Late onset of rhegmatogenous retinal detachments after successful posterior segment intraocular foreign body removal

D J Weissgold, P Kaushal

EXTENDED REPORT

Retinal detachment (RD) is a known complication that occurs as a result of: (1) posterior segment intraocular foreign body (PSIOFB) injury; (2) surgical interventions performed to remove PSIOFBs and/or correct collateral ocular damage, and; (3) formation of proliferative vitreoretinopathy (PVR). While the literature is replete with cases of RDs owing to PSIOFB perforation. Vitrectomy was performed before vitrectomy. Pars plana lensectomy/capsulectomy was removed through the original corneoscleral entry wound and/or a pars plana sclerotomy was impossible; it was cavity was so large that removal through a limbal incision was not performed. Laser retinopexy surrounded retinal impact sites. Gas tamponade was employed at the surgeon’s discretion. Intravitreal antibiotics were administered variably. Binocular indirect ophthalmoscopy with scleral depression was performed before closure to assure the lack of iatrogenic retinal breaks, dialyses, etc. Patient 1’s PSIOFB was removed via an external magnet approach. A scleral cut down was fashioned overlying the far peripheral intraretinal foreign body. Magnet extraction through the exposed choroid was performed. The scleral wound was sutured and the area treated with external, trans-scleral cryoretinopexy. A small section of silicone scleral buckle exoplant was placed in the region of the scleral cut down.

Subconjunctival and postoperative systemic antibiotics were employed in all cases. One surgeon (DJW) delivered all short term and almost all long term postoperative retinal care.

RRDs were considered “late” postoperative ones when they occurred either more than 2 months following vitrectomy without gas tamponade or when they occurred more than 2 months following the complete dissolution of vitreous cavity gas in cases treated with vitrectomy with gas tamponade.

RESULTS

Eleven patients (two females) with an average age of 35.6 years (range 17–73 years) were included in this series (table 1). Patient 10 had a foreign body embedded in the pars plana vitrectomy for PSIOFB removal. Two patients experienced late RRDs that were managed with excellent long term visual outcomes.

Conclusions: Late RRD may occur following successful removal of PSIOFBs, even several months after initial management. These RRDs may be successfully managed with a variety of methods, depending upon the extent and location of the detachment and causative break as well as surgeon comfort and preference.
<table>
<thead>
<tr>
<th>Patient No</th>
<th>Age</th>
<th>Sex</th>
<th>IOFB location</th>
<th>Mechanism of injury</th>
<th>Preoperative visual acuity</th>
<th>Time to surgery</th>
<th>Findings at presentation</th>
<th>Lens status</th>
<th>Gas</th>
<th>IOFB removal method</th>
<th>ABX†</th>
<th>Subsequent surgeries</th>
<th>Postoperative visual acuity</th>
<th>Follow up duration (months)</th>
<th>Time from surgery to RRD(s) (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30</td>
<td>M</td>
<td>intraretinal metal on metal</td>
<td>metal on metal</td>
<td>20/70</td>
<td>~36 hours</td>
<td>cornoæscleral laceration; hyphaema; vitreous haemorrhage; sleral laceration</td>
<td>normal</td>
<td>none</td>
<td>external magnet</td>
<td>No</td>
<td>none</td>
<td>20/20</td>
<td>66</td>
<td>NA</td>
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<tr>
<td>2</td>
<td>34</td>
<td>M</td>
<td>intramacular</td>
<td>fireworks</td>
<td>hand motion</td>
<td>&lt; 12 hours</td>
<td>normal</td>
<td>normal</td>
<td>18%</td>
<td>C3F8</td>
<td>via enlarged pars plana sclerotomy</td>
<td>Yes</td>
<td>none</td>
<td>20/20</td>
<td>23</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
<td>M</td>
<td>intravitreal with retinal impact</td>
<td>pebble thrown by garden string trimmer</td>
<td>light perception</td>
<td>&lt; 8 hours</td>
<td>cornoæscleral and retinal laceration</td>
<td>ruptured</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>20/20</td>
<td>23</td>
<td>NA</td>
</tr>
<tr>
<td>4</td>
<td>73</td>
<td>F</td>
<td>intravitreal with retinal impact</td>
<td>pebble thrown by power lawnmower</td>
<td>no light perception</td>
<td>&lt; 6 hours</td>
<td>massive cornoæscleral and retinal laceration with traumatic aphasia and intraocular disorganisation</td>
<td>NA</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>20/20</td>
<td>23</td>
<td>NA</td>
</tr>
<tr>
<td>5</td>
<td>42</td>
<td>M</td>
<td>intraretinal</td>
<td>metal on metal</td>
<td>counting fingers</td>
<td>&lt; 8 hours</td>
<td>cornoæscleral laceration; cataract; vitreous haemorrhage; sleral laceration</td>
<td>ruptured</td>
<td>20%</td>
<td>SF6</td>
<td>via enlarged pars plana sclerotomy</td>
<td>No</td>
<td>RRD repair</td>
<td>20/20</td>
<td>20</td>
</tr>
<tr>
<td>6</td>
<td>31</td>
<td>M</td>
<td>intraretinal</td>
<td>metal on metal</td>
<td>hand motion</td>
<td>&lt; 6 hours</td>
<td>cornoæscleral laceration; cataract; vitreous haemorrhage; sleral laceration</td>
<td>ruptured</td>
<td>16%</td>
<td>C3F8</td>
<td>via enlarged pars plana sclerotomy</td>
<td>No</td>
<td>RRD repairs</td>
<td>20/30</td>
<td>36</td>
</tr>
<tr>
<td>7</td>
<td>30</td>
<td>M</td>
<td>intraretinal</td>
<td>power tool</td>
<td>20/100</td>
<td>&lt; 12 hours</td>
<td>cornoæscleral laceration; cataract; vitreous haemorrhage; sleral laceration</td>
<td>ruptured</td>
<td>20%</td>
<td>SF6</td>
<td>via enlarged pars plana sclerotomy</td>
<td>No</td>
<td>none</td>
<td>20/20</td>
<td>26</td>
</tr>
<tr>
<td>8</td>
<td>17</td>
<td>M</td>
<td>intraretinal</td>
<td>metal on metal</td>
<td>counting fingers</td>
<td>&lt; 8 hours</td>
<td>normal</td>
<td>normal</td>
<td>18%</td>
<td>C3F8</td>
<td>via enlarged pars plana sclerotomy</td>
<td>Yes</td>
<td>none</td>
<td>20/25</td>
<td>31</td>
</tr>
<tr>
<td>9</td>
<td>43</td>
<td>M</td>
<td>intraretinal</td>
<td>metal on metal</td>
<td>20/40</td>
<td>3 days</td>
<td>vitreous haemorrhage; cornoæscleral laceration; cataract; vitreous haemorrhage; sleral laceration</td>
<td>normal</td>
<td>16%</td>
<td>C3F8</td>
<td>via enlarged pars plana sclerotomy</td>
<td>Yes</td>
<td>secondary PCIOL; YAG capsulotomy; LASEK</td>
<td>20/15</td>
<td>31</td>
</tr>
<tr>
<td>10</td>
<td>43</td>
<td>M</td>
<td>pars plana metal on metal</td>
<td>metal on metal</td>
<td>20/20</td>
<td>&lt; 12 hours</td>
<td>sleral laceration</td>
<td>normal</td>
<td>none</td>
<td>thru sleral entry site</td>
<td>No</td>
<td>(lost to long term follow up)</td>
<td>20/20</td>
<td>2</td>
<td>NA</td>
</tr>
<tr>
<td>11</td>
<td>19</td>
<td>F</td>
<td>subretinal</td>
<td>metal on rock</td>
<td>20/20</td>
<td>&lt; 8 hours</td>
<td>vitreous haemorrhage; sleral laceration</td>
<td>normal</td>
<td>none</td>
<td>via enlarged pars plana sclerotomy</td>
<td>Yes</td>
<td>none</td>
<td>20/20</td>
<td>21</td>
<td>NA</td>
</tr>
</tbody>
</table>

NA, not applicable.

*Patient 1 had the entry wound repaired and an unsuccessful attempt made at IOFB removal made at an outlying facility via pars plana vitrectomy approximately 24 hours before our described external magnet extraction surgery. Preoperative visual acuity reported was the day after the initial surgical wound repair and unsuccessful vitrectomy. Findings at presentation were present hours after the injury—before any surgical intervention was undertaken, and lens status was both before the initial surgery and before our subsequent surgery.

†Antibiotics at time of IOFB removal.
This eye was included in the series both for the sake of completeness and because it was believed that the eye was struck firmly enough that RRD was possible. This case was excluded from some of the analysis.

Patients 3 and 4 met study criteria but are excluded from some analyses. Their eyes were so badly injured that primary globe closure was followed within days by enucleation. It would have been meaningless to include these eyes in an analysis aimed at determining the incidence of late RRD complicating PSIOFB injuries and primary PSIOFB removal.

The mean postoperative follow up, excluding those eyes that were enucleated shortly after PSIOFB removal, was 28.4 (SD 17.1) months (range 2–66 months). Of those nine cases, five (55%) had associated classic or local metal on retina. Findings on initial ophthalmic examination included lens involvement (rupture, traumatic aphakia, or traumatic opacities without frank rupture) in six eyes (55%); scleral laceration in four eyes (36%); corneoscleral lacerations in four eyes (36%); and corneal laceration in three eyes (27%). Three eyes (27%) were treated with intravitreal antibiotics as prophylaxis against endophthalmitis. All but two patients (82%) had definitive foreign body removal performed within 24 hours of the injuries. Of the nine patients who underwent pars plana vitrectomy for PSIOFB removal, seven (78%) had the PSIOFBs removed through enlarged surgical pars plana sclerotomies, one (11%) had the PSIOFB removed through a surgical corneoscleral limbal incision, and one (11%) had the PSIOFB removed through the massive corneoscleral entry wound. No intraoperative or short term postoperative iatrogenic peripheral retinal breaks, dialyses, etc, were identified in any of these cases.

Initial post-traumatic visual acuity ranged from 20/20 to no light perception. Of those nine patients not requiring enucleation, four (44%) had poor presenting visual acuities (counting fingers or worse). All eyes not ultimately requiring enucleation enjoyed final visual acuities of 20/30 or better.

Two patients (22%) who did not require enucleation experienced late RRDs. Patient 5 developed an inferior RRD 8 months after initial injury and vitrectomy. Growing posterior hyaloid separation resulted in RRD in two patients 4 months: a superior RRD 8 months after initial vitrectomy for PSIOFB removal, seven (78%) had the PSIOFBs removed through enlarged surgical pars plana sclerotomies, one (11%) had the PSIOFB removed through a surgical corneoscleral limbal incision, and one (11%) had the PSIOFB removed through the massive corneoscleral entry wound. No intraoperative or short term postoperative iatrogenic peripheral retinal breaks, dialyses, etc, were identified in any of these cases.

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retinal breaks (for example, PSIOFB impact sites). Unfortunately, most PSIOFB injuries occur in young patients in whom the posterior hyaloid can be difficult to remove, especially when pre-existing retinal breaks may be present. Additionally, the risks of posterior hyaloid stripping include the creation of retinal tears and RRDs. If the hyaloid is not peeled at the time of vitrectomy, it will ultimately detach spontaneously. At the time of that spontaneous detachment, peripheral retinal breaks and RRDs may ensue, as was the case in patients 5 and 6.

DeSouza and Howcroft reported that it was possible to induce posterior hyaloid separation at the time of vitrectomy for PSIOFB removal in 17 of 38 eyes, but did not report what complications occurred, nor did they analyse whether successful intraoperative posterior hyaloid stripping had any beneficial effect on final visual outcome. Pavlovic et al. attempted surgical posterior hyaloid stripping in 29 eyes with PSIOFBs managed with vitrectomy and encircling, but did not report how often hyaloid stripping was successful. They did not mention any induced complications, nor was there any analysis of the visual and/or anatomical benefit of this manoeuvre. Despite the lack of data, these authors strongly advocate surgical posterior hyaloid stripping at the time of PSIOFB removal by vitrectomy to: (1) decrease vitreoretinal traction and lessen the risks of both RRD and PVR associated tractional RDs; and (2) decrease the incidence of macular pucker. Jonas and colleagues reported that they routinely peeled the posterior hyaloid at the time of vitrectomy in their series of 119 PSIOFB harbingering eyes. Once again, however, this report does not describe how often posterior hyaloid stripping was possible, any problems it may have caused, or analysis of its purported benefits. Interestingly, Kuhn and Kovacs vociferously advocated for posterior hyaloid stripping in these cases, but the eyes in their series managed in this fashion had largely poor visual and anatomical outcomes. Aaberg and Sternberg cited Slusher et al.'s high RD rate following vitrectomy without posterior hyaloid stripping for PSIOFB removal as evidence that posterior hyaloid stripping should be performed, particularly when a retinal impact site was present. However, Ambler and Sanford had excellent results in their series of five eyes with intraretinal foreign bodies that were managed with vitrectomy but without posterior hyaloid stripping or retinopexy.

Prophylactic scleral buckling in traumatised eyes has been a controversial topic for decades. The issue of prophylactic buckling in eyes with PSIOFBs is no exception to this controversy. No randomised data exist comparing similarly injured eyes harbouring PSIOFBs managed with and without prophylactic scleral buckling. El-Asrar and colleagues employed encircling bands in eyes without evident retinal breaks and combined buckles and encircling bands in eyes with retinal breaks (but without RRDs) in 41 of 94 cases managed with pars plana vitrectomy for PSIOFB injuries. In another retrospective series, DeSouza and Howcroft found a trend towards decreased risk of RD development in eyes with PSIOFB injuries that had adjunctive prophylactic scleral buckling in comparison with eyes that were not buckled. However, no statistical significance was seen. While they did find a decreased rate of postoperative RD in those eyes in their series managed in this fashion, that advantage over the RD incidence in eyes not banded/buckled was not statistically significant. Karel and Diblik managed 76 eyes with PSIOFBs with vitrectomy. While only nine eyes in this series had RRDs at the time of presentation and vitrectomy, all 76 eyes were managed with encircling bands and some with adjunctive buckles. Only three eyes developed late RDs. In the series of Pavlovic et al., 22 of 29 vitrectomised eyes were encircled, but no meaningful analysis resulted with versus without encircling.

In the cases presented here where the injuries were not so severe that enucleation was required shortly after PSIOFB removal, all patients achieved final visual acuities of 20/30 or better. It is believed that the excellent visual results in this series are attributable to: the rapidity with which most PSIOFB removal surgeries were performed; the relatively small size of most of the PSIOFBs; the limited extent of collateral intraocular damage; the extramacular locations of the retinal impact sites; the lack of endophthalmitis; and the successful management of postoperative complications. While neither posterior hyaloid stripping nor prophylactic scleral buckling was employed, two patients did develop late post-vitrectomy RRDs.

The data in this series reiterate the importance of prompt recognition and repair of PSIOFB injuries. Although this series suffers from its small size and retrospective nature, it offers several strengths: (1) long term follow up; (2) all vitreoretinal surgeries and virtually all follow up and subsequent management were performed by one surgeon; (3) patient demographics, mechanisms of injury, and methods of surgical intervention are comparable to those most commonly seen in other reports; and (4) similarities existed in case to case injuries (for example, the preponderance of retinal impact sites). Thus, these results may be representative of injuries like those described and there may be approximately a 25% chance of late retinal tear and/or RRD complicating vitrectomy for PSIOFB removal when the posterior hyaloid is not stripped at the time of surgery.

Late RRD may occur following successful PSIOFB removal. These RRDs may be successfully managed with a variety of methods, depending upon the extent and location of the detachment and causative break(s), surgeon comfort and preference, etc. No consensus exists regarding surgical posterior hyaloid stripping at the time of vitrectomy in such cases, and as there are few data regarding its efficacy and/or safety.

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REFERENCES
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