

# Management of endophthalmitis with retained intraocular foreign body

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CLINICAL STUDY

## Abstract

**Aims** To assess the impact of primary injection of intravitreal antibiotics and delayed pars plana vitrectomy with removal of intraocular foreign body (IOFB) in patients with clinical features of bacterial endophthalmitis and retained IOFB.

**Methods** Retrospective review of all patients with clinical features of infective endophthalmitis and a retained IOFB who had immediate injection of intravitreal antibiotics and delayed pars plana vitrectomy with removal of IOFB in two vitreo-retinal centres during 1995–2001. Nine patients were identified and minimum follow-up was 3 months.

**Results** Four of the nine patients had a final visual outcome of 6/18 or better. One patient developed total retinal detachment.

**Conclusions** The current series suggests that immediate injection of intravitreal antibiotics with delayed removal of IOFB in eyes with clinical features of infective endophthalmitis and a retained IOFB is a possible alternative to immediate removal of IOFB. This management may be associated with preservation of the eye and restoration of useful visual acuity.

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**Keywords:** endophthalmitis; intraocular foreign body; intravitreal antibiotics; trauma

## Introduction

Infective endophthalmitis following penetrating intraocular trauma is a potentially devastating complication with a relatively poor prognosis. Previous reports have documented an incidence of infective endophthalmitis in eyes with retained intraocular foreign body (IOFB) between 5 and 13%.<sup>1–3</sup>

The timing of vitrectomy in the setting of retained IOFB without evidence of endophthalmitis is a controversial issue. There are many studies in the literature discussing the dilemma of early or late intervention, and the consequences of post-traumatic endophthalmitis.<sup>4–11</sup> To our knowledge, there have been no previous reports on the management options of patients with retained IOFB and endophthalmitis. The main reason for early removal of the IOFB is to decrease the risk of endophthalmitis. If a patient presents to the vitreo-retinal surgeon with endophthalmitis and a retained IOFB, then the main indication for early removal of the IOFB no longer applies. The purpose of the current study was to assess the impact of primary injection of intravitreal antibiotics and then delayed vitrectomy and removal of IOFB in patients presenting with clinical features of endophthalmitis and retained IOFB.

## Materials and methods

A retrospective review of all patients from 1995 to 2001 with clinical signs of endophthalmitis in the presence of retained IOFB who were managed with immediate injection of intravitreal antibiotics and delayed removal of IOFB was conducted in two large teaching ophthalmology units in Ireland: the Royal Victoria Hospital in Belfast and the University College Hospital in Galway. These units provide a vitreo-retinal service for a population of approximately two million. The total number of IOFB removals by pars plana vitrectomy performed in the two units between 1995 and 2001 was approximately 120.

The records of nine patients were identified. The following information was extracted from the outpatient and inpatient records: (1) time of injury, (2) mode and type of injury, (3) initial management of the injury, (4) time from injury

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to presence of endophthalmitis, (5) initial management of endophthalmitis, (6) cultures performed and results, (7) associated ocular findings, (8) nature and timing of surgery, (9) initial and final visual acuities, and (10) length of follow-up.

Endophthalmitis was diagnosed clinically if hypopyon, vitritis, or retinal periphlebitis were present.

Intravitreal antibiotics used were vancomycin 1 mg and amikacin 400 µg. Intravitreal steroids were not used in any cases. Aqueous and/or vitreous samples obtained were inoculated on to blood, chocolate, and Sabouraud's agar.

**Results**

All nine patients were male, and the average age was 42 years (Table 1). The mechanism of injury was hammering

metal on metal in all patients except patient 3 who was wire brush grinding. All nine patients had radio-opaque foreign bodies on orbital radiography. The foreign body site was retinal in three eyes and vitreal in six eyes. In each eye, only a single IOFB was present. IOFB size ranged from 3 to 15 mm and was unknown in one patient. The median IOFB size was 4 mm.

The initial visual acuities ranged from 6/12 to light perception (LP).

The time from injury to the diagnosis of clinical endophthalmitis ranged from 24 to 72 h. A total of six of the nine cases presented to the ophthalmology units with signs of clinical endophthalmitis in the presence of a retained IOFB as a result of the patient delaying to seek medical attention following the injury. The remaining three patients developed signs of clinical endophthalmitis while awaiting vitreo-retinal surgery in

**Table 1** Data from patients with endophthalmitis and retained intraocular foreign body

Patient no.	Age (years) and sex	Time from injury to endophthalmitis (h)	IOFB site	IOFB size (mm)	Associated ocular findings	Initial visual acuity	Type of surgical procedure and timing from injury	Final visual acuity and follow-up (months)	Reasons for poor visual acuity at follow-up
1	74, male	48	Retina	3	Retinal impact site	HM	PPV, removal of IOFB, day 6	6/36, 6	Macular scar
2	45, male	24	Vitreous	4	Corneal laceration, retinal tear	HM	PPV, removal of IOFB, injection of gas, day 6	HM, 6	Macular scar
3	34, male	72	Retina	15	Retinal tears	6/12	PPV, removal of IOFB, cryotherapy to tears, day 7	6/7.5, 6	
4	29, male	24	Vitreous	Unknown	Cataract, vitreous haemorrhage, giant retinal tear	6/24	Phaco, PPV, removal IOFB, cryotherapy to tear, silicone oil, day 21	6/36, 11	Cystoid macular oedema
5	52, male	27	Vitreous	4	Vitreous haemorrhage	HM	PPV, removal IOFB, injection of gas, day 24	6/18, 3	
6	18, male	72	Retina	12	Corneal laceration, cataract	HM	Phaco, PPV, IOFB removal, buckle, insertion of gas, day 19	6/18, 11	Macular scar
7	40, male	38	Vitreous	6	Cataract, retinal detachment	LP	Phaco, PPV, removal of IOFB, day 11	LP, 3	Total retinal detachment
8	30, male	41	Vitreous	3	Cataract	6/18	Phaco, PPV, removal of IOFB, insertion of IOL, cryotherapy to retinal tears, day 10	6/9, 3	
9	59, male	48	Vitreous	4	Cataract	LP	Phaco, PPV, removal of IOFB, day 8	6/60, 9	Cystoid macular oedema

the units. These three patients had immediate repair of any corneal lacerations and received a combination of topical steroid, topical and systemic antibiotics at presentation. All nine of the patients received immediate injection of intravitreal antibiotics when signs of clinical endophthalmitis were evident—eight of the nine cases had hypopyons and one patient had vitritis and retinitis. Removal of IOFB was deferred in all cases until the eye was quiet.

Two of the patients had primary repair of corneal laceration on the day of presentation. The remaining patients had self-sealed lacerations which did not require surgical repair. Six patients had vitreous aspirate and seven patients had aqueous aspirate and culture. One patient had unsuccessful vitreous aspirate and two patients had no vitreous or aqueous aspirate taken. The patient in whom vitreous aspirate was unsuccessful had aqueous aspiration and culture.

Gram-positive staphylococcus, coagulase negative was cultured in one patient. Another patient had Gram-positive cocci present on Gram stain of the vitreous aspirate. All other cultures did not result in growth.

One patient required repeat injection of intravitreal antibiotics and anterior chamber washout 2 days following the first injection because of no clinical improvement.

The time interval between injury and removal of IOFB ranged from 6 to 24 days. All of the retained IOFBs were removed by pars plana vitrectomy. Five patients had traumatic cataract removed by phacoemulsification.

Four patients required repeat surgical procedures at a later date. One had repeat pars plana vitrectomy and membrane peel for continuing retinal traction, another had repair of a secondary retinal detachment by pars plana vitrectomy, one had removal of oil and insertion of sulcus sutured intraocular lens, and another had suturing of sulcus intraocular lens.

Follow-up time ranged from 3 to 11 months with a median of 6 months. The final visual acuities varied from 6/7.5 to LP with a median of 6/36.

Four patients had a final visual acuity of 6/18 or better and seven patients had a final visual acuity of 6/60 or better. Four patients had reduced visual acuity owing to macular damage. Two had macular scars as a result of an impact site (final visual acuities 6/36 and HM) and two had cystoid macular oedema unresponsive to treatment (visual acuity 6/36 and 6/60). One patient developed a total retinal detachment with proliferative vitreoretinopathy (visual acuity PL).

## Discussion

The risk factors for the development of endophthalmitis in the setting of trauma are the presence of an IOFB,

delay in primary repair, disruption of the crystalline lens, and a rural setting.<sup>1,2,12</sup> The most common organisms isolated in post-traumatic endophthalmitis are Staphylococcus species and Bacillus species, and mixed infections are not uncommon.<sup>13</sup>

There have been several previous studies suggesting that early vitrectomy and removal of IOFB reduces the risk of infectious endophthalmitis and proliferative vitreoretinopathy.<sup>9,10</sup> However, some surgeons suggest that delaying vitrectomy in eyes without evidence of infection decreases the chance of intraoperative bleeding and allows spontaneous separation of the posterior hyaloid.<sup>7</sup> In eyes that have established endophthalmitis, the main incentive for performing early vitrectomy and removal of IOFB is no longer an issue.

Despite this, there is a general consensus that immediate vitrectomy should be carried out in patients presenting with endophthalmitis and retained IOFB, to remove the IOFB, the presumed nidus of infection and debulk inflammatory debris in the vitreous. However, surgery in an eye with active endophthalmitis is technically difficult, visualization of the IOFB is often problematic and a vitreo-retinal service may not be immediately available. Also, the role of pars plana vitrectomy in endophthalmitis has been challenged by the Endophthalmitis Vitrectomy Study results, whereby vitrectomy is only beneficial in eyes with bacterial endophthalmitis following cataract surgery with perception of light vision.<sup>14</sup> However, the results of the Endophthalmitis Vitrectomy Study must be used with caution in trauma. In this series, we report reasonable visual outcomes with immediate intravitreal injection of antibiotics and delayed vitrectomy in patients with clinical features of endophthalmitis and retained IOFB. The visual results compare favorably with previous studies where immediate vitrectomy was performed on eyes with infectious endophthalmitis and retained IOFB.<sup>1,13</sup> In the Affeldt *et al*<sup>13</sup> study, all four of the patients with endophthalmitis and a retained IOFB managed by primary pars plana vitrectomy and IOFB removal had a final visual acuity of LP or worse. However, this study was published in 1987 and two of the patients had positive cultures for Bacillus species. Thompson *et al*<sup>1</sup> analysed 34 cases of endophthalmitis and retained IOFB presenting to the National Eye Trauma System in America between 1985 and 1991. A total of 58% of eyes managed by primary removal of the IOFB had a final visual acuity of 6/60 or better. There are no more recent studies in the literature documenting visual outcomes in eyes presenting with endophthalmitis and a retained IOFB.

Only one of the six vitreous samples taken had a culture-positive growth. This is lower than previous

studies, where the culture-positive results in traumatic endophthalmitis varied from 50 to 87%.<sup>1,9,15</sup> The patients in our study may have had less virulent causative organisms accounting for the reduced rate of culture-positive growth and the reasonable visual outcomes. The fact that the patients showed a clinical improvement in the size of the hypopyon after the intravitreal antibiotics and prior to the commencement of any topical steroids strongly suggests that the inflammation was because of infective endophthalmitis. The culture-positive rate in endophthalmitis following cataract surgery in the same ophthalmology units is low at 40% in comparison to 69% in the Endophthalmitis Vitrectomy Study.<sup>16</sup> In the light of these findings of low culture rates, plans are being carried out to use enrichment media in future cases to try and increase the yield—a method not previously practised in these units. Polymerase chain reaction of the vitreous aspirate may have been useful in this study as it can often identify the causative organism when cultures are negative.<sup>17</sup>

Patient 7 had a poor final acuity (LP). However, he had a poor initial visual acuity, retinal detachment, and cataract at the time of surgery and a large foreign body (6 mm), which are all factors associated with poor visual outcome. Other factors associated with a poor visual outcome are virulent causative organism and delay in treatment of the endophthalmitis.<sup>2,15</sup>

Obviously, delay of vitrectomy may not be suitable in all cases of traumatic endophthalmitis. In this series, none of the IOFBs were organic material. In this situation, the causative organism may be fungal, and immediate vitrectomy may be a more appropriate management option.

An obvious limitation of this study is the small number of cases involved. Clearly, further cases are needed before comment can be made on whether immediate intravitreal antibiotics and delayed vitrectomy is a suitable alternative to immediate vitrectomy and removal of IOFB in patients with endophthalmitis and retained IOFB. This series has, however, shown promising results in a condition which has for years been associated with poor visual outcomes.

While a multicentre study addressing this management issue would seem desirable, it is likely that the many variables involved in traumatic endophthalmitis with retained IOFB will mean that a definitive answer is unobtainable. Consequently, the decision on when to remove the IOFB is more likely to be determined by the individual surgeon and the availability of a vitreo-retinal service.

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