Int.J.Curr.Microbiol.App.Sci (2018) *7*(8): 3147-3153

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 7 Number 08 (2018)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2018.708.336

Small Outbreak with a Big Impact: Post Cataract *Bacillus* Endophthalmitis Outbreak

Huma Majeed[1*], Juneed M. Lanker[2], Rubina Lone[1] and Syed Arshi[1]

[1]Department of Microbiology, SKIMS MC, J&K, India
[2]Department of surgery, SKIMS, J&K, India

**Corresponding author*

Keywords

Cataract, Endophthalmitis, Bacillus

Article Info

Accepted:
17 July 2018
Available Online:
10 August 2018

A B S T R A C T

Endophthalmitis is an event which is considered to be quite rare nowadays. There are many studies on post cataract endophthalmitis but very few studies have come up on post cataract *Bacillus* endophthalmitis and our study focuses on a similar event. Our aim was to evaluate an outbreak of post operative endophthalmitis which took place in a hospital in north Kashmir and lasted over a period of three weeks. Elective cataract surgery was performed on patients, all above 50 years of age with intra ocular lens implantation. Out of all these patients operated for cataract, 8 patients developed endophthalmitis. Vitreal tap was done and subjected to gram staining, KOH and wet mount preparations and culture. Samples from different areas and instruments of the ophthalmology unit were also taken. Out of the eight vitreous taps of the cases, three were positive. These three samples showed gram positive bacilli in singles and chains supported by cultures which also revealed *Bacillus* spp. Subsequently samples from different areas and instruments of the ophthalmology unit also revealed *Bacillus* spp. The coexistence of *Bacillus* spp with human flora, its image as a contaminant and its rare occurrence as a cause of endophthalmitis are the things which hinder its establishment as an etiological agent. But the thing which always has to be kept in mind is that *Bacillus* spp whenever cultured from ocular tissues or fluids should not be dismissed as contaminant and should always be investigated. This outbreak of *Bacillus* endophthalmitis was linked to contaminated ophthalmic instruments and other materials used during the surgery and in the post operative period. The key is recognition of sterilization and decontamination as a problem, raising awareness, providing practical training and resources for the same.

Introduction

Endophthalmitis is an event which is considered to be quite rare nowadays. Mostly endophthalmitis is exogenous in origin (95%) i.e. due to trauma or intraocular surgery. (Gribomont, 2009) It is one of the most devastating complications of intraocular surgery.

Endophthalmitis is the inflammatory response to a bacterial, fungal, or parasitic invasion of the eye. (Gribomont, 2009) Bacterial endophthalmitis is a blinding eye disease that can result from either exogenous (post-operative, post-traumatic) or endogenous (hematogenous) causes. The outcome of the infection varies with the microbial agent involved and the rapidity of response to

treatment. Studies have shown that endophthalmitis, where the causative agents include normal flora from oral cavities, nasal cavities and skin is of a low grade type and treatment is usually successful. In contrast, endophthalmitis due to environmental organisms like *Bacillus* spp is more resistant to handle and is quickly devastating for ocular structures (Das *et al.,* 2001).

Post-operative endophthalmitis is a rare but feared complication after cataract surgery and enucleation can be rare sequelae (Roger F. Steinert) Endophthalmitis caused by *Bacillus* sppis rare, and most cases are related to trauma (Das *et al.,* 2001; Foster *et al.,* 1996; Barletta and Small, 1996; Roy *et al.,* 1997). There are many studies on post cataract endophthalmitis butvery few studies have come up on post cataract *Bacillus* endophthalmitis (Simini, 1998) and our study focuses on a similar event. What could have been the reasons and the preventive measures for it.

The present study aimed to evaluate an outbreak of post-operative endophthalmitis which took place in a hospital in north Kashmir and lasted over a period of three weeks.

Materials and Methods

Elective cataract surgery was performed on patients, all above 50 years of age with intra ocular lens implantation. Patients were operated in the ophthalmology theatre. In the post-operative period within 2-5 days patients complained of redness, pain, declining visual acuity in the operated eyes.

Out of all these patients operated for cataract, 8 patients developed endophthalmitis. Median time for presentation of post-operative endophthalmitis has been reported to be 3-10 days with majority presenting within two weeks (Roger F. Steinert). Vitreal taps were performed and intra vitreal and systemic antibiotics were given. Vitreal taps are considered to be better samples (Jack J. Kanski and Brad Bowling, 2011) and the probability of finding a microorganism by direct examination or by culture is indeed higher in the vitreous (40 to 69% of the cases) than in the aqueous humour (Gribomont, 2009). The samples were collected from those patients only, who presented with features of endophthalmitis.

This vitreal tap was subjected to gram staining, KOH and wet mount (Edward J. Bottone, 2010) preparations. Part of the sample was directly plated on blood agar and maconkey agar and part of the sample was inoculated in BHI broth for sub-culturing.

Repeated samples from different areas and instruments of the ophthalmology unit were also taken over a period of three weeks and culture of the same was performed.

Results and Discussion

An outbreak of endophthalmitis developed over a period of three weeks. Eight patients out of all the patients who were operated for cataract, had features of endophthalmitis. The patients developed acute endophthalmitis over a period of 2-5 days postoperatively. Patients had symptoms of redness, decreased vision and pain in the operated eye. It was associated with systemic symptoms of fever, malaise and leukocytosis.

Out of the eight vitreous taps of the cases, three were positive. These three samples showed gram positive bacilli in singles and chains on direct gram staining. Wet preparation of the vitreous fluid showed motile bacilli. Culture of the same vitreous taps grew *Bacillus* spp. Gram-stained smears prepared from it revealed uniform bacillary

morphology with oval, centrally situated spores.

On blood agar at 37°C, colonies were dull grey and opaque with a rough matted surface. Colony perimeters were irregular and swarming in character, likely due to swarming motility. Zones of beta-hemolysis were present. Rests of the five cases of endophthalmitis were culture negative.

Subsequently samples from different areas and instruments of the ophthalmology unit were taken over a period of three weeks and culture of the same was performed. This was what it revealed.

Our study is based on a small outbreak in an ophthalmology unit in a hospital in north Kashmir. The occurrence of two or more similar cases relating to place and time is identified as a cluster or an outbreak. (Guidelines on Prevention and Control of Hospital Acquired Infections)

Studies show very low rates of incidence of post cataract surgery endophthalmitis like 0.040% (Wrong *et al.*,), 0.030% (Miller *et al.*, 1997), 0.17% (Menikoff *et al.*,; Roger F. Steinert)

In one of the studies, *Bacillus* spp was mentioned as a causative agent in 22% cases of traumatic endophthalmitis whereas in 0% cases of postoperative endophthalmitis (Ashok Nataraj, 2010). Our study had cases of postoperative endophthalmitis but the causative agent was *Bacillus* spp which is a rare cause for the same. *Bacillus* species of all kinds as a cause of postoperative endophthalmitis has been reported only rarely. (Simini, 1998; Wai-Man Chan *et al.*, 2003)

Out of 8 cases of endophthalmitis only 3 vitreous samples showed gram positive bacilli on grams staining (37.5%). Gram positive bacilli detected on vitreous microscopy have to be taken as *Bacillus* spp unless proved otherwise (Das *et al.*, 2001). The same three vitreous samples grew *Bacillus* spp on culture (37.5%). Approximately 64% of eyes with clinical endophthalmitis will display a positive culture (Ashok Nataraj, 2010). Although in our study lesser percentage of endophthalmitis cases were positive on culture but it has been documented that negative cultures don't rule out infection (Jack J. Kanski and Brad Bowling, 2011).

A virulent micro-organism should be suspected when the endophthalmitis occurs around 48 hours after cataract surgery (Gribomont, 2009) and that is what we were looking for. Although from our research we established the causative organism to be *Bacillus* spp but from its cultural characteristics, high virulence of the *Bacillus* spp which caused the infection in our patients, its refractoriness to antibiotic administration and poor visual outcome (loss of eyesight) we assumed our organism to be *Bacillus cereus* (Don B. David *et al.*, 1994).

B. *cereus* endophthalmitis is a devastating malignant eye infection because of the rapidity with which the infection progresses and the bacterium's elaboration of a multitude of virulence factors (Edward J. Bottone, 2010). Drobniewski detailed the results of 35 cases of B. *cereus* endophthalmitis reported during a century, of which 20 eyes were lost to enucleation and one was lost to blindness (Edward J. Bottone, 2010; Drobniewski, 1993).

Despite antibiotic administration and surgical intervention *Bacillus cereus* results in the loss of eye very quickly with possible need of enucleation. This is supplemented by the fact that even if the antibiotics render the eye sterile, ocular damage continues to occur due to toxin production (Das *et al.*, 2001). This

intervention window is extremely narrow for B. *cereus*; in addition, there may be irreversible and progressive intraocular damage. (Wai-Man Chan *et al.*, 2003)

Very few culture-confirmed cases of postoperative B. *cereus* endophthalmitis in the English-language literature (Wai-Man Chan *et al.*, 2003; Roy *et al.*, 1997; Orsi *et al.*, 1999; Kunimoto *et al.*, 1999) have been reported.

The prognosis remains dismal in spite of recent advances. The most important reason for this includes a delay in diagnosis and virulent spectrum of organisms. (Ashok Nataraj, 2010)

The prognosis is poor once a diagnosis of *Bacillus* spp endophthalmitis is established (Hemady *et al.*, 1990). *Bacillus* spp was regarded as a "contaminant" when isolated from a clinical specimen but any *Bacillus* spp whenever cultured from ocular tissues or body fluids should not be dismissed as contaminants. (Hemady *et al.*, 1990; Edward J. Bottone, 2010)

Table.1

SAMPLE	CULTURE	SAMPLE	CULTURE
IOL jars	Sterile	Scissors	*Bacillus* spp
Dressing pads of theatre	Sterile	Irrigation aspiration bulb	*Bacillus* spp
Betadine	Sterile	Trolley	*Bacillus* spp
Theatre eye sheet	Sterile	Eye pads	*Bacillus* spp
Surgical instrument trays	Sterile	Microscope attachments	*Bacillus* spp
Gloves	Sterile	Linen sheets	*Bacillus* spp
Microscope	Sterile	Gown	*Bacillus* spp
Forceps	*Bacillus* spp	Face mask	*Bacillus* spp
Dressing pad of ward	*Bacillus* spp	Surgical instruments	*Bacillus* spp
OT table surface	*Bacillus* spp		

This outbreak of *Bacillus* endophthalmitis was linked to contaminated ophthalmic instruments and other materials used during the surgery and in the post-operative period. It was because *Bacillus* spp was yielded on cultures from the same (Table).

Besides flora of the eye, contaminated solutions and instruments have been considered to be potential sources of endophthalmitis. Contamination of sterilized instruments, disposable supplies, surgical field, or the intraocular lens all have been reported (Jack J. Kanski and Brad Bowling, 2011; Donzis *et al.*, 1988). Epidemic clusters of endophthalmitis have resulted from these types of external contaminations (William Lloyd Clark, 2016) as has resulted in our case. B. *cereus* nosocomial infections by contaminated fomites such as gauze, linens, and ventilators, etc., may serve as the source of the B. *cereus* outbreak (Edward J. Bottone, 2010; Simini, 1998). *B. cereus* endophthalmitis due to contaminated needles, injection paraphernalia, illicit drugs (Grossniklaus *et al.*, 1985; Shamsuddin *et al.*, 1982) or iatrogenic methods has been mentioned in many studies (Edward J. Bottone, 2010; Kerkenezov, 1953). It is conceivable that other items, e.g., alcohol sponges and gloves etc could also have been contaminated (Kerkenezov, 1953).

Roy *et al.*, (1997) reported the largest case

series of *Bacillus* endophthalmitis related to cataract extraction; 14 eyes were infected as a result of intraocular use of bacteria-contaminated viscoelastic material during the procedure (Wai-Man Chan *et al.,* 2003; Roy *et al.,* 1997).

Now the reasons which could be attributed to this post-operative *Bacillus* endophthalmitis outbreak could be improper cleaning of instruments, resistant organism and CSSD failure.

Keeping instruments free from gross soiling and minimizing the time between instruments leaving the operating rooms and cleaning will reduce the risk of biological material drying in the grooves and crevices (Reducing Public Health Risks Associated with Reusable Medical Devices). Among instruments considered as difficult to clean includes some ophthalmic instruments also like aspirators, phaco needles and tubings (Reducing Public Health Risks Associated with Reusable Medical Devices).

Improper washing of instruments prior to sterilizing could be a more important cause than faulty sterilization. Care is required with both washing the instruments and autoclaving them, as the latter is never absolute.

So both matters need to be investigated if there is an ongoing epidemic of post-operative endophthalmitis (ESCRS Guidelines on Prevention).

Spores of *Bacillus* are particularly troublesome because spores can be refractory to pasteurization and gamma radiation, and their hydrophobic nature allows them to adhere to surfaces. (Edward J. Bottone, 2010)

It has been pointed out that *Bacillus* spores can survive multiple heat disinfection treatments as well as chemical disinfection systems used for the minimum recommended lens care techniques (Edward J. Bottone, 2010; Kunimoto *et al.,* 1999). CSSDs have a significant contribution to the quality of services provided by healthcare facilities and have an impact on public health, patient safety, infection control and thus needs to be strengthened.

Despite their supposed rare occurrence as cause of endophthalmitis, *Bacillus* spp is an environmentally pervasive bacterium coexisting with human flora. The major obstacle in evaluating its presence when isolated from a clinical specimen is overcoming its dubious image as a contaminant.

But the thing which always has to be kept in mind is that *Bacillus* spp whenever cultured from ocular tissues or fluids should not be dismissed as contaminant (Hemady *et al.,* 1990; Edward J. Bottone, 2010) and should always be investigated.

Reprocessing of medical devices is common worldwide due to cost constraints and non-availability of adequate number of devices. There is under reporting of infections/ outbreaks due to inadequate decontamination of medical devices (Nizam Damani, 2014). This leads to infections during surgery and spread of MDR organisms. Issues which need to be put forward are; decontamination in resource limited countries; what are the possibilities. The way forward is that it should be a continuous process of improvement based on many small steps rather expecting a revolutionary innovation.

There should be a structured approach towards quality improvement which includes recognition of sterilization and decontamination as a problem, raising awareness, providing practical training and resources, implementing good practices and

audit, and keeping a documentation of the same.

References

Ashok Nataraj. Post Traumatic Endophthalmitis, Kerala Journal of Ophthalmology, Sept. 2010. XXII (3), Pg 258-261.

Barletta JP, and Small KW. Successful Visual Recovery in Delayed Onset *Bacillus Cereus* Endophthalmitis. Ophthalmic Surg Lasers. 1996; 27: 70–2.

Das T, Choudhary K, Sharma S, Jalali S, Nuthethi R. Clinical Profile and Outcome in *Bacillus* Endophthalmitis, Kanuri Santhama Retina Vitreous Centre, LV Prasad Eye Institute, Hyderabad, Tpd@Ivpeye.Stph.Net

Das T, Choudhury K, Sharma S, Jalali S, Nuthethi R. Clinical Profile and Outcome in *Bacillus* Endophthalmitis. Endophthalmitis Research Group. Ophthalmology. 2001 108: 1819–25.

Don B. David, Graham R Kirkby, Bruce A Noble. *Bacillus Cereus* Endophthalmitis, British journal of ophthalmology 1994; 78: 577-580.

Donzis, P. B., B. J. Mondino, and B. A. Weisman. 1988. *Bacillus* Keratitis with Contaminated Contact Lens Case System. Am. J. Ophthalmol. 105: 195–197.

Drobniewski, F. A. 1993. *Bacillus Cereus* and Related Species. Clin. Microbiol. Rev. 6: 324–338

Edward J. Bottone, *Bacillus Cereus*, a Volatile Human Pathogen, Clinical Microbiology Reviews, Apr. 2010, 23(2): 382–398.

ESCRS Guidelines on Prevention, Investigation and Management of Post-Operative Endophthalmitis. www.Escrs.Org/Vienna2011/Programme/Handouts/IC-100/IC.

Foster RE, Martinez JA, Murray TG, Rubsmen PE, Flynn HW, Forster RK. Useful Visual Outcomes after Treatment of *Bacillus Cereus* Endophthalmitis. Ophthalmology. 1996. 103: 390–7.

Gribomont, A.C. Post-Cataract Surgery Endophthalmitis: An Update. Bull. Soc. Belge Ophthalmol, 2009. 311, 43-49.

Grossniklaus, H., H. Bruner, W. E. Frank, and E. W. Purnell. 1985. *Bacillus cereus* Panophthalmitis Appearing as an Acute Glaucoma in a Drug Addict. Am. J. Ophthalmol. 100: 334.

Guidelines on Prevention and Control of Hospital Acquired Infections, Pg-40p, WHO

Hemady, R., M Zaltas, B Paton, C F Foster, A S Baker, British Journal of Ophthalmology 1990; 74(1): 26-9

Jack J. Kanski and Brad Bowling. Lens. Clinical Ophthalmology; 2011. Elsevier, 7: 289-291

Kerkenezov, N. Panophthalmitis after a Blood Transfusion. Br. J. Ophthalmol. 1953. 37: 632–636.

Kunimoto DY, Das T, Sharma S, *et al.*, Microbiologic Spectrum and Susceptibility of Isolates. I. Postoperative Endophthalmitis. Am J Ophthalmol 1999; 128:240–2.

Nizam Damani, 2014. WHO Revised CSSD Manual and Guidelines, Processing Medical Devices.

Orsi GB, Aureli P, Cassone A, Venditti M, Fara GM. Post-Surgical *Bacillus Cereus* Endophthalmitis Outbreak. J Hosp Infect 1999; 42: 250–2.

Reducing Public Health Risks Associated with Reusable Medical Devices, NCCTG, Australia, Pg; 18, 21, 22. Http:/Www.Tga.Gov.Au

Roger F. Steinert, Cataract Surgery, 3ed, Elsivier, David A, Eichensaum, Robert I Park, Post-Operative Endophthalmitis. 671-672

Roy M, Chen JC, Miller M, Boyaner D, Kasner O, Edelstein E. Epidemic *Bacillus* Endophthalmitis After Cataract Surgery. Ophthalmology 1997; 104: 1768–72.

Shamsuddin, D., C. V. Tuazon, C. Levy, and J. Curtin. 1982. *Bacillus Cereus* Panophthalmitis: Source of the Organism. Rev. Infect. Dis. 4: 97–103.

Simini, B. Outbreak of *Bacillus Cereus* Endophthalmitis in Rome. Lancet. 1998. 351: 1258

Wai-Man Chan, 1, 2 David T. L. Liu, 1 Carmen K. M. Chan, 2 Kelvin K. L. Chong, 1 and Dennis S. C. Lam 1, 2. Infective Endophthalmitis Caused by *Bacillus Cereus* after Cataract Extraction Surgery, Clinical Infectious Diseases 2003; 37: E31–34

William Lloyd Clark, MD; Chief Editor: Hampton Roy Sr, Postoperative Endophthalmitis, 2016.

How to cite this article:

Huma Majeed, Juneed M. Lanker, Rubina Lone and Syed Arshi. 2018. Small Outbreak with a Big Impact: Post Cataract *Bacillus* Endophthamitis Outbreak. *Int.J.Curr.Microbiol.App.Sci.* 7(08): 3147-3153. doi: https://doi.org/10.20546/ijcmas.2018.708.336