AMERICAN ACADEMY™
OF OPHTHALMOLOGY

Posterior Segment Intraocular Foreign Bodies: A 10-Year Review

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Purpose: To describe the characteristics of open-globe injuries with posterior segment intraocular foreign bodies (IOFBs).

Design: Retrospective chart review study.

Participants: Patients treated for posterior segment IOFB injuries.

Methods: Retrospective analysis of all patients with posterior segment IOFBs from 2003 to 2014 was conducted. Data including demographics, mechanism of injury, type of IOFB, method of diagnosis, presenting examination, medical and surgical treatment, visual outcomes, and complications were recorded.

Main Outcome Measures: Visual acuity (VA); anatomically successful retinal reattachment; need for additional surgery; frequency of post-traumatic complications, such as sympathetic ophthalmia (SO), endophthalmitis, and enucleations; and accuracy of Ocular Trauma Score (OTS).

Results: Thirty-one patients (28 male; mean age, 36.6 years; 42% Hispanic) had posterior segment IOFB injuries, 23 (74%) of which were construction work related. Twenty-five IOFBs (81%) were metallic. Twenty-four IOFBs (77%) had Zone I entry. Computed tomography (CT) scan detected an IOFB in 21 of 22 eyes in which it was performed, with 1 scan highly suspicious for an IOFB. Average size of the IOFB was 10 mm^3; size or initial VA did not have any correlation with final VA. The OTS had 60% accuracy in predicting final VA ($n = 20$). The majority of patients had traumatic cataract and vitreous hemorrhage (VH) on presentation (77% and 61%, respectively); 65% had a retinal tear or retinal detachment (RD), and these patients had worse final VA than those with no retinal pathology. Average time from injury to IOFB removal was 3 days because of the delay in presentation to our facility; 27 of 31 patients (87%) had IOFBs removed within 24 hours of presentation with pars plana vitrectomy (PPV) and either gas or silicone oil tamponade. Patients were admitted for an average of 4 days of intravenous antibiotics. The most common complication was recurrent RD in 11 patients (35%), which portended worse final VA. One patient (3%) developed SO. There were no cases of postoperative endophthalmitis or enucleation.

Conclusions: Open-globe injuries with posterior segment IOFBs have a guarded visual prognosis, particularly when associated with RD. Increased awareness of the importance of eye protection can help minimize the occurrence of these injuries. *Ophthalmology Retina 2017;■:1–6 © 2017 by the American Academy of Ophthalmology*

Intraocular foreign body (IOFB) injury, although a type of penetrating injury, is considered a separate category in the trauma classification scheme given the unique clinical implications in treatment and visual prognosis.[1,2] Management of IOFB injuries begins with prophylactic measures such as tetanus vaccination/booster and systemic antibiotic treatment, with prompt closure of the wound. Early globe closure is thought to maximize visual potential and reduce the risk of endophthalmitis and sympathetic ophthalmia (SO).[3] Visual outcome depends on various factors, including the mechanism of injury. Open globe injuries associated with IOFBs have been found to have a more favorable visual outcome than other types of injuries, such as blunt trauma.[4] However, these analyses often combine both anterior and posterior segment foreign bodies. Posterior segment IOFBs are more likely to cause comorbidities such as traumatic cataract, vitreous hemorrhage (VH), and retinal detachment (RD), which have been associated with poorer visual outcome.[4] Therefore, foreign bodies in the posterior segment likely confer worse visual prognosis than anterior segment IOFBs. Given that few analyses focusing exclusively on posterior segment IOFBs have been published, the nature of these injuries, optimal management, complications, and visual prognosis for these patients are not well known.

In this study, we aim to describe the patient demographic, types of foreign bodies, presenting ocular features, treatment, visual outcome, and potential complications of patients who have sustained penetrating globe injuries with posterior segment IOFBs.

Methods

After obtaining approval from the Institutional Review Board, a retrospective chart review of patients with the International Classification of Diseases 9th Revision codes of foreign body and open globe injuries from January 2003 to June 2014 was performed. Patients with no foreign body or anterior segment foreign body

http://dx.doi.org/10.1016/j.oret.2017.01.007
ISSN 2468-6530/17

only were excluded. Patients with perforating injuries (e.g., gunshot injuries with entrance and exit wounds) were excluded. Patient demographics, nature and time of injury, presenting examination, method of diagnosis, treatment and postoperative care, and visual outcomes were collected. Zones of globe entry were noted, with Zone I involving the cornea or limbus, Zone II affecting the anterior 5 mm of the sclera, and Zone III being >5 mm posterior to the limbus.[1] The Ocular Trauma Score (OTS) on presentation based on Kuhn's point system, incorporating initial visual acuity (VA), presence or absence of afferent pupillary defect, penetrating versus perforating injury, rupture, RD, and endophthalmitis,[5] was calculated when possible. The VA was converted to logarithm of minimum angle of resolution (logMAR) scale for analysis with the following equivalents: count fingers (CF) = 1.6, hand motion = 2.0, light perception (LP) = 2.5, and no light perception (NLP) = 3.0 logMAR units.[6] Statistical analyses including *t* tests were performed with $\alpha = 0.05$ and power of 80% ($\beta = 0.2$).

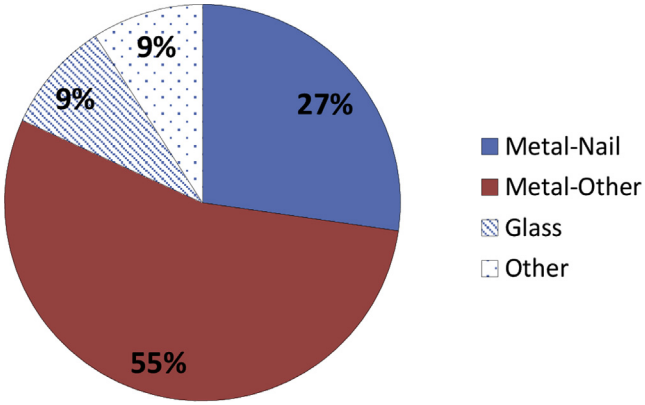

Figure 1. Type of intraocular foreign body (IOFB), the majority of which were metallic.

Results

Review of medical records revealed 70 patients with open globe injury with IOFBs from January 2003 to June 2014. Of those, 39 patients had IOFBs in the anterior segment, and 31 patients had posterior segment IOFBs. Patients had an average follow-up of 17 months (range, <1−84 months). Thirty-one eyes of 31 patients (28 male, 3 female; mean age, 36.6 years) were identified with posterior IOFBs. The ethnicity of the majority of patients was Hispanic (13 of 22 in whom ethnicity was recorded). Twenty-three of 31 injuries (74%) were thought to be work or construction related. The majority of IOFBs (25 of 31 [81%]) were metallic, 9 of which were nails (Fig 1). The zone of entry is shown in Figure 2. Diagnosis of an IOFB was made with computed tomography (CT) scan in the majority of cases, with or without additional findings from B-scan or clinical examination (Fig 3). Average volume of the IOFB, excluding 1 outlier (who was injured with a piece of glass from a motor vehicle accident), was 10 mm^3 (range, 1−66 mm^3; outlier 240 mm^3, 12×4×5 mm^3). There was no correlation between the size of the IOFB and the final VA ($r^2 = 0.01$).

Average initial VA was CF (logMAR 1.43), and mean final VA was 20/100 (logMAR 1.07) with a trend of poorer final VA being associated with worse initial VA, although no significant correlation was noted ($r^2 = 0.11$). Figure 4 demonstrates the percentage of patients in each category of VA at presentation and at last follow-up. The OTS could be calculated in only 20 of 31 patients (65%), because the pupillary examination often was not documented. Figure 5 shows the percentage of patients observed with a final VA in a specific range, compared with the percentage expected based on standard data for the OTS, for each score value. For example, 25% of patients with OTS of 2 attained a VA between 20/200 and 20/50, compared with the expected 13% based on standard data.[5] Overall, only 12 of 20 patients (60%) achieved the VA predicted by the OTS.

Nineteen patients (61%) had VH on presentation, and 24 patients (77%) had traumatic cataract. Patients with VH or traumatic cataract had worse initial VA than patients without these complications, but final VA was equivalent (Table 1, $P = 0.79$ and $P = 0.92$ for final VA in patients with or without VH and with or without traumatic cataract, respectively). On presentation, 21 patients (68%) had a retinal tear, 11 of whom (39% of total) had a subsequent RD. The patients with RD had worse initial and final VA than patients without RD (Table 1, Fig 6). The macula was spared in all detachments, but the IOFB was noted to cause retinal tear or subretinal hemorrhage that extended just inside the area centralis in 2 cases. Most tears were located peripherally, with 8 anterior and 4 posterior to the equator. The specific location of 7 of these tears could not be identified from the records but were noted not to involve the macula.

The average time from injury to IOFB removal was 3 days (range, <24 hours to 21 days). For 7 patients, prolonged time to removal was due to a delay in presentation to our facility. In 1 patient, a suspicious hyperintense area was noted on ultrasonography performed 1 week after open globe repair, and a subsequent exploratory vitrectomy identified an IOFB.

Once patients presented to our facility, 27 of 31 (87%) had removal of posterior IOFB with pars plana vitrectomy (PPV) within 24 hours. Of the remaining, 1 patient had emergent globe closure with removal of an anterior chamber IOFB on presentation and removal of the posterior segment IOFB 1 day later, once identified on a follow-up CT scan. Two patients were found to have intraocular cilia during PPV surgery for VH or RD repair 4 and 6 days, respectively, after initial surgery for globe closure. Last, 1 patient opted against removal of the IOFB because of the lack of ocular reaction to an inert FB. Final VA of patients who had immediate IOFB removal was similar to that of patients who had delayed intervention. Most IOFBs were extracted with intraocular forceps; silicone oil tamponade was used in 14 (45%) of 31 patients.

All 31 of the patients in this cohort were phakic; 24 patients (77%) presented with a concurrent traumatic cataract. Twenty of those patients required a pars plana lensectomy for traumatic

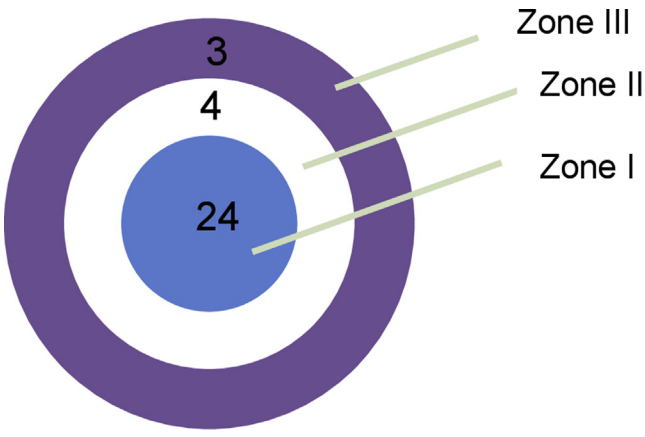

Figure 2. Number of eyes with each zone of entry. Zone I is defined as the cornea and limbus. Zone II is the anterior 5 mm of the sclera posterior to the limbus. Zone III extends >5 mm posterior to the limbus.