

# Prognosis and visual outcome following pars plana vitrectomy in posterior segment intraocular foreign body

Sumeet Chopra<sup>1</sup>, Madhushmita Mahapatra<sup>2\*</sup>

<sup>1</sup>Professor and HOD, <sup>2</sup>Resident Ophthalmology, Department of Ophthalmology, Dayanand Medical College and Hospital, Ludhiana, INDIA.

Email: [Madhushmita7@gmail.com](mailto:Madhushmita7@gmail.com)

## Abstract

**Purpose:** To determine the prognostic factors and visual outcome in eyes with posterior segment intraocular foreign body post pars plana vitrectomy **Design:** Prospective interventional study **Methods:** 30 consecutive patients with posterior segment intraocular foreign body (IOFB) who presented to a tertiary hospital in north India were included in the study. After a detailed history and ocular examination, the patients were surgically managed with 20G pars plana vitrectomy and followed up for a period of 6 weeks thereafter. The correlation between visual acuity (VA) and age, IOFB size, time of presentation, site of injury, presence of endophthalmitis, retinal detachment, number of surgeries and site of IOFB was analyzed. VA of <6/18 was considered as poor and >6/18 considered as good. **Results:** 30 patients (29 male and 1 female with mean age of 24.3±7.71 years, range 21-30 years) were treated. At presentation 5/30 (16.67%) had good VA and 25/30 (83.33%) had poor VA. After surgical intervention, final VA of >6/18 was obtained in 16/30 patients (53.33%) and <6/18 in 14/30 (46.67%). Age, time of presentation, corneal tear at entry site and associated lens injury had no significant correlation with final visual outcome (p>0.05). IOFB size, endophthalmitis, retinal detachment, greater number of surgeries, location of IOFB at macula were significantly associated with adverse visual outcome (p<0.05). **Conclusion:** Final visual outcome in patients of posterior segment IOFB is dependent on multiple factors. Presence of endophthalmitis, retinal detachment, location of foreign body in macular area and more numbers of surgeries were found to be significant determinants of final visual outcome post pars plana vitrectomy. Good VA at presentation was seen to be significantly associated with a good final visual outcome.

**Key Words :** Intraocular foreign body, Pars plana vitrectomy, Prognostic factors, Visual acuity

## \*Address for Correspondence:

Dr. Madhushmita Mahapatra, Resident Ophthalmology, Department of Department Ophthalmology, Dayanand medical college and hospital, Ludhiana, Punjab, INDIA.

Email: [madhushmita7@gmail.com](mailto:madhushmita7@gmail.com)

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## INTRODUCTION

Intra ocular foreign body (IOFB) is a commonly encountered ocular injury. Up to 40% eyes with an open globe injury contain at least one IOFB.<sup>1</sup> Retained IOFB represents a true emergency that can lead to severe vision loss due to endophthalmitis, retinal detachment, ocular metallosis and even loss of the eye despite best treatment

efforts. Most posterior segment IOFBs are metallic and ferromagnetic<sup>2</sup>. Hammer chisel trauma is the mode of injury in 56-80% of cases<sup>3</sup>, other modes being trauma while working with machine tools, mowing the lawn, explosion, road side accident. IOFBs can enter the eye through cornea (65%) or sclera (25%)<sup>4,5</sup>. IOFB most frequently lodges in the vitreous cavity (16%), but can also be located in anterior chamber (15%), retina (14%), lens (8%) or subretinal space (5%)<sup>4</sup>. Radiological tests like plain X-ray, Computed Tomography (CT) scan of orbit and ultrasound serve as good diagnostic tools for presence and localization of IOFB. The introduction of vitreous surgery has substantially changed the management of posterior segment IOFB injuries. Most authors agree that vitrectomy has improved the visual results of injuries with IOFB<sup>6</sup>. The purpose of this study is to identify the major prognostic factors which govern the final visual outcome after IOFB extraction. Predictive

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factors of visual outcome would aid the ophthalmologist in choosing the appropriate surgical or medical management of IOFB trauma and help in counselling the patients about the visual prognosis.

### MATERIAL AND METHODS

Thirty patients with posterior segment IOFB who presented to a tertiary care hospital in north India over a period of 2years (November 2011 to November 2013) were included. Patients with anterior segment IOFB, scleral IOFB and with double perforation were excluded. Patients with previous history of surgery (except cataract surgery), glaucoma, retinal detachment, squint were also excluded from the study. A detailed history was taken to prove or exclude the presence of IOFB, type of foreign body and time of injury. A specific history about circumstances of trauma, exposure to hammering, drilling, grinding and explosion, time elapsed since injury and use of safety glasses was documented. A detailed ocular examination was carried out in each patient which includes initial visual acuity (VA) documentation using standard Snellen acuity chart, gross external eye examination with reference to the globe and surrounding adnexal structures, anterior segment examination done by slitlamp biomicroscopy in ambulatory patient and diffuse torch light examination in non ambulatory patients, posterior segment examination by direct and indirect ophthalmoscopy. X-ray orbit was done in all patients to confirm the diagnosis. B-scan and CT scan was done whenever indicated. The time from injury to initial surgical intervention was recorded. The initial surgical procedure performed, the method of IOFB removal, the number of subsequent procedures were also recorded. The laceration caused by entry of foreign body(site of entry) was identified and divided into corneal and others (scleral and corneo-scleral). In all the patients, the foreign body was removed by pars plana vitrectomy, which was carried out within 24hours of admission.

#### Surgical technique-

After 360degree conjunctival peritomy, the sclera was explored and any corneo-scleral wounds were closed using multiple interrupted sutures. First sclerotomy port was made 3.5-4mm behind the limbus and infusion canula was secured. Two further sclerotomy made using MVR blade for cutter and fiberoptic light pipe. Vitrectomy was done using 20G cutter. For removal of foreign body, we used hand held intraocular magnet for metallic foreign body and intraocular forceps for nonmetallic one. Pars plana vitrectomy was combined with coagulation of retinal lesion caused by foreign body and an ocular tamponade using silicon oil or C<sub>3</sub>F<sub>8</sub> gas where ever indicated. Silicon oil was removed in the second procedure when the retina was fully attached. Cryo-coagulation and endolaser coagulation was carried out in all cases with retinal lesion anterior to equator. Characteristics of IOFB recorded including location, type(metal, glass, plastic others), magnetic property and size. Patients were followed up for a period of 6weeks post surgery. During follow up patients were monitored for VA, alignment, cornea, anterior chamber, lens, intraocular pressure, fundus examination. For statistical analysis VA was defined as good if best corrected VA (BCVA) was  $\geq 6/18$  and poor if BCVA was  $< 6/18$ . The results were analyzed using Z test, Chi square test, t-test, multiple logistic analysis. p-value of  $< 0.05$  was considered statistically significant.

### RESULTS

The study population included 30 patients with posterior segment IOFB with follow up period of 6weeks post surgery. The patients age ranged from 21-30 years (mean age 24.3 years). 29/30 (96.67%) patients were male and only one female(3.33%). Right eye was involved in 16/30 patients(53.33%) and left eye in 14/30 patients(46.67%). The material of foreign body varied as follows: metallic 90% (27), glass 6.67% (2), plastic 3.33% (1). Majority of the foreign-body size was  $< 5\text{mm}$  (24/30, 80%). 2/30 (6.67%) eyes had foreign-body of 5-8mm size and only 4/30 eyes (13.33%) had  $> 8\text{mm}$  size foreign body.

**Table 1:** Prognostic factors for final VA according to univariate analysis (table 1)

Prognostic factors	Final outcome				P Value
	GOOD			POOR	
Age (Mean/ SD)	25.13	8.96	23.36	6.17	0.26613
IOFB size (Mean/SD)	3.75	1.22	6.54	6.62	0.09541
TOP (Mean/SD)	81.27	206.23	7.73	17.89	0.12406
Corneal tear (No./%age)	13	81.25	11	78.57	0.90173
Normal lens (No./%age)	7	43.75	4	28.57	0.19171
Endophthalmitis (No./%)	0	0.00	4	28.57	0.04267
Retinal detachment(No./%)	1	6.25	8	57.14	0.00850
Presenting visual acuity(No./%)	5	31.25	0	0.00	0.04196
No. of surgeries (Mean/SD)	1.31	0.48	1.93	0.62	0.00838
Foreign body in macular area(No./%)	1	6.25	5	35.71	0.04869

Mean age of patients with good final VA was 25.13(SD=8.96) and patient with poor final VA was 23.36 years ( p-value=0.26613). Mean size of IOFB of patient with good final VA was 3.75mm and poor final VA was 6.54mm (p-value=0.09542). Mean time of presentation of patient with good final VA was 81.27days and poor final VA was 7.73days (p-value=0.12406). Percentage of patients with corneal tear only with good final VA was 81.25 and with poor final VA was 78.57 (p-value=0.90173). 43.75% of patient with lens injury had good final and 28.57% had poor final VA (p-value=0.19171). No patient with endophthalmitis had good visual outcome and all 4 patients (28.57%) had poor visual outcome (p-value=0.04267). 6.25% with retinal detachment had good final VA and 57.14% has poor final VA (p-value=0.00850). 31.25% of patients with good vision at the presentation had good final VA and 31.25% had poor final VA (p-value=0.04196). Mean number of surgeries of patients with good final VA was 1.31 and with poor final VA was 1.93 (p-value=0.00838). Number of patients with IOFB in the macular area having good final VA was only 1 (6.25%) and having poor final VA was 5 (p-value=0.04869)

**Table 2:** Prognostic factors for final VA according to multiple logistic analysis (table 2)

FACTORS	REGRESSION COEFFICIENT	P-VALUE	95% C.I.		
			UPPER	LOWER	AVERAGE
Constant	2.179	0.003	0.847	3.510	2.179
Age	-0.0089	0.365	-0.029	0.011	-0.009
IOFB size	-0.0129	0.026	-0.441	0.052	-0.195
TOP	-0.00002	0.962	-0.001	0.001	0.000
Corneal tear	-0.0239	0.906	-0.442	0.394	-0.024
Normal lens	-0.0469	0.785	-0.400	0.307	-0.047
Endophthalmitis	-0.697	0.005	-1.157	-0.238	-0.698
Retinal detachment	-0.478	0.013	0.113	0.842	0.478
No. of surgeries	-0.379	0.012	-0.663	0.094	-0.285
Presenting VA	0.139	0.036	-0.367	0.419	0.026
Foreign body in macular area	-0.179	0.043	-0.378	0.406	0.014
R-square	0.671	0.001			

Age has no significant association with final VA. (Regression coefficient(RC)=0.0089, p-value=0.365). IOFB size was significantly and adversely associated with final VA (RC=0.0129, p-value=0.026). Time of presentation has no significant association with final VA (RC=-0.00002, p-value=0.906). Corneal tear as entry site was not significantly associated with final VA (RC=-0.0239, p-value=0.906). Endophthalmitis was significantly associated with adverse visual outcome (RC=-0.697, p-value=0.005). Retinal detachment was significantly associated with adverse visual outcome (RC=0.478, p-value=0.013). Greater number of surgeries was significantly associated with adverse visual outcome (RC=0.379, p-value=0.012). Location of IOFB at macular area was significantly associated with adverse visual outcome (RC=-0.174, p-value=0.043)

## DISCUSSION

Ocular trauma remains a major cause of blindness and ocular morbidity<sup>7</sup>. Young male industrial workers being the population at greater risk. Previous reports investigating the prognostic factors of IOFB are mostly retrospective, however our study is a prospective study evaluating the prognostic factors and final visual outcome of IOFB post pars plana vitrectomy. Both univariate (P=0.26613) and multivariate logistic analysis (P=0.365)

failed to show any significant impact of age on final visual outcome, unlike a multivariate study done by Sternberg P which showed a significant association between young age and final visual outcome<sup>8</sup>. Our study like other studies failed to show any correlation between site of entry and final visual outcome<sup>9,10</sup>. Our study both univariate (P=0.04196) and multivariate logistic analysis (P=0.043) showed that good visual acuity at presentation is significantly associated with good final visual outcome, similar to the study done by Chiquet C *et al*<sup>10</sup> and Wickhem L *et al*<sup>9</sup>. Several authors have stressed on the prognostic value of IOFB size. Roper Hall showed that the size and weight of IOFB were the most important factors in prognosis<sup>2</sup>. Percival<sup>11</sup> and Johnson<sup>12</sup> noted that visual prognosis deteriorates with increasing size of IOFB. We also found that large size of IOFB is associated with poor visual outcome<sup>9</sup>. As fovea is the point of maximum visual acuity, so damage to the fovea or neighboring structures causes maximum decrease in vision. Our study also showed that the presence of IOFB in the macular area is significantly associated with poor prognosis both univariately (P=0.04869) and multivariate logistic analysis (P=0.043). Some traumatic complications influences the final visual outcome. Our study showed no significant association between development of cataract and final visual outcome,

however a study done by Ehlers JP *et al* had shown that excellent visual outcome was significantly associated with normal lens at presentation<sup>[13]</sup>. Similar to our study, Chiquet C *et al*<sup>10</sup> and Wickham L *et al*<sup>9</sup> also demonstrated that retinal detachment is significantly associated with poor visual outcome. In our study presence of endophthalmitis was not significantly associated with retained IOFB (P=0.00454). However, the presence of endophthalmitis is significantly associated with poor visual outcome. We found that increase in the number of surgeries was significantly associated with poor visual outcome as proved by univariate analysis (P=0.00838) and multiple logistic analysis (P=0.012).

## CONCLUSION

In our study, we found that the final visual outcome in patients with IOFB depends on multiple factors. Final visual outcome was significantly (P=0.00963) good in 53.33% of our patients. Presence of endophthalmitis, retinal detachment, location of foreign body in the macula area and more numbers of surgeries were factors significantly associated with poor visual outcome. Good visual acuity (VA $\geq$  6/18) at the time of presentation was factor significantly associated with good visual outcome. The age of patient, time of presentation, site of entry and lens injury were not significant factors determining the final visual outcome in our study.

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