

MODERN ASPECTS AND CLINICAL EFFICACY OF PARS PLANA VITRECTOMY IN THE TREATMENT OF POSTOPERATIVE AND POST- TRAUMATIC ENDOPHTHALMITIS

Gayratov Azizjon Xasan O'gli

Khodjaeva Zilolakhon Anvar qizi

Republican Specialized Scientific and Practical

Medical Center of Eye Microsurgery

e-mail: gayratov.aziz615@gmail.com

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Abstract

This research offers an evaluative clinical assessment comparing the therapeutic outcomes of microincision 25/27-gauge Pars Plana Vitrectomy (PPV) between acute postoperative intraocular infections and post-traumatic endophthalmitis resulting from open-globe mechanical trauma with retained intraocular foreign bodies (IOFB). Based on a sample of 58 affected eyes, the article examines structural eye preservation, pathogen diversity, functional visual recovery, and post-operative complications, while offering refined intraocular irrigation protocols and surgical timing criteria.

Keywords: post-traumatic endophthalmitis, postoperative endophthalmitis, pars plana vitrectomy, intraocular foreign body, silicone oil tamponade, retinal detachment, vitreoretinal surgery.

Introduction

In contemporary ophthalmic practice, intraocular endophthalmitis remains among the most alarming visual-threatening emergencies. Although postoperative endophthalmitis (POE) typically occurs as a secondary complication following elective surgical interventions on the anterior segment, post-traumatic endophthalmitis (PTE) complicates approximately 10–17% of penetrating globe injuries, particularly when accompanied by intraocular foreign bodies (IOFBs). The visual prognosis in PTE is remarkably poor due to concomitant structural tissue degradation, mixed microbial contamination (frequently involving aggressive strains such as *Bacillus cereus*), and delayed hospital presentation. However, recent advances in microinvasive vitreoretinal techniques, notably 25G and 27G Pars Plana Vitrectomy (PPV), have substantially broadened clinical capabilities in controlling both POE and PTE.

Theoretical and Methodological Framework

The underlying etiology of POE and PTE differs markedly regarding initial bacterial load, pathogenic virulence, and the structural integrity of the scleral-

corneal shell. In POE cases, infectious processes are predominantly restricted within the vitreous cavity while the outer ocular wall remains intact. In contrast, PTE presents with corneal/scleral ruptures, traumatic lens opacification, hyphema, and frequently a foreign body serving as a persistent infectious reservoir. The primary biomechanical objective of 25/27G PPV is the exhaustive clearance of purulent vitreous, removal of bacterial toxins, and extraction of IOFBs, followed by continuous intraoperative vitreous irrigation using antibiotic-enriched balanced solutions and subsequent endotamponade (C_3F_8 gas or silicone oil).

Materials and Research Methods

A retrospective comparative analysis was performed on 58 patients (58 eyes) managed for acute intraocular infection between 2022 and 2025. The study population was categorized into two distinct clinical cohorts:

- Group A (n = 31 eyes):** Patients with acute POE following cataract phacoemulsification or antiglaucomatous surgery.

- Group B (n = 27 eyes):** Patients with PTE secondary to open-globe injury (16 eyes presenting with metallic or glass IOFBs).

Surgical management via emergency 25G/27G PPV was executed in all cases within a 12–36 hour window post-admission.

Table 1. Comparative Analysis of Baseline Characteristics and Clinical Outcomes Between POE and PTE Groups

Clinical Parameter	Group A: POE (n = 31)	Group B: PTE (n = 27)	Statistical Significance (p-value)
Mean Age (years)	66.4 ± 5.8	38.2 ± 9.4	p < 0.001
Pathogen Culture Positive	61.2% (Gram- positive)	81.5% (Polymicrobial / Bacillus)	p < 0.05
Post-op BCVA ≥ 0.1	67.7% (21/31 eyes)	40.7% (11/27 eyes)	p < 0.05
Anatomical Eye Retention Rate	96.7% (30/31 eyes)	85.1% (23/27 eyes)	p < 0.05

Results and Discussion

Clinical Case Study: A 34-year-old male was admitted 28 hours following a high-energy metallic penetration to his right eye. Clinical evaluation demonstrated a corneal entry laceration, traumatic cataract, hyphema, hypopyon (2.5 mm), and visual acuity limited to Hand Motions (HM). Computed tomography confirmed a 3.5 mm intraocular metallic fragment. The patient underwent urgent 25G PPV integrated with lensectomy, subtotal core vitrectomy, intraocular magnet extraction of the IOFB, endolaser photocoagulation, and primary silicone oil tamponade. At the 3-month evaluation following silicone oil removal, the retina was fully attached, infection was completely controlled, and BCVA recovered to 0.25.

Current evidence-based protocols supported by the American Academy of Ophthalmology (AAO) and European VitreoRetinal Society (EVRS) suggest that while conservative intravitreal injections can treat mild POE, immediate PPV is imperative in all PTE presentations and severe POE cases. In Uzbekistan, specialized ophthalmic tertiary centers—such as the Republican Specialized Scientific and Practical Medical Center of Eye Microsurgery—are routinely implementing 25G/27G PPV protocols for severe ocular trauma, resulting in a dramatic reduction in historically high organ-removal rates.

Conclusion

Microincision Pars Plana Vitrectomy stands as a definitive, highly successful intervention for controlling acute postoperative and post-traumatic intraocular infections. The combination of modern 25G/27G vitrectomy, targeted intravitreal antimicrobial therapy, and primary silicone oil endotamponade preserves the eyeball in over 85% of complex traumatic clinical presentations. For optimal outcomes, clinical practice should incorporate three mandatory principles:

1. Urgency of Surgical Intervention: Traumatic cases with documented or suspected IOFBs require immediate PPV within 24 hours to mitigate fulminant Bacillus or mycotic panophthalmitis.

2. Primary Intraocular Endotamponade: In eyes with severe vitritis and traumatic retinal tears, primary silicone oil injection is critical to preserve structural integrity.

3. Empiric Antibiotic Protocol: Direct intravitreal administration of Vancomycin (1 mg) paired with Cefazidime (2.25 mg) remains the gold-standard initial regimen.

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