Complications secondary to a retained metallic intraocular foreign body

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Background: *Delays in the diagnosis of a ferrous intraocular foreign body (IOFB) have been shown to result in ocular sinerosis and subsequent loss of visual function.*
Purpose: *To report a case of a missed ferrous IOFB with subsequent apparent ocular siderosis, visual loss and severe complications.*
Material and Methods: *Visual acuity assessment and comprehensive eye examination were performed, and an X-ray of the eye and orbit taken.*
Results: *A 25 year-old male patient had a history of hammer-and-chisel (metal-related) injury to the right eye and was treated conservatively. A year after the traumatic event, the eye had phacoemulsification with intraocular lens (IOL) implantation at a local clinic. Two years thereafter, the patient presented to the Filatov institute, and was diagnosed with grade 3 ocular siderosis, artifakia and rhegmatogenous retinal detachment OD. During pars plana vitrectomy, a preretinal IOFB was found and removed. Four months thereafter, the patient was re-hospitalized and received a repeat pars plana vitrectomy and 5700-cSt silicone oil tamponade of the vitreous cavity for retinal re-detachment OD. At discharge, the ophthalmoscopy and ultrasound examination showed a re-attached retina.*
Conclusion: *The reported case of missed IOFB highlights the importance of early diagnosis and removal of IOFB to prevent siderosis and subsequent serious complications.*

Keywords:
intraocular foreign body, siderosis, vitrectomy

Introduction

Traumatic penetration of the globe with a foreign body not only is associated with the initial mechanical damage but also causes reactive changes in the eye. Immediately after the traumatic event, there is a reactive tissue response to trauma, with formation of exudate and a loose capsule around the intraocular foreign body (IOFB), but eventually the IOFB becomes encapsulated by fibrous tissue. An IOFB can further be complicated by recurrent iridocyclitis, vitreous opacities and vitreous adhesions, retinal degeneration and detachment, and metallosis. The severity of metallosis can be classified into four grades, mild, moderate, severe, and profound [1].

Ocular siderosis is a severe complication of retained ferrous IOFB. Unfortunately, delays in the diagnosis of an IOFB are not uncommon, and IOFBs may be missed or overlooked by clinicians, in spite of advanced diagnostic techniques [2]. Cases of ocular siderosis subsequent to a missed metallic IOFB that masqueraded as inflammatory process, uveitis, panuveitis [3-5] and retinitis pigmentosa [6] have been reported.

Siderosis bulbi is a term coined by Bunge in 1890 to describe the effects of iron IOFBs on the eye [7]. A ferrous IOFB undergoes dissociation resulting in the deposition of iron in the intraocular epithelial structures, notably the lens epithelium, iris and ciliary body epithelium, and the sensory retina, where it exerts a toxic effect on cellular enzyme systems, with resultant cell death and loss of visual functions. Siderosis may develop as early as 18 days to as late as years after penetrating globe injury with IOFB [8]. Although most patients with IOFB are diagnosed at presentation, there were reports of patients who received late diagnosis of IOFB only after siderosis developed along with apparent symptoms of IOFB.

Early diagnosis of IOFB is important for selecting the best treatment strategy for patients. In addition, the medicolegal implications are considerable; missed IOFBs constitute most of all trauma-related legal claims in ophthalmology [9-11].

The purpose of this paper was to report a case of a missed ferrous foreign body with subsequent apparent ocular siderosis, visual loss and serious complications.

Material and Methods

A 25-year-old male patient presented to the Department of Ocular Trauma of the Filatov institute with complaints

of reduced vision and a change in iris color. He reported a three-year history of hammer-and-chisel (metal-related) injury to his right eye. On the day of his traumatic injury, he visited a local ophthalmologist who prescribed eye drops, but neither roentgen examination nor dilated pupil examination was carried out. He also reported that, subsequently, vision in the affected eye gradually decreased to 0.02 within a year. The eye had phacoemulsification with intraocular lens (IOL) implantation at a local clinic a year after the traumatic event,. Although there was a history of traumatic event, a radiograph was not done. Two years thereafter, the patient presented to the Filatov institute.

On examination at admission, the right eye appeared moderately irritated and was artiphakic. In addition, the cornea was transparent, anterior chamber moderately deep and aqueous humor transparent. Other features of the right eye included post-operative mysriasis, heterochromic iris, destruction of the vitreous body, rhegmatogenous retinal detachment from the ora serrata, and iron decomposition products deposited on the retina in the form of multiple dots. An X-ray of the right eye and orbit for retained IOFB was negative. There was ultrasonic evidence of retinal detachment OD.

Patient's visual acuity was counting fingers OD and 1.0 OS; intraocular pressure (IOP) measured by pneumotonometry, 7.0 mmHg OD, and 15.0 OS. There were visual field defects in the inferior hemifield OD and normal and no visual field defects in the left eye. The patient was diagnosed with grade 3 ocular siderosis, artifakia and rhegmatogenous retinal detachment OD. Pars plana vitrectomy with posterior hyaloid removal was performed. During vitrectomy, a preretinal thinned and partially decomposed foreign body was found, and easily removed with vitrectomy cutter. The retina was flattened with perfluordecalin, and diode endolaser coagulation of the retina as well as tamponade of the vitreous cavity with mixture of perfluoropropane and air (20% C3F8) was performed. No postoperative complication was encountered.

At 2 months after vitrectomy, the eye was quiescent. In addition, the cornea was transparent, anterior chamber moderately deep and aqueous humor transparent. Other features of the right eye included heterochromic iris, mydriasis, artiphakia and lack of the vitreous. The retina appeared attached and there were iron decomposition products deposited on the retina in the form of multiple dots. Visual acuity OD improved to 0.3, and IOP measured by Maklakoff tonometry was 21.0 mmHg OD. The temporal visual field was 30 degrees narrower, and the nasal visual field, 20 degrees narrower than the norm. The ophthalmoscopy and ultrasound examination showed a re-attached retina. Phosphene threshold current was 108 μA OD and 51 μA OS, and critical frequency of phosphene disappearance, 43.0 Hz OD and 41.6 Hz OS.

At 4 months after surgery, the patient was re-hospitalized at the Filatov institute for recurrent retinal detachment. On examination at admission, the right eye appeared quiescent and was artiphakic. In addition, the cornea was transparent, anterior chamber moderately deep and aqueous humor transparent. Other features of the right eye included post-operative mydriasis, heterochromic iris, lack of the vitreous, and recurrent retinal detachment. The ultrasound examination showed a totally detached retina.

Patient's visual acuity was 0.01 OD and 1.0 OS, IOP measured by pneumotonometry, 6.0 mmHg OD, and 14.0 OS. Repeat pars plana vitrectomy with epiretinal membrane removal was performed. The retina was flattened with perfluordecalin, and diode endolaser coagulation of the retina as well as 5700-cSt silicone oil tamponade of the vitreous cavity was performed. No postoperative complication was encountered.

Results

At discharge, a week after repeat pars plana vitrectomy, the right eye appeared quiescent and was artiphakic. In addition, the cornea was transparent, anterior chamber moderately deep and aqueous humor transparent. Other features of the right eye included post-operative mydriasis, heterochromic iris, and silicone oil in the vitreous cavity. Moreover, the retina appeared attached and there were iron decomposition products deposited on the retina in the form of multiple dots. Uncorrected visual acuity OD was 0.03; corrected visual acuity, 0.1 OD with a spherical correction of +3.5; and IOP measured by Maklakoff tonometry, 25.0 mmHg OD. The temporal visual field was 40 degrees narrower than the norm. The ophthalmoscopy and ultrasound examination showed a re-attached retina.

Conclusion

The reported case of missed IOFB highlights the importance of early diagnosis and removal of IOFB to prevent siderosis and subsequent serious complications. The following factors contributed to late diagnosis of metallic IOFB. First, during the first post-traumatic examination of the eye, the ophthalmologist failed to place the focus of attention on the fact that this was a hammer-and-chisel (i.e., metal)-related eye injury. Second, a scleral entry wound was not identified, and roentgenological examination was made neither immediately after the traumatic event nor immediately prior to phacoemulsification with IOL implantation. It is essential to perform a comprehensive eye examination in patients with a history of eye trauma to select the best treatment strategy and avoid medicolegal issues.

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