chamber, and the second at the end of surgery. BacT/Alert culture system was used to detect bacterial contamination in the aqueous samples.

• **RESULTS:** Neither aqueous samples obtained at the beginning nor conclusion of the surgery was positive for microorganisms on BacT/Alert culture system. The rate of bacterial contamination during surgery was 0%. None of the eyes developed acute–onset endophthalmitis after surgery.

• **CONCLUSION:** In this study, no bacterial contamination of anterior chamber was observed during cataract surgery. This result shows that meticulous surgical preparation and technique can prevent anterior chamber contamination during phacoemulsification cataract surgery.

• **KEYWORDS:** phacoemulsification; bacterial contamination; endophthalmitis

DOI:10.3980/j.issn.2222–3959.2014.04.19

phacoemulsification surgery using an automated microbial detection system. *Int J Ophthalmol* 2014;7(4):686–688

INTRODUCTION

Postoperative infectious endophthalmitis is a rare but serious complication of cataract surgery that may result in severe visual loss, despite improved methods of prophylaxis, surgical technique, and appropriate treatments [1]. Although the incidence of this serious complication is low, estimated to be between 0.029%–1.2%, ophthalmic surgeons may face this annoying complication due to the large number of cataract operations [1–4]. Postoperative intraocular infections are caused by microorganisms gained access to the eye at the time of surgery. This conclusion has been supported by several studies in which bacterial contaminations were detected at the end of the surgery [5–8]. Indigenous flora of the eyelids and conjunctiva are presumed to be a source of postoperative endophthalmitis [9]. Therefore, it is extremely important to minimize entry of microorganisms into the anterior chamber to prevent postoperative endophthalmitis. Meticulous preoperative preparation and proper surgical technique can minimize bacterial contamination during surgery.

BacT/Alert is a continuously monitored blood culture system which has also been used for culturing of other types of sterile body fluids such as pleural, peritoneal, amniotic, and synovial fluids [10].

This study was designed to verify the sterility of aqueous humour at the beginning of surgery and to evaluate the incidence of bacterial contamination at the conclusion of the surgery using BacT/Alert automated blood culture system, in the eyes which were carefully prepared preoperatively.

SUBJECTS AND METHODS

Sixty–nine eyes of 60 consecutive cataract patients, who were scheduled for phacoemulsification surgery with intraocular lens (IOL) implantation, were enrolled to this prospective study. All the operations were performed by the same surgeon (Kocak I) between June and August 2012. The study was conducted in accordance with the Declaration of Helsinki and approved by local ethics committee. Informed consent approved by Istanbul Medipol University Research Ethics Committee was signed by all subjects. All subjects

underwent a complete ophthalmic examination including medical history, dilated biomicroscopy and IOP measurement before surgery. Patients with systemic or ocular risk factors for infection such as diabetes mellitus, systemic immunosuppressive-steroid therapy, blepharitis, conjunctivitis were excluded. Subjects with a history of penetrating eye injury, ocular surgery, or systemic antibiotic therapy two weeks prior to surgery were not eligible. Patients included in this study had grade one-four cataract. Patients with intraoperative complications those may increase the risk of contamination by extending the time of surgery weren't included in the study.

One our preoperatively the pupil was dilated with mydriatics [tropicamide 1% and phenylephrin hydrochloride 10% . (Tropamid 1% , Bilim ilac, Istanbul, Turkey and Phenylephrine Hydrochloride Ophthalmic Solution, USP , Lake Forest, USA)]. Neither systemic nor topical antibiotic prophylaxis was performed. Proparacaine hydrochloride 0.5% (Alcaine, Alcon, Elkridge, USA) was instilled 4 times with five minutes intervals before surgery to maintain topical anesthesia. The skin of periocular area including eyebrows and eyelashes were cleaned with povidone-iodine 10% solution (Batticon 10% , Adeka, Istanbul, Turkey). Povidone-iodine 5% solution was instilled into the conjunctival sac. Operative field, eyelashes, and eyelid margins were covered by a sterile drape with an adhesive foil. After draping, conjunctival sac was irrigated with povidone-iodine 5% solution again. Then operating field was rinsed with balanced salt solution (BSS). The BSS used for operation included 1:100 000 concentration of adrenaline. The eye was anesthetized using sub-tenon anesthesia, if necessary. Twenty gauge sideport incision, 1.8% NaHa viscoelastic fluid injection (Eyefill M.B., CromoPharma, Leobendorf, Austria), 2.8 mm clear corneal incision, continuous circular capsulorhexis were performed respectively. After hydrodissection and phacoemulsification, cortical remnants were removed by coaxial irrigation-aspiration system. A foldable intraocular lens (Acryva, VSY, Istanbul, Turkey) was inserted in the bag using a 2.4 mm injector system. Following viscoelastic fluid aspiration from anterior chamber, wound hydration was performed with BSS, and finally intracameral 1 mg cefuroxime was given.

Two intraoperative anterior chamber aspirates were obtained from each patient by collecting 200 μ L of fluid from the anterior chamber, the first taken upon entering and the other at the conclusion of surgery, just before administration of intracameral cefuroxime. Aspirates were immediately transferred to a 20 mL BacT/Alert pediatric blood culture bottle (Biomerieux Inc., Durham, NC, USA) in aseptic conditions and were cultured for 14d. Statistical analyses were performed with Statplus software (Analysoft, USA).

RESULTS

Sixty-nine eyes of 60 patients were operated for cataract. And

24 of the 60 patients were male, and 36 female. The mean age (\pm SD) of the patients was 67.09 ± 10.07 y (range, 42-85y). Thirty of the 69 eyes were left, and the remainder 39 were right. The mean duration of the surgery (\pm SD) was 15.11 ± 4.5 min (range, 11-32min). There was no complication occurred during surgery.

In all patients, the aqueous samples obtained at the beginning of the surgery were sterile. Also, none of the samples collected at the end of surgery cultured positive using BacT/Alert system. According to these results, the incidence of intraoperative anterior chamber contamination at the conclusion of the surgery was 0% . None of the eyes developed acute postoperative endophthalmitis.

DISCUSSION

Since endophthalmitis is a devastating complication of cataract surgery, prevention of this serious complication is of great importance. Sources of bacterial contamination can be conjunctival sac or environmental [8,11]. Contamination during the surgery may take its source from surgical devices or conjunctival flora. Previous studies evaluating bacterial contamination during intraocular surgery have shown that the incidence of contamination of anterior chamber was between 0% and 10% [12-17]. In this study, preoperative anterior chamber contamination rate was 0%.

In the present study, all the measures were taken to prevent the contamination before and during surgery. First of all, nurses on duty had been educated about hand antisepsis and preoperative preparation technique. Before all medications to the eye, they used antiseptic solutions to clean their hands. The eye drops used for preoperative preparation were separately used for each patient and re-use for any other patient was avoided. Hand hygiene is reported to be related with surgical area infections in previous reports [18,19].

Because the skin of eyelids and eyelashes are likely source of endophthalmitis, cleaning the operation area and proper surgical draping are important considerations. In our study, preparation of the surgical area was performed with povidone-iodine 10% as usual. After proper draping, conjunctival sac was irrigated with povidone-iodine 5% for three minutes. Irrigating conjunctival sac with povidone-iodine 5% has been recommended by previous reports [17,20]. Shimada *et al* [21] suggested a different way of applying povidone-iodine. They reported that repeated irrigation of the operative field with povidone-iodine at a concentration of 0.25% achieved an extremely low bacterial contamination rate in the anterior chamber [21].

In our study, injector systems were preferred to implant IOL. Theoretically, injector systems avoid dragging of the microorganisms into the eye. However, previous studies observed no difference in anterior chamber bacterial contamination rate at the completion of cataract surgery, even when injectors or forceps were used [17]. In contrast to general belief, if bacterial contamination resulting in endophthalmitis does not happen during surgery, it is possible that bacteria get

in anterior chamber through an unhealed incision after surgery [12,22]. Therefore it is essential not to leave a leaking incision at the end of the surgery to prevent entry of microorganisms into anterior chamber.

We did not use prophylactic topical antibiotics before all our surgeries. Although the use of prophylactic topical antibiotics prior to surgery is recommended by European Society of Cataract and Refractive Surgeons (ESCRS) Guidelines on prevention of post-operative endophthalmitis, there is a lack of evidence supporting the topical antibiotic prophylaxis. For example, Bausz *et al* [17] succeeded in prevention of contamination with an incidence of 2% without prophylactic topical antibiotics.

Conditions of the operating room may cause contamination during the surgery. Fridkin *et al* [23] reported an *Acremonium Kiliense* endophthalmitis that was of airborne source. The infective agent was isolated from HEPA filters of the operating room. According to the report, the HEPA filters may have been contaminated due to prolonged usage. To prevent such fungal infections originated from airborne source, HEPA filters and conditioners of the operating room has to be checked and changed periodically.

Although Cornut *et al* [12] reported 0% contamination that is similar to ours with eubacterial PCR technique; most studies show some contamination during the surgery. So sensitivity of BacT/Alert test might affect the contamination rates and needs to be investigated by further studies.

In conclusion, the results of present study showed no peroperative bacterial contamination of the anterior chamber. The incidence of bacterial contamination of the anterior chamber during phacoemulsification was 0% using BacT/Alert system, emphasizing the role of following protocols of antisepsis. A small number of cases were included in this study, larger case groups are needed to make consistent conclusions.

ACKNOWLEDGEMENTS

Conflicts of Interest: Kocak I, None; Kocak F, None; Teker B, None; Aydin A, None; Kaya F, None; Baybora H, None.

REFERENCES

- Pathengay A, Flynn HW Jr, Isom RF, Miller D. Endophthalmitis outbreaks following cataract surgery: causative organisms, etiologies, and visual acuity outcomes. *J Cataract Refract Surg* 2012;38(7):1278–1282
- Shorstein NH, Winthrop KL, Herrinton LJ. Decreased postoperative endophthalmitis rate after institution of intracameral antibiotics in a Northern California eye department. *J Cataract Refract Surg* 2013;39(1):8–14
- Friling E, Lundström M, Stenevi U, Montan P. Six-year incidence of endophthalmitis after cataract surgery: Swedish national study. *J Cataract Refract Surg* 2013;39(1):15–21
- Barreau G, Mounier M, Marin B, Adenis JP, Robert PY. Intracameral cefuroxime injection at the end of cataract surgery to reduce the incidence of endophthalmitis: French study. *J Cataract Refract Surg* 2012;38(8):1370–1375
- Durand ML. Endophthalmitis. *Clin Microbiol Infect* 2013;19(3):227–234

- Keynan Y, Finkelman Y, Lagacè–Wiens P. The microbiology of endophthalmitis: global trends and a local perspective. *Eur J Clin Microbiol Infect Dis* 2012;31(11):2879–2886
- Lin M, Zhang W, Liu Y, Wang L, Ding Y, Wu X, Shi Y, Sun L, Li Y. Nosocomial acute-onset postoperative endophthalmitis at a university teaching hospital in China. *J Hosp Infect* 2011;79(4):323–327
- Jambulingam M, Parameswaran SK, Lysa S, Selvaraj M, Madhavan HN. A study on the incidence, microbiological analysis and investigations on the source of infection of postoperative infectious endophthalmitis in a tertiary care ophthalmic hospital: an 8-year study. *Indian J Ophthalmol* 2010;58(4):297–302
- Suto C, Morinaga M, Yagi T, Tsuji C, Tshida H. Conjunctival sac bacterial flora isolated prior to cataract surgery. *Infect Drug Resist* 2012;5:37–41
- Mitteregger D, Barousch W, Nehr M, Kundi M, Zeitlinger M, Makristathis A, Hirschl AM. Neutralization of antimicrobial substances in new BacT/Alert FA and FN Plus blood culture bottles. *J Clin Microbiol* 2013;51(5):1534–1540
- Mattsos FB, Saraiva FP, Angotti–Neto H, Passos AF. Outbreak of *Ochrobactrum anthropi* endophthalmitis following cataract surgery. *J Hosp Infect* 2013;83(4):337–340
- Cornut PL, Vandenesch F, Lina G, Benito Y, Etienne J, Piras C, Kodjikian L, Denis P, Burillon C. Bacterial contamination rate of the anterior chamber during cataract surgery using conventional culture and eubacterial PCR. *Eur J Ophthalmol* 2010;20(2):365–369
- Leong JK, Shah R, McCluskey PJ, Benn RA, Taylor RF. Bacterial contamination of the anterior chamber during phacoemulsification cataract surgery. *J Cataract Refract Surg* 2002;28(5):826–833
- Bucci FA Jr, Amico LM, Evans RE. Antimicrobial efficacy of prophylactic gatifloxacin 0.3% and moxifloxacin 0.5% in patients undergoing phacoemulsification surgery. *Eye Contact Lens* 2008;34(1):39–42
- Ta CN, Egbert PR, Singh K, Blumenkranz MS, De Kaspar HM. The challenge of determining aqueous contamination rate in anterior segment intraocular surgery. *Am J Ophthalmol* 2004;137(4):662–667
- Nentwich MM, Rajab M, Ta CN, He L, Grueterich M, Haritoglou C, Gandorfer A, Kampik A, Mino De Kaspar H. Application of 10% povidone iodine reduces conjunctival bacterial contamination rate in patients undergoing cataract surgery. *Eur J Ophthalmol* 2012;22(4):541–546
- Bausz M, Fodor E, Resch MD, Kristof K. Bacterial contamination in the anterior chamber after povidone–iodine application and the effect of the lens implantation device. *J Cataract Refract Surg* 2006;32(10):1691–1695
- Shepherd A. Contamination of injection sites by landmark palpation after skin antisepsis. *J Hosp Infect* 2009;71(1):97–98
- Wilson R. Minimising the spread of infection in the operating department. *J Perioper Pract* 2012;22(6):185–188
- Quiroga LP, Lansingh V, Laspina F, Samudio M, Stanley J, Kaspar HM, Cibils D, Cibils PA. Prospective study demonstrating the effect of 5% povidone–iodine application for anterior segment intraocular surgery in Paraguay. *Arg Bras Oftalmol* 2010;73(2):125–128
- Shimada H, Arai S, Nakashizuka H, Hattori T, Yuzawa M. Reduction of anterior chamber contamination rate after cataract surgery by intraoperative surface irrigation with 0.25% povidone–iodine. *Am J Ophthalmol* 2011;151:11–17
- McDonnell PJ, Taban M, Sarayba M, Rao B, Zhang J, Schiffman R, Chen Z. Dynamic morphology of clear corneal cataract incisions. *Ophthalmology* 2003;110(12):2342–2348
- Fridkin SK, Kremer FB, Bland LA, Padhye A, McNeil MM, Jarvis WR. *Acremonium kiliense* endophthalmitis that occurred after cataract extraction in an ambulatory surgical center and was traced to an environmental reservoir. *Clin Infect Dis* 1996;22(2):222–227