

# Surgical treatment and outcome of patients with giant retinal tears

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## Abstract

**Objective** To report the management and outcome in retinal detachments associated with giant retinal tears (GRTs).

**Methods** Retrospective, case note analysis of patients treated between November 1991 and June 2002 at a tertiary referral hospital.

**Results** The case notes of 29 patients (24 males, 5 females) with a follow-up ranging from five months to 7 years were reviewed. In all, 25 eyes had retinal detachments with macular involvement and 10 patients had myopia more than 6 D. All patients underwent vitrectomy. A total of 23 patients had heavy liquid and 16 had scleral explants; 28 patients had silicone oil and one had C3F8 tamponade. Intraoperative complications included lens trauma and iatrogenic GRT. Six eyes had recurrent retinal detachment and needed multiple surgical procedures. At the last follow-up, 25 patients had anatomically attached retinas. In all, 18 fellow eyes were treated prophylactically. Three patients had total retinal detachment and marked PVR. The visual acuity improved in 20 eyes.

**Conclusion** GRTs are more common in patients with high myopia. With newer techniques of surgical treatment of GRTs, the anatomical and visual outcomes are more favourable.

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A giant retinal tear (GRT) is defined as a full-thickness retinal break involving more than 3 clock hours (90°) of the retina associated with posterior vitreous detachment. The management of retinal detachment associated with giant retinal tears has presented a

challenge to Vitreo-retinal surgeons.

Consequently, a wide range of techniques have been used with varying degrees of success. Rapid head movements to unfold the retinal tear,<sup>1</sup> fluid–air exchange with the patient pronated, and the surgeon operating from underneath in a supine position are some of the innovations that retinal surgeons have practised over the years.<sup>2,3</sup> Intraoperative fixation of the retina has seen the usage of retinal micro-incarceration,<sup>4</sup> adhesives,<sup>5</sup> sodium hyaluronate,<sup>6</sup> retinal tacks,<sup>7,8</sup> screws,<sup>9</sup> and sutures<sup>10,11</sup> in the past to the more modern and widely practised methods of vitrectomy and silicone oil tamponade.<sup>12,13</sup>

Giant retinal tears are associated with hereditary conditions, for example, Marfan's, Stickler's, axial myopia, extensive lattice degeneration, multiple holes, and trauma. With such a large tear, the anterior insertion of the retina no longer offers peripheral support and the retina folds back on itself. The retina also tends to roll due to the absence of vitreous attachment. These patients develop proliferative vitreoretinopathy (PVR) in as many as 40–50% cases, thereby complicating their treatment.<sup>14</sup>

The use of perfluorocarbons (heavy liquids) as an adjunctive tool has made unfolding and stabilisation of the retina easier.<sup>15,16</sup> The use of silicone oil has also been proven to be more effective in early visual rehabilitation,<sup>17</sup> and is also safer to exchange with perfluorocarbons.

We report surgical results in a consecutive series of 29 eyes with GRT-induced retinal detachment over a period of nearly 11 years and a median follow-up of 1 year. We analyse the visual and anatomical outcomes and look at the surgical techniques and complications.

## Patients and methods

This is a retrospective case note analysis of 29 eyes of 29 consecutive patients between the ages

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of 7 and 64 years. These patients underwent surgery to repair rhegmatogenous detachment due to GRT between November 1991 and June 2002 at the Birmingham and Midland Eye Centre. This is a tertiary referral centre and a teaching hospital with four Consultant Vitreo-retinal surgeons. During the same period of study, there may have been other patients with GRT, which may not have required surgery or the patients/surgeons might have declined surgery. These remain unidentified in this series as the patients were identified from the recorded database in the theatre. All case notes were then reviewed. Patients with giant retinal tears only were included in the study. Age, sex, ethnicity, presenting complaints, preoperative ocular pathology, choice of surgical procedure, complications (both intraoperative and postoperative), length of follow-up, and anatomical and visual outcome was noted. Postoperative data were collected for retinal reattachment and incidence of PVR.

## Results

There were 29 patients with retinal detachment associated with GRT (either primary or traumatic). Of these, 25 were males and four females, with 14 right eyes and 15 left eyes being affected. Their age ranged between 7 and 60 years with a mean of 35.03 years. In all, 26 of the patients were Caucasian, two Asian, and one Afro-Caribbean. Postoperative follow-up period ranged from 5 months to 7 years (mean 28 months).

In all, 24 (82.75%) eyes had a retinal detachment involving the macula with a significant drop in visual acuity. Altogether, 19 (65.51%) of the eyes had a predisposing condition in the form of either high myopia or trauma and 10 patients (34.48%) were myopes of 6 D or more. There was history of significant trauma in nine (31.03%) cases. There were two patients with Stickler's syndrome.

A total of 20 eyes had giant tears that extended between 3 and 6 O' clock hours circumferentially, with two eyes having 360° tears. In 16 (55.17%) of these cases, GRTs occupied a predominantly/partially superior part of the retina. The other 13 occupied the inferior retina either wholly or partially. Five of the patients were pseudophakic with posterior chamber intraocular lens, and one was aphakic. Tobacco dusting of the vitreous was a common feature being present in 28 cases (96.55%). In one case, it was not recorded in the case note. Vitreous haemorrhage was present in five cases (17.24%).

Operative procedures varied according to the surgeon and the particular type of the case. All the patients underwent a three-port pars plana vitrectomy. Heavy liquid (perfluorocarbon) was used to flatten the retina intraoperatively in 23 patients (79.31%) and six (20.68%) had air tamponade. Heavy liquid was used to displace

the subretinal fluid from posterior to anterior direction within the eye and also to unroll the retinal flap.

Silicone oil tamponade was used in 28 cases (96.55%). Perfluoropropane (C3F8-16%) gas was used in one case. Adjunctive treatments included localised cryotherapy, explant, and argon laser. In all, 16 (55.17%) patients had Explants, which included 12 encirclements, one segmental, and three being a combination of both. The decision to buckle/encircle was based on the presence of PVR and in cases with inferior GRTs. The cryotherapy and laser treatment were meant to tamponade the retina. The internal tamponade was meant to keep the retina attached in position till the laser or cryo scar was established.

The fellow eye had 360° prophylactic treatment in 18 patients (62.06%) in the form of either argon laser or cryotherapy intraoperatively. Six fellow eyes did not receive any prophylactic treatment because these were associated with traumatic GRT. None of these 24 eyes developed GRT at the last follow-up visit. Of the remaining five patients, three developed GRTs before any treatment could be instituted. This occurred within 2–4 weeks of the primary GRT surgery. Two others refused to have any treatment to the fellow eye. Both of them did not have any problems with the fellow eye up to the last follow-up visit 3 years postoperatively.

Both the patients with Stickler's syndrome had total retinal detachment associated with the GRTs and one of them had residual inferior detachment even after multiple surgeries. One of them had retinal detachment in the fellow eye before prophylactic treatment could be performed. The other patient had prophylactic cryotherapy to the fellow eye.

Complications of surgery included one lens trauma and one iatrogenic GRT. The iatrogenic tear occurred in the only patient to receive C3F8 gas tamponade. Seven patients developed cataracts postoperatively and required subsequent cataract surgery at the time of silicone oil removal.

In all, 18 patients had removal of silicone oil at 2–10 months (mean of 6 months) after first surgery. Of those 10 patients that did not have oil removal, four had extensive retinal detachment and PVR after multiple surgery and had a quiet eye. The remaining six patients, after discussing the prognosis with the surgeon, declined to have further surgery. Retina remained attached in five out of the six patients who declined further surgery. One patient required a further surgery to top up the oil and re-attach the retina, which had detached under oil.

Anatomical re-attachment with primary procedure was achieved in 19 patients (65.51%). In all, 10 patients (34.48%) needed more than one surgery to re-attach the retina. Of these, six were re-attached with one further surgery. Four patients had total retinal detachment with

severe PVR and needed between two and three additional surgical procedures. These four patients had persistent retinal detachment even after multiple surgeries. The retina was anatomically attached in 25 cases (86.20%) on their last postoperative visit.

Preoperative best corrected visual acuity (BCVA) ranged from perception of light (PL) in patients with macular detachment to 6/9 in patients with localised retinal detachment not involving the macula. Postoperative BCV improved in 22 patients (75.86%) with a range from 6/60 to 6/9 and deteriorated in five patients (17.24%) with persistent retinal detachment and extensive PVR. Two patients did not have any change in their visual status. There was an improvement of two or more Snellen's lines in nine patients (31.03%).

### Conclusion

GRTs are more common in males (76.5%), high myopia (25.3%), and are associated with blunt trauma (12.3%).<sup>18</sup> These patients present a surgical challenge because of the high incidence of PVR and re-detachment rate. PVR has an incidence of up to 40–50% in association with GRT.<sup>14</sup> This suggests that, unless these eyes have adequate management of PVR, there will be a high failure rate. Our series compared favourably with these figures with an incidence of PVR of 14% (4/29). Some authors have suggested the use of antimetabolites and heparin in the infusion fluid in high-risk cases including GRTs, to reduce the incidence of PVR.<sup>19</sup> Our series predates the publication of this paper and we did not use any antimetabolites in any of our cases. There is also an increased incidence of PVR with cryotherapy, which is why laser photocoagulation is preferred.

There have been numerous attempts to find the perfect treatment modality for this condition, but no consensus has ever been reached. Heavy liquids (perfluorocarbons) have revolutionised giant retinal tear surgery. They allow hydraulic manipulation of the retina. Their high specific gravity enables the retinal flap to be unrolled, and displacement of subretinal fluid in a posterior to anterior direction allows surgery to be performed with the patient in a supine position. Due to their high surface tension, retinal breaks can be closed internally, without the heavy liquid flowing into the subretinal space. Glaser *et al*<sup>16</sup> showed that, in GRTs complicated by severe PVR, the use of heavy liquids to flatten the retina followed by long-acting gas tamponade yielded a significantly better outcome compared to fluid air exchange and silicone oil tamponade. Similarly, they also demonstrated the efficacy of heavy liquid flattening of GRTs with inverted flaps in the absence of PVR.<sup>20</sup> Vitrectomy was performed as the primary procedure with scleral buckling as an adjunctive measure instead of silicone oil tamponade.

Their anatomical and visual success rates compared favourably to others using nonbuckling technique and silicone oil tamponade.<sup>26</sup> In our series, where heavy liquid was used in 23/29 cases, four had re-detachment (17%). In the six cases where heavy liquid was not used, the re-detachment rate was 50% (3/6). These results are in keeping with previous studies advocating the use of heavy liquid in the management of GRTs.

Expansile gases and silicone oil have been used as tamponade in GRT surgery. The advantage of silicone oil is in its ability to maintain long-term tamponade in difficult cases with PVR. Since the first report of the use of silicone oil for the treatment of retinal detachment in 1962, this agent has been increasingly used as a tamponade in managing complex retinal detachments including those resulting from GRTs.<sup>8</sup> The Silicone Oil Study has shown that, in eyes with complex retinal detachment, the retinal reattachment rates, visual acuity outcomes, and complication rates are better with silicone oil compared to sulphur hexafluoride gas as an internal tamponade,<sup>21,22</sup> and comparable with C3F8.<sup>23</sup> In our institution, the use of silicone oil may have contributed to the high anatomical success rate (86.2%).

Scleral buckles are supposed to aid in reduction of traction within the vitreous base, thereby ensuring that the GRTs do not extend or re-open. This reduces the chances of recurrence of retinal detachment due to the formation of fresh anterior retinal breaks or PVR.<sup>24</sup> However, this procedure has also been implicated in complicating the closure of GRTs due to distortion of the shape of the eye, tendency to increase 'slippage' of the retina posteriorly and the possible induction of PVR due to additional trauma.<sup>25</sup> Hence, scleral buckling has been in and out of favour in surgical treatment of GRTs. Kreiger *et al*<sup>26</sup> showed in their series that management of GRTs were quite effective with trimming the vitreous base as close to the retina as possible with vitrectomy alone, without the use of scleral buckling procedure. But, in their series, the re-operation rate was quite high (82%). However, in our series, we found that retinal re-attachment was successful with a single surgery in 15/16 cases (93.7%) with a scleral buckling procedure in addition to vitrectomy. Only one patient required a further surgery and developed total detachment as a result of extensive PVR. These results were significant in the light of a previous paper,<sup>26</sup> which shows anatomical success rates of over 90% without the use of explants, but with multiple surgeries.

In our study, the success rate with primary procedure was 65.51%, which increased to 86.20% with multiple surgeries. Our primary success rate compared favourably to the figures published in some of the major multi-centre studies.<sup>18</sup> But, our final retinal re-attachment rate was slightly less than that reported in some of the

other studies. This was due to recurrent retinal detachment in four cases, resulting from severe PVR.

Prophylactic treatment of the fellow eye is controversial. Some authors suggest that fellow eyes of those with nontraumatic GRT should be treated prophylactically.<sup>27</sup> Prophylactic treatment can be either cryotherapy,<sup>28</sup> laser photocoagulation or scleral buckling procedure.<sup>29</sup> None of these procedures have been shown to be more efficacious than the other. In our series, prophylactic treatment of the fellow eye in nontraumatic cases of GRT was recommended, either with laser treatment or by cryotherapy. But the decision was left to the patients, after explaining the risks *vs* benefits of prophylactic treatment. In our series of patients, none of the treated fellow eyes developed GRT, but three out of five nontreated eyes went on to develop GRT. In this series, poor outcome was related to the extent of tear (more than 5 O'clock hours), detachment involving the macula and duration of symptoms.

To conclude, the anatomical success and visual acuity outcome in our case series were comparable to those described in literature. The two patients with Stickler's syndrome had poor surgical outcome, as has also been reported in the literature. Vitrectomy combined with explant, silicone oil, laser, and/or cryotherapy was the most common procedure. Compared with other techniques, silicone oil helps in early visual rehabilitation, avoidance of strict positioning after surgery, and unrestricted air travel. Silicone oil removal is not always necessary, unless associated with complications. In our series, scleral buckling procedure yielded a high retinal re-attachment rate in cases with inferior GRT.

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