

Outcome of vitrectomy for intraocular foreign bodies at Thammasat university hospital.

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Aim: to study the postoperative outcomes of vitrectomy for retained posterior segment intraocular foreign bodies (IOFB) in patients with ocular injury

Study Design: Retrospective Case Series

Methods: Patient registry of patients with cases of retained posterior segment IOFB in patients with ocular injury who received vitrectomy at Thammasat University Hospital between October 2012-September 2016 were examined. Statistical analysis exact fisher's test to examine the treatment outcome and the relationship of different factors that may affect the treatment outcome.

Results: Of all 25 patients, 23 were male (92%), 2 were female (8%) mean age 34.04 ± 8.97 years. Twelve right eyes (48%) and 13 left eyes (52%). Mean duration between injury and operation was 23.24 ± 46.18 days. 19 patient's eyes (76%) had postoperative visual acuity (VA) of 20/200 or better. 6 patient's eyes had postoperative VA lesser than 20/200 (24%). One eye resulted in no light perception. No factor was found to have statistically significant association.

Conclusion: The study results have not found any other statistical significance in occurrence relations between postoperative visual outcomes and other examined factors.

Keywords: Penetrating ocular injury, Intraocular foreign body, Pars plana vitrectomy

Ethical Considerations: this study has been approved by the Human Research Ethics Committee of Thammasat University Faculty of Medicine (Research ID:MTU-EC-OP-1-038/60)

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Introduction

Open globe injuries with retained intraocular foreign bodies are a major cause for blindness¹ found between 17-41% of ruptured globes. Risk factors are age groups 21-40 years, occupational hazards (54-72%) with 60-80% of globe rupture cases caused by metal hammering.^{2,3,4} Management of intraocular foreign bodies (IOFB) requires surgery to remove the foreign object which often carries a poor prognosis. Multiple factors contribute to the prognosis such as endophthalmitis, retinal detachment, site of injury and visual acuity (VA) prior to surgery,^{2,5,6,7,8} afferent pupillary defect^{9,10}, size of IOFB; where larger sizes are associated with poor visual outcomes.^{7,9,11} Duration of injury prior to surgical IOFB removal have been found not to affect visual outcomes.^{12,13}

Materials and Methods

Patient records at Thammasat University Hospital between October 2012 - September 2016 were examined for cases of retained posterior segment IOFB that also required vitrectomy to remove foreign bodies. Exclusion criteria were patients lost to follow up, patients with history of visual loss prior to injury. Data collection parameters include gender, age, cause of IOFB, site and side of globe rupture, type and size of IOFB, VA before and after surgical management. Patients included in this study have stable VA with pinhole for two consecutive follow up sessions, we did not use BCVA. Every patient who had cataracts affecting vision will have received cataract surgery and IOL

implantation. Occurrence of associated complications such as endophthalmitis, retinal detachment, and vitreous hemorrhage are also recorded. All of the above parameters are analyzed for statistical significance for their effects on postoperative visual outcomes in cases of IOFB receiving vitrectomy. Favorable postoperative visual outcome is defined in this study as a visual acuity reading of 20/200 or better using the Snellen chart.⁵

Statistical analysis

Collected parameters specified in the methods section are analyzed by the SPSS software, using Fisher's Exact Test to determine which independent nominal variables are statistically significant in affecting postoperative visual outcomes for cases of IOFB receiving vitrectomy. A p-value of less than 0.05 was accepted as having statistical significance.

Results

Of all 29 patients, 4 were excluded (one was loss to follow up, one was due to being aphakic, another was referred back to their original point of care, and one due to a loss of medical history records. Of the remaining 25 patients, all received intravenous ceftazidime 2 grams every 8 hours and vancomycin 1 gram every 12 hours after having received 72 hours topical ceftazidime (2 mg / 0.1 ml) and vancomycin (1 mg / 0.1 ml) every 1 hour from start of treatment until discharge. Twenty three patients are male (92%) and 2 were female (8%) with a mean age of 34.04 ± 8.97 years. Twelve right eyes (48%) and 13 left eyes (52%) were analyzed. The causes for IOFB injuries

were; 7 steel extractions (28%), 5 grass cuttings (20%), 5 metal shearings (20%), 4 nail hammerings (16%) and 4 other causes (16%). All IOFBs were found to be metal (100%). Site of IOFB injury entry points were; 18 cornea (72%), 6 sclera (24%), 1 corneoscleral (4%). Sizes of IOFB were; 3 millimeters or smaller in 12 eyes (48%), larger than 3 millimeters in 13 eyes (52%). Duration between injury and operation was found to be between 0-195 days, averaging 23.24 ± 46.18 days. 4 eyes (16%) received surgery within 24 hours, whilst 21 eyes (84%) received surgery after 24 hours. 7 eyes (28%) had visual acuity prior to

surgery of better than or equivalent to 20/40, 6 eyes (24%) had visual acuity between 20/50 and 20/200, 12 eyes (48%) had visual acuity of less than 20/200. All cases underwent pars plana vitrectomy to remove IOFBs. Postoperatively, 14 eyes (56%) had visual acuity of greater than 20/40, 5 eyes (20%) had visual acuity between 20/50 and 20/200, 6 eyes (24%) had visual acuity of less than 20/200 and 1 eye had no light perception. Complications observed were 8 retinal detachments (32%), 6 vitreous hemorrhages (24%), 6 endophthalmitis (24%). Demographic information is shown in table 1.

Table 1 .Demographic data of patients with retained intraocular foreign body) total 25 eyes)

Age		Mean (range, SD)
		34.04 (18-57, 8.97)
Gender	Male	Number (%)
	Female	23 (92) 2 (8)
Eye	Right	12 (48)
	Left	13 (52)
Injury mechanism	Metal Extraction	7 (28)
	Grass Cutting	5 (20)
	Metal Shearing	5 (20)
	Nail Hammering	4(16)
	Others	4(16)
Type of IOFB	Metallic	25 (100)
Site of injury	Cornea	18(72)
	Scleral	6 (24)
	Corneoscleral	1(4)
Size of IOFB	$\leq 3\text{mm.}$	12 (48)
	$> 3\text{mm.}$	13 (52)
Time of surgery Number (%)	$\leq 24\text{ hours}$	4 (16)
	$> 24\text{ hours}$	21 (84)
Initial VA	$\geq 20/40$	7 (28)
	$20/50 - 20/200$	6 (24)
	$< 20/200$	12 (48)
Final visual acuity	$\geq 20/40$	14 (56)
	$20/50 - 20/200$	5 (20)
	$< 20/200$	6 (24)
Complication	Retinal detachment	8 (32)
	Vitreous hemorrhage	6 (24)
	Endophthalmitis	6 (24)

Results suggest none of the factors investigated are significantly related to visual prognostic outcomes for retained posterior segment IOFB after vitrectomy. Prognostic factors for visual outcome shown in Table 2.

Table 2. Prognostic factors for visual outcome in patients with penetrating ocular injury with retained intraocular foreign body

Prognostic factors	Final VA \geq 20/200 total 19 eye Number/total (%)	Final VA $<$ 20/200 total 6 eye Number/total (%)	p-value
Initial VA $<$ 20/200			0.732
Yes = 12	6/19 (31.58)	6/6 (100)	
No = 13	13/19 (68.42)	0/6 (0)	
Time of surgery $<$ 24 hours			0.208
Yes = 4	4/19 (21.05)	0/6 (0)	
No = 21	15/19 (78.95)	6/6 (100)	
Size of IOFB $<$ 3 mm			0.076
Yes = 12	9/19 (47.37)	3/6 (50)	
No = 13	10/19 (52.63)	3/6 (50)	
Presence of corneal injury			0.404
Yes = 18	13/19 (68.42)	5/6 (83.33)	
No = 7	6/19 (31.58)	1/6 (16.67)	
Presence of scleral injury			0.638
Yes = 6	5/19 (26.32)	1/6 (16.67)	
No = 19	14/19 (78.95)	5/6 (83.33)	
Presence of retinal detachment			0.679
Yes = 8	4/19 (21.05)	4/6 (66.67)	
No = 17	15/19 (78.95)	2/6 (33.33)	
Presence of vitreous hemorrhage			0.316
Yes = 6	6/19 (31.58)	0/6 (0)	
No = 19	13/19 (68.42)	6/6 (100)	
Presence of endophthalmitis			0.638
Yes = 6	2/19 (10.53)	4/6 (66.67)	
No = 19	17/19 (89.47)	2/6 (33.33)	

Discussion

This study found that there are no significant factors that affect post-operative visual outcomes in vitrectomy for retained posterior segment IOFB, in the contrary to previous literature.^{2,5,6,7,8} This may be due to a small sample size that was analysed for statistical significance in finding associative factors affecting post-operative visual outcomes.

The size of IOFB has also been a known determinant for post-operative visual outcomes in vitrectomy for retained posterior segment IOFB^{7,9,11} with larger foreign bodies causing more tissue damage to the eye and consequently causing other complications such as retinal detachment, vitreous hemorrhage, proliferative vitreoretinopathy (PVR).¹⁴ These complications are significant to the prognosis of the patient, however this

study found no association between IOFB size and postoperative visual outcomes ($p=0.076$) and all patients had IOFBs in the retina or vitreous without involving the center of the macula.

The time to surgery for removal of IOFB within the first 24 hours of injury was not found to have any significant associations for postoperative visual outcomes ($p=0.208$), which is mentioned literature.^{12,13} However, all four patients in our study who received treatment within the first 24 hours of injury were found to have favourable postoperative visual outcomes, suggesting early IOFB removal with vitrectomy may significantly reduce rates of infection.^{14,15} Furthermore, patients receiving early surgical intervention may be more likely to have a lesser severity of injury, as smaller injuries do not require as much time for preoperative preparation and can be operated on almost immediately after injury – leading to better postoperative visual outcomes. Nevertheless, this theory requires larger samples sizes for matched and correlated data analysis to prove the association.

The presence of vitreous hemorrhage suggests a high severity of traumatic injury to the eye and is associated to less favorable postoperative visual outcomes, and is a risk factor for proliferative vitreoretinopathy that may follow. Thus, patients receiving early surgical removal of IOFB following injury may also reduce risk of fibrotic sequelae. In our study, patients who suffered with vitreous hemorrhage were all found to be mild in severity and has favorable VA prior to surgery; data for this group was found to have no

association with postoperative visual outcomes, contrary to other literature, this may be due to the small sample size of the study.

The presence of retinal detachment in IOFB injuries is a known factor associated with poorer postoperative visual outcomes; however, this study does not suggest there is an association ($p = 0.679$) potentially due to a small sample size. Furthermore, the cause of all cases of retinal detachment following IOFB injuries in this study do not appear to be related to the injuries themselves.

Endophthalmitis is not found to be significantly associated with postoperative visual outcomes, contrary to other literature. This could be attributed to the fact that all patients received topical, oral and intravenous antibiotics during their treatment to reduce the rate of infection. However, this group may be at risk of poorer postoperative visual comes similarly to that of retinal detachment.

The patient's baseline visual acuity prior to surgery was not significantly associated with postoperative visual outcomes. Due to the fact that some injuries may have simultaneously caused cataracts which may be the cause of a sudden and severe worsening of visual acuity. Nevertheless cataracts can be curatively treated by surgery and intraocular lens implantation.

The site of injury, whether it is the cornea or sclera does not appear to be significantly associated with postoperative visual outcomes in our study. This may be due to a small sample size, however, cornea injuries are more

likely to have worse postoperative outcomes.

Site of IOFB injury entry point is not associated with postoperative visual outcomes, regardless of entry point being corneal or scleral. This may be due to a limited sample size. However, corneal entry points are known to cause worse postoperative visual outcomes due to cornea damage or astigmatism as a result of corneal repair surgery.

In conclusion, our study did not find preoperative and intraoperative factors to be significantly associated with postoperative visual outcomes in cases of IOFB with vitrectomy. The potential reasons for the lack of associations in our data may be due to a small sample size and its retrospective nature in which only visual acuity with pinhole correction was made and may not be suitable for analysis for associations.

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