Hydrophilic Intraocular Lens as a Cause of Outbreak of Postcataract Pseudomonas endophthalmitis

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Objective: To present the process of investigation and outcome of an outbreak of post-cataract surgery endophthalmitis. Methods: Analysis of clinical and laboratory data of 11 patients who developed endophthalmitis among 385 patients of cataract surgery, during 6 to 29th September 2010. Environmental surveillance specimens were investigated. Genotypic diversity was determined to find the source. Results: Eleven patients underwent vitrectomy or biopsy with IOAB. Vision improved to 20/50 or better in 8 of 11 patients (72.7%). Pseudomonas aeruginosa was isolated from 8 eyes. Among all surveillance specimens, only hydrophilic IOLs grew Pseudomonas with antibiotic susceptibility and genetic pattern identical to clinical isolates. Conclusions: Positive smears and cultures and the ERIC-PCR results proved that contamination of Hydrophilic IOLs were the source of infection in this outbreak. Planned way of investigation and review of documents of involved patients can lead to the source of infection.

Post cataract surgery endophthalmitis is a potentially sight threatening complication, with an incidence of 0.07% to 0.12%. Less well reported in the ophthalmic literature, is the outbreaks of acute post-operative endophthalmitis. Outbreaks of post-cataract surgery endophthalmitis can be potentially devastating when it occurs and warrants thorough investigation. Potential sources of post cataract surgery endophthalmitis outbreaks include contaminated surgical intraocular instruments and fluids, or contaminated environment. Outbreaks of postoperative P. aeruginosa endophthalmitis have been described in the literature. The aim of the present study is to report the process of investigation of an outbreak of Pseudomonas endophthalmitis after cataract surgery that led to identification of contamination of hydrophilic intraocular lenses preserved in a solution as a new source of infection.
MATERIALS AND METHODS

An outbreak of acute post-cataract surgery endophthalmitis occurred at our tertiary care center between 6 and 29 September 2010 form the basis for the study. An approval of the Institutional Review Board for Human Studies was taken for the post outbreak analysis for the outcome.

During the outbreak, as an initial investigative measure surveillance samples were obtained from the internal tubes of the phacoemulsification machines, the povidone-iodine solution, the irrigation solutions (Ringer's lactate and balanced salt solutions), viscoelastic devices, trypan blue and intracameral adrenaline of the same batches used for the cataract surgery. Samples were also collected from the surfaces of operating microscopes, operating tables, instrument trolleys, air-conditioning system of the operating rooms, HEPA filters and the Aquaguard (Eureka Forbes, India) water used for scrubbing. Microbiological analysis was performed.

Following the outbreak of a series of initial six endophthalmitis patients, the Operating Rooms complex was shut down and intensive cleaning of the complex, including cleaning and reconditioning of the air-conditioning system and HEPA filters, and formalin fumigation was performed. All the instruments with hallow tubing including cannulas and phacomachine tubes were changed. After reopening, another 5 patients developed endophthalmitis. All the 11 patients’ records were thoroughly investigated. During the investigation, the intraocular lenses were identified to be common to all patients. Intraocular lenses from the same lot as was used in the cases were also sent for Microbiological analysis.

Smears were examined after Grams, Giemsa, KOH and Calcofluor white staining. Any growth of more than 10 colonies (confluent colonies) on a solid culture medium or turbid growth in two liquid media was considered significant. The Vitek system (BioMérieux, La Balme les Grottes, Montalieu Vercieu, France) was used for phenotypic identification of all positive cultures. The bacterial strains were stored at -80°C for further reference. Antibiotic susceptibility was tested using the classic agar disk diffusion (Kirby-Bauer) method. Genotyping of the bacterial isolates were performed by ERIC-PCR, to know the similarity of the isolates between the patients and the source.

The additional data collected included the number of cataract surgeries performed during the outbreak, demographic information, eye affected, type of cataract surgery, type of intraocular lens implanted, presenting signs and symptoms, treatment advocated, visual and anatomic outcomes of the affected patients at final follow up.
RESULTS

The first patient observed was on 6th September 2010. However the alert has come with occurrence of additional 5 patients between 6th and 20th September 2010. The initial investigative measure included collection of surveillance samples from the internal tubes of the phacoemulsification machines, the povidone-iodine solution, the irrigation solutions, viscoelastic devices, trypan blue and intracameral adrenaline, all were found to be sterile. Additional samples collected from the surfaces of operating microscopes, operating tables, instrument trolleys, air-conditioning system of the operating rooms, HEPA filters and the aquaguard (Eureka Forbes, India) water were also sterile. The sterilization process of the instruments and linen was also checked and found to be alright. Operating room complex was shut down and intensive cleaning of the complex and double formalin fumigation was done.

Having no positive samples, the Operating room complex was opened for surgical procedures. After reopening, between 25th to 30th September, 2010 another 4 patients developed endophthalmitis. All the 10 patients’ records were thoroughly scrutinized, for common offending factor. The intraocular lenses were then identified to be common to all patients. The culture of the same batch of IOLs and the suspension solution sent for microbiological evaluation.
The Intra Ocular Lens and the suspension solution grew Pseudomonas aeruginosa. All the intraocular lenses of the same make were immediately withdrawn and the manufacturer was informed about the incident.

One patient from initial period also developed endophthalmitis and presented to us afterwards. Overall eleven patients developed post-operative endophthalmitis among 385 cataract surgeries performed during the study period, amounting to an incidence of 2.86% endophthalmitis rate during the outbreak. The median interval between surgery and diagnosis of endophthalmitis was 1 day (1-46 days), with 6 of the 11 patients diagnosed to be having endophthalmitis on day 1 of presentation. Ten patients underwent phacoemulsification and one patient underwent small incision cataract surgery with all 11 patients being implanted hydrophilic foldable posterior chamber intraocular lens. Smear examination revealed Gram-negative bacilli in 8 of eleven patients in anterior chamber exudates, while 4 of the 8 vitreous aspirates revealed Gram negative bacilli. Bacterial cultures showed positive growth identified as Pseudomonas aeruginosa in 5 patients. The isolates were sensitive to all the antibiotics except cefuroxime and chloramphenicol. The antibiotic susceptibility pattern was the same in all isolates from the patients and the intraocular lens and its suspension solution. Genetic analysis of the P. aeruginosa strains with ERIC PCR, revealed similar band patterns in isolates from the patients and from the intraocular lens and its solution.

The presenting visual acuity ranged from light perception to 20/50. Eight of the eleven patients had visual acuity less than or equal to 20/200. One patient had 20/100 vision and two had visual acuity better than 20/50. Management of endophthalmitis included parsplana vitrectomy with intraocular antibiotics in 7 patients, vitreous biopsy and intraocular antibiotics in one and anterior chamber tap with intraocular antibiotics in 3 patients. Visual acuity recorded at final follow-up was better than 20/50 in 8 patients, 20/100 in one and two patients had no perception of light. Both patients who had no perception of light developed phthisis bulbi.

**DISCUSSION**

By definition an outbreak of post-cataract surgery endophthalmitis constitute occurrence of endophthalmitis much higher than local incidence pattern.18 The initial two cases we presumed it to be as per our incidence rate (Green), however occurrence of another two cases in rapid succession alerted us (Amber) to start investigation for the offending agents. After fifth case we stopped surgeries (Red) and operating room complex was shut down and intensive cleaning of the complex and double formalin fumigation was done. Having no positive samples, the operating room complex was opened for surgical procedures. After reopening, we had another 4 patients developing...
endophthalmitis. That’s when we have become more vigilant and started thorough investigation. We have looked for outbreaks of cataract surgery-related endophthalmitis caused by Pseudomonas species, reported in the literature.\textsuperscript{10,33-36} Most of the outbreaks seem to have an exogenous origin. All the related samples were sent for microbiological evaluation and found to be sterile.

We now turned to other factors including the surfaces of operating microscopes, operating tables, instrument trolleys, air-conditioning system of the operating rooms, HEPA filters and the Aquaguard (Eureka Forbes, India) water, sterilization process of the instruments and linen were also sterile.\textsuperscript{28-31,40-42} We now turned to the patients’ records to find out any common offending agent and found that intraocular lenses implanted were of same batch and common to all patients. Our next task was to examine whether Pseudomonas grown from the patients’ samples and the intraocular lens solutions is genetically same. The antibiotic susceptibility pattern was the same in all isolates from the patients and the intraocular lens and its suspension solution. This can be only an indicator, but ERIC-PCR is a simple, rapid, and high-resolution method of establishing a clonal relationship between bacterial strains isolated from the patients and potential sources.\textsuperscript{38,39} This technique has been used for genotyping of P. aeruginosa isolates from patients with cystic fibrosis, contact lens-related corneal ulcers and cataract surgery-related endophthalmitis.\textsuperscript{38,43} With ERIC-PCR we have found a similarity of the DNA base pairs between isolates from the patients and the intraocular lens and its suspension solution (two from different sites of the same eye, AC exudates and vitreous exudates shared 100% similarity with the isolates from the intraocular lens and its suspension solution) thus strongly suggesting that the source of infection was the contaminated IOL solvent.

In conclusion, we report a through investigative process that led to identification of a new cause of outbreak of post-operative pseudomonas endophthalmitis, in the form of hydrophilic intraocular lens preserved in a solution. Based on our experience, we would recommend inclusion of cultures from various intraocular lenses, especially hydrophilic lenses, as part of hospital infection committee surveillance protocols. We also recommend using molecular biology techniques, such as ERIC-PCR, to confirm the source of infection. During such outbreaks, while detecting the source of infection, one should balance between the speed of investigation and care of the patients.

\textbf{REFERENCES}


