

REVIEW ARTICLE

CURRENT TRENDS IN PREVENTION OF ENDOPHTHALMITIS AFTER CATARACT OPERATION

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INTRODUCTION

After doing a neat and clean phacoemulsification (phaco) of cataract, eye specialist and the patient are elated as the visual recovery appears to be a miracle. But if the next day patient comes with pain, redness and decreased vision, ophthalmologist's nightmare has become reality. Endophthalmitis is ocular inflammation occurring because of introduction and proliferation of bacteria or fungi in posterior segment of the eye.

PATHOPHYSIOLOGY

Pathogenic bacteria present on ocular surface enter the eye in approximately 30-45% of cataract operations but endophthalmitis occurs in a few cases only [1-3]. The occurrence and severity of endophthalmitis depends on virulence and quantity of pathogens as well as eye's immune status. The incubation period is mainly determined by replication time of the organism and toxin production. The next is destruction phase in which the macrophages and lymphocytes release inflammatory mediators especially cytokines which attract further leukocytes and cause retinal injury [4, 5]. In case of Gram-positive organisms, ocular inflammation is due to growing organisms as well as metabolically inactive organisms, whole cell walls, and cell wall components. Gram-negative lipopolysaccharide when injected in the vitreous produces inflammatory-cell infiltration and protein leakage into the aqueous humor [6]. Approximately 50% cases of post-phaco endophthalmitis [5] are due to Coagulase - negative staphylococci (CNS). Staphylococcus

aureus, Streptococci, Gram negative bacteria (each in 15% of cases) and rarely (5%) Fungi (Candida, Aspergillus) are responsible in the rest.

FACTORS INCREASING THE RISK

Clear corneal incision: The European Society of Cataract and Refractive Surgery (ESCRS) study [7] found endophthalmitis incidence was approximately 6 times greater with clear corneal incision (CCI) than with scleral tunnel incision (CSI). Wound leak on first post op day [8] has been found to be an important factor and therefore suturing of the wound has been found preferable [9]. The endophthalmitis risk was reduced by 5 fold in superior CSI compared to temporal CCI [10].

Diabetes Mellitus: About one fifth of all patients who develop post operative endophthalmitis after cataract operations are diabetic [11, 12]. If diabetic control is poor or diabetic retinopathy is present [11], outcome is usually worse.

Immune Suppression: Patients on topically or systemically administered immuno suppressants (corticosteroids, antimetabolites) at the time of operation have a significantly higher risk of endophthalmitis [13].

Atopy and acne Rosacea: These patients have preponderance of Staph aureus [14]. Preferably they should be given anti Staph prophylaxis prior to and after surgery. [15]

Patients having intraoperative capsular or zonular complications: They were 4.95 times more likely to develop infection.

FACTORS DECREASING THE RISK

Injectable intraocular lenses (IOL): These have been found to reduce the risk of developing infection as intraocular lenses do not make contact with the ocular surface [16].

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PREVENTION

Antisepsis

The aim of pre-operative antisepsis is to reduce the total bacterial count in the wound area.

For peri-orbital skin antisepsis, a 10 % povidone-iodine solution applied for a minimum of 3 min is recommended. For antisepsis of conjunctiva and cornea, 5 % solution of povidone -iodine (a 10% solution of povidone - iodine can be diluted 1:1 with BSS or isotonic saline) applied for 3 min reduces the number of bacteria from 10 to 100 fold [17, 18]. It can, however, cause problems if it gets into the anterior chamber [19].

Large bottles of diluted povidone -iodine or chlorhexidine should be avoided and single-use sachets or vials be used as both antiseptics can become contaminated with *Pseudomonas aeruginosa*. Covering the eye lashes with adhesive tape (Opsite etc) prevents them from coming in the surgical field.

Antibiotics

Before Operation

Topical: Topical ofloxacin has been found to decrease endophthalmitis rate more as compared to topical ciprofloxacin [20]. Levofloxacin reaches higher concentrations in the anterior chamber than ofloxacin and ciprofloxacin [21-23]. In ESCRS study [7] patients were administered one drop of 0.5% levofloxacin one hour and one drop 30 min before surgery and three drops at five - minute intervals immediately following surgery. Moxifloxacin (Vigamox, Megamox etc) has been found to penetrate the eye significantly better than ofloxacin [24]. In Canada, topical antibiotics, of which moxifloxacin is the most common (32%), is being used preoperatively by 78% [25] of eye specialists.

During Operation

Addition to irrigating solution: Gentamicin and vancomycin, added to the irrigating solution has not been found to decrease incidence of endophthalmitis [26-28].

Intracameral injection: ESCRS study found that risk of endophthalmitis following phaco was reduced by five fold by 1 mg cefuroxime in 0.1ml when given at the end of surgery [7, 29]. Moxifloxacin has also been found to be safe in an animal model [30] and humans [31]. It can be taken directly from the eye drop bottle as it is preservative free and isotonic with the aqueous. For the last one and a half years, authors are routinely injecting 0.1 ml of moxifloxacin intracamerally at the end of cataract operation, going behind the capsulorhexis edge so that antibiotic reaches the microorganisms if any are trapped between posterior capsule and IOL. So far we have given injections in more than 4000 operations.

Subconjunctival injection: It has not been found effective [5, 32].

After Operation

In ESCRS study [7] patients were administered three drops of 0.5% levofloxacin at five - minute intervals immediately following surgery. They recommended that to maintain an adequate level of levofloxacin in the anterior chamber, it may be considered continuing to dose every one to two hours topically post operatively on the day of surgery and from the next day on four times daily [33]. Use of the preoperatively applied topical antibiotic is recommended four times a day for upto two weeks. 1.25 per cent povidone - iodine has been recommended post operatively as it significantly reduced conjunctival bacterial count [34]. Postoperative topical antibiotics, of which moxifloxacin is the most common (30%), are being used by 97% of ophthalmologists in Canada [25]. Authors are also using moxifloxacin eye drops before and after the operation.

REFERENCES

1. Sherwood DR., Rich WJ, Jacobs JS, Hart RJ, Fairchild YL. Bacterial contamination of intraocular and extraocular fluids during extracapsular cataract extraction. *Eye*.1989; 3: 308-12
2. Dickey JB, Thompson KD, Jay WM: Anterior chamber aspirate cultures after uncomplicated cataract surgery. *Am J Ophthalmol*.1991;112:278-82,

3. Streilein JW: Ocular immune privilege and the faustian dilemma. *Invest Ophthalmol Vis Sci.* 1996; 37: 1940-50
4. Kon CH, Occlleston NL, Aylward GW, Khaw PT: Expression of vitreous cytokines in proliferative vitreoretinopathy: a prospective study. *Invest Ophthalmol Vis Sci.* 1999; 40: 705-12
5. Peyman G, Lee P, Seal DV. *Endophthalmitis-Diagnosis and management.* Taylor & Francis, London: 2004; 1-270
6. Michelle C, Callegan, Michael Engelbert, David W. Parke II, Bradley D. Jett Michael S. Gilmore. *Bacterial Endophthalmitis: Epidemiology, Therapeutics, and Bacterium-Host Interactions.* *Clin Microbiol Rev.* 2002; 15: 1: 111-24.
7. ESCRS Endophthalmitis Study Group: Prophylaxis of post-operative endophthalmitis following cataract surgery: results of the ESCRS multi-centre study and identification of risk factors. *J Cataract Refract Surg.* 2007; 33: 978-88.
8. Wallin T, Parker J, Jin Y, Kefalopoulos G, Olson RJ: Cohort study of 27 cases of endophthalmitis at a single institution. *J Cataract Refract Surg.* 2005; 31: 735-41.
9. Msaket S. Is there a relationship between clear corneal cataract incisions and endophthalmitis? *J Cataract Refract Surg.* 2005; 31: 643-5.
10. Nagaki Y, Hayasaka S, Kadoi C, Matsumoto M, Yanagisawa S, Watanabe Ka, Watanabe Ko, Hayasaka Y, Ikeda N, Sato S, Kataoka Y, Togashi M, Abe T. Bacterial endophthalmitis after small-incision cataract surgery. Effect of incision placement and intraocular lens type. *J cataract refract Surg.* 2003; 2:20-6.
11. Dey S, Pulido JS, Tessler HH, Mitra RA, Han DP, Mieler WF, Conno TB Jr. Progression of diabetic retinopathy after endophthalmitis. *Ophthalmology.* 1999; 106; 774-81.
12. Philipps WB and Tasman WS. Post-operative endophthalmitis in association with diabetes mellitus. *Ophthalmology.* 1994; 101: 508-18
13. Montan PG, Koranyi G, Setterquist HE, Stridh A, Philipson BT, Wiklund K. Endophthalmitis after cataract surgery. Risk factors relating to technique and events of the operation and patient history. A retrospective case-control study. *Ophthalmology.* 1998; 105: 2171-7.
14. Seal D, Wright P, Ficker L, Hagan K, Troski M, Menday P. Placebo-controlled trial of fusidic acid gel and oxytetracycline for recurrent blepharitis and rosacea. *Br J Ophthalmol.* 1995; 79:42-5.
15. Seal DV, Bron AJ, Hay J. Ocular infection-investigation and treatment in practice. *Martin Dunitz, London* 1998, pp1-275
16. Mayer E, Cadman D, Ewings P. A 10 year retrospective study of cataract surgery and endophthalmitis in a single eye unit: injectable lenses lower the incidence of endophthalmitis. *Br J Ophthalmol.* 2003; 87; 867-9.
17. Isenberg SJ, Apt L, Yoshimori R, Khwarg S. Chemical preparation of the eye in ophthalmic surgery. IV. Comparison of povidone-iodine on the conjunctiva with a prophylactic antibiotic. *Arch Ophthalmol.* 1985; 103; 1340-2.
18. Isenberg SJ, Apt L, Yoshimori R. Chemical preparation of the eye in ophthalmic surgery. I. Effect of conjunctival irrigation. *Arch Ophthalmol.* 1983; 101; 761-3.
19. Alp BN, Elibol O, Sargon MF, Aslan OS, Yanyali A, Karabas L, Talu H, Caglar Y. The effect of povidone iodine on the corneal endothelium. *Cornea* 2000; 19: 546-50.
20. Jensen MK, Fiscella RG, Crandall AS, Moshirfar M, Mooney B, Wallin T, Olson RJ. A retrospective study of endophthalmitis rates comparing quinolone antibiotics. *Am J Ophthalmol.* 2005; 139: 141-8.
21. Bucci FA. An In Vivo Study Comparing the Ocular Absorption of Levofloxacin and Ciprofloxacin prior to Phacoemulsification. *Am J Ophthalmol.* 2004; 137: 308-12.
22. Colin J, Simonpoli S, Geldsetzer K, Ropo A. Corneal penetration of levofloxacin into the human aqueous humour: a comparison with ciprofloxacin. *Acta Ophthalmol Scand.* 2003; 81: 611-3.
23. Koch HR, Kulus SC, Roessler M, Ropo A, Geldsetzer K. Corneal penetration of fluoroquinolones: aqueous humour concentrations after topical application of levofloxacin 0.5% and ofloxacin 0.3% eyedrops. *J cataract Refract Surg.* 2005; 31: 1377-85.
24. Lai WW, Chu KO, Chan KP, Choy KW, Wang CC, Tsang CW, Pang CP. Differential aqueous and vitreous concentrations of moxifloxacin and ofloxacin after topical administration one hour before vitrectomy. *Am J Ophthalmol.* 2007; 144: 2: 315-8.
25. Hammoudi DS, Abdoell M, Wong DT. Patterns of perioperative prophylaxis for cataract surgery in Canada. *Can J Ophthalmol.* 2007; 42: 5: 681-8.
26. Center for Disease Control: Recommendations for preventing the spread of vancomycin resistance. *Morb Mort Wkly Rep* 1995; 44 (RR-12): 1-13.
27. AAO-CDC Task Force: The prophylactic use of vancomycin for intraocular surgery. *Quality of care Publications, Number 515, American Academy of Ophthalmology.* San Francisco, CA, October 1999.
28. May L, Navarro VB, Gottsch JD. First do no harm; Routine use of aminoglycosides in the operating room. *Insight* 2.5, 2000; 77-80.
29. Seal DV, Barry P, Gettinby G, Less F, Peterson M, Revie CW, Wilhelmus KR. ESCRS study of prophylaxis of post-operative endophthalmitis after cataract surgery: Case for a European multi-centre study. *J Cataract Refract Surg.* 2006; 32: 396-406.

30. O'Brien TP, Arshinoff SA, Mah FS Perspectives on antibiotics for postoperative endophthalmitis prophylaxis: potential role of moxifloxacin. *J Cataract Refract Surg.* 2007; 33: 10: 1790-800.
 31. Espiritu CR, Caparas VL, Bolinao JG. Safety of prophylactic intracameral moxifloxacin 0.5% ophthalmic solution in cataract surgery patients. *J Cataract Refract Surg.* 2007; 33: 1: 63-8.
 32. Ciulla TA, Starr MB, Masket S. Bacterial endophthalmitis prophylaxis for cataract surgery. *Ophthalmology.* 2002; 109: 13-24.
 33. Sundelin K, Stenevi U, Seal D, Gardner S, Ropo A, Geldsetzer K. Corneal penetration of topical levofloxacin 0.5% pharmacokinetic profile with aqueous humour concentrations after intensive pre- and post-operative dosing and implications for prophylactic use. 2007, manuscript submitted to *Acta Ophthalmol Scand.*
 34. Isenberg, SJ, apt L, Yoshimori R, Pham C, Lam NK. Efficacy of topical povidone-iodine during the first week after ophthalmic surgery. *Am J Ophthalmol.* 1997; 124: 31-5
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