



Original Article

Posterior Segment Retained Intraocular Foreign Body: A Study from Western Nepal

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Abstract

Introduction: Posterior segment retained Intraocular foreign body (IOFB) management is challenging. Facility of pars plana vitrectomy (PPV) and availability of well trained vitreo retina surgeons are the basic need to accomplish this work. Encircling band provide permanent 360° support to close the anterior retinal break and prevent traction on the retina. The objective of this study is to analyse the clinical characteristics and predictors of the final visual outcome and survival of the globe in cases of retained IOFB in the posterior eye segment.

Materials and methods: A hospital based retrospective observational study was conducted. All the patients of retained IOFB in the posterior segment presented from January 2016 to June 2019 were enrolled. Patients presented with visual acuity of NPL were excluded. Statistical analysis was performed using a variety of tests using SPSS version 21.

Results: Forty eyes of 40 patients were included. The mean age was 27.08±10.68 years (range 5-66). 95% of our patients were male. Most of them (52.5%) worked on the farm. 26(65%) of 40 eyes had Zone I injury. The median time spent before presentation was 13.5 day. Retinal detachment, vitreous hemorrhage, and endophthalmitis were present in 15, 23 and 5 eyes, respectively, before IOFB removal. The mean LogMAR visual acuity was improved significantly from 2.50±0.87 to 1.33± 1.01 (p=0.003). Poor presenting visual acuity, retinal detachment and large diameter of IOFB were found as the predictor of poor final visual acuity.

Conclusion: Pars plana vitrectomy by a vitreo retinal surgeon can give encouraging results in the cases of retained posterior segment IOFB. Poor presenting visual acuity, large diameter of IOFB and RD before IOFB removal are predictors of poor visual outcome.

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Key words: Posterior segment intraocular foreign body, Pars plana vitrectomy, Western Nepal.

Introduction

Open globe injuries (OGI) are the most severe mechanical eye injury characterized by presence of one or more full-thickness wounds of the outer fibrous coat, regardless of the presence or absence of uveal or retinal involvement (Kuhn et al 2004). Retained intraocular foreign body (IOFB) accounts 17% to 41% of OGIs which are more difficult to manage and pose worst prognosis thus declining the visual outcome and globe survival (Yang et al 2019 & Loporchio et al 2016). Patients of this severe trauma are mostly working male (Loporchio et al 2016). IOFBs can cause various devastating consequences, including toxic effects, chronic inflammation, development of fibro cellular proliferation, detachment of the retina and retinal traction, endophthalmitis and phthisis bulbi (Ahmadieh et al 1993).

Goals of treating posterior segment IOFBs are to remove the IOFB, retain globe integrity, and provide better anatomic and visual outcomes (OzdamarErol et al 2019). The prognostic factors reported are age, wound length, period between injury and repair, initial visual acuity, volume and content of IOFBs, location of IOFB impact and complications such as relative afferent pupillary defect (RAPD), vitreous hemorrhage, retinal detachment and endophthalmitis. Often, IOFB causes significant visual loss. The final visual acuity of 22-43 percent of eye injuries with IOFB is worse than 6/60 (Sharma et al 2018).

The treatment involves primary repair of open globe first and removal of IOFB as early as possible with avoiding possible complications. Most of the posterior segment IOFB is removed in second surgical settings. Advances in microsurgical and vitreo-retinal techniques provide direct visualization and controlled removal of posterior segment IOFBs. Even

suture less vitrectomy has been used nowadays to minimize the complications (Yang et al 2019, OzdamarErol et al 2019& Sharma et al 2018).

To our knowledge, there is only one research published on eye injury related to posterior segment intraocular foreign body from central Nepal (Sharma et al 2018). In order to examine demographic characteristics, clinical characteristics and prognostic factors in patients with intraocular foreign bodies removed by Pars Plana Vitrectomy (PPV) in western Nepal, this research was carried out.

Materials and methods

This is a retrospective observational study conducted at the Vitreo-Retina department of the Lumbini Eye Institute (LEI), a tertiary eye care centre at western Nepal. All consecutive cases of retained posterior segment IOFBs that were treated with PPV and adjunctive procedure during the period from January 2016 to June 2019 were included in the study. The study excluded patients with No Perception of Light (NPL) vision at presentation and who did not complete 6 months of postoperative follow-up.

From the medical records, the following data were collected: age, gender, address, occupation, time elapsed between the time of IOFB removal from injury, Snellen's Chart pre- and postoperative best corrected visual acuity (BCVA), presence of endophthalmitis, phthisis bulbi, cataract, vitreous hemorrhage and retinal detachment. Slit-lamp examination findings, Ultrasonography findings, X-ray orbit or computed tomography or magnetic resonance imaging whichever imaging has been performed, its findings were collected.

Based on the Birmingham Eye Trauma Terminology (BETT), the OGI zone was determined and was classified as Zone 1,

Zone 2, and Zone 3 (Kuhn et al 2004). Data on endophthalmitis, vitreous hemorrhage and retinal detachment were taken on the basis of case reports based on clinical findings and diagnosis. The preoperative and final postoperative visual acuity was taken from the case-sheet. All the complications were noted from the case sheet. The nature and type of foreign body including size and shape as well as location was collected. Adjunctive procedure including lensectomy, formation of sclerocorneal tunnel, limbal incision to retrieve IOFB, endolaser, internal tamponade whichever was performed was collected from a case sheet.

To collect information, a simple, convenient sampling technique was applied. Data was entered into the 2007 MS Excel. Using the Statistical Package for the Social Science Program (SPSS) version 21, statistical analysis was carried out. The descriptive variables were expressed in number, percentage, Mean and median and expressed in tables. Normality of data was tested by Kolmogorov-Sminrov test. Using the paired T test, means were compared. The correlation between various variables was obtained by Pearson's r test.

Results

Out of 52 eyes of 52 patients who had retained posterior segment IOFB during the study period, 40 eyes of 40 patients were included in this study. The mean age was 27.08 ± 10.68 (5 – 66) years. Most of them (>80%) belonged to the economically active age group, that is, 15-59 years of age (Briere J. et al. 2010.). Thirty-eight patients (95%) were male and 2 patients (5%) were female. There was a male: female ratio of 19:1. Most of our study population belongs to India (82.5%) whereas 17.5% were Nepalese. Almost 55% were farmers by occupation. Other occupations were welder (10.0%), student (32.5%), and housewife

(2.5%). The most of the injuries were with moving projectiles while hammering. The right eye (52.5%) and left eye (47.5%) were involved in an equivalent manner. Only 10% present to the hospital on the day of injury whereas 22.5% present hospital after 1 month of injury. The range of time of presentation to hospital after trauma was 1 hour to 548 day (Table 1).

The presenting symptoms were visual disturbance (100%), red eye and ocular pain. Almost 90% of eyes had visual acuity of < 6/60, 5% had 6/18-6/60 and 5% had normal vision of $\geq 6/18$. The mean visual acuity of the preoperative LogMAR was 2.50 ± 0.877

The other clinical findings detected at the time of presentation were cataract, retinal detachment, corneal wound, limbal and scleral wound, hypopyon, shallow anterior chamber with cells and flare, fibrin, hyphema, uveal prolapse, vitreous prolapse and visible IOFB in fundus as shown in Figure 1.

The most frequent zone involved in OGI was Zone I (65%). At the time of presentation 65% were self-sealed on Seidel's test, 25% needed primary repair and 10% were already repaired outside. In 11 patients primary repair surgery was performed after 24 hours of injury while in 3 cases within 24 hours. The entry wound was at the cornea in 65% of cases. Iris hole was a common anterior segment finding observed in 22.5% of cases. Cataract was observed in almost 2/3rd of cases. Vitreous hemorrhage was observed in 57.5%, Preoperative Retinal detachment in 37.5% and Endophthalmitis in 12.5% of cases as shown in Table 2.

X-ray orbit revealed a radio-opaque tiny shadow in the orbit in 39 eyes. Ultrasonography revealed posterior segment IOFB in all eyes along with the status of posterior segment before surgery i.e. retinal detachment in 15 eyes, Vitreous haemorrhage in 23 eyes and endophthalmitis in 5 eyes.

The different surgical procedures were applied as enlisted in table 3 according to the location, size and shape of IOFB in the posterior segment, preoperative status of retina and intra-operative complications. Most of the IOFB were removed through limbal route. Most common IOFB material was Iron. The mean size of IOFB was 4.25 mm. The largest IOFB retrieved was 12 mm in its largest diameter as shown in **Table 3**. Most of the retained IOFB (45%) were removed between 1 week to 1 month of injury, only 17.5% were removed within 1 week of injury. The 37.5% patients underwent surgery to remove IOFB only after 1 month of injury. Scleral encircling Buckle is applied along with PPV in 19 eyes (47.5%) whereas only PPV was done in 21 eyes (52.5%). Silicon oil was used as a tamponading agent in 27 eyes (67.5%) and C3F8 gas was used in 13 eyes.

The reported complications after surgery were cataract formation (3 eye) and RD (7 eye) due to retinal break in 5 eye, retinal dialysis in 1 eye and giant retinal tear (GRT) in 1 eye. Other complications were epiretinal membrane, hypotony, occlusion papillae, secondary glaucoma and subretinal fibrosis. Almost 40% eyes underwent second surgery for retinal detachment (RD), cataract, aphakia, emulsified silicone oil, epiretinal membrane, occlusive papillae etc. The intra-operative complications including GRT and retinal break were treated at same setting with photocoagulation or cryopexy.

The mean follow-up was 11.35 ± 7.7 months and ranged between 6 and 36 months. The 22 eyes were aphakic (55 percent), 5 eyes were phakic (12.5 percent), and 13 eyes (32.5 percent) were pseudo-phakic. Retina was attached in 34 eyes (85%) and detached in 6 eyes (15%) on last follow up despite of multiple surgeries. Three eyes (7.5%) developed phthisis bulbi.

The mean LogMAR visual acuity at the last follow up (at least 6 month after IOFB removal) was 1.33 ± 1.01 . The mean LogMAR visual acuity was significantly improved from mean LogMAR presenting visual acuity of 2.5 ± 0.87 ($p=0.003$) by Paired T-test. Visual acuity was improved in 75%, unchanged in 12.5% and deteriorates in 12.5% of eyes. Nine of the patients had poor final visual acuity of Hand motion or perception of light only due to persistent RD (6 eyes), Subretinal fibrosis involving macula (2 eyes), and phthisis bulbi (1 eye). Two of our patients had visual acuity of NPL due to phthisis bulbi on affected eye. Final visual and structural outcome at last visit is shown in Table 4.

Poor presenting visual acuity, large diameter of IOFB and RD were found to be statistically significant predictor of poor final BCVA whereas Vitreous hemorrhage and endophthalmitis were not statistically significant predictors of it as shown in table 5.



Figure 1: Left eye fundus photograph showing IOFB

Table 1: Demographic profile of the patient

Age group	Number	Percentage	Mean age (\pm SD)
≤18 years	7	17.5	27.08±10.68
18-50 years	32	80.0	
≥50 years	1	2.5	
Sex	Number	Percentage	M:F ratio
Male	38	95	19:1
Female	2	5	
Address	Number	Percentage	
India	33	82.5	
Nepal	7	17.5	
Occupation	Number	Percent	
Farmer	22	55	
Housewife	1	2.5	
Student	13	32.5	
Welder	4	10	
Laterality	Number	Percent	
Right	21	52.5	
Left	19	47.5	
Duration of symptom before presentation	Number	Percent	
Within 24 hours	4	10	
1-7 day	11	27.5	
7-30 day	16	40	
>30 day	9	22.5	

Table 2: Clinical characteristics at presentation

Clinical characteristic	Frequency	Percentage	
Defective vision	40	100	
Red eye/ bleeding	15	37.5	
Ocular pain	25	62.5	
Uveal prolapse	8	20	
Vitreous prolapse	7	17.5	
Visual acuity	6/6-6/18	2	5
	6/18-6/60	2	5
	6/60-1/60	7	17.5
	HM-LP	29	72.5
	NPL	0	0

Clinical characteristic		Frequency	Percentage
Lens status	Cataract	27	67.5
	Pseudophakia	1	2.5
	Normal	12	30.0
Zone of OGI	I	26	65.0
	I+ II	1	2.5
	II	12	30.0
	II+ III	1	2.5
Anterior segment findings	Hyphema	4	10.0
	Iris hole	9	22.5
	Sphincter tear	1	2.5
	Hypopyon	5	12.5
	Shallow AC	5	12.5
	Iridodialysis	1	2.5
Vitreous Hemorrhage		23	57.5
RD		15	37.5
Endophthalmitis		5	12.5

Table 3: Intra-operative procedures, findings and complications

		Frequency	Percentage
Surgical Procedure	BB+ PPV+ IOFB R+ EL+ SOI	17	42.5
	BB+ PPV+ IOFB R	2	5.0
	PPV+ IOFB R+ EL+ SOI	5	12.5
	BB+ PPV+ IOFB R +EL+ C3F8	1	2.5
	PPV +IOFB R	10	25.0
	PPV+ IOFB R+ EL+ C3F8	5	12.5
Duration from injury to IOFB removal	≤ 1 week	7	17.5
	1 week to 1 month	18	45
	After 1 month	15	37.5
Route of IOFB removal	Limbal	28	70.0
	Scleral	12	30.0
IOFB Material	Iron	37	92.5
	Aluminum	2	5.0
	Brick	1	2.5
Size of IOFB (maximum diameter)	Range	Mean ± SD	
	1-12 mm	4.25 ± 2.45 mm	

Abbreviations: BB= Band Buckle, IOFB R= IOFB removal, EL= Endo laser, SOI= silicone oil injection for internal tamponade, C3F8= Octafluoropropane gas for internal tamponade

Table 4: Final visual and structural outcome

		Frequency	Percent
BCVA at last Follow up	>6/18	13	32.5
	6/18-6/60	7	17.5
	1/60-6/60	9	22.5
	HM-PL	9	22.5
	NPL	2	5
Visual status at last visit compared to day of presentation	Improved	30	75
	Stationary	5	12.5
	Deteriorated	5	12.5
Final ocular anatomical status	Improvement with maintained structural integrity	37	92.5
	Phthisis bulbi	3	7.5
Retinal Detachment	Present	6	15
	Absent	34	35

Table 5: Predictors of poor final visual acuity (Pearson's r test)

	Preoperative RD	Preoperative endophthalmitis	Preoperative VH	IOFB size	Preoperative VA
Correlation coefficient	0.490	0.165	0.084	0.435	0.540
P-value	0.001	0.308	0.606	0.005	0.000

Abbreviations: RD= retinal detachment, VH= Vitreous hemorrhage, VA= visual acuity, IOFB= Intraocular foreign body

Discussion

Intraocular foreign bodies indicate a subset of ocular trauma that poses complex surgical challenges for the successful extraction of IOFB while preserving the vision, restoring the ocular architecture and avoiding the complications as defined by Greven CM et al (2000). The established predictors of worse visual outcome are worse VA, larger wounds, IOFB in the posterior segment, wounds larger than IOFB in the largest length, and endophthalmitis. History, clinical findings, timely and complete diagnosis of patients with possible retained IOFB provides the ophthalmologist with the treatment plan and possible prognosis, which

allows them to provide the patient with practical preoperative counseling (Zhang et al, 2011).

In the young working-age population, IOFB has been found to be prevalent and our study confirms this. We found that the majority of IOFB patients were young, averaging 27.08 years of age. This finding is similar to the findings of several authors (Sharma et al. 2018, Zhang et al.2011, Greven et al.2000 &Yang et al. 2019). Almost 95% patients in this study were male similar to the finding in china, India and Bangladesh(Yang et al. 2019, Anil et al. 2015 & Ademola et al. 2016), But Sharma et al (2018) observed only 80% of their IOFB patient were male at central Nepal. As most



of the patients sustain injury while working at work place, we search occupation of patients and found to be farmer, student and welder, this finding was also observed by Yang et al. (2019) and Zhang et al (2011).

Only 10% of our patients presented to the hospital within 24 hour of injury and 37.5% of patients presented within 7day of Injury. Most of the patients of central Nepal (46%), India (73%), present to the hospital within 7 day. This may be due to difficult geography, poverty and lack of awareness (Sharma et al.2018 & Anil M et al. 2015). Visual acuity was <6/60 in 90% of our cases representing high severity of the type of trauma. This finding is similar to the findings of other authors (Sharma et al.2018, Ademola et al. 2016 &Zhang et al 2011). RD was observed in 37.5% of cases in this study which is higher compared to other studies such as Sharma et al 2018 observed it in 30%, Zhang et al 2011 in 23.15%. But Yang et al 2019 showed higher (54.7%) incidence of RD in posterior segment IOFB. Endophthalmitis was observed in 12.5% of case in this study, which is comparable to studies in China by Zhang et al 2011 (16.76%) &Yang et al 2019(19.05%) whereas a study by Sharma et al 2018 from Nepal observed higher incidence of endophthalmitis (30%). Iron was the most common IOFB material in this study similar to other studies as most of these injuries occurred during hammering. Different surgical procedures enlisted in Table 3 were applied according to the location of IOFB in the posterior segment and injury caused by it.

Visual acuity was improved in 75% which is an encouraging outcome. Complete visual loss was observed in 5% of eyes less frequent than other studies (Sharma et al 2018 & Zhang et al 2011). The predictors of poor visual outcome were poor presenting visual acuity, large diameter of IOFB and RD. These findings are attesting the results of other studies but interestingly endophthalmitis is not found to be a bad prognostic predictor which might be

due to small sample size and timely treatment of endophthalmitis by PPV.

Conclusion

Pars plana vitrectomy by a vitreo retinal surgeon can give encouraging results in the cases of retained posterior segment IOFB. Presenting visual acuity, presence of retinal detachment and maximum diameter of the IOFB are preoperative predictors of visual outcome following treatment.

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