Anterior Chamber Contamination at the Conclusion of Phacoemulsification

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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.

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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.[1-3] DNA analysis techniques have also demonstrated that organisms causing endophthalmitis are commonly the same as the patient's own ocular bacterial flora.[4-8] Organisms may enter the anterior chamber (AC) directly or indirectly via intraocular lenses (IOLs), intraocular instruments and irrigation solutions.[2] The role of such contamination in development of postoperative endophthalmitis is well recognized.[1-3,9] The rate of AC contamination during cataract surgery varies widely from 2% to 46.25% in different studies.[10-12] The purpose of the current study was to evaluate AC contamination during phacoemulsification and intraocular lens implanttation (PE+IOL) at our center.

METHODS

This prospective study included 80 eyes of 80 patients undergoing standard PE+IOL at Labbafinejad 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 ºC, 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.[13-16]

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%),[7,8] however AC contamination has been reported from 2% to 46.25% during PE[10-12] and from 22.5% to 43% during uncomplicated extracapsular cataract extraction (ECCE)[12,17]. 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.[2,3,18,19]

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 microorganism access to the AC and vitreous cavity. The incidence of endophthalmitis is higher after intracapsular cataract extraction compared to ECCE[20] and also higher in cases complicated by posterior capsule rupture.[21] AC collapse and shallowing during the aspiration phase of ECCE can introduce organisms into the AC by producing lower than atmospheric pressures.[22] 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.[23, 24]

Bacteria may enter the AC via irrigating solutions, instruments, IOLs or ocular surface fluid influx. Contaminated irrigation solutions have caused epidemic outbreaks of endophthalmitis.[25-32] Polypropylene IOL haptics have been reported as a risk factor for bacterial adherence.[33] 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.[34]

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%.[34-36] Contamination may also occur during the process of obtaining and culturing intraocular samples.[35,36]

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.

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