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Research Article



# Evaluation of the Effectiveness of Delayed Extraction of The Intraocular Foreign Body in Open Globe Trauma

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## Abstract

**Background:** According to the modern concept of ocular traumatism, great importance is attached to the choice of atraumatic tactics for the removal of intraocular foreign bodies (IFB), especially when they are localized in the structures of the posterior segment of the eye.

**Purpose:** The aim of the study was to study the feasibility, safety, and clinical efficacy of delayed removal of IFB in open trauma of the eyeball with damage to the posterior segment.

**Material and methods:** The clinical material is based on the results of surgical treatment of 42 patients (42 eyes) with an open globe trauma during the introduction of IFB into the structures of the posterior segment.

**Results:** The results of the conducted studies proved the feasibility and safety of the method of delayed removal of IFB by transvitreal access no later than 24hours after the initial surgical repair (ISR). In all eyes IFB was successfully extracted (100%), its removal was atraumatic, intraoperative complications were not observed in any case.

**Conclusion:** The presented method of delayed removal of IFB by transvitreal access using 23G technology no later than 24hours after the ISR allows atraumatic removal of IFB, reducing the incidence of intraoperative and postoperative complications, as well as improving the clinical and functional outcomes of penetrating wounds with the achievement of a stable anatomical effect.

**Keywords:** Open globe trauma, Intraocular foreign body, The results of delayed transvitreal IFB extraction

## Introduction

According to the modern concept of ocular traumatism, great importance is attached to the choice of atraumatic tactics for the removal of intraocular foreign bodies (IFB), especially when they are localized in the structures of the posterior segment of the eye [1,2]. Of interest are the works where the authors, weighing the risks of developing complications when extracting IFB with the threat of their occurrence when an unremoved IFB is in the eye, conclude that, in some cases, IFB left in the eye is less harmful than traumatic removal of it from the eyeball [3-5].

The introduction of vitreoretinal surgery (VRS) into clinical practice has made it possible to achieve simultaneous removal of IFB by transvitreal access within the framework of initial surgical repair (ISR) with minimization of complications, both in the early and late postoperative periods [6-8]. Considering that in the Republic of Uzbekistan vitreoretinal operations remain the prerogative of single specialized clinics`, there was a need for delayed transvitreal removal of IFB (no later than 24hours) in case of penetrating wounds of the posterior part of the eye.

## Purpose of Research

The aim of the study was to study the feasibility, safety, and clinical efficacy of delayed removal of IFB in open trauma of the eyeball with damage to the posterior segment.

## Materials and Methods

The clinical material is based on the results of surgical treatment of 42 patients (42 eyes) with an open globe trauma during the introduction of IFB into the structures of the posterior segment. Males (34) of young working age from 18 to 40years old (mean age 32±9 years) predominated.

In addition to standard ophthalmological examinations, all patients underwent special research methods (plain radiography of the orbits in two projections and X-ray localization according to Komberg-Baltin). According to X-ray localization, IFB was in the vitreous (19 eyes) or retina (23 eyes).

All patients received specialized emergency care in 2 stages. At the first stage, ISR was performed, the volume of which included restoration of the integrity of the eyeball with sealing of the inlet in the fibrous capsule of the eye, stopping bleeding and preventing intraocular infection. At the second stage, within 24hours after IST, VRS was performed with a transvitreal access to extract IFB through the flat part of the ciliary body. The volume of VRS included a standard three-port subtotal vitrectomy using 23G technology with removal of the altered vitreous body around the fragment, excision of the preretinal ligaments and vitreous tractions. To reduce the traction effect on the retina, a preliminary tamponade of the vitreal cavity with a perfluoroorganic compound liquid (PFCL) was performed. Endolaser coagulation of the retina was performed in the PFCL medium to create a scar barrier around IFB with its further extraction with collet tweezers or a magnet. The detected peripheral retinal breaks, as well as retinal defects in the IFB rebound zone, served as an indication for additional endolaser coagulation, after which PFCL was exchanged with a gas-air mixture (20% SF6, 16% C2F4, or 12% C3F8). Gas-air endotamponade was performed in the presence of rebound retinal defects in 9 eyes, with local upper retinal detachments in 3 eyes, and in the presence of partial hemophthalmos in 10 eyes.

In the presence of hemophthalmos and retinal detachment, the volume of VRS was supplemented with silicone tamponade, followed by removal of silicone after 3 months. Silicone tamponade was performed in 4 eyes with retinal detachment, in 6 eyes with dense hemophthalmos, and in 5 eyes with post-traumatic retinal tears, at the sites of extraction of impacted IFB, the size of which exceeded 3mm. When the wound channel passed through the lens, the volume of vitreoretinal interventions was supplemented by the extraction of the lens (26 eyes), regardless of the degree of its opacification.

Evaluation of the clinical effectiveness of surgical treatment was carried out on the next day after the operation and on the 5$^{th}$ day after VRS. The criterion for the effectiveness of the treatment was the removal of IFB, the anatomical fit of the retina, increased visual acuity, the presence and frequency of complications, as well as the timing of their occurrence.

## Results

The best corrected visual acuity (BCVA) varied from 0.01 to 0.2, averaging 0.06±0.04. The IFB inlet was corneal in 13 eyes, and scleral in the remaining 39 eyes. The size of the IFB in all cases did not exceed 4mm (from 0.6 to 3.8mm). In most cases (38 eyes), IFB was metallic.

In 11 eyes with IFB in the vitreous body, rebound retinal injury in the form of peripheral ruptures was noted. Associated traumatic complications included: traumatic cataracts of varying intensity (24 eyes), peripheral retinal breaks, including those in rebound damage (14 eyes), partial hemophthalmos (16 eyes), and traumatic rhegmatogenous retinal detachment (7 eyes).

Intraoperative complications after delayed removal of IFB by transvitreal access did not occur in any case. In all eyes (100%) it was possible to extract IFB, the removal was atraumatic with complete retinal reattachment in the presence of retinal detachment. Postoperative therapy included instillations of antibacterial drugs, non-steroidal anti-inflammatory drugs, and corticosteroids.

The early postoperative period proceeded favorably in 88.1% of cases (37 eyes). There was no deterioration in visual acuity in any case. Ophthalmotonus varied from 9 to 19mm Hg, averaging 13±1.5mm Hg. Single complications in the form of corneal edema (2 eyes-4.8%), reactive hypertension up to 29±2.0mm Hg. (2 eyes-4.8%) and postoperative iridocyclitis (3 eyes-7.1%) were stopped within 2-3 days by subconjunctival injections of corticosteroids and an intensive regimen of instillations of anti-inflammatory, dehydration, antihypertensive drugs, as well as short-acting mydriatics.

On the 5$^{th}$ day after surgery, a satisfactory condition was observed in all 42 eyes. There was an improvement in visual functions with the restoration of peripheral vision (control method) and an increase in central vision. Visual acuity ranged from 0.05 to 0.3, averaging 0.2±0.09 ($p \leq 0.05$). Normalization of ophthalmotonus was noted with an average value of 15±2.5mm Hg. (From 10 to 20mm Hg). According to ophthalmoscopy, the anatomical fit of the retina was visualized in all eyes, which was confirmed by the results of B-scan and OCT.

## Discussion

The results of the conducted studies proved the feasibility and safety of the method of delayed removal of IFB by transvitreal access no later than 24hours after the ISR. In all eyes IFB was successfully extracted (100%), its removal was atraumatic, intraoperative complications were not observed in any case. The postoperative period was favorable in 87.5% of cases. Single

postoperative complications such as corneal edema (4.8%), reactive hypertension (4.8%) and postoperative iridocyclitis (7.1%) were stopped by instillations of anti-inflammatory, dehydration, and antihypertensive drugs for 2-3days.

An analysis of the functional results on the 5th day of surgery showed an improvement in visual functions with an expansion of the peripheral field of vision and an increase in central vision. BCVA significantly increased by 0.15±0.04 ($p \leq 0.05$), which averaged 0.2±0.09. In all eyes, according to B-scan and ultrasound biomicroscopy the correct anatomical and topographic position of the inner membranes of the eyeball was observed. Anatomical fit of the retina, confirmed by the results of ophthalmic biomicroscopy, B-scan and OCT, was observed in all cases (100%).

## Conclusion

The presented method of delayed removal of IFB by transvitreal access using 23G technology no later than 24hours after the ISR allows atraumatic removal of IFB, reducing the incidence of intraoperative and postoperative complications, as well as improving the clinical and functional outcomes of penetrating wounds with the achievement of a stable anatomical effect.

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