Management of a unique case of post-traumatic posterior giant retinal tear and macular hole-associated rhegmatogenous retinal detachment

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Blunt trauma to the eye can present with protean manifestations involving the anterior and posterior segments of the eye. Giant retinal tear (GRT) following trauma occurs most commonly at the equatorial region or anterior to the equator. GRT posterior to the equator is rare. Herein, we present a case of a 21-year-old male, who presented with sudden diminution of vision in the right eye following blunt-trauma with a cricket ball. Examination revealed a posterior-GRT, full-thickness macular hole, rhegmatogenous retinal detachment, and vitreous hemorrhage in the right eye. He was managed with vitrectomy, encircling scleral band, perfluorocarbon liquid-assisted flattening of GRT, internal limiting membrane peeling, and endotamponade. The probable etiopathogenesis of posterior-GRT and various surgical challenges encountered in this case were also described illustratively in this report.

Key words: Blunt trauma, GRT, posterior giant retinal tear, retinal detachment, traumatic macular hole

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Giant retinal tear (GRT) is a full-thickness retinal break extending circumferentially for 3 or more clock-hours.[1-3] Trauma is the most common predisposing factor for the development of GRT,[1] constituting 16.1% of all GRT cases.[4] GRTs are most commonly located posterior to ora (82%) or at the equator (15%); very few being posterior to the equator (3%).[5] Traumatic full-thickness macular hole (FTMH) is reported in approximately 1.4% of closed-globe injuries and is often associated with various posterior segment manifestations.[6,7] In this report, we present a young individual with myriads of posterior segment manifestations in the form of rhegmatogenous retinal detachment (RRD), GRT, FTMH, and vitreous hemorrhage (VH) following blunt-trauma. The unique feature of this case is the posterior nature of GRT and its coexistence with FTMH. We also described the probable etiopathogenesis, various surgical challenges, and its management.

Case Report

A 21-year-old male presented with sudden diminution of vision in the right eye (RE) for 4-days following a blunt-trauma with a cricket ball. His best-corrected visual acuity (BCVA) was

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hand-movement close to face (HMCF) in RE and 6/6 in the left eye (LE). Intraocular pressure (IOP) was 10 and 14 mm of Hg in RE and LE, respectively. Anterior segment of RE [Fig. 1a] revealed broad-based posterior synechiae, pupillary-sphincter tears, and posterior subcapsular cataract (PSC). Fundus of RE [Fig. 1b and 1c] revealed a posterior-GRT abutting fovea, FTMH, RRD, and mild VH. The posterior-flap of GRT was elevated with partially rolled edges, had few overlying retinal hemorrhages, and was approximately one disc-diameter (DD) away from the temporal margin of the FTMH. The examination of LE was unremarkable. He was undertaken for pars-plana vitrectomy (PPV). After applying 240-band encircling 360°, 25-gauge PPV (Stellaris PC, Bausch & Lomb) was initiated. Posterior vitreous detachment (PVD) was induced from nasal disc margin; posterior hyaloid was strongly adhered beyond the anterior-flap of GRT. After completing core-vitrectomy, a partially inverted posterior-flap of GRT was unfolded with the help of perfluorocarbon liquid (PFCL). Care was exercised to avoid fish-egging of PFCL-globule and subretinal migration through posterior-GRT. Adherent hyaloid from the anterior-flap was removed with cutter and intraocular forceps [Fig. 2a-c]. Vitreous-base dissection was completed with 360° peripheral scleral indentation. Internal limiting membrane (ILM) peeling could be performed in an area of 1-DD radius only centering on fovea with help of ILM-peeling forceps under PFCL [Fig. 2d].

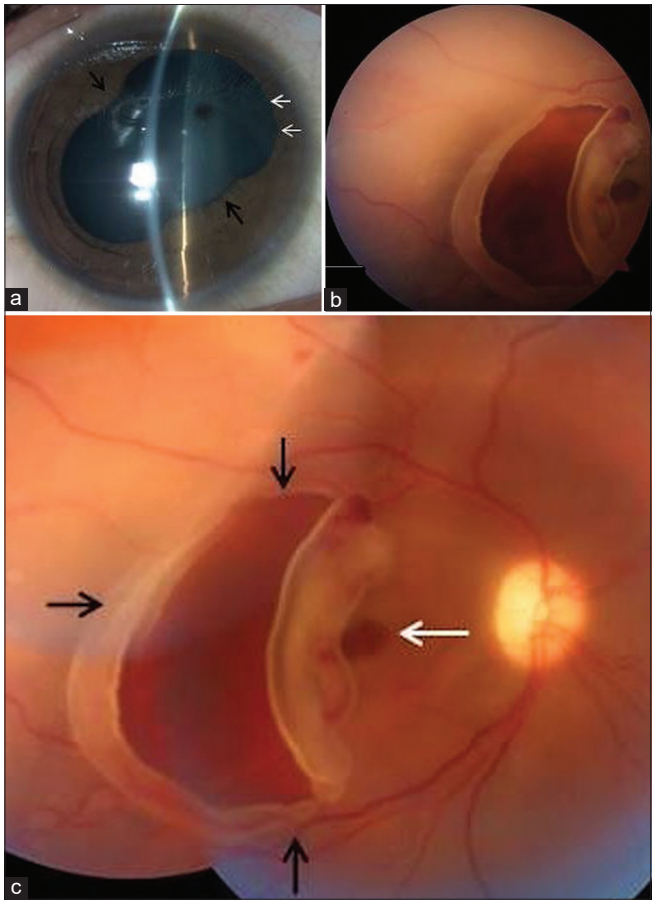

Figure 1: (a) Slit-lamp photograph of the right eye at presentation showing broad-based posterior synechia (black arrow), pupillary sphincter tears (white arrow), pigments on the anterior lens surface, and localized PSC. Posterior pole (b) and montage (c) fundus photo of the right eye at presentation showing GRT (black arrow) with underlying bare choroid and FTMH (white arrow)

This was followed by a nasal retinotomy, PFCL-air exchange, and endolaser after complete drying of the lips of GRT to avoid any slippage [Fig. 2e-f]. Nearly 14% perfluoropropane (C3F8) gas-tamponade was done subsequently and strict prone positioning was followed postoperatively for 2-weeks. Follow-up at 2 weeks showed an attached retina with type-1 MH closure [Fig. 3a] on optical coherence tomography (OCT). However, localized subretinal fluid (SRF) appeared inferiorly after 3 weeks, which was attributed to a stretch break at the 7-o'clock region at the posterior-edge of 240-band. He was subjected to re-PPV and silicone-oil tamponade (SOT) after 4 weeks from the initial surgery. Three-weeks following SOT, his BCVA improved to 1/60 with normal IOP, attached retina, and closed MH [Fig. 3b and c]. Three-months following SOT, he underwent phacoemulsification with posterior chamber intraocular lens implantation (PCIOL) and silicone oil removal without any adverse events. Examination at 6 months revealed, BCVA of 4/60, well-placed PCIOL, attached retina with closed MH [Fig. 3d].

Discussion

Scott classified GRT in three categories: equatorial, equatorial with posterior extension, and oral.[8] GRT posterior to the equator is extremely rare. The majority of the GRT-related RD in adults are associated with PVD and dynamic vitreous traction, although isolated small case-series of GRT-related RD without PVD has been reported.[9]

The etiopathogenesis of anterior and posterior-GRT might be different. Traumatic-GRT anterior to equator might result from sudden traction of less distensible vitreous-base over retina during sudden compression-decompression. Conversely, posterior-GRT may occur as a result of post-traumatic contusion necrosis and atrophic retinal fragmentation without any apparent PVD. Post-traumatic atrophic fragmentation has been shown in the experimental model even after minor trauma as early as 48-h, although overlying vitreous-liquefaction and retinal break may develop after variable duration.[10] Hence, we postulate that the anterior GRT occurs mostly due to tractional factor and almost always associated with PVD whereas posterior GRT, as in our case, maybe secondary to contusion necrosis in addition to tractional factor and may not be associated with PVD. This is further substantiated by an isolated report of bilateral horseshoe-shaped macular-tear following blunt trauma due to retinal dehiscence without vitreous traction. One eye of this patient was already vitrectomized and the other eye had preexisting PVD before the development of macular tears, thus ruling out PVD-induced tractional cause as the contributing factor.[11]

The pathophysiology of traumatic-MH is also controversial. Various factors such as contusion necrosis, retinal stretching, cystoid degeneration with foveal dehiscence have been postulated. Following a violent blunt trauma, there is sudden flattening of posterior sclera due to direct impact, giving rise to a horizontal force over macula and there is trampoline-like movement during retraction, giving rise to anteroposterior traction over the macula. The combined interplay between this horizontal and anteroposterior traction gives rise to an irregular and elliptical traumatic-MH. Majority of the traumatic-MH present without concomitant PVD, especially in young individuals where posterior hyaloid densely adheres to underlying ILM.[6,7]

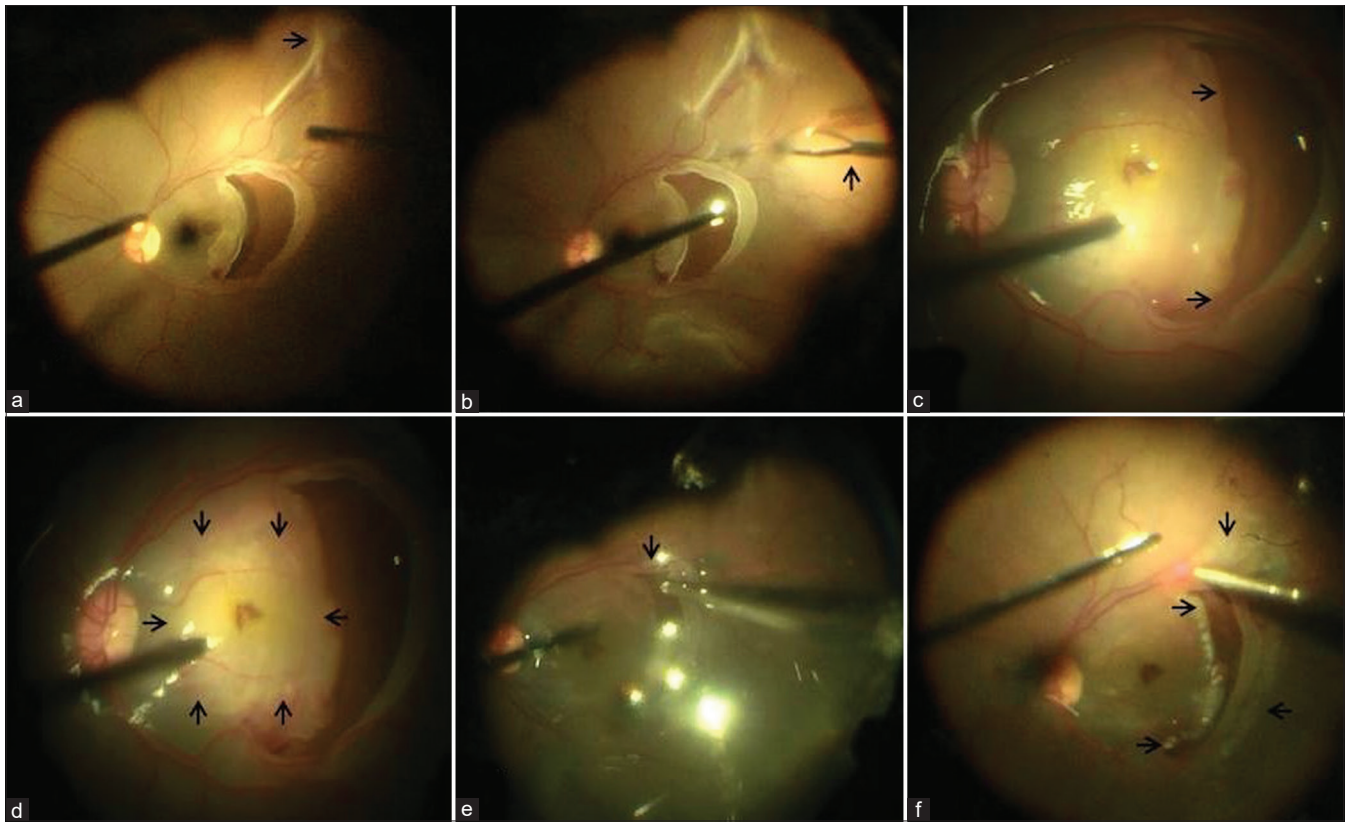

Figure 2: Intraoperative photograph of the right eye (surgeon's view; a-f) demonstrating surgical steps. (a) Posterior pole view with GRT and FTMH. Infero-temporal localized star fold (arrow) was also noted. (b) Membrane peeling with help of intraocular forceps (arrow). (c) PFCL-assisted flattening of GRT (edges unrolled; arrow). (d) ILM-peeling under PFCL; area of peeled ILM demarcated with a black arrow. (e) Drying of edges of GRT with soft tip (arrow). (f) Gentle endolaser around flat GRT (arrow)

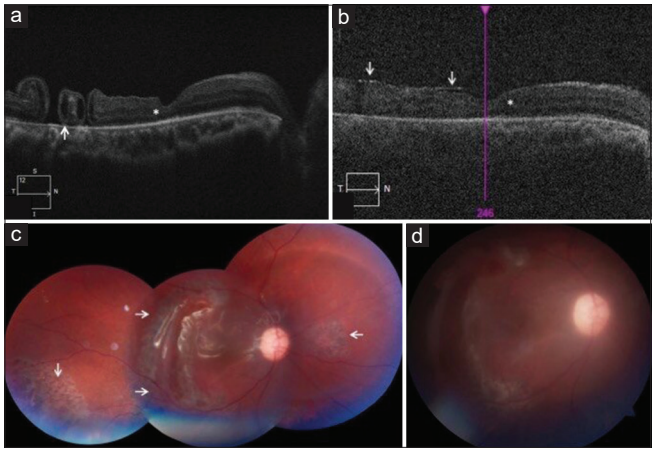

Figure 3: (a) OCT of right eye following first surgery showing closed FTMH (white star) and small dehiscence of neuroretinal tissue at the site of GRT (arrow). (b) OCT following second surgery (after SOT) showing closed FTMH (star) and visible oil meniscus (arrow). (c) Montage fundus photo following SOT showing well-lasered GRT, nasal retinotomy scar of the first surgery, and lasered inferotemporal suspicious lesion (arrows). (d) Fundus photo at last visit (6 months) showing attached retina, lasered GRT, and closed FTMH

Various surgical challenges were encountered in this case. Due to the posterior location of the GRT, removal of adherent hyaloid from long anterior-flap was difficult. The peeling of ILM from a temporal narrow mobile strip of the retina was challenging and had a risk of radial extension of GRT-edges. The GRT might have acted as a relaxing incision to relieve temporal tangential traction of MH, thus enabling MH-closure with a lesser area of ILM peel. Incomplete pupillary dilatation was another challenge although peripheral vitrectomy was completed with the help of a wide-angle viewing system and peripheral scleral indentation.

There is no conclusive benefit of additional encirclage over PPV alone in the management of GRT.[2,12] However, encirclage was done in this case due to phakic status, suboptimal pupillary dilatation, and early inferior proliferative vitreoretinopathy. Direct PFCL-silicone oil exchange over PFCL-air exchange is recommended to avoid the presence of any aqueous in the PFCL-air interface.[13] The anatomical outcome of GRT-associated RD with both long-acting gas and oil as a tamponading agent is comparable.[14,15] Considering posterior-GRT and FTMH without any noticeable peripheral break, gas-tamponade was done during the first surgery in this case, although primary SOT could have been a better alternative considering traumatic etiology and high risk for proliferative vitreoretinopathy.

Conclusion

To our knowledge, concurrent posterior-GRT and FTMH-associated RRD following blunt-trauma has not been reported earlier. Although the etiopathogenesis of posterior-GRT might be different, surgical management in such a scenario is mostly the same as compared to other

GRT-associated RRD. However, a specifically tailored approach may be required on an individual basis to optimize the best outcome.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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