Giant Retinal Tear

16

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16.1 Introduction

A Giant Retinal Tear (GRT) is a type of full-thickness retinal break located in the peripheral retina, which is extending equally to or more than 3 clock hours (>90°) in a circumferential pattern [1, 2], They are associated with posterior vitreous detachment. Vitreous is attached to the anterior flap of the break but the posterior flap is free from vitreous. Hence, it rolls back toward posterior pole. More retinal pigment epithelial (RPE) cells get released due to large size of the break, leading to more chances of proliferative vitreoretinopathy which makes its management challenging.

16.2 Epidemiology

GRTs comprise 1.5% out of all rhegmatogenous retinal detachments [3]. According to a British Giant Retinal Tear Epidemiology eye study, the incidence of GRT is between 0.094 and 0.114 per 100,000 persons in a year. Males constitute the majority of patients (65–91%) with a mean age of 42 years [4]. About 54% of GRTs are idiopathic, 12% are post traumatic, 25% in high myopic patients, 14% occur secondary to systemic conditions, i.e., Sticklers syndrome, Marfan syndrome, Ehlers Danlos syndrome, or Wagner Syndrome [4, 5]. Fellow eye has 6.6% GRT rate at presentation in a study by Freeman et al. [6]. In another study conducted on 128 eyes with GRT, 16.1% had detachment in the fellow eye of which 3.2% had GRT. Lattice degeneration was seen in 12.1% of eyes and 0.7% of eyes were treated for retinal tear by cryopexy or laser photocoagulation [7]. In another UK based study among the 50 nontraumatic non-iatrogenic GRT, 12% has previous or current GRT and 6% had previous or current non-GRT RD in the fellow eye [4].

16.3 Classification

Schepens et al. [2] have classified GRTs into three types based on etiology:

(a) Idiopathic (70% cases)
(b) Traumatic (15–20%)
(c) Along the posterior margin of chorioretinal degenerations (10%)

It is seen that idiopathic and traumatic GRTs are more common in males along with associated myopia.

Scott et al. [8] have classified GRTs on the basis of their location and pathophysiology into:

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(a) Equatorial, located at the equator (most common)
(b) Equatorial with posterior extension (poor prognosis as posterior extension leads to more mobile posterior flap)
(c) Oral, located at the ora serrata (least common)

GRTs can also be classified on the basis of:

1. Extent: In degrees (90–360°) or clock hours [3–11]
2. Location: Superior, Temporal, Nasal, and Inferior
3. Configuration:
   (a) Giant tear without detachment
   (b) Giant tear with detachment with:
      - Flat or undisplaced posterior flap
      - Rolled posterior flap
      - Inverted posterior flap
      - Associated with posterior extensions, i.e., radial rips at or along the margin of the tear
4. Associated proliferative vitreoretinopathy changes (absent to severe)

16.4 Pathogenesis

Usually giant retinal tears occur due to abnormal vitreous traction around areas of peripheral vitreous condensation (white without pressure with central vitreous liquefaction). Subsequent contraction of the cortical vitreous causes focal vitreoretinal traction and neurosensory retinal tear in a circumferential manner. The vitreous is adherent to the anterior flap of the retinal break while the posterior flap remains free from vitreous. Hence, the posterior flap is freely mobile and has a tendency of rolling over posteriorly. Unlike GRT, the vitreous is adherent to the posterior margin of retinal tear in cases of retinal dialysis and hence the posterior flap is not very mobile.

Due to large area of retinal tear, RPE cells are released in greater numbers. They transdifferentiate into myofibroblasts and lead to severe proliferative vitreoretinopathy and intense inflammation.

16.5 Risk Factors

Trauma is one of the most important risk factors associated with GRT. Traumatic GRTs usually occur in young myopes. Open globe injuries can cause vitreous incarceration in the wound with subsequent traction and GRT. Closed globe injuries can also cause GRT due to shearing forces. Traumatic GRTs may not be associated with posterior vitreous detachment.

High myopia with large areas of white without pressure and posterior vitreous detachment, is also important risk factor for GRT. Complicated cataract surgery with vitreous loss, vitreous incarceration in wound or vitreous traction due to increased maneuvring increases the risk for GRT. Hereditary vitreoretinopathies such as Wagner syndrome, Stickler syndrome, Ehler Danlos syndrome, and Marfans syndrome pose an increased risk for GRT. Young age is a significant risk factor predisposing to giant retinal tears due to presence of tight vitreoretinal adhesions with greater predisposition to ocular trauma.

16.6 Clinical Features

Symptoms depend upon the status of macula and configuration of the flap with respect to macula. In cases of macula off retinal detachments and flaps covering macula, visual acuity is very poor.

Tobacco Dusting (Schaffer sign) is usually seen in anterior vitreous due to RPE pigment release in large numbers. It may be associated with vitreous hemorrhage if the tear involves a major retinal vessel. Examination of fellow eye may show WWOP areas and other retinal degenerations predisposing to detachments. Degenerations not usually leading to retinal detachments are sometimes treated in fellow eyes of GRTs due to increased risk of detachment.

16.7 Differential Diagnosis

GRTs should be differentiated from giant retinal dialysis, which is circumferential disinsertion of retina from the ora and is usually associated with

blunt trauma. The main differentiating feature between the two is the presence of posterior vitreous detachment in case of GRT. In giant retinal dialysis, the break is located anteriorly at the vitreous base insertion. As the vitreous is usually attached to the posterior margin of the break, the flap does not invert or roll backward.

16.8 Management

We have come a long way in managing giant tears and complicated retinal breaks. The advent of wide-angle viewing system, microincision surgeries, and perfluorocarbon liquids (PFCL) have made vitrectomy the first choice in managing these patients. Complete vitrectomy up to or beyond the ora serrata is now possible under direct visualization. PFCL has unique properties like high specific gravity, low viscosity, and optical clarity. Due to its high interfacial tension than water, PFCL bubble has tendency to maintain its circular shape and helps in easy flap manipulation and helps in giving tamponade promoting apposition of detached retina with the RPE in complex vitreoretinal surgeries. This close apposition helps in laser or cryo retinopexy along the tear margins (Fig. 16.1). This has increased the primary attachment rate from 58% to 94% and also helped us to come out of some tedious procedures used before like retinal tacks, inverted surgical beds (Stryker Frame), transscleral suturing, retinal incarceration, etc. [9]. Final anatomical success rate of up to 98% has been reported in literature [10].

Scleral buckling is usually not the treatment of choice and can be tried in cases where the edge of the tear is not folded and there are no PVR changes or in children to salvage the lens and to get rid of postoperative positioning.

Complete vitrectomy along with the use of PFCL fluids with gas or oil tamponade is done to unfold the flap and settle the retina. After core vitrectomy, vitreous is freed from all of the edges of giant tear. PFCL bubble is then injected to unfold the retina. PFCL should be injected as a single bubble and fish eggs on dispersion should be avoided by keeping the PFCL level below the infusion. After stabilizing the posterior retina, anterior vitreous and anterior retinal flap should be removed. Any epiretinal membranes are removed under PFCL. Staining of the membrane with brilliant blue or ICG should be done prior to injecting PFCL. Edge of the tear should be managed well with removal of all vitreous traction as any residual vitreous traction in this area can lead to redetachment. Laser retinopexy is applied in two to three rows to the corners and edge of the tear up to the ora serrata (Fig. 16.2). Air–fluid exchange is a very crucial step as retinal slippage can occur if done incorrectly. All the fluid anterior to the PFCL edge should be removed prior to removing PFCL to prevent slippage of the retina. The residual PFCL can then be aspirated over the optic nerve. Direct PFCL silicone oil exchange is preferred over air–fluid exchange to prevent this

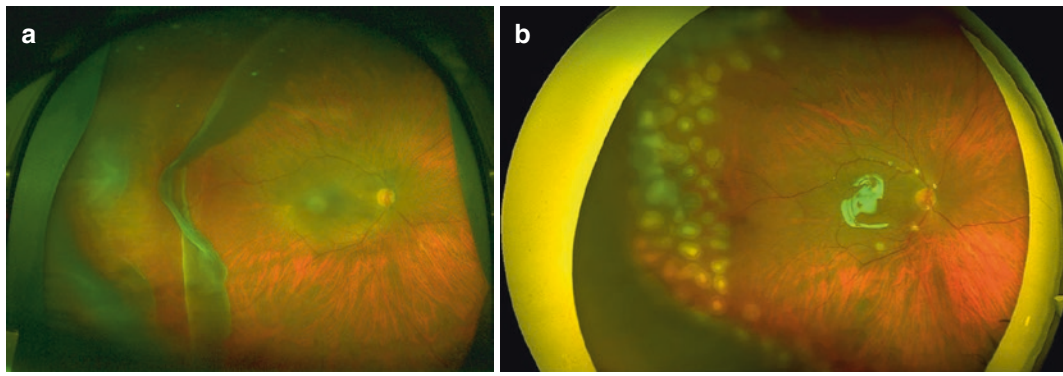

Fig. 16.1 (**a**) Preoperative ultrawidefield fundus photograph of a patient showing temporal GRT with macula on. (**b**) 6 weeks postoperative photograph showing well-attached retina with lasered flap

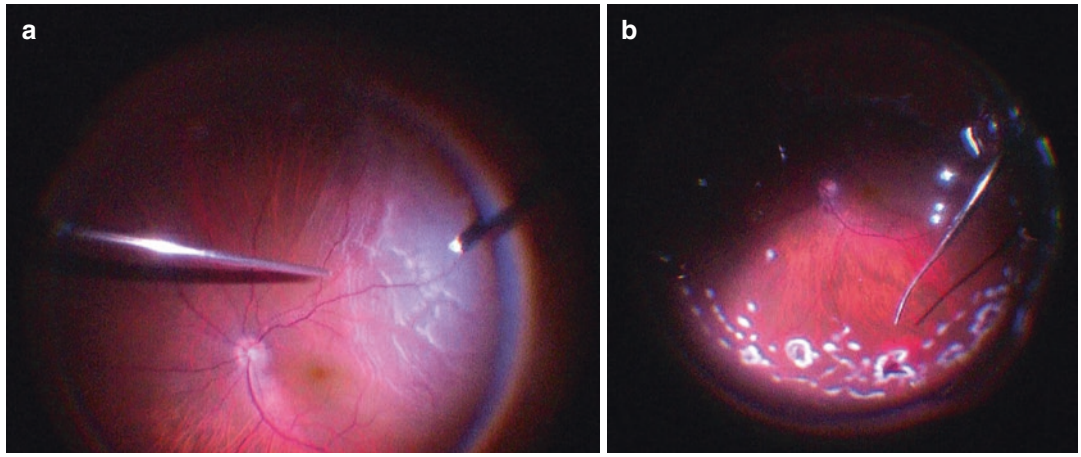

Fig. 16.2 (**a**) Important surgical steps showing complete release of vitreous traction. (**b**) Laser retinopexy of GRT flap in 2–3 rows

complication of retinal slippage. Phakic eyes may pose a problem in removing the anterior vitreous and anterior retinal flap due to risk of iatrogenic trauma to the lens. Scleral depression can be performed to prevent lenticular damage. Alternatively, lens can be removed by phacoemulsification or pars plan lensectomy. Use of encircling band in cases without PVR is not usually recommended as there are increased chances of tear fish mouthing, anterior retinal folds causing tear slippage and choroidal hemorrhage.

Proliferative vitreoretinopathy (PVR) is more commonly seen in GRTs in around 50% of cases due to large RPE dispersion and associated vitreous hemorrhage. It is more common in trauma-induced GRTs or long-standing GRTs. In these cases, encircling silicone band can be put to support the vitreous base and to counteract the axial shortening due to fibrous membranes. Fibrous proliferation on both the surfaces of the retina should be removed. Subretinal membranes if present should be removed prior to injection of PFCL.

There may be multiple factors responsible for surgical and visual outcomes in GRT surgery. Factors responsible for good postoperative visual acuities are no history of previous vitrectomies, no preoperative PVR changes, good preoperative vision, no need for retinotomies, etc. Factors found to be associated with poor visual outcome after surgery were poor preoperative vision, severe PVR changes, GRTs more than 180°, hypotony, concurrent choroidal detachment, pseudophakia, aphakia, etc.

16.9 Complications

The most common complication in vitrectomy for GRT repair is retinal slippage during air–PFCL exchange. It can be prevented by performing a direct PFCL–silicone oil exchange. Recurrent retinal detachment with PVR can occur due to residual traction and re-proliferation at the edges of the tear, missed breaks away from the tear, and the occurrence of PVR. Re-detachment due to PVR is more common in eyes with old detachments, associated vitreous hemorrhage, GRT extending more than 180° and pre-existing PVR. Other complications include progression of cataract, and PFCL remnants in subretinal space.

16.10 Treatment of Fellow Eyes

Due to high incidence of vitreoretinal pathologies and chances of RD in fellow eye of patients of GRT, proper screening of the fellow eye should be done. Incidence of bilateral nontraumatic GRT is between 0% and 21%. Freeman's 16-year observational study of fellow eyes of 226 nontraumatic GRTs found that bilateral GRTs

occurred in 12.8% of patients [6]. In 3.7 years of follow up, 11% of eyes develop GRTs, among untreated 124 fellow eyes. Even 11.7% of patients had unrelated concurrent RDs not related to GRTs at initial visit. Overall incidence of RD was 15.9% in fellow eyes. Another study found 16.1% cases of bilateral RD of which 3.2% had GRT. 12.1% had lattice degeneration in the fellow eye and, 9.7% were treated by retinopaxy for a retinal tear in the fellow eye [7].

In the Freeman series, the most common predisposing lesion found to be in fellow eyes were WWOPs without any associated breaks (15.6%), lattices with or without retinal breaks (8%), and chorioretinal atrophy (5.3%).

There are no prospective randomized controlled trials regarding prophylactic treatment of fellow eyes in GRTs. Recommendations made by preferred practice panel of the American Academy of Ophthalmology are based on expert opinion but there is insufficient evidence to support prophylactic treatment in fellow eyes. A recent Cochrane review concluded that there was no supportive evidence of using 360° laser treatment of fellow eyes. Another study on 160 patients of GRT reported that prophylactic laser treatment reduced the occurrence of GRT in the fellow eye [11]. Peripheral vitreoretinal pathologies should be treated with laser retinopexy.

16.11 Conclusion

Modern-day vitrectomy practices like valved cannulas, chandelier illumination, PFCLs, and microincision surgeries have increased survival of retinal attachment. Final anatomical success has been reported in up to 98.4% of patients. Fellow eye of these cases should be examined thoroughly. Although prophylactic treatment is controversial, laser retinopexy is recommended in cases of retinal pathologies.

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