Metallic orbital foreign body: to dive or not to dive?

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Introduction

Intraorbital foreign body (IOrFB) is a rare occurrence and usually is a result of a high-velocity penetrating injury such as gunshot injuries or industrial accidents. However, sometimes it may occur even with trivial trauma with a vague history. Decision to remove an orbital foreign body is based on several factors, weighing the risks vs benefits. We present a case of a young male who presented with an iron foreign body within the lateral rectus muscle that was successfully removed.

Case report

A 39-year-old gentleman, driver by profession, presented to our hospital with a history of injury to the right eye 6 days ago. He sustained the injury while he was beating an iron wire with a hammer, trying to fashion it into a ring. On presentation, the vision in right eye was counting fingers at 1 m. Ocular motility was full, free and painless. Pupil was reacting to light briskly and there was no relative afferent pupillary defect. Slit lamp examination revealed a localized area of conjunctival congestion over the insertion of lateral rectus muscle. There was a self-sealed corneal tear inferonasally and a subsequent tear in the peripheral iris inferiorly (Figure 1). Although the lens was cataractous, no frank breach was noted in the anterior capsule and there was no cortical matter in the anterior chamber. Intraocular pressure was 16 mmHg on applanation tonometry. Dilated retinal evaluation revealed normal attached retina and optic nerve head with localized vitreous hemorrhage inferiorly. Vision in left eye was 6/6, N6 and ocular examination was normal.

On ultrasonography (USG) B scan of the right eye, a high reflective echo was noted in the inferotemporal quadrant, raising the suspicion of an intraocular foreign body. Thus, computed tomography (CT) scan of the orbits was performed. It revealed a hyperdense mass in the lateral rectus muscle and the mid-posterior orbit level, suggestive of an iron foreign body within the orbit. There was no evidence of any intraocular foreign body (Figure 2).

The patient subsequently underwent removal of the foreign body through an inferotemporal fornical incision. Intraoperatively, a flat iron particle (4 × 5 mm) was found to be embedded into the substance of the lateral rectus ∼10–15 mm from the insertion of the lateral rectus (Figure 3). At the final visit 2 months postoperatively, the patient was doing well with no functional deficit. He was advised cataract surgery in the right eye for visual rehabilitation for which he is yet to report back.

Discussion

Most commonly, metallic foreign bodies enter the orbit with high-velocity injuries. BB pellets or metal fragments in cases of BB injuries are light weight with a velocity of 250–750 feet/s. They, thus, are lodged within the confines of the orbit without causing much collateral damage. Bullets, on the other hand, in cases of gunshot injuries are heavier with a higher velocity and are more likely to enter the sinuses or brain through the orbit, causing excessive damage. In case of work-related injuries, this assessment is difficult to make as the history is often unclear. Hence, every such accident should be dealt with a high suspicion of ocular and orbital foreign body and fully examined and investigated for assessing the extent of damage caused. In our patient, we found that the iron particle entered through the cornea, tore the peripheral iris and grazed through the inferotemporal retina and scleral and got lodged in the lateral rectus. It is noted in experimental studies that the scleral wounds heal by fibrosis within 7 days of injury. This is probably the reason that there was no scleral wound seen as the patient presented 6 days after the injury.

It is universally accepted that organic foreign bodies in the orbit are to be removed as early as possible, due to the danger of causing infection, inflammation and resultant functional and visual deficits. However, guidelines for the management of metallic and inorganic foreign bodies are still controversial. In this scenario, it is appropriate to consider the size, location and present and possible future complications caused by the foreign body. Also, it is essential to contemplate upon the iatrogenic complications that might occur on its removal. Removal of posteriorly located IOrFB may be fraught with postoperative optic neuropathy, strabismus and ocular motility deficits. Anteriorly placed IOrFBs, on the other hand, are comparatively easier to remove; hence, in the presence of anteriorly located inorganic IOrFBs, the decision of removal can be taken after discussing with the patient.

Another aspect to be considered while deciding on IOrFB removal is the content of FB. Most metallic FBs are known to be inert, except Iron, Copper and Lead. There was a conflict of decision in terms of the iron FB removal in our case. Iron IOrFBs carry a theoretical risk of siderosis,
resulting in vision loss. Experimental models in rats have shown significant iron absorption in the sclera, choroid, retina, ciliary body and corneal epithelium of rats in which iron foreign bodies were placed in the orbit close to the sclera. The severity of penetration and damage was found to be directly proportional to the area of contact with the sclera and the amount of iron.8,9 A similar risk existed in our patient as the iron IOrFB was lodged in the lateral rectus at the level

Figure 1. External photograph showing a sealed corneal wound (black arrow) and localized conjunctival congestion over the lateral rectus muscle (asterisk).

Figure 2. CT scan of the orbits revealing a hyperdense foreign body in the substance of the lateral rectus muscle posteriorly (white arrow), in close proximity to the macula (black arrow).

Figure 3. Photograph taken under the operating microscope showing a iron particle in the lateral rectus posteriorly (black arrow).
posterior to the equator (as evident in Figure 2), in close proximity to the macula. The patient presented within a week of injury which negated the chance of any fibrosis. There was exact localization on CT scan and presence in the rectus muscle instead of orbital soft tissue. We thus predicted easy surgical removal of the IOrFB. All these factors collectively led to our decision of removing the iron IOrFB.

Copper is another metal that warrants removal due to its tendency to incite intense inflammation. Intraocular iron and copper are known to diminish Electroretinography (ERG) responses. In cases of a conflict, serial ERGs can be performed to monitor and detect early retinal damage and subsequently plan management. Lead, present in gunpowder, is the offending foreign body in gunshot injuries. Ho et al. observed no ocular complications in 95% of patients with gunshot injuries over a follow-up period of 6 months to 6 years (median 2 years). However, few studies have demonstrated increased serum levels of lead in patients with retained lead pellets. Thus, the risk of systemic absorption and toxicity cannot be denied. Signs of systemic lead intoxication include colicky abdominal pains, stomatitis with a blue line around the gums, polyneuritis with wrist drop and encephalopathy. Ocular complications include papilledema, retinal hemorrhages, vascular sheathing, pupillary dilation, optic neuritis and extraocular muscle palsies may be noted. It is worthwhile to mention that due to the developments in the ammunition manufacturing, current gun pellets include an antimony coating rendering the lead insoluble. Modern day lead pellets can thus be safely left untouched in the orbit and in high-risk cases, serum lead levels can be monitored.

There is no room for complacency in cases of penetrating ocular and orbital injuries. A high suspicion must be kept for a foreign body and thorough examinations and investigations must be carried out on those lines. Removal of a metallic foreign body in cases where there is no functional or visual deficit due to it is a controversial subject and decision needs to be taken on a case-to-case basis.

References

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