

Outcomes of Complete and Early Vitrectomy in Post-Operative Endophthalmitis After Cataract Surgery

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ABSTRACT

Objective: To evaluate the outcomes after complete and early micro-incision vitrectomy surgery in patients with post-operative endophthalmitis after cataract surgery.

Study Design: Quasi-experimental study.

Place and Duration of Study: Vitreoretina Department, Armed Forces Institute of Ophthalmology, Rawalpindi Pakistan, from Jul 2017 to Dec 2020.

Methodology: Thirty (30) patients diagnosed with post-operative endophthalmitis after cataract surgery were included in the study. A vitreous sample was taken and sent for bacterial and fungal culture. A complete vitrectomy was performed after induction of posterior vitreous detachment. The peripheral vitreous base was trimmed, followed by intravitreal antibiotics. Patients were followed up on the first post-operative day and followed up at one week, month and three months. At three months follow-ups, the best corrected visual acuity was noted. Success was defined as best corrected visual acuity (BCVA) of $\geq 6/60$, while failure was defined as BCVA $< 6/60$ three months after vitrectomy.

Results: Mean age of patients was 61.33 ± 14.38 years. Average time from onset of symptoms of endophthalmitis to vitrectomy was 13.46 ± 9.99 days. Pre-operatively one patient had BCVA $\geq 6/60$, and 29 patients had BCVA $< 6/60$, whereas post-operatively, 25 patients had BCVA $\geq 6/60$, and 5 patients had BCVA $< 6/60$. This difference was statistically significant ($p < 0.001$).

Conclusion: Complete and early vitrectomy is safe and effective in managing post-operative endophthalmitis with better visual outcomes.

Keywords: Cataract surgery, Endophthalmitis, Micro incision vitrectomy surgery, Pars plana vitrectomy, Phacoemulsification.

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INTRODUCTION

Post-operative endophthalmitis is a rare but devastating complication of ocular surgery with incidence from 0.066% to 0.11% after cataract surgery and 0.005% to 0.007% after micro incisional vitrectomy surgery (MIVS).¹⁻³ In 1995 Endophthalmitis Vitrectomy Study (EVS) was conducted on 420 eyes and established the fact that vitrectomy was only indicated in eyes with the vision of light perception. Moreover, 50% of core vitrectomy without induction of posterior vitreous detachment (PVD) was recommended by EVS.^{4,5} One study concluded the benefits of complete and early vitrectomy in our local set-up.⁶ Thus, a study with a larger sample size and 23G/25G vitrectomy was needed to determine the outcomes of complete and early vitrectomy in our local population. This study was then conducted with a larger sample size to evaluate the outcomes after complete and early 23G/25G vitrectomy in patients of post-operative

endophthalmitis after cataract surgery.

METHODOLOGY

The quasi-experimental study was conducted at Vitreoretina Department, Armed Forces Institute of Ophthalmology, Rawalpindi Pakistan, from July 2017 to December 2020 after approval by Hospital Ethical Review Committee (187/ERC/AFIO dated 05 June 2017). The sample size was calculated using an online calculator available at Statistics Kingdom.com (https://www.statskingdom.com/sample_size_chi2.html). It was assumed that there would be 2 Categories and Medium Effect Size (0.55).⁷

Inclusion Criteria: Patients of either gender aged 20 to 85 years with post-operative endophthalmitis after cataract surgery who underwent vitrectomy were included in the study.

Exclusion Criteria: Patients of post-operative endophthalmitis who improved after intravitreal antibiotics, patients having retinal and choroidal detachments, severe corneal oedema obscuring view of iris at presentation and endophthalmitis due to other causes, including post-intravitreal injections, post-traumatic,

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endogenous and post vitrectomy endophthalmitis were excluded from the study.

Post-operative endophthalmitis was diagnosed clinically by the history of a painful red eye after cataract surgery, decreased vision, severe anterior chamber reaction or hypopyon, vitreous cells or marked vitreous echoes on B-scan ultrasonography.⁷ Acute post-operative endophthalmitis was diagnosed if symptoms occurred within six weeks of cataract surgery and delayed post-operative endophthalmitis if symptoms were noticed after six weeks of cataract surgery.⁸ The outcome of surgery at three months was considered for final analysis. success was defined as best corrected visual acuity (BCVA) of $\geq 6/60$ at three months. Failure was defined as BCVA of $< 6/60$ at three months.⁹

After the complete history, the ocular examination was carried out in all patients, including BCVA, anterior segment examination, intraocular pressure, red reflex and fundus examination. Ultrasound B scan was performed in all patients where the retinal view was obscured to rule out retinal detachment.

If the red reflex was good, immediately a vitreous sample was taken and sent for culture sensitivity, 1mg of vancomycin and 2.25 mg of ceftazidime were injected intravitreal, and the patient was observed closely for the next 24 hours. If there was an improvement in cell count in the anterior chamber and vitreous, improvement in fundus view or red reflex, medical therapy was continued. If there was no improvement in red reflex after the first dose of intravitreal antibiotics, or if there was no red reflex at presentation patient was planned for vitrectomy.¹⁰ Surgeries were performed by a team of VR surgeons at AFIO with the following protocol.

Vitrectomy was performed from anterior to posteriorly approach.^{5,11} Undiluted vitreous samples were collected by vitreous biopsy before turning ON the infusion cannula. Vitreous samples were sent for culture sensitivity. Once the optic disc was identified, PVD was induced carefully if not already present and peripheral vitreous trimming with indentation was performed.¹⁰ Care was taken not to induce PVD over the necrotic retina.⁵ 360 degrees search with indentation was performed to rule out any peripheral break. If a break was found, laser retinopexy was performed, followed by silicon oil (SO) tamponade.^{11,12} At the end, 1mg of Vancomycin and 2.25 mg of ceftazidime were injected into the vitreous cavity.^{13,14} Patients were reviewed on the first post-operative day (post-op) and followed up at one week, one month and three months. At three months, patients were evaluated for BCVA.⁸

In case of retinal detachment or recurrence of endophthalmitis, a redo vitreous lavage was performed. So was used in those cases where there was severe widespread necrotic retina, retinal break or retinal detachment. SO was removed at two months post-op. Patients with SO were re-evaluated four weeks after removal of SO.^{9, 11,12,15}

Statistical Package for Social Sciences (SPSS) version 22.0 was used for the data analysis. Quantitative variables were expressed as Mean \pm SD and qualitative variables were expressed as frequency and percentages. Fisher’s exact test was applied to explore the inferential statistics. The *p*-value of ≤ 0.05 was considered statistically significant

RESULTS

The total number of patients was 30. The complete detail of all cases has been presented in Table-I.

Table-I: Details of all the Cases (n=30)

| Age (yrs) | Gender | Onset of S/S to Vity (days) | Culture | SO | Pre op BCVA | Post op VA at 03 Months | Success at 03 Months | Remarks |
|-----------|--------|-----------------------------|------------------------|-----|-------------|-------------------------|----------------------|---|
| 60 | M | 4 | Negative | YES | PL | 6/60 | YES | - |
| 62 | F | 4 | Pseudomonas Aeruginosa | YES | PL | 6/36 | YES | - |
| 55 | M | 5 | Negative | NO | HM | 6/24 | YES | Redo Vitreous Lavage Due To Coagulum In Inferior Vitreous |
| 65 | M | 14 | Pseudomonas Aeruginosa | NO | PL | 6/9 | YES | - |
| 60 | M | 34 | Negative | YES | PL | 6/15 | YES | - |
| 60 | F | 24 | Negative | NO | PL | PL | NO | Secondary Angle Closure Glaucoma, Iop Controlled with 3 Drugs |
| 52 | F | 12 | Negative | NO | HM | 6/30 | YES | Pigment Dispersion |
| 78 | M | 7 | Negative | NO | HM | 6/12 | YES | 25G MIVS |

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| | | | | | | | | |
|----|---|----|--|-----|------|-------|-----|---|
| 84 | M | 14 | Negative | YES | PL | 6/18 | YES | - |
| 85 | M | 33 | Achromobacter Xylooxidans | YES | PL | NPL | NO | Phthisis Bulbi, Retinal Necrosis, Iatrogenic Inferior Breaks, Densiron Injected |
| 83 | M | 18 | Gram Negative Cocci On Gram Stain | YES | PL | HM | NO | Culture Was Negative, ECCE with Only 2 Loose Sutures at Presentation |
| 70 | F | 27 | Negative | NO | CF | 6/12 | YES | - |
| 42 | M | 5 | Streptococcus Pneumoniae | YES | PL | PL | NO | Necrotic Retina at Posterior Pole. Extensive Plaques in Bag and iol, iol Explanted. |
| 24 | F | 21 | Negative | NO | PL | 6/60 | YES | Optic disc pallor |
| 70 | F | 30 | Negative | YES | PL | 6/60 | YES | Camp Surgery, HCV+, SICS, PC IOL IN AC, PCR, VL, total Hypopyon, IOL Removed, |
| 62 | M | 4 | Negative | NO | PL | 6/36 | YES | Delayed Post-operative Endophthalmitis, Extensive Plaques in Bag, Removal of Bag IOL Complex |
| 60 | M | 10 | Negative | NO | HM | 6/9 | YES | Delayed Post-operative Endophthalmitis |
| 25 | M | 28 | Pseudomonas Aeruginosa | NO | 6/60 | 6/9 | YES | Low grade Inflammation, Multiple Intravitreal Antibiotics, Developed Raised IOP Post op, Controlled with 2 drugs, Steroid Responder |
| 40 | M | 14 | Fusarium | YES | CF | 6/36 | YES | - |
| 61 | M | 5 | Negative | YES | PL | 6/24 | YES | - |
| 55 | F | 7 | Negative | NO | CF | 6/18 | YES | - |
| 60 | F | 14 | Pseudomonas Aeruginosa | YES | PL | PL | NO | Severe PVR with Retinal Detachment Under oil at 3Months. Eye was Quiet. Patient Opted for Conservative Management. |
| 67 | M | 7 | Negative | YES | PL | 6/60 | YES | - |
| 70 | M | 3 | Negative | YES | PL | 6/60 | YES | Multiple Macular Hemorrhages with Periphlebitis Retinae noted Intra-operatively |
| 60 | F | 8 | Negative | NO | HM | 6/18 | YES | - |
| 65 | M | 8 | Negative | NO | HM | 6/12 | YES | - |
| 69 | M | 28 | Negative | NO | HM | 6/7.5 | YES | 25G MIVS, At 2 Months Post op had Reinfection but Improved with Intravitreal Cavity Antibiotics |
| 63 | M | 4 | Staphylococcus Aureus | YES | CF | 6/24 | YES | - |
| 61 | F | 2 | Streptococcus Pneumoniae And Staphylococcus Aureus | YES | PL | 6/18 | YES | Mixed Infection |
| 72 | M | 10 | Negative | YES | CF | 6/60 | YES | - |

Keys M=Male; F=Female; NPL=no perception of light; PL= perception of light; HM=hand movement; CF=counting fingers; AMD=age related macular degeneration; S/S=signs and symptoms of endophthalmitis; ECCE=extra capsular cataract extraction; HCV= hepatitis C virus; SICS=small incision cataract surgery; PC IOL=posterior chamber intraocular lens; AC= anterior chamber; PCR=posterior capsular rupture; VL= vitreous loss, G=gauge; MIVS=micro incision vitrectomy surgery; PVR= proliferative vitreoretinopathy; IOP= intraocular pressure; vity= vitrectomy

The mean age of patients, average time from the onset of signs and symptoms of endophthalmitis to vitrectomy were elaborated in Table-II. Moreover, percentages of Success (83.3%) and Failure (16.7%) in treatment were also mentioned. Positive vitreous cultures were documented in 10 patients (33.3%).

Table-III compares pre-operative and post-operative BCVA in patients. Pre-operatively one patient had BCVA $\geq 6/60$, and 29 patients had BCVA $< 6/60$, whereas post-operatively, 25 patients had BCVA $\geq 6/60$, and 5 patients had BCVA $< 6/60$. This difference was statistically significant ($p < 0.001$).

Table-II: Clinical and Demographic Details of the Patients (n=30)

| Parameters | Results |
|---|---------------------|
| Total no of Patients (n) | 30 patients |
| Mean age of Patients | 61.33±14.38 years |
| Male: Female | 2 : 1 |
| Mean time duration from onset of symptoms to vitrectomy | 13.46±9.99 days |
| Positive Vitreous Cultures | 10 patients (33.3%) |

Table-III: Relationship of Pre-Operative Best Corrected Visual Acuity (BCVA) and Post-Operative BCVA (n=30)

| | BCVA≥6/60 | BCVA<6/60 | p-value |
|---------------------|---------------------|---------------------|---------|
| Pre-operative BCVA | 01 patient (3.3%) | 29 patients (96.7%) | <0.001 |
| Post-operative BCVA | 25 patients (83.3%) | 5 patients (16.7%) | |

DISCUSSION

Studies have shown a drop in the incidence of post-operative endophthalmitis in the twenty-first century due to the latest surgical techniques and equipment.¹⁵ However, still, it is a nightmare for the patients and treating ophthalmologists.¹⁶ In our study mean time interval from the onset of endophthalmitis to vitrectomy was 13.46±9.99 days. This delay was primarily due to late presentation at tertiary care centres from distant referring hospitals. This time-lapse could be why only seven patients (23.3%) had ≥6/12 vision in our study. In our study, 29 patients (96.7%) had BCVA of <6/60 at presentation, and they achieved >6/60 BCVA in 25 patients (83.3%) despite late presentation. Hsu *et al.*² revealed 47.4% of patients achieved ≥6/12 vision when operated on after a mean of 4.1 days. Their results are better than our study as the patients were operated on earlier than ours, and the toxins of bacteria cleared before damage to the retina. Thapa *et al.*¹⁷ in their study in Nepal, on 34 patients of post-operative endophthalmitis, reported ≥6/18 vision in 17.6% of patients after vitrectomy. The majority of their cases were small incision cataract surgery with late presentation. Our study revealed 12 patients (40%) with ≥6/18 vision. Our study showed better outcomes than theirs because our cases were mainly post-phacoemulsification endophthalmitis.

In our study, positive vitreous cultures were reported in 10 patients (33.3%). *Pseudomonas aeruginosa* was seen in 4 patients (34.4%), *Staphylococcus aureus* in 2 patients (18.2%), *Streptococcus pneumoniae* in 2 patients (18.2%), and *Fusarium* in 1 patient (9.1%). Our study results are comparable with Das *et al.*, who reported a higher frequency of *pseudomonas aeruginosa*

followed by *fusarium* in the indian population.¹⁸ Our data suggests 54.5% of patients had endophthalmitis secondary to gram-negative bacteria in our set-up. Local data from Khaqan *et al.*¹⁵ shows *pseudomonas aeruginosa* in 25% of cases and *streptococcus pneumoniae* in 20.5% of cases of post-operative endophthalmitis. Sridhar *et al.*¹⁹ reported streptococcus species and coagulase-negative staphylococcus as common isolates from the vitreous samples in endophthalmitis. One patient in our study revealed *achromobacter xylosoxidans*, an aerobic, oxidase-positive, non-fermenting gram-negative rod. It most commonly leads to bacteremia, meningitis, urinary tract infection, abscesses, corneal ulcers and very rarely to endophthalmitis.^{20,21}

LIMITATION OF STUDY

This study has a limited number of cases (n=30) due to the rarity of the disease, as endophthalmitis has a disease frequency of 6 to 10 patients per 10,000 cataract surgeries. Thus, the results of this study cannot be generalized to the whole population.

CONCLUSION

In conclusion, complete and early vitrectomy is safe and effective in managing post-operative endophthalmitis with better visual outcomes. Hence, Ophthalmologists need to raise awareness that recovery of visual acuity not only depends on vitrectomy after endophthalmitis but, more importantly, it is the early referrals to Vitreoretina Centers followed by early vitrectomy.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

MAA & WM: Data acquisition, data analysis, data interpretation, approval of the final version to be published.

OF & MNA: Conception, data acquisition drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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