EYE INJURIES WITH RETAINED INTRAOCULAR FOREIGN MATERIAL

MOHINDER SINGH

SUMMARY

A retrospective study of 37 intraocular foreign bodies treated over a five-year period is presented. Their aetiology, complications and visual results are discussed in the light of recent development in the management of serious ocular trauma.

INTRODUCTION

Perforating eye injuries have been reported in a few general surveys mostly from developed industrial countries. The pattern of eye injuries can vary from place to place depending upon the local customs and occupations. Penetrating ocular trauma incur the most serious consequences especially if it is associated with the retention of foreign material within the eye.

This paper presents and discusses the aetiology, management and outcome of intraocular foreign bodies treated over a five-year period in the Ophthalmology Department, Universiti Kebangsaan Malaysia (UKM).

MATERIAL AND METHODS

Case histories of patients with the diagnosis of intraocular foreign bodies (IOFB) admitted to the Eye Department of UKM between August 1979 and July 1984 were reviewed. A total of 37 cases were available for detailed analysis. Their follow-up period varied from two months to four years with an average of 14 months.

Mohinder Singh, MBBS, DOMS, MS, FRCS
Department of Ophthalmology
Faculty of Medicine
Universiti Kebangsaan Malaysia
50300 Kuala Lumpur, Malaysia

RESULTS

Age of Sex

There were 31 males and six females. Their ages ranged between six to 49 years. Age and sex distribution are shown in Table I. Almost 65% of the patients were young adults in the age group of 11–30 years. Intraocular foreign bodies (IFOB) were relatively uncommon in children. Only two children (5.4%) were seen in this series, both of them sustaining it while playing.

TABLE I

AGE AND SEX DISTRIBUTION OF PATIENTS TREATED FOR INTRAOCULAR FOREIGN BODIES

Age (yrs.)	No. of patients	(%)	Male	Female	Sex Ratio M : F
0-10	2	(5.4)	2	0	2 : 0
11-20	9	(24.3)	8	1	8 : 1
21-30	15	(40.5)	14	1	14 : 1
31-40	6	(16.2)	4	2	2 : 1
41-50	5	(13.5)	3	2	1.5 : 1
Total	37	(100)	31	6	5 : 1

Aetiology

The most common cause of IOFB was industrial accidents (73%). About 74% of the industrial injuries were caused by hammering and the rest by machinery, drilling and others. All the agricultural injuries (8.1%) occurred due to grass cutting with a high-speed rotating cutter (Table II). 70.3% of the IOFB were magnetic in nature. The incidence of non-magnetic IOFB is high in this series (29.7%) and majority of these were non-metallic (27%) (Table III).

Presentation

31 cases (83.7%) presented to the hospital within one week of their injury. Of these, 22 patients (59.4%) came for medical advice within 48 hours of the injury. One female attended six months after the trauma and had developed retinal detachment (Table IV). Most of the cases (62.1%) presented with sudden impairment of vision. Pain was surprisingly not a constant feature, occuring only in nine cases (20.3%) (Table V).

TABLE II

AETIOLOGY OF INTRAOCULAR FOREIGN BODIES

Cause	No.	(%)
Industrial	27	73
Domestic	3	8.1
Assault	1	2.7
Road traffic accidents	1	2.7
Agricultural	3	8.1
Children at play	2	5.4

TABLE III

TYPES OF INTRAOCULAR FOREIGN BODIES

Type	No.	%
Magnetic	26	70.3
Non-magnetic	11	29.7
Non-metallic	10	27.0
Metallic	1	2.7

TABLE IV

DELAY IN PRESENTATION TO HOSPITAL

Time of presentation	No.	(%)
6 – 48 hours	22	59.4
3 – 7 days	9	24.3
1 – 4 weeks	5	13.5
Over 1 month	1	2.7

TABLE V

PRESENTING SYMPTOMS

Symptom	No.	(%)
Pain	9	24.3
Redness	10	27.0
Tearing	9	24.3
Photophobia	5	13.5
Visual upset:		
– Sudden	23	62.1
– Gradual	1	2.7
Bleeding	2	5.4

Characteristics of Injury

In 25 (67.5%) cases, the IOFB entered through the cornea; in 10.8% *via* the limbus; in the remainder (21.6%) through the sclera (Table VI). Most of the IOFB (67.5%) were finally lodged in the posterior segment, either in the retina or in the vitreous. More IOFB were located in the lower temporal quadrant of the fundus (29.7%). All the other three quadrants showed almost equal preference. There were more non-metallic IOFB confined to the anterior segment eight out of nine). All the three intra lenticular foreign bodies were metallic in nature.

15 cases (40.5%) had localization of IOFB by the limbal ring technique. No attempt was made at localization in three instances where the presentation was very early. In most of the patients (51.4%), the IOFB could be seen either with the slit lamp examination or with the binocular indirect ophthalmoscopy assisted by gentle

TABLE VI

SITE OF ENTRANCE OF INTRAOCULAR FOREIGN BODIES

Site	No.	(%)
Cornea	25	67.5
Limbus	4	10.8
Sclera	8	21.6

scleral indentation. The foreign body was directly visible in the anterior chamber in nine cases, in the crystalline lens in three cases, and in the posterior segment in seven cases.

Treatment

Surgical procedure to extract the IOFB varied depending on the location, size and nature of the retained intraocular material. **Anterior approach** – 10; original entry site – 8; Abexterno Limbal wound –2; Lens removal – 2.

A giant magnet was used to extract three IOFB, but seven IOFB were easily removed with a forceps. Cataractus lenses containing a metallic foreign body were extracted in two cases.

Pars plana approach: rate of successful removal of IOFB by the pars plana technique was about 50%. Most of the failures with this approach were due to long delay in presentation after the injury, resulting in partial encapsulation of the foreign body by the inflammatory reaction. Poor visibility due to vitreous haemorrhage or lens opacity was also partly responsible for lack of success in this category.

Posterior approach: the removal of IOFB directly through the located site over the sclera was very rewarding. Out of 11 extractions attempted *via* the posterior route, only one failure was encountered. Most of the magnetic IOFB were easy to remove directly from the site of location in the posterior segment.

Visual Results

Visual recovery was much better with anterior route extraction. A total of 20 patients (54%) regained visual acuity of 6/12 or better. A further eight cases (21.6%) achieved visual acuity between 6/18 and 6/36. Four (10.8%) out of 37 patients in this series had total loss of vision in the injured eye (Table VII). Three eyes (8.1%) were enucleated but only one because of infection.

Complications

Early development of variable lens opacities occured in 12 cases (32.4%) and was one of the major factors responsible for reduction in vision. Incidence of vitreous haemorrhage has also been high (27%) in this series. Localised retinal detachment. seen in two cases gradually settled after the removal of IOFB. One patient presented late with almost total retinal detachment which was successfully reattached. Infective endophthalmitis was observed only in one case. This patient had sustained a scleral perforation with the prolapse of uveal tissue and came to the department ten days after the injury (Table VIII).

DISCUSSION

Eye injuries still remain one of the major health problems in developing countries and are frequently the cause of preventable visual loss. Incidence of various causes of IOFB in this series is closely similar to those reported by Johnston[1] and Roper Hall.[2] 74% were caused by hammering. Incidence of 5.4% of IOFB in the paediatric age group is less in the present series than reported by Johnston (12%).[1] This is probably

TABLE VII

VISUAL RESULT OF INTRAOCULAR FOREIGN BODIES IN RELATION TO ROUTE OF REMOVAL

Vision	Total no.	(%)	Anterior route	Pars plana	Posterior route
6/6 – 6/12	20	(54)	10	3	7
6/18 – 6/36	8	(21.6)	3	5	0
6/60 – PL	5	(13.5)	0	5	0
NPL or enucleated	4	(10.8)	0	0	4

TABLE VIII

COMPLICATIONS OF INTRAOCULAR FOREIGN BODIES

	No.	(%)
Cataract	12	32.4
Vit Haemorrhage	10	27.0
Retinal Detachment	4	10.8
Macular Oedema	3	8.1
Hyphaema	3	8.1
Uveitis	2	5.4
Squint	1	2.7
Infective Endophthalmitis	1	2.7
Enucleated	3	8.1

due to the lack of deadly toys like air guns available to most children in Malaysia.

The incidence of non-magnetic IOFB in this series has been high (29.7%) and is similar to the report of Johnston from Ireland (27.2%) but very high when compared with that of Roper-Hall[3] and Chisholm.[4] This perhaps reflects the nature of local customs and occupations which are not yet as mechanised as in other industrially developed nations. Only 59.4% of the patients presented to the hospital within 48 hours of their injury. This figure is much lower than 72% reported by Johnston.[1] A much higher incidence of delay in coming to the hospital, noted in the present series suggests a lack of awareness regarding the seriousness of such injuries in Malaysian patients. More concerted efforts in health education of vulnerable working people is therefore needed.

The overall final position of IOFB seen in this series are almost similar to previously reported figures (Table IX). 25% of IOFB ended up in the anterior segment of the eye. Most of these IOFB were non-metallic. According to Archer *et. al.*,5 non-metallic foreign bodies have a lower velocity and thus have less penetrance than metallic foreign bodies. The use of a giant magnet has made removal of IOFB much easier.

TABLE IX

POSITION OF INTRAOCULAR FOREIGN BODIES IN THE EYE: PERCENTAGE OF TOTAL

	Roper-Hall, 1959	Chisholm, 1964	Johnston, 1971	Present Study
Anterior segment	20	15	38	24.3
Lens	10	18	2	8.1
Posterior segment	70	67	59	67.5

It has been seen in this study that failure in removal of IOFB was related to the delay in presentation causing partial encapsulation of the foreign material and also to bleeding in the vitreous, resulting in poor visibility to the fundus. This study has shown no difference in the rate of successful removal of IOFB *via* the anterior or posteior route. This is surprisingly in disagreement with previous reports where the successful rate with the anterior route extractions has been higher by about 20%.[1] Judicious use of binocular indirect ophthalmoscopy and precise localization of IOFB prior to its removal has made posterior route extractions reasonably rewarding.

Nevertheless, visual results have been shown to be comparatively much better with anterior route extractions in the present as well as in previous series.[1] The visual recovery is depicted in Table X. Results were good in 54% in this study and compare favourably with those reported earlier by Johnston (52%),[1] Percival (61%),[6] Chisholm (48%)[4] and, Teoh and Yow (38%).[7] All the eyes enucleated in this series (8.1%) were associated with posterior route extractions reflecting their complicated nature and severity. Only one eye (25%) was enucleated because of infection which resembles figures of Levy (25%)[8] but less than that of Johnston (31.57%)[1] and Roper-Hall (33.3%).[3]

Recently, newer surgical techniques have been introduced to Ophthalmology. Primary repair of

TABLE X

SUCCESS RATE OF SURGICAL MANAGEMENT PERCENTAGE

	Chisholm, 1964 73 cases	Johnston, 1971 81 cases	Present study 37 cases
Good (6/6 – 6/12)	48	57	54
Fair (6/18–6/36)	12	4	21.6
Poor (6/60–PL)	24	16	13.5
NPL or Enucleated	16	23	10.8

ocular wounds under the microscope and removal of blood, vitreous and traumatised lens material with the help of automated tissue cutters have increased the rate of successful removal of IOFB especially of the non-magnetic variety. Most of the IOFB can now be extracted either with a giant magnet or with intraocular micro surgical instrumentation. This study however has not revealed any significant improvement in the visual outcome of IOFB when compared to the reported results of earlier years. Similar observations have also been made by Eagling[9] and Ryan.[10] Although the ultimate visual prognosis of IOFB has not shown much change in this as well as in other recent studies, the chances of retaining a cosmetically-viable eye within the orbit have certainly increased.

Development of cataract due to the direct effect of IOFB or associated with the surgical trauma of their removal, presents another problem of management. As most of these patients are usually young, working class individuals, surgery for the removal of their cataract has not been very rewarding in the past due to problems of unilateral aphakia. Availability of safe contact lenses and intraocular implants have largely overcome these difficulties in recent years. In this series, one young patient was successfully given an intraocular implant after removing his intralenticular metallic foreign body. Most of the young patients can manage contact lenses reasonably well after cataract surgery.

It must be stressed that undue enthusiasm at removing IOFB, especially the non-metallic types, should be avoided. The long-term prognosis of such retained IOFB is not always gloomy as has already been reported from the department.[11] Non-invasive localising techniques are becoming popular in the management of serious ocular trauma. B-Scan ultrasonography and CT scanning of the eye and orbit are proving extremely useful. Such diagnostic facilities should be available at large referral ophthalmic centres in this country.

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