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Open-Globe Injury With Intraocular Foreign Body

Filippos Vingopoulos, MD[1], Yvonne Wang, MD[2], Seanna Grob, MD[2], Chloe Yang Ling Li, BA[1], Dean Eliott, MD[2,3], Leo A. Kim, MD, PhD[2,3], Demetrios G. Vavvas, MD, PhD[2,3], and John B. Miller, MD[1,2,3]

Abstract

Purpose: To investigate characteristics of Open Globe Injuries (OGI) that presented with Intra-Ocular Foreign Body (IOFB), along with their long-term visual outcomes and complications. **Methods:** Retrospective interventional consecutive case series of OGIs with IOFBs that presented at Massachusetts Eye and Ear from 2010 to 2015. Data collected included time from injury to OGI repair, location of IOFB, retinal detachment (RD) rate, presenting and final visual acuity and subsequent surgeries. **Results:** Fifty-seven consecutive cases of OGIs with IOFBs were included. Mean follow-up was 28 months and median time from injury to OGI repair was 0 days. Overall, 38/57 (66.7%) eyes achieved final vision of 20/40 or better and 43/57 (75.4%) 20/150 or better. Thirty-three cases had IOFBs in the anterior segment only, 24 cases had posterior segment involvement. Thirty percent of cases (17/57) were complicated by an RD, 58.3% (14/24) in the posterior versus 9.1% (3/33) in the anterior IOFB group ($P = .01$). There were no cases of endophthalmitis. Posterior IOFB and higher zone of injury were risk factors for RD both at presentation (both $P < .001$) and post-primary repair (both $P < .001$). Posterior IOFB was associated with higher vitrectomy rates both at presentation ($P < .001$) and post-primary repair ($P = .002$) and worse long-term visual outcome ($P = .01$). **Conclusions:** OGIs with IOFB involving the posterior segment are associated with higher complication and re-operation rates and worse visual prognosis compared to those involving the anterior segment only.

Keywords

intraocular foreign body, ocular trauma, open-globe injury

Introduction

Ocular trauma is the leading cause of monocular vision loss in the United States,[1,2] with open globe injuries (OGIs) being a major risk factor for ocular morbidity and blindness.[3] Recently published epidemiological data have shown OGI incidence in the US population to be 4.49 per 100 000, with the associated economic burden of emergency department visits and hospital admissions reaching $793 million.[4]

In adults, intraocular foreign body (IOFB) represents the second most common cause of OGI following "being struck by an object or person," with almost 20% of OGIs between the ages 18 and 50 years being caused by an IOFB.[4] Besides damage from the initial injury, complications at presentation or following the OGI primary repair are a major determinant in the need for reoperation and final visual outcome.[5-8] Traumatic endophthalmitis and retinal detachment (RD) are among the vision-threatening sequelae,[9-12] occurring in 2% to 30%[9,10,13-21] and 5.5% to 30%,[5,6,7,21,22] respectively, in OGIs with IOFBs.

We present a retrospective interventional consecutive series of OGIs with IOFB aiming to investigate characteristics, complications including RD and proliferative vitreoretinopathy (PVR), long-term visual outcomes, and need for subsequent surgery following primary repair at a single ocular trauma center over a 5-year period.

Methods

This is a retrospective review of consecutive cases of OGIs with IOFBs that presented to the eye trauma service at Massachusetts Eye and Ear (Boston, Massachusetts) from 2010 to 2015. Clinical data were retrieved from the Massachusetts Eye and Ear Trauma Service database, in which all open-globe case data are recorded.

An OGI was defined as a full-thickness break in the structural integrity of the cornea, sclera, or both, which creates a connection between the external environment and intraocular

[1] Harvard Retinal Imaging Lab, Massachusetts Eye and Ear, Boston MA, USA
[2] Department of Ophthalmology, Harvard Medical School, Boston, MA, USA
[3] Retina Service, Massachusetts Eye and Ear, Boston, MA, USA

Corresponding Author:
John B. Miller, MD, Retina Service, Massachusetts Eye and Ear Infirmary, 243 Charles St, Boston, MA 02114, USA.
Email: john_miller@meei.harvard.edu

contents. All OGI cases were evaluated and treated immediately on presentation following the Massachusetts Eye and Ear open-globe protocol.[23] On presentation, emergency department staff routinely performed a full ophthalmologic examination, which included best-corrected visual acuity (VA) (Snellen VA), slitlamp examination, and indirect ophthalmoscopy. Additionally, all patients underwent a preoperative computed tomography (CT) scan of the orbits that was reviewed by the radiology department to evaluate for foreign bodies and associated trauma. All cases were repaired within 24 hours of the injury except when the patient presented after 24 hours from the time of the injury.

IOFBs were found at initial examination, on, CT scan, or during surgical repair. The location of each IOFB was described either in the initial examination or in the operative report. Conjunctival or orbital foreign bodies as well as OGIs with IOFBs that perforated the eye through and through were not included in this study. All patients were admitted for 48 hours of intravenous (IV) antibiotics (vancomycin plus ceftazidime), and some also received intravitreal antibiotics (vancomycin plus ceftazidime).

At our institution, the presence of an IOFB that may involve the posterior segment redirects the OGI primary repair to the on-call retina team. These IOFB-associated OGIs underwent immediate repair within 24 hours of injury or as soon as possible presentation was delayed. All IOFBs that involved the vitreous and/or retina underwent a concurrent vitrectomy.

OGIs were classified by the area of the globe involved, as described by Pieramici et al (zone I: cornea with or without involvement of the limbus; zone II: scleral wound < 5 mm posterior to the limbus; and zone III: scleral wound > 5 mm posterior to the limbus).[24] OGIs involving more than 1 zone were classified in more than 1 zone category (instead of being classified in the higher zone only). If the foreign body was embedded in the cornea and penetrated into the anterior chamber, without posterior segment involvement, it was considered as anterior segment only. Posterior segment involvement was defined as foreign bodies that were protruded into the vitreous chamber, suspended in the vitreous chamber, or embedded in the retina. When an IOFB spanned multiple parts of the eye, all locations involved were documented. For statistical analysis, IOFB location was categorized into 2 groups: either involving the posterior segment or involving the anterior segment only. Cases with both anterior and posterior segment involvement were included in the posterior segment group.

Subsequent surgical procedures were defined as any procedure relating to an open-globe complication for which the patient was brought to the operating room, including examinations under anesthesia and suture removal under anesthesia. Eyelid and orbital procedures such as canalicular or entropion repair were also included.

Outcomes of the present study included IOFB material, timing from injury to open-globe repair, timing from injury to IOFB removal, location of injury, location of IOFB, complications including RD and PVR at both presentation and postprimary repair, preoperative and final VA, as well as need for subsequent surgery.

Table 1. Open-Globe Injuries With Intraocular Foreign Body Baseline Characteristics.

Age, y	37
Sex	97% male/3% female
Time from injury to open-globe repair, mean (range) d	1.05 (< 1 to 16)
Corneal/scleral wound zone[a], %	
I	86.7
II	16
III	10
IOFB location (%)	
Anterior segment only	33 (57.9)
Posterior segment involvement	24 (42.1)
Posterior segment only	18 (31.6)
Presenting visual acuity (%)	
≥ 20/80	26 (45.6)
< 20/80 and ≥ 20/150	3 (5)
< 20/150 and ≥ 20/400	4 (7)
< 20/400 to LP	21 (36.8)
NLP	1 (1.7)

Abbreviations: IOFB, intraocular foreign body; LP, light perception; NLP, no light perception.
[a]In 17% of cases (10 of 57), more than 1 zone was involved.

Statistical analysis was performed using RStudio (version 1.2.5033) and running R (version 3.6.2 GUI 1.70 El Capitan build). For categorical variables with 2 dimensions (eg, number of patients with or without RD), 2-tailed Fisher exact test was performed because the number observations in some cases was small. For categorical variables with more than 2 dimensions (eg, zone of ocular injury), a contingency table was created and Pearson χ^2 test was performed. For continuous variables (eg, VA), summary statistics, including mean, SD, and SEM, were calculated for each group of interest. Two-tailed Welch *t* tests were then performed to compare 2 continuous variables of interest. Results were considered statistically significant if *P* values were less than .05.

Results

Fifty-seven eyes of 57 consecutive patients that sustained OGIs with IOFBs were identified and included in this study. The majority of patients were male (93%), and the average age was 37 years. The average length of follow-up was 28 $\pm$ 22 months. The most common IOFB material was metal (68%), followed by wood (14%). Rock, glass, vegetation, and unknown materials each accounted for 3.5% of the cases. No bilateral IOFB cases were identified. The mean time from injury to open-globe repair was 1.05 days (median, 0 days; range, 0-16 days) (Table 1).

Timing of IOFB Removal

The mean time from injury to removal of the IOFB was 4.9 days (median, 0 days; range, 0-16 days), excluding 3 outliers of

Table 2. Complications and Pars Plana Vitrectomy Rates in Posterior and Anterior-Only Intraocular Foreign Body Groups.

	IOFB cohort (n = 57)		Posterior IOFB group (n = 24)		Anterior-only IOFB group (n = 33)	
	At presentation (%)	Postprimary repair (%)	At presentation (%)	Postprimary repair (%)	At presentation (%)	Postprimary repair (%)
Retinal detachment	10 (17.5)	17 (30)	10 (41.7)	14 (58.3)[a]	0 (0)	3 (9.1)
PVR	0 (0)	9 (15.8)	0 (0)	8 (33.3)	0 (0)	1 (3)
Endophthalmitis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Enucleation	0 (0)	1 (1.7)	0 (0)	1 (4.1)	0 (0)	0 (0)
PPV	17 (29.8)	14 (24.6)	17 (71)	11 (45.8)[a]	0 (0)	3 (9.1)

Abbreviations: IOFB, intraocular foreign body; PPV, pars plana vitrectomy; PVR, proliferative vitreoretinopathy.
[a]Recurrent and new cases are included.

52 days, 156 days, and 4 years. A total of 92.9% of IOFBs were removed at the time of primary open-globe repair. Three cases (5.3%) had secondary removal during a subsequent surgery. Of those 3 delayed removal cases, 2 had wooden IOFBs not seen on initial CT scan or in the primary globe repair. The third delayed IOFB removal case had inert material embedded in the lens that was removed with cataract extraction 4 years after primary open-globe repair. There was also 1 case in which a metallic IOFB was unable to be visualized and removed during the initial repair, despite being seen on the preoperative CT scan. At the 7-day postoperative follow-up, the globe was enucleated because of a painful no light perception (NLP) eye.

IOFB Location

Zone I injuries were the most common (86%), followed by zone II (16%) and zone III (10%). Fourteen percent of cases involved more than 1 zone. Thirty-three cases had IOFBs in the anterior segment only, and 24 cases had posterior segment involvement. Of the 24 cases involving the posterior segment, 18 cases had IOFBs in the posterior segment only, and 6 cases had IOFBs in the anterior and posterior segment. Twenty-one cases (37%) involved more than 1 structure. The cornea was the most frequently involved structure (25 cases), followed by the vitreous (24 cases) (Table 1).

Complication Rates

In total, 17 of 57 cases (30%) were complicated by an RD either at presentation or postprimary repair: 58.3% (14 of 24) in the posterior vs 9.1% (3 of 33) in the anterior IOFB group ($P = .01$). Seventy-six percent (13 of 18) of cases with an IOFB in the vitreous only were associated with an RD. An RD was reported at presentation in 41.7% (10 of 24) of posterior IOFB cases vs 0% (0 of 33) in the anterior IOFB group ($P < .001$) and at postprimary repair in 58.3% (14 of 24) vs 9.1% (3 of 33), respectively ($P = .01$). When analyzing RD rates in the various zones of injury, we found 22% of cases with only zone I injuries, 73% of cases with only zone II injuries, and 100% of cases with zone III injuries to have an RD ($P < .001$).

PVR was reported in 15.8% (9 of 57) of cases overall, with postprimary repair rates being 33.3% (8 of 24) in the posterior vs 3% (1 of 33) in the anterior IOFB group ($P = .002$). The average time to PVR requiring intervention was 54 days (range, 11 days-4 months). No endophthalmitis cases were reported in this cohort, either at presentation or postprimary repair. Further, there was no evidence of IOFB (metal or otherwise) toxicity in any of our cases. Overall, no eyes were enucleated during primary repair; 1 eye (1 of 57) with posterior IOFB was enucleated afterprimary repair at 12 days post injury because of a painful NLP eye (Table 2).

Additional Surgery

Among patients who had an IOFB in the posterior segment, 75% (18 of 24) required additional surgery after the initial open-globe repair, with the most common additional surgery being a pars plana vitrectomy (PPV) for RD or PVR (11 of 24). One patient had a PPV associated with a pars plana lensectomy. In the anterior IOFB group, 13 of 33 (40%) patients required additional surgery, with secondary intraocular lens insertion for aphakia being the most common subsequent surgery (5 of 33). In those 5 patients, the native lens was either lost at the time of the initial injury or removed surgically with the IOFB. In the posterior IOFB group, 71% (17 of 24) underwent a PPV as part of their primary open-globe repair surgery and 45.8% (11 of 24) required a PPV at postprimary repair compared with 0% (0 of 33) at presentation ($P < .001$) and 9.1% (3 of 33) at postprimary repair ($P = .002$) in the anterior IOFB group.

Long-Term Visual Outcomes

At presentation, 26 of 57 eyes (45.6%) had a VA of 20/80 or better; 3 of 57 (5%) had a VA less than 20/80 and greater than or equal to 20/150; 4 of 57 (7%) had a VA less than 20/150 and greater than or equal to 20/400; 21 of 57 (36.8%) had a VA less than 20/400 to light perception (LP); and 1 of 57 (1.7%) eyes was NLP (see Table 1). Two pediatric patients had no recorded preoperative VA. One was a 10-year-old who presented already intubated from a gunshot wound that resulted in multisystem trauma. The second patient was only 2 years old and in too much distress to obtain a reliable preoperative VA. Fortunately, they both recovered significant vision to a best-corrected VA of 20/80 and 20/30, respectively. Overall, final VA was 20/80 or

Table 3. Presenting and Final Visual Acuity Subgroups for Anterior-Only and Posterior Intraocular Foreign Body Groups.

	IOFB cohort (n = 57)		Anterior-only IOFB group (n = 33)		Posterior IOFB group (n = 24)	
	At presentation (%)	Postprimary repair (%)	Presenting VA[a] (%)	Final VA (%)	Presenting VA (%)	Final VA (%)
≥ 20/80	26 (45.6)	43 (75.4)	17 (54.8)	30 (90.9)	9 (37.5)	13 (54.2)
< 20/80 and ≥ 20/150	3 (5)	0 (0)	2 (6.5)	0 (0)	1 (4.2)	0 (0)
< 20/150 and ≥ 20/400	4 (7)	1 (1.7)	4 (12.9)	1 (3.0)	0 (0)	0 (0)
< 20/400 to LP	21 (36.8)	11 (19.3)	8 (25.8)	1 (3.0)	13 (54.2)	10 (41.7)
NLP	1 (1.7)	2 (3.5)	0 (0)	1 (3.0)	1 (4.2)	1 (4.2)

Abbreviations: IOFB, intraocular foreign body; LP, light perception; NLP, no light perception; VA, visual acuity.
[a]VA at presentation was not available for 2 patients because of intubation status.

better in 43 of 57 eyes (75.4%); less than 20/80 and greater than or equal to 20/150 in 0 of 57 eyes (0%); less than 20/150 and greater than or equal to 20/400 in 1 of 57 eyes (1.7%); less than 20/400 to LP in 11 of 57 eyes (19.3%); and NLP in 2 of 57 eyes (3.5%). In the overall cohort, 38 of 57 eyes (66.7%) achieved a final VA of 20/40 or better and 43 of 57 (75.4%) achieved a final VA of 20/150 or better (Table 3).

Presenting VA along with final VA in anterior-only and posterior IOFB subgroups are shown in Table 3. The mean presenting VA in the posterior-segment IOFB group was 1.3 logMAR (Snellen equivalent, 20/400) with 6 eyes excluded from analysis because of NLP or LP status (LP is considered only stimulus recognition; LP and NLP are not measurements of VA).[25] Mean presenting VA in the anterior IOFB group was logMAR 0.81 (Snellen, 20/150) after excluding 3 eyes because of NLP or LP status. The difference in presenting VA among the 2 groups was not found to be statistically significant ($P >$ .99), potentially because of the exclusion of more NLP/LP eyes in the posterior compared with the anterior IOFB group (6 vs 3 eyes, respectively). Mean final VA in the posterior IOFB group was 0.87 logMAR (Snellen, 20/150) vs 0.14 logMAR (Snellen, 20/30) in the anterior IOFB group after excluding 5 NLP/LP eyes in the posterior and 1 NLP eye in the anterior IOFB group. The final VA in the posterior IOFB group was found to be statistically significantly worse than the final VA in the anterior IOFB group ($P = .01$) even after excluding 5 NLP/LP eyes vs only 1 NLP eye in each group, respectively.

Cases of Delayed Detection of IOFB

In our cohort, 32% of IOFBs were nonmetallic, hence there was difficulty getting a positive reading from the CT scan. In 2 cases the IOFB was not found during the initial surgery. In the first case, the initial open-globe repair consisted of uveal repositioning and repair of the scleral laceration. One month later the patient developed a tractional RD and underwent a PPV, pars plana lensectomy, and hyaloid peel. No IOFB was noted in this surgery. The patient then developed PVR and underwent a third surgery in which a piece of glass was found adherent to the retina with tractional strands. In the second case of delayed IOFB removal, the patient was cutting wood with a table saw and presented with a zone 1 laceration. There were 3 wood pieces embedded in the cornea that were removed during the primary open-globe repair. On postoperative day 1, an ultrasound biomicroscopy of the anterior segment identified a foreign body adjacent to the lens. The patient was taken back to the operating room the same day and the wooden foreign body was removed.

We had only 1 case in which an IOFB was seen on CT scan but could not be surgically removed. The patient had a zone I/II laceration from a screwdriver and LP vision on presentation. In his initial open-globe repair the large foreign body was behind an incarcerated retina and was unable to be removed because of poor visualization from corneal edema, hyphema, and vitreous hemorrhage. At the 7-day postoperative follow-up, the eye had NLP. It was decided to proceed with enucleation given the NLP vision, poor visual prognosis, and eye pain. On pathologic examination, the large IOFB was noted to be embedded in the posterior sclera.

Conclusions

In the present cohort of 57 consecutive OGIs with IOFBs, we found involvement of the posterior segment to be associated with higher rates of RD (58% vs 9%), PVR (33.3% vs 3%), and reoperation (75% vs 40%) and worse long-term visual prognosis (0.87 logMAR vs 0.14 logMAR) compared with involvement of the anterior segment only. No endophthalmitis cases were reported at presentation or postprimary repair in either group (0.87 logMAR [20/150] vs 0.14 logMAR [20/30]).

Various prognosticators of final visual outcome in OGIs with IOFBs have been described, including presenting VA,[9-11,14-17,26] zone of injury,[26-28] corneoscleral wound size greater than 4 mm,[12,16] endophthalmitis,[9-12,26] RD,[11,12,26-28] vitreous hemorrhage,[26-28] uveal prolapse,[17,26,27] relative afferent pupillary defect,[26] delayed primary repair,[21] need for PPV,[29] and need for reoperation.[16]

The visual prognosis for eyes with OGI is extremely guarded in part because of a high prevalence of posterior-segment complications such as RD.[30-33] A clinical prediction mode named the Retinal Detachment after Open-Globe Injury (RD-OGI) score was created[23] and subsequently validated[34] based on a series of 900 OGIs at our institution to assess the probability of RD following primary OGI repair. The model uses factors that are highly correlated with the risk of ensuing RD, including the presence of vitreous hemorrhage, anatomical zone of injury, and VA at time of presentation.[23] Of interest, presence of an IOFB was not found to be associated with higher RD probability, yet a distinction between anterior and posterior IOFB was not made.

In the present study, the total rate of RD was 29% but largely varied depending on the location of the IOFB. In cases in which the IOFB was only in the anterior segment, RD occurred in 9%, with the RD rate increasing to 58% when the IOFB also involved the posterior segment, and to 76% in cases with an IOFB in the posterior segment only. Our results are in line with those reported by Parke and colleagues that showed a posterior IOFB to be associated with increased rates of RD both at presentation and after primary repair.[21] Of note, IOFBs are frequently associated with media opacities including hyphema, traumatic cataract, and vitreous hemorrhage that may limit identification of RD preoperatively by dilated fundus exam.[35]

Postoperative RD has been associated with IOFB impact sites on the retina that may predispose the eye to retinal breaks and PVR following PPV.[21] PVR is considered the main complication leading to RD in cases with posterior IOFB, occurring in 6.7% to 46% of eyes with a history of retained IOFB and leading to vision worse than 5/200 in up to 70% of eyes.[12,14,16,36,37] Along with a retinal tear, choroidal and/or vitreous hemorrhage, and a large posteriorly located wound, the presence of an intraretinal IOFB is listed among the risk factors for PVR after OGI.[36,38,39] In our study, of the 17 cases that were complicated by an RD at any time, PVR was present in 9 cases, 33.3% (8 of 24) in the posterior vs 3% (1 of 33) in the anterior IOFB group ($P = .002$). The average time to PVR requiring intervention was 54 days (range, 11 days-4 months), which was consistent with studies that have shown that vitreoretinal remodeling is most active around 1 month after injury yet continues up to 4 months after injury.[40] RDs that develop post primary repair occur usually during the first 4 months and carry with them a poor visual prognosis because of PVR.[5,6,7,12,21-23,41]

In the present cohort, no eyes were enucleated during primary repair and only 1 eye (1.7%) was enucleated post primary repair. Our enucleation rate is on the lower end compared with previous studies that have reported enucleation rates between 2% to 11%.[16,17,21,26,42,43]

Retained IOFBs can have a detrimental effect on the visual outcome after OGI by inducing direct structural damage to the visual system, delivering infectious agents to the intraocular contents, and causing chemical toxicity to select intraocular cells.[44]

In the present study, there were no cases of endophthalmitis at presentation or post primary repair. The absence of endophthalmitis in this study may have been due to this institution's standardized use of broad-spectrum IV antibiotics for 48 hours with additional intravitreal antibiotics in some IOFB cases (10 of 57) at the time of repair. In the literature, rates of endophthalmitis in OGIs with IOFBs have ranged from 0% to 30%,[5,6,9,10,13-21,26,45] with the presence of an IOFB in OGI associated with increased rates of culture-positive endophthalmitis,[13,16,21,45] especially if the IOFB involved the posterior segment.[26] Delayed (> 24 hours) IOFB removal has been associated with increased risk for endophthalmitis[9,14,15] yet Colyer et al reported 79 IOFB cases without endophthalmitis in eyes with combat-related IOFBs, all of which received rapid wound closure and systemic antibiotics but delayed removal of the IOFB, which suggests that timely antibiotic administration may be more important than immediate IOFB removal for endophthalmitis prevention.[5]

Regarding long-term visual outcomes, our cohort had an average follow-up of 28 $\pm$ 22 months with 38 of 57 (66.7%) eyes in the overall cohort achieving vision of 20/40 or better and 43 of 57 (75.4%) vision of 20/150 or better. Our visual outcomes were similar to those previously reported, in which 14% to 71% of patients with OGI with IOFB achieved final vision of 20/40 or better and 68% to 80% 20/200 or better.[10,11,14,16,41] Presenting VA is generally acknowledged to be a key factor that affects final visual outcome, which was consistent with our results[9-11,14-17,26] (see Table 2).

Mean final VA in the posterior IOFB group was 0.87 logMAR (Snellen, 20/150) vs 0.14 logMAR (Snellen, 20/30) in the anterior-only group. Our results seemed better than previous posterior IOFB studies that have reported 23% to 48% of cases better than 20/40 vision and 62% to 65.6% better than 20/200.[17,38] This may have been due to our institution's typical diversion of IOFBs to the retina service for simultaneous IOFB removal and globe repair as well as 48 hours of IV antibiotics, which may have limited additional retinal injuries by the retained IOFB and reduced the risk of endophthalmitis, respectively. Of note, the final VA in our posterior IOFB group was found to be significantly worse than the final VA in the anterior IOFB group ($P = .01$) even after excluding from the analysis 5 NLP/LP eyes vs only 1 NLP eye in each group, respectively.[25]

In a large series from China, Zhang et al reported only 17% of patients with OGI with IOFB reached a final VA of 20/40 or better and 58% had a final VA worse than 4/200 to NLP; posterior-segment IOFB had the greatest odds ratio in the multivariable analysis for final VA worse than 20/400 than any other factor, even more so than presenting VA and endophthalmitis.[26]

The encouraging long-term visual outcomes we reported potentially could have been be attributed to (1) our early vitrectomy protocol for posterior IOFBs to remove the vitreous and blood scaffold for PVR,[30,46-48] better visualize the IOFB, and identify retinal breaks and RDs; (2) the standardized use of broad-spectrum IV antibiotics for 48 hours on initial presentation, which may be even more important in preventing endophthalmitis than the timely removal of the IOFB,[38] potentially explaining our 0% endophthalmitis rates; and (3) performing a CT scan in all cases of OGIs.

Limitations of our study include (1) its retrospective nature, potentially introducing bias due to variability in reporting clinical findings (following the standardized Massachusetts Eye and Ear protocol for management of OGIs reduces such variability) (2) surgeon-to-surgeon variability in the repair of OGIs and complex RDs; and (3) being a single-site study performed at a tertiary care academic medical center with a high-volume eye trauma service, which may limit generalizability to other settings.

In conclusion, in the present cohort of 57 consecutive cases of OGIs with IOFBs, we found involvement of the posterior segment to be associated with higher RD and PVR rates, higher rates of PPV and reoperation, and worse visual prognosis compared with involvement of the anterior segment only. Timely initiation of broad-spectrum IV antibiotics on presentation might explain the absence of endophthalmitis in our cohort.

Authors' Notes

This work was previously presented at the Association for Research in Vision and Ophthalmology (ARVO) Annual Meeting, 2017, Baltimore, MD.

Ethical Approval

This study is part of an institutional review board–approved protocol compliant with Health Insurance Portability and Accountability Act (HIPAA) at Massachusetts Eye and Ear and adhered to the tenets of the Declaration of Helsinki.

Statement of Informed Consent

Informed consent was waived because of the retrospective nature of this study.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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