Research Article

Risk factors for retinal detachment after intraocular foreign bodies' removal

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Abstract

Objective: To evaluate the risk factors for late retinal detachment occurrence after successful posterior segment intra-ocular foreign bodies removal.

Method: This prospective cases series study included subjects presented to one vitro-retinal surgeon at vitrectomy clinic/ Ibn Al-Haetham Teaching Eye Hospital from January 2007 to January 2012 with retained posterior segment intra-ocular foreign bodies. Ocular complications related to the trauma were recorded. Extractions of foreign bodies were done through standard three-port vitrectomy technique. Nature and sizes of the foreign bodies were noted. Post operative occurrence of retinal detachment was recorded, regarding possible risk factors. Follow-up time was at least 6 months after surgeries.

Results: 51 subjects with posterior segment intra-ocular foreign bodies were included. Most important mechanism of injury was shell injuries (43.1%). Majority of foreign bodies were metallic (82.4%), with mean average size of 4.6 mm3. Ocular complications at presentation were; vitreous hemorrhage (76.5%), lens injury (52.9%), retinal detachment (21.6%), siderosis bulbi (3.9%), endophthalmitis (3.9%), and increased intraocular pressure (2.0%). Late postoperative retinal detachment developed in 18 subjects (35.3%); 16 cases (88.9%) were due to formation of proliferative vitreo-retinopathy, while 2 cases (11.1%) occurred in eyes with siderosis bulbi. Ten cases had post traumatic retinal detachment, and 6 of them had large foreign bodies (size was 10 mm3 or more).

Conclusion: After successful posterior segment intra-ocular foreign bodies' removal late retinal detachment can occur mainly due to development of proliferative vitreo-retinopathy which was related to presence of post traumatic retinal detachment and large foreign bodies.

Keywords: Retinal detachment, vitrectomy, intra-ocular foreign body

INTRODUCTION

Intraocular foreign body injuries are relatively common, serious form of ocular trauma. Intraocular foreign bodies (IOFBs) account for approximately 15- 25% of penetrating ocular injuries.[1-4] Around 70% of the IOFBs located behind the lens in the posterior segment (PSIOFBs).[5-7] IOFB causes damage to the eye by confluent predictive factors including mechanical trauma, introduce infection and exert toxic effects. Immediate damage to the eye related to the size, site, and velocity of impact, while delay damage related to the composition, contamination of IOFB, and the initial damage. Several factors have been shown to be associated with a poor visual outcome following penetrating injury with PSIOFB. These include large diameters of IOFB, poor visual acuity on presentation, uveal prolapse, vitreous hemorrhage, and presence of a secondary retinal detachment (RD).[8-11]

Several clinical studies reported incidence of late RDs following successful PSIOFB removal ranging from 22%

to 79%[12-14], but there are only few data concerning the risk factors of developing retinal detachments (RD) after successful PSIOFBs removal.[15] The aim of this study is to evaluate the risk factors for late RD occurrence after successful PSIOFB removal.

PATIENTS AND METHODS

Ethical board approval was granted by scientific committee of Ibn Al-Haetham Teaching Eye Hospital.

This study included successive new subjects presented to one vitro-retinal surgeon at vitrectomy clinic/ Ibn Al-Haetham Teaching Eye Hospital from January 2007 to January 2012 with retained PSIOFBs.

All subjects with a leaking wound underwent primary globe repair, performed by general ophthalmologists, before consultation with the vitrectomy clinic for IOFBs removal. Cases with severe corneal opacities that prevent fundus examination were referred for keratoplasty.

The data collected comprised age, gender, demographical features and mechanism of injury. All subjects underwent a complete ocular examination, which included preoperative visual acuity (VA) measured with a standard Snellen acuity chart, examination of the anterior segment with a slit lamp, fundus examination with indirect ophthalmoscopy and indirect slit lamp biomicroscopy. Intraocular pressure was measured using Goldman applanation tonometer or air puff tonometer.

In cases with opaque media foreign bodies were localized with the radiograph of the skull and ultrasonography. Extractions of foreign bodies were done through standard three-ports, 20-gauge vitrectomy technique with peripheral vitreous trimming and removal of vitreous adherent to the PSIOFB and around any retinal impact sites. Complete posterior vitreous detachments were not routinely performed. IOFBs were extracted through enlarged sclerotomies or limbal incision using intraocular forceps. Any injured retinal areas, including detached retina, were secured by endolaser photocoagulation, and using silicone oil as intraocular tamponade agent. Lensectomy or phacoemulsification was also done in cases of traumatic cataract or lens injury. Time of interval from injury to IOFBs removal, nature of foreign bodies and the average size of the IOFBs (maximum length X maximum width X maximum height) were recorded. PSIOFB were considered as large if the average size was 10 mm^3 or more while smaller size were considered as small PSIOFB. Post operative VA and complications regarding occurrence of proliferative vitreoretinopathies and RDs were noted. Follow-up time was at least 6 months after surgery.

RESULTS

During the five years of this study 51 patients with PSIOFBs were included. There were 48 (94.1%) males, and average age of the patients was 26.3 years (ranging from 5 to 65 years). Right eye was injured in 28 cases (54.9%), while two patients had bilateral eye injuries with one eye severely damaged that had been eviscerated. Mechanisms of injuries were listed in table 1.

Table 1. Mechanism of injuries

Mechanism of injury	Number (%)
Shell injuries	22 (43.1%)
Hammering on nail	15 (29.4%)
Chiseling on metal	6 (11.8%)
Car accident	5 (9.8%)
hunting gunshot	3 (5.9%)
Total	51 (100%)

Only in 8 cases (15.7%), the PSOFB was directly visible on clinical examination, while in other cases detection of IOFB was by ocular ultrasound and skull x-ray. The sites of entry of the IOFBs were corneal in 26 cases (51.0%), corneo-scleral in 8 cases (15.7%), and scleral in 17 cases (33.3%).

Ocular complications in patients with PSIOFBs at presentation to the vitrectomy clinic were listed in table 2: Moderate to severe vitreous hemorrhage was recorded in 39 cases (76.5%); 19 cases with vitreous hemorrhage were associated with lens injury and/ or RD, while 20 cases had vitreous hemorrhage without other intraocular complications. Lens injury without other intraocular complications was recorded in 12 cases. RDs were recorded in 11 cases (21.6%), 6 cases with large PSIOFB. Siderosis bulbi and post traumatic endophthalmitis were recorded in 2 cases (3.9%) for each, while increased intraocular pressure was recorded in one case (2.0%). The mean time interval between injury and IOFBs removal was 24.4 days range between 12-90 days. In 14 cases removal of PSIOFB was delayed for more than 4 weeks. The majority of foreign bodies were metallic; 42 cases (82.4%), glass; 4 cases (7.8%), stones; 3 cases (5.9%), wood and eyelash one case for each (2.0%).

The mean average size of IOFB was 4.6 mm^3 (range 1–50.0 mm^3). 6 cases had large FB (more than 10 mm^3).

Table 2: Ocular complications in patients with PSIOFB at presentation

Ocular complications		Number
Vitreous hemorrhage without other intraocular complications		20
Lens injury without other intraocular complications		12
Post-traumatic RD*	**RD with large PSIOFB**	6
	RD with small PSIOFB	5
Siderosis bulbi		2
Endophthalmitis		2
Increased intraocular pressure		1
Without intraocular complications		3
Total number		51

***Retinal detachment**

Late postoperative RDs after successful PSIOFBs removal developed in 18 patients (35.3%). Average time of developing RDs was 6 weeks post operative, ranged between 3-14 weeks. Out of 18 cases with RDs; 16 cases (88.9%) were due to formation of PVR, while 2 (11.1%) cases occurred in eyes with siderosis bulbi. Out of 18 cases with RDs; 8 cases operated after 4 weeks from trauma, 2 of them had siderosis bulbi, while 2 cases had post traumatic endophthalmitis and removal of IOFB postponed till the infection was controlled. 10 cases had primary RD (pre-removal of IOFBs), 6 of them with large PSIOFB (table 3).

The final VA after 6 months from removal of PSIOFBs ranged between 6/9 to no light perceptions

DISCUSSION

PSIOFB management varies depending upon the severity of injury, nature and location of the foreign objects. Major surgical approaches for PSIOFBs removal include both direct and indirect external magnet extraction and pars plana vitrectomy technique (PPV).[16] In recent years, magnetic extraction of iron PSIOFBs has been criticized for posing undue risk to adjacent ocular structures, while vitrectomy techniques allow for more precise localization and extraction of virtually all PSIOFBs, and safer in terms of later vitreoretinal complications.[12] .During the last 10 years, at Ibn Al-Haetham Teaching Eye Hospital, removal of most of PSIOFBs was through PPV technique.

In the current 5 years study, formation of proliferative vitreoretinopathy (PVR) was the causative factor for 16 out of 18 cases (88.9%) with late RDs occurred after successful removal of PSIOFBs. PVR can occur following RD or penetrating eye trauma due to glial or retinal pigment epithelium (RPE) proliferation; causing retinal scars with tractional retinal detachment.[17] In the current study PVR occurred after trauma with large size PSIOFB and in cases of post traumatic RD before removal of the PSIOFBs. Large PSIOFB can cause severe damage to the ocular tissue and RDs which predispose latter to the formation of PVR and late RD after successful removal of PSIOFBs and management of primary RD.

A previous study,[18] reported an association of late onset RD and the separation of posterior hyaloids. Probably, prophylactic posterior hyaloid stripping performed at the time of vitrectomy for primary PSIOFB removal might prevent late PVR particularly in traumatized eyes harboring intravitreal blood products, mediators of inflammation, and retinal breaks. In the current study posterior hyaloids separation was not routinely done because most PSIOFB injuries occur in young patients in whom the posterior hyaloid can be difficult to remove, especially when pre-existing retinal detachment was present. Chorioretinectomy, can be used as a prophylaxis against PVR formation for eyes with deep-impact IOFB, and may be effective as a late treatment option in the presence of such PVR.[19]

Presence of cataract, vitreous hemorrhage did not affect the development of PVR or occurrence of late RD. While late interference (after 4 weeks) of primary injury had poor prognostic effects in cases with iron IOFBs due to the development of siderosis bulbi. The exact pathogenesis of late development of RDs in siderosis bulbi is still not well understood but it is probably due to the damage to the normal physiological factors that maintain the attachment between the sensory retina and retinal pigment epithelium. In cases of endophthalmitis after primary injury, removal of PSIOFBs was postponed till the control of the infection, but this delay predisposed for formation of vitreoretinal bands and latter tractional **RDs.[20]** Conclusion: After successful PSIOFB removal through PPV technique late RD can occur mainly due to formation of PVR which was related to the presence of post traumatic RD and large IOFBs.

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Table 3. Proposed risk factors for RD in patients treated for IOFB after 6 months from surgery

Proposed risk factors for RD	Number of cases	Condition of the retina 6 months after IOFBs removal		Chi-square*	p-value
		Flat Retina (n=28)	RD (n=18)		
Vitreous hemorrhage without other intraocular complications	20	20/20 (100%)	0/20 (0%)	36.1	0.00
Lens injury without other intraocular complications.	12	12/12 (100%)	0/12 (0%)	20.17	0.00
Delayed removal of PSIOFB (more than 4 weeks post trauma)	12	4/12 (33.3%)	8/12 (66.6%)	1.5	0.22
RD with large PSIOFBs	6	0/6 (0%)	6/6 (100%)	8.33	0.0021
RD with small PSIOFBs	5	1/5 (20%)	4/5 (80%)	1.60	0.206

***Fisher exact test**

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