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Surgical success in the management of retinal detachment secondary to a giant retinal tear

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ABSTRACT

BACKGROUND: The purpose of this study was to describe anatomical and visual outcomes after scleral buckling, pars plana vitrectomy, and the use of silicone oil as a tamponade in the management of retinal detachment associated with giant retinal tears (GRT).

MATERIAL AND METHODS: A retrospective descriptive chart review was conducted for cases with an initial presentation of rhegmatogenous retinal detachments associated with GRT. Patients underwent surgical management by a single surgeon and had follow-ups at least 12 months.

RESULTS: We included 32 eyes of 32 patients. All eyes underwent 23G pars plana vitrectomy with scleral buckling and silicone oil as tamponade. Lensectomy was performed for all phakic eyes. Mean pre-operative best-corrected visual acuity (BCVA) was 20/800, and post-operative was 20/40 (20/20-LP). The mean follow-up was 18 months. Fourteen eyes (45%) had grade C proliferative vitreoretinopathy, and five eyes (16%) had GRT more than 180º. The primary reattachment rate was 93%, and the overall final anatomical success rate was 100%. Transient intraocular pressure (IOP) elevation was found in 6 (19%), and after silicone oil removal surgery, no patient required antihypertensive management.

CONCLUSION: High rates of anatomical success support the management of GRT-associated retinal detachment with scleral buckling, lensectomy, par plana vitrectomy, and the use of silicone oil as tamponade. Removal of silicone oil helps to avoid complications secondary to its emulsification, such as glaucoma and band keratopathy.

KEY WORDS: giant retinal tear; retinal detachment; proliferative vitreoretinopathy; scleral buckling; pars plana vitrectomy

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INTRODUCTION

Giant retinal tears (GRT) are defined as full-thickness circumferential tears of more than 90 degrees of the retina associated with vitreous detachment [1]. The incidence of GRT is rare and is associated with rhegmatogenous retinal detachments (RD) in approximately 1.5% of cases [2]. Although GRT can be idiopathic, it's often associated with various comorbidities, such as ocular trauma, high myopia, aphakia, pseudophakia, collagen-related genetic mutations, young age, and male sex [1, 3, 4].

Innovations in micro incisional surgery and surgical supplies have improved the prognosis of patients with GRT [5]. The use of perfluorocarbon

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liquid (PFCL) makes manipulation of the retina easier by stabilizing and decreasing the mobility of the posterior flap [6].

This pathology presents significant challenges for vitreoretinal surgeons due to the high risk of postsurgical complications. The most frequent are proliferative vitreoretinopathy (PVR), the persistence of rolled edges with retinal slippage, retinal re-detachment, and cataract formation [3, 5].

There is currently much debate about the surgical approach using different techniques, including scleral buckling (SB), lensectomy, pars plana vitrectomy (PPV), and/or silicone oil injection [7]. Therefore, the optimal surgical approach remains highly controversial because a safe and effective treatment modality has not been established.

Given this controversy, we conducted the present study to determine the efficacy of SB, lensectomy, PPV, and silicone oil tamponade in treating retinal detachment associated with GRT over a 10-year period.

The purpose of this study was to determine the final anatomic success, defined as a fully adherent retina for a minimum of 6-months after surgery.

MATERIAL AND METHODS

A single-center, retrospective, descriptive, consecutive case series of 32 eyes of 32 patients diagnosed with RD associated with GRT was performed. All patients were treated in a referral center in the city of Barranquilla, Colombia, between January 1, 2009, and December 31, 2018.

Medical records of patients were reviewed, and the following data were recorded: age, sex, size and position of the GRT, presence or absence of PVR and its classification, macular status, pre and postoperative best-corrected visual acuity (BCVA), intraocular pressure (IOP), characteristics of the surgical intervention and follow-up in months. Cases of retinal slippage or retinal detachment rate were noted.

Patients of legal age who underwent surgical repair and a minimum of 1-year postoperative follow-up were included in the study.

Patients with a history of PVR grade D1 or higher, proliferative diabetic retinopathy, inflammatory diseases, and inferior and/or temporal dialysis presence were excluded from the study.

All cases were performed by the same retina and vitreous surgeon (CAC). The procedure began with the placement of a 504-silicone sponge SB halfway through (ref. S 1982-4, Labtician Ophthalmics, Oakville, Canada). Phakic eyes underwent lensectomy. 23G three-port PPV was performed with Constellation® Vision Systems (Alcon Laboratories, Fort Worth, Texas, USA) and a non-contact wide-angle fundus visualization system, EIBOS® (Haag-Streit Surgical, Rosengarten, Wedel, Germany), was used. A 25G chandelier illumination system (Alcon Laboratories, Fort Worth, Texas, USA) was used to allow bimanual surgery. The vitreous was totally removed, and the epiretinal membranes were carefully peeled. The mobile retina was flattened and stabilized by injection of PFCL. Subsequently, the vitreous base was shaved in 360 degrees performing scleral depression with the other hand. The anterior retinal flap and posterior rolled edges were unrolled and completely resected. Once retinal retinopexy was completed, and the edges of the retinal tear were adherent, laser photocoagulation was proceeded with 3-lines laser photocoagulation at the posterior edge of the tear under PFCL or air infusion. Finally, surgery was completed by thorough PFCL-air exchange (to prevent slippage of the posterior edge of the tear) and injection of 5000 cSt silicone oil as tamponade. The sclerotomies and conjunctival peritomy were closed with 8-0 Vicryl suture.

After surgery, patients were advised to maintain the head-down position for the first 24-hours. Then they were positioned according to the location of the GRT. During the postoperative period, control follow-ups were conducted the first day after surgery, and then one week, one month, three months, six months, and one year after surgery.

Surgical variables were analyzed using the chi-squared and Student's t-test. All statical analyses were performed using SPSS version 24.0 (IBM Corporation, Armonk, NY, USA).

RESULTS

Thirty-two eyes of 32 patients who had an initial presentation of RD associated with GRT were included in the present study.

All participants underwent SB, primary PPV with silicone oil injection, and had a minimum follow-up of 12-months after surgery.

Demographics reveal a mean age of 49 years (range 18–65) and a clear male predominance (89%). Lens status showed that 71.4% of eyes were phakic, and 28.4% were pseudophakic with IOL implanted in the capsular bag. The most affected eye was the left eye (60%).

Table 1. Demographic and baseline characteristics

Mean ± SD age, years (range)	49 ± 13 (18–65)
Sex: male/female, %	89/11
Operated eye: left/right, %	60/40
Lens status, n (%)	
Phakic	22 (71)
Pseudophakic	10 (29)
Previous argon laser photocoagulation treatment, n (%)	5 (16)
Duration of symptoms SD, days (range)	20 ± 11 (1–45)
Mean BCVA	
Snellen	20/800
LogMAR equivalent	1.60
History of trauma, n (%)	4 (13)

SD — standard deviation; BCVA — best-corrected visual acuity

Table 2. Surgical characteristics and intraoperative procedures

Size of giant retinal tear, n (%)	
≤ 90°	10 (32)
> 90° and < 180°	17 (52)
≥ 180°	5 (16)
Mean ± SD quadrants of retinal detachment (range)	2.7 ± 0.8 (1–4)
Macula-off, n (%)	25 (78)
Proliferative vitreoretinopathy grade, n (%)	
A	4 (11)
B	14 (44)
C1	8 (26)
C2	2 (7)
C3	4 (11)
Eyes with additional peripheral break/s, n (%)	4 (11)
Vitreous haemorrhage, n (%)	2 (7)
Scleral buckle, n (%)	32 (100)
Lensectomy, n (%)	23 (71)
Application of perfluorocarbon liquid, n (%)	32 (100)
Retinotomy/retinectomy, n (%)	4 (11)

SD — standard deviation

Regarding pre-surgical history, in pseudophakic eyes, the mean time between cataract surgery and RD was 20.5 months (range 1–90 months). Regarding retinal characteristics, 5 of 32 eyes (16%) previously received laser photocoagulation treatment for retinal lesions. No patient had RD in the contralateral eye (Tab. 1).

During surgery, the size of GRT was assessed: ≤ 90° in 10 patients (32%), > 0° and < 180° in 17 patients (52%), and ≥ 180° in 5 (16%). The most frequent PVR grade was B in 14 eyes (44%), in second place C1 with 8 cases (26%), followed by A (11%) and C3 (11%) with four eyes each one, and C2 present in 2 cases (7%). The macula was detached in 25 cases (78%) at the time of surgery.

All patients underwent the previously described surgical technique. There were no intraoperative complications such as iatrogenic tears or retinal flap slippage during an air-liquid exchange. In 100% of cases, PFCL was used to stabilize the retina and unfold the edges of the rolled retina. In cases where this step could not be performed, peripheral retinectomy was conducted to apply the retina completely (Tab. 2).

An anatomical success rate of 93% was obtained with the performed technique in the first surgery. In the cases with retinal re-detachment, a second surgery was needed, obtaining 100% anatomical success.

The three eyes (7%) that required two surgeries presented retinal re-detachment, and two of them had a higher degree of pre-surgical PVR (grade C compared to lower grades; p = 0.065), and in 2 patients, the extent of the GRT was greater than 180° (p = 0.84). Eyes with a history of trauma have similar rates of retinal re-detachment compared to those not associated with trauma (p = 0.55). Regarding the onset of symptoms, when it was more significant than one month, there was a higher rate of retinal re-detachment (p = 0.02).

The second surgery was performed in a mean of 2 months (range, 1–3 months) after the initial PPV. It included silicone oil removal, pre- and subretinal membrane dissection, retinal stabilization with PFCL, variable retinectomy extension depending on retinal compromise, endolaser photocoagulation, and silicone oil re-injection. Postoperative transient IOP elevation after vitrectomy was recorded in 19% of eyes and was successfully controlled with topical anti-glaucomatous treatment. After silicon removal surgery and scleral fixation of IOL, no patient required antihypertensive management. Likewise, subretinal PFCL and partial optic atrophy were found in 15% of cases, respectively.

At the final visit, the silicone oil extraction and scleral fixation of IOL had been performed in 100% of patients. No new RD was observed (mean follow-up: 8 months, range 6–36 months); thus, no procedures to control the pathology or its complications were necessary during those surgeries (Tab. 3).

Table 3. Postoperative results	
Mean ± SD follow-up, months (range)	18 ± 5 (12–25)
Primary anatomical success, n (%)	29 (93)
Final anatomical success, n (%)	32 (100)
Recurrent retinal detachment, n (%)	3 (7)
Number of reoperations, n (%)	2 (6)
Visual acuity	
Mean ± SD BCVA, LogMAR (range)	0.30 ± 0.62 (0.0–3.0)
Mean Snellen BCVA equivalent (range)	20/40 (20/20–LP)
≥ 20/40, n (%)	1 (4)
20/40–20/200, n (%)	23 (74)
< 20/200, n (%)	8 (22)
Mean ± SD duration of silicone oil, months (range)	8 ± 2 (4-12)
Mean ± SD IOP, mm Hg (range)	15.4 ± 4 (8–23)
Transient IOP elevation > 20 mm Hg, n (%)	6 (19)
Lens status, n (%)	
Pseudophakic	32 (100)
Aphakic	0 (0)

SD — standard deviation; BCVA — best-corrected visual acuity; IOP — intraocular pressure

Mean preoperative BCVA was 20/800 — ≥ 20/400 in 29 eyes (93%).

At six months, only one eye (4%) had BCVA ≥ 20/40, and 16 eyes (50%) had BCVA ≥ 20/400. At 1-year of follow-up, one eye (4%) had BCVA ≥ 20/40, 23 eyes had between 20/40–20/200, and 8 eyes (22%) had BCVA ≥ 20/400. Compared with BCVA at initial presentation, 29 eyes (93%) were stable or improved at final follow-up. There was no statistical difference in mean final BCVA between eyes with macula-off versus macula-on RD (p = 0.34).

DISCUSSION

Many techniques have been described to manage this pathology. In this study, we present a method encompassing SB with 504 sponge, lensectomy, PPV, endolaser photocoagulation, exhaustive PF-CL-air exchange, and silicone as a tamponade for the management of RD secondary to GRT. We showed 93% and 100% primary anatomic success rates in the second surgery with a low postoperative complication rate.

Comparatively, in the study of Hocaoglu et al. [7], who performed 23G vitrectomy and silicone oil as a tamponade without placement of SB, they reported success rates of 84% with one surgery and 95% with two surgeries. It should be noted that only seven eyes (16%) presented PVR grade C. In a case series presented by Rodriguez et al. [5], they reported 86% success with one surgery and 98% with two or more surgeries. In that study, they performed SB placement and PPV in some patients according to clinical criteria, which did not show differences in reattachment rate. As a limitation, they did not consider the degree of PVR. Rofail et al. [8] reported a low RD rate without SB in populations with a low degree of PVR.

The previously described differences of this study could be based on the use of SB, lensectomy, use of 23G in vitrectomy, and silicone oil as a tamponade.

Currently, the use of SB in RD surgery is controversial, and there is a tendency to stop using it. This is because of several publications with similar retinal replication rates without the need to place it [1, 5, 9], the distortion of the globe shape, and the increased retinal slippage risk [10]. On the contrary, its benefit is reported to provide support to the vitreous base, decrease traction, and create an external buffer [11, 12]. Dabour et al. [13] reported the benefit of SB and PPV in patients with RD secondary to GRT, and Goezinne et al. [14] reported it as a positive predictive factor for retinal reapplication.

Lensectomy allows greater access to vitreous base shaving [10], and cataract formation after surgery is unavoidable. The need to remove the lens in the presence of PVR and the option of not performing it in the absence of PVR is reported [15]. Most of the time, the decision of whether to perform lensectomy is multifactorial and subject to surgeon preference.

With technological advances, promising results have been reported with 25G vitrectomy in treating RD associated with GRT [16, 17]. This may lead to increased surgical difficulty and time. The longer suction time during fluid-air exchange using smaller caliber instrumentation leads to the risk of retinal slippage [2].

The tamponade used was silicone oil-based on evidence of preventing intraoperative slippage [13], reducing the risk of new tears and postoperative PVR [19]. Rodriguez et al. [15] and Mohamed et al. [20] found no difference between the use of silicone oil and gas as tamponade, but selected patients had PVR grades lesser than B. Hocaoglu et al. [7] reported a high success rate using silicone oil but recommend removing it as soon as possible to avoid complications such as band keratopathy, endothelial cells loss, glaucoma, and visual loss for no apparent reason.

At the same time that management shows good outcomes, risk factors influence the prognosis. As previously analyzed, tear size, PVR degree, and history of ocular trauma were not significant, but the time between the RD and the surgery was.

Limitations of this study include its observational, descriptive, and retrospective nature. All patients were managed in a standardized manner despite differences in PVR, GRT extent, and lens status. With this in consideration, randomized clinical trials would be ideal to show the benefits of the performed techniques.

CONCLUSION

Initial surgical management, as we presented in the presence of RD secondary to GRT, is an excellent election to achieve high rates of retinal reattachment and reduces the need for a second surgery.

It is necessary to perform a second surgery during follow-up to avoid silicone oil-related complications, such as glaucoma or band keratopathy secondary to its emulsification. At the same time, it is possible to implant a secondary IOL and thus improve the visual prognosis.

Conflict of interest

The authors declare that they have no conflict of interest.

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Informed consent and human and animal rights statements

Informed consent has been obtained from all individuals included in this study.

Authorization for the use of human subjects and ethical approval

The research related to human use complies with all the relevant national regulations, institutional policies, is in accordance with the tenets of the Helsinki Declaration and has been approved by the Ethics Committee of Grupo Oftalmológico Abdala -Figuerola AF, Barranquilla, Colombia.

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