

# Microbiologic spectrum and susceptibility of isolates in delayed post-cataract surgery endophthalmitis

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**Abstract:** The objective of this study was to evaluate the microbiological spectrum and antimicrobial susceptibility of isolates in delayed post-cataract surgery endophthalmitis. A retrospective review of 33 consecutive patients with culture proven delayed post-cataract surgery endophthalmitis was done from January 2006 to March 2013. There were 22 bacterial and eleven fungal cases. Common isolates were *Streptococci* (seven cases), coagulase-negative staphylococci (five), Gram-negative bacilli (seven), *Nocardia* (two), *Aspergillus* (five), *Candida* (five). Gram-positive cocci were most susceptible to vancomycin and gatifloxacin (91.7%). Gram-negative isolates were most susceptible to ofloxacin (85.7%). Fungi being slow growing organisms are an important cause of delayed post-cataract surgery endophthalmitis.

**Keywords:** delayed endophthalmitis, microbiology, antibiotic sensitivity

## Introduction

Endophthalmitis is a serious vision threatening complication of cataract surgery. It can be classified into two broad categories: acute-onset and delayed-onset. According to endophthalmitis vitrectomy study, infection occurring within 6 weeks after cataract surgery was defined as acute-onset and after 6 weeks as delayed-onset.<sup>1</sup> These two categories differ in their microbiological spectrum.<sup>2</sup>

The purpose of the current study was to investigate the spectrum of organisms causing culture proven delayed post-cataract surgery endophthalmitis and their antimicrobial susceptibilities at our center between 2006 and 2013 and compare it with available western literature.

## Methods

This was a retrospective, non-comparative, consecutive case series. Microbiology records were reviewed of all the culture proven delayed post-cataract surgery endophthalmitis cases treated at L V Prasad Eye Institute, Hyderabad, India between January 2006 and March 2013. The study was approved by the institutional review board and adhered to the guidelines of the Declaration of Helsinki.

Vitreous samples from all patients had been investigated for bacteria and fungus using institutional protocol. Bacterial isolates were identified using Analytical Profile Index system until 2010 and Vitek-2 compact system (bioMérieux, Craponne, France), thereafter. The susceptibility was determined by the Kirby-Bauer disk diffusion method. Fungal species were identified based on their colony and microscopic characteristics. Susceptibilities for fungal isolates were not performed.

## Results

### Microbial spectrum

A total of 33 isolates from 33 vitreous samples were identified. Isolates included 12 (36.4%) Gram-positive cocci, one (3.0%) Gram-positive bacilli, seven (21.2%) Gram-negative bacteria, two (6.1%) *Nocardia* sp., and eleven (33.3%) fungi (Table 1).

Most common isolates identified were coagulase negative staphylococci, *Aspergillus* sp. and *Candida* sp. (5/33, 15.2% each) followed by *Streptococcus pneumoniae* (3/33, 9.1%) and *Burkholderia cepacia* (3/33, 9.1%).

Onset of endophthalmitis occurred 30 days to 15 years (median 150 days) post-operatively in streptococcal cases, 30 to 168 (median 72) days in coagulase-negative staphylococcal cases, 60 to 157 (median 84) days in Gram-negative cases, and 60 to 365 (median 76) days in fungal cases.

### Antimicrobial susceptibility

Gram-positive cocci were most susceptible to vancomycin and gatifloxacin (91.7%). Gram-negative isolates were most susceptible to ofloxacin (85.7%) followed by ceftazidime, ciprofloxacin, gatifloxacin, and moxifloxacin (71.4% each). Susceptibility of Gram-negative organisms to amikacin was 57.1%. These data can be viewed in detail in Table 1.

## Discussion

The microorganisms in delayed post-cataract surgery endophthalmitis are believed to be less virulent as indicated by its insidious onset and low grade of inflammation. In most of the studies published in the literature, *Propionibacterium acnes* were most commonly isolated from the vitreous samples of delayed-onset endophthalmitis.<sup>2-5</sup> In the current study, *P. acnes* were not isolated from any sample. One of the reasons for this could be that anaerobic culture was not done in all cases. From India, there are mostly case reports on delayed-onset endophthalmitis after cataract surgery,<sup>6</sup> thus it is not possible to comment on the incidence of *P. acnes* associated delayed post-cataract surgery endophthalmitis in this region. A higher incidence of fungal isolates noted in the current study is consistent with other studies from the same geographic region.<sup>2</sup> Fungi, being slow growing organisms, are the frequent cause of delayed-onset endophthalmitis. Comparison of microorganisms identified in various delayed-onset post-cataract surgery endophthalmitis studies is given in Table 2.

The antimicrobial susceptibility of the organisms is comparable to that of the same organisms in different clinical settings like acute post-cataract endophthalmitis and post-traumatic

**Table 1** Organisms identified and their susceptibility results in delayed post-cataract surgery endophthalmitis

Organism	Total (%)		Amikacin		Cefazolin		Ceftazidime		Gatifloxacin		Ciprofloxacin		Ofloxacin		Moxifloxacin		Vancomycin						
	N	S %	N	S %	N	S %	N	S %	N	S %	N	S %	N	S %	N	S %	N	S %					
<b>Gram-positive cocci</b>	12	36.4	12	4	33.3	12	10	83.3	3	2	66.7	12	11	91.7	12	9	75.0	11	9	81.8	12	11	91.7
Coagulase negative staphylococci	5	15.2	5	4	80.0	5	4	80.0	-	-	-	5	5	100	5	3	60.0	5	4	80.0	5	5	100
<i>Streptococcus</i> spp.	7	21.2	7	0	0.0	7	6	85.7	3	2	66.7	7	6	85.7	7	6	85.7	6	5	83.3	7	6	85.7
<b>Gram positive bacilli</b>	1	3.0	1	0	0.0	1	1	100	1	1	100	1	1	100	1	1	100	-	-	-	1	1	100
<i>Listeria</i> sp.	1	3.0	1	0	0.0	1	Not applicable	Not applicable	1	1	100	1	1	100	1	1	100	-	-	-	1	1	100
<b>Gram-negative organisms</b>	7	21.2	7	4	57.1	-	-	-	7	5	71.4	7	5	71.4	7	6	85.7	7	5	71.4	-	-	-
<i>Burkholderia cepacia</i>	3	9.1	3	0	0.0	-	-	-	3	2	66.7	3	2	66.7	3	2	66.7	3	2	66.7	-	-	-
Other Gram-negative bacteria	4	12.1	4	4	100	-	-	-	4	3	75.0	4	3	75.0	4	4	100	4	4	100	-	-	-
<i>Nocardia</i> spp.	2	6.1	2	2	100	2	0	0.0	-	-	-	2	2	100	2	2	100	2	2	100	2	2	100
<b>Total bacteria</b>	22	66.7	22	10	45.5	15	11	73.3	11	8	72.7	22	19	86.4	22	18	81.8	20	16	80.0	15	14	93.3
<b>Total fungi</b>	11	33.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Aspergillus</i> sp.	5	15.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Candida</i> sp.	5	15.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Bipolaris</i> sp.	1	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Susceptibility tests not performed

**Notes:** Bold values indicate main groups, ie, Gram-positive and Gram-negative and Gram-negative organisms, while the non-bold values indicate the other remaining groups. \**Streptococcus pneumoniae* (three), *Streptococcus mitis* (one), *Enterococcus faecalis* (one), alpha hemolytic streptococci (species not identified, one), beta hemolytic streptococci (species not identified, one). #*Pseudomonas stutzeri* (one), *Rosomonas gilardii* (one), *Stenotrophomonas maltophilia* (one), *Escherichia coli* (one). \**Enterococcus faecalis* was resistant to vancomycin. N – number of samples tested for the given antibiotic, S – number of samples found susceptible to the antibiotic.

**Table 2** Microbiologic comparison of delayed-onset endophthalmitis studies

	Current study (2006–2013)	Shirodkar et al <sup>2</sup> (2000–2009)	Al-Mezaine et al <sup>3</sup> (1997–2006)	Fox et al <sup>5</sup> (1979–1989)
Number of isolates	33	26	17	19
<i>Propionibacterium acnes</i>	0	11	7	12
Fungal species	11	7	3	3
Gram-positive species	13	3	3	4
Gram-negative species	7	3	1	0
<i>Mycobacteria</i>	0	2	0	0
<i>Nocardia</i> species	2	0	0	0
Mixed	0	0	3	0

endophthalmitis in the same geographic region.<sup>7,8</sup> Gram-positive organisms are most susceptible to vancomycin and Gram-negative organisms to fluoroquinolones and ceftazidime. Low susceptibility of Gram-negative organisms to amikacin was due to *B. cepacia* being the most common cause and they have been shown to be less susceptible to amikacin as compared to ceftazidime and ciprofloxacin.<sup>9</sup>

This is the first study from India on the antimicrobial spectrum and antimicrobial susceptibility of delayed post-cataract surgery endophthalmitis. Less virulent and slow growing organisms like coagulase negative staphylococci and fungi are the most common causative agents of delayed-onset endophthalmitis.

## Disclosure

The authors report no conflicts of interest in this work.

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