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ORIGINAL RESEARCH

Relaxing retinotomies and retinectomies in the management of retinal detachment with severe proliferative vitreoretinopathy (PVR)

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Khaled AG Shalaby

Opthamology Department, Al-Azhar University, Cairo, Egypt; Chief Vitreoretinal Service, Dr Soliman Fakeeh Hospital, Jeddah, Saudi Arabia

Abstract: Relaxing retinotomies and retinectomies are used in the presence of retinal shortening resulting from retinal incarceration or fibrous proliferation and contraction that prevents contact of the retina with the retinal pigment epithelium. The peripheral retina is usually cut or excised to preserve function of the posterior retina which is more visually significant.

Objective: To investigate the techniques, therapeutic effects, indications, and complications of relaxing retinotomies and retinectomies for complicated retinal detachment with severe proliferative vitreoretinopathy (PVR).

Methods: Thirty eight eyes of 38 patients of complicated retinal detachment with severe PVR were recruited for a noncomparative retrospective study. They were operated on and followed-up for at least six months. The operative technique included buckling, vitrectomy, peeling, relaxing retinotomy and/or retinectomy, intraocular tamponade, and laser treatment.

Results: Retina was reattached in 34 (89.5%) eyes in operations. Retinal detachment was recurrent in seven eyes in follow-up, in which the retina was reattached again in two eyes by a second operation. The final success rate was 76.3% (29 eyes out of 38 eyes). Visual acuity was perception of light with bad projection in 35 (92%) eyes and hand motion in three (8%) eyes before operation. Visual acuity was better than 4/60 in 23 eyes (60.5%) after operation. The complications included iatrogenic retinal breaks, bleeding from the retinotomy site, hypotony, and recurrent fibrous proliferation from the retinotomy site.

Conclusion: Retinotomy and retinectomy can improve the curative effect of complicated retinal detachment. There are potentially serious complications of these maneuvers and they should not be performed if less aggressive measures will suffice.

Keywords: relaxing retinotomy, retinectomy, proliferative vitreoretinopathy, recurrent retinal detachment, iatrogenic retinal breaks, intraoperative hemorrhage, intraocular tamponade, hypotony

Introduction

The first description of a relaxing retinotomy (RR) during pars plana vitrectomy was by Machemer, for an eye with retina incarcerated in a scleral wound following trauma.[1] Machmer[2] and Machemer et al[3] have described other indications for, techniques, complications, and results of retinotomies and retinectomies.

Zivojnovic[4] described techniques of management of the retina with silicone oil following retinotomy or retinectomy, while Parke and Aberg[5] described the use of retinotomies and retinectomies in association with gas tamponade techniques and laser endophotocoagulation for management of eyes with severe proliferative vitreoretinopathy (PVR). Quiram et al stated that radical anterior vitreous base dissection and

Correspondence: Khaled AG Shalaby
Opthamology Department, Al-Azhar University, Cairo, Egypt; Chief Vitreoretinal Service, Dr Soliman Fakeeh Hospital, Jeddah, Saudi Arabia
Tel +966 5 5548 1455
Fax +966 2 660 8013
Email kasoliman@hotmail.com; kagretina@gmail.com

lensectomy in conjunction with inferior 180° retinectomy improve anatomic success of complex PVR-related retinal detachment (RD).[6]

RRs and retinectomies are used in the presence of retinal shortening resulting from retinal incarceration or fibrous proliferation and contraction that prevents contact of the retina with the retinal pigment epithelium. Usually, peripheral retina is cut or excised to preserve function of posterior, more visually significant retina.[6–13]

Except for retinal incarceration in traumatic or surgical wounds, all of the indications for RRs or retinectomies involve PVR or proliferative vascular retinopathy with fibrous proliferation, causing contraction and shortening of the retina.[14–23]

The aim of this study is to investigate the techniques, therapeutic effects, indications, and complications of RRs and retinectomies for complicated RD with severe PVR.

Methods

Thirty eight eyes of 38 consecutive patients of complicated RD with severe PVR were recruited for a noncomparative retrospective study. They were operated on between 1999 and 2003. Exclusion criteria included history of trauma, proliferative diabetic retinopathy, giant retinal tear, and ocular inflammatory disease. The patient who had been followed-up for a period of less than six months was excluded as well.

All eyes underwent full preoperative and postoperative best-corrected visual acuity (BCVA) testing with refraction, applanation tonometry, slit lamp biomicroscopy, lens status, and binocular indirect ophthalmoscopy.

Baseline PVR was graded intraoperatively according to the revised Retina Society Classification system.[24] Hypotony was defined as intraocular pressure (IOP) of $\leq$5 mmHg.[25]

Surgical procedure

All eyes underwent encircling silicone band scleral buckle 3.5 mm (if was not already present) to support the vitreous base. A lensectomy was performed if lens opacity was suspected to hamper adequate dissection of anterior PVR. Intraocular lenses were left in place. Standard 20 gauge three-port pars plana vitrectomy with meticulous peeling of all epiretinal membranes (ERMs) as far anterior as possible was performed under the binocular indirect ophthalmomicroscope system (BIOM system; Oculus Optikgerate GmbH, Wetzlar, Germany). Upon completion of posterior ERMs removal, 1–2 mL of perfluorocarbon liquid (PFCL) was injected to flatten the posterior retina. Additional PFCL was then injected (as the retina became more mobile) until the level of the bubble reached the level of predetermined anterior break. The aim of early and additional injections of PFCL is to allow assessment of residual tractional elements, stabilizing the retina for retinotomy and peripheral dissection of anterior PVR as well as drainage of subretinal fluid.[25,26] The decision to perform an RR incision was made only after maximal removal of ERMs had failed to adequately release retinal traction. Before creation of an RR, intraocular diathermy was applied to the margin of the entire area to be incised. The retinas were incised with automated microscissors or the vitreous cutter, with careful attention given to maintain hemostasis (brief elevation of the infusion bottle and/or endodiathermy). RR incisions were placed as peripherally as possible along the posterior margin of the vitreous base or along the posterior margin of previous retinopexy adhesions (laser and/or cryotherapy) adjacent to the scleral buckle. The retinectomy was extended circumferentially as far as necessary to relieve all retinal traction. Its location and extent in degrees were noted. The peripheral non-functioning retina anterior to the incision of RR was removed (retinectomy) to prevent neovascularization secondary to ischemia, and to minimize recurrence of RD secondary to reproliferation.[27,28,32]

In case of retinal incarceration (eg, in previous drainage sclerotomy), retinectomy of incarcerated retina was done before attempting RR. Any retinal breaks (either primary or iatrogenic) were marked with endodiathermy for later on retinopexy. Upon completion of retinectomy, additional PFCL was then injected until the level of the bubble extended anterior to the edge of the retinal flap to completely drain the subretinal fluid and flatten the retina. Endolaser retinopexy (in three to four rows) along the margin of the retinotomy and to retinal breaks, followed by fluid-air exchange and placement of a long-acting tamponade were then performed. Gas in minimally expansive concentrations (12% perfluoropropane C3F8 or 20% sulfur hexafluoride SF6) or silicone oil (1000 cSt) was used to achieve a postoperative intraocular tamponade.

Recorded patient characteristics for analysis were age, sex, diagnosis, location of RR (posterior, anterior), length of RR (in degrees), type of intraocular tamponade, and anatomic retinal configuration. Intraoperative complications, namely iatrogenic retinal breaks and intraoperative hemorrhages, were also noted. Patients were followed-up at regular intervals postoperatively. Functional outcomes (including BCVA and IOP) as well as anatomic outcomes (including the incidence of retinal reattachment and reproliferation) were recorded.

Where appropriate, the Chi-square test, Fisher exact test, and analysis of variance tests were used to get correlations between baseline ocular characteristics and the anatomical and functional outcomes. Statistical analyses were performed using STATA for Windows version 8.0 (StataCorp Inc, College Station, TX).

Results

Baseline patients and ocular characteristics are summarized in Table 1. A total of 38 eyes of 38 patients, 20 (52.6%) male and 18 (47.4%) female patients, were included in this study. The mean age of the patients was 56.6 ± 13.5 years (range 18–76 years), and the mean follow-up time was 20.6 ± 8.2 months (range 6–29 months). The mean number of operations before diagnosis of PVR requiring retinectomy was 1.42 ± 1.32 (range 0–3). Preoperatively, three (8%) eyes were aphakic, 15 (39.5%) were pseudophakic, and the remaining 20 (52.6%) were phakic. At study entry, 23 (60.5%) patients had a history of prior RD surgery (scleral buckling), including 13 (34.2%) patients who had undergone previous vitrectomy.

Baseline PVR was characterized intraoperatively and graded according to the revised Retina Society Classification system.[24] PVR grade C (anterior or posterior) was observed in all cases that PVR grade was recorded (34, 89.5% eyes). Anterior PVR (grade C type 4 and 5) was present in all eyes and involved ≥12 clock hours in 26 (68.4%) eyes. Posterior PVR (grade C type 1 and 2 ± type 3) was present in 18 (47%) eyes involving 6–12 clock hours. The PVR grade was not recorded in four (10.5%) eyes. PVR was secondary to rhegmatogenous RD that was associated with macular detachment. Preoperative BCVA was ≤ hand motions (HM) in all eyes.

Table 1 Baseline patients and ocular characteristics (n = 38)

Mean age, SD (range), years	56.6 ± 13.5 (58)
Sex, number (%)	
Male	20 (52.6)
Female	18 (47.4)
Best-corrected visual acuity, number (%)	
Hand motions	3 (8)
Light perception	35 (92)
Lens status, number (%)	
Phakic	20 (52.6)
Aphakic	3 (8)
Pseudophakic	15 (39.4)
RD, quadrants, number (%)	
≤three quadrants	5 (13.2)
Four quadrants	33 (86.8)
Retinal breaks, number (%)	
One	10 (26.3)
≥two	24 (63.2)
Missing	4 (10.5)
PVR classification (grade C), number (%)	
Anterior ($C_{A\geq12}$, type 4 and 5)	26 (68.4)
Posterior ($C_{P\,6\text{–}12}$, type 1 and 2 ± type 3)	18 (47)
Missing	4 (10.5)
Prior operations, number (%)	
Scleral buckling (SB)	10 (26.3)
Vitrectomy + SB	13 (34.2)
Cataract extraction	18 (47.4)
Mean (SD)	1.42 (1.32)

Abbreviation: SD, standard deviation.

Intraoperative factors

Intraoperative data are summarized in Table 2. A total of 20 (52.6%) eyes underwent combined lensectomy and vitrectomy. By the conclusion of the surgical procedure, all eyes had received a scleral buckle, the majority placed before the surgery (23, 60.5%), and the remaining eyes simultaneously with the vitrectomy procedure (15, 39.5%). However five (13.2%) eyes with preplaced buckle needed intraoperative revision of its locations.

An RR was performed in all eyes, and the average size of RR in all eyes was 241 ± 62.8 (range 90–330°) in which the majority of eyes (28, 73.7%) required an RR size of ≥180°. Sixteen (42%) eyes had the RR placed anterior to or on the scleral buckle and 22 (68%) eyes had the RR placed posterior to the scleral buckle. Two (5.2%) eyes with retinal incarceration (in previous drainage scelerotomy) underwent retinectomy of incarcerated retina before attempting RR. By reviewing the data of the eyes that needed extensive RR (≥180°), it was found that most of them (26 out of 28, 92.8%)

Table 2 Intraoperative data (n = 38)

Procedures in addition to vitrectomy, number (%)	
Scleral buckling procedure	15 (39.5)
Scleral buckle revision	5 (13.2)
Lensectomy	20 (52.6)
Relaxing retinotomy (RR), number (%)	38 (100)
Anterior to or on the scleral buckle	16 (42)
Posterior to the scleral buckle	22 (58)
RR size, mean (SD, range)	241° (±62.8, 240)
≥180°	28 (73.7%)
<180°	10 (26.3%)
Retinectomy, number (%)	2 (5.2%)
Intraocular tamponade, number (%)	
Sulfur hexafluoride	3 (7.9)
Perfluoropropane	10 (26.3)
Silicone oil	25 (65.8)
Intraoperative complications, number (%)	
Iatrogenic retinal breaks	9 (23.7)
Intraoperative hemorrhage	10 (26.3)

Abbreviation: SD, standard deviation.

Table 3 Anatomical and functional outcome in relation to the extent of relaxing retinotomy

		RR ≥ 180° n = 28	RR < 180° n = 10	Total	Chi-square	
					X^2	*P*-value
PVR	Anterior PVR ($C_{A\geq12}$) n = 26	26 (92.85)	0 (0)	26 (68.42)	32.98	<0.001*
	Other PVR n = 12	2 (7.14)	10 (100)	12 (31.57)		
RRD	RRD	5 (17.85)	2 (20)	7 (18.42)	0.022	0.882
	No RRD	23 (82.14)	8 (80)	31 (81.57)		
BCVA	Improved BCVA	17 (73.91)	6 (26.08)	23 (100)	0.002	0.968
	Not improved BCVA	11 (78.94)	4 (21.05)	15 (100)		
Iatrogenic retinal breaks	Iatrogenic retinal breaks	7 (25)	2 (20)	9 (23.7)	0.013	0.9092
	No iatrogenic retinal breaks	21 (75)	8 (80)	29 (76.3)		
Intraoperative hemorrhage	Intraoperative hemorrhage	8 (28.57)	2 (20)	10 (26.3)	0.012	0.912
	No intraoperative hemorrhage	20 (71.42)	8 (80)	28 (73.7)		

Abbreviations: PVR, proliferative vitreoretinopathy; CA, anterior grade C proliferative vitreoretinopathy; RRD, recurrent retinal detachment; BCVA, best corrected visual acuity; RR, relaxing retinotomy.

are those who had preoperative advanced degree of anterior PVR (*P*-value ≤ 0.001) (Table 3).

Intraoperative complications such as iatrogenic retinal breaks were reported in nine (23.7%) eyes and intraoperative hemorrhage developed at the retinotomy edge was reported in 10 (26.3%) eyes. No intraoperative choroidal hemorrhage was reported. Most of these complications, six out of nine (66.6%) for iatrogenic retinal breaks and seven out of 10 (70%) for intraoperative hemorrhage, were encountered in eyes with severe anterior PVR specially type 5 in which there were anterior PVR that needed extensive RR (≥180°) (Table 3).

Thirteen (34.2%) eyes received perfluorocarbon gas as intraocular tamponade, and 25 (65.8%) eyes received silicone oil. The choice of intraocular tamponade depended on the complexity of the surgery, the ability of the patient to comply with postoperative long-term positioning, and the patient's need to travel by air emergently. The patient's preference to avoid the need for further surgery (silicone oil removal) was also considered.

Anatomic outcomes

Complete reattachment rate after one operation was achieved intraoperatively in 34 (89.5%) eyes, with final complete reattachment success rate of 29 of 38 (76.3%) eyes at last examination (at least six months). RD recurred in seven eyes in follow-up, in which the retina was reattached again in two eyes by a second operation. The cause of recurrent RD was reproliferation of ERMs at the posterior edge of the retinotomy incision, which was associated with retinal rolling and macular detachment. This reproliferation was noted at mean time of 4.4 months (range 2–7 months) from the operation with the retinectomy. Four eyes of the reported recurrent RD (57%) were among those eyes that attained gas (13 out of 38 eyes) as an intraocular tamponade, representing 30.7% of them. The remaining three (43%) eyes with recurrent RD were among the siliconized eyes (25 out of 38) representing only 12% of them. Neither the size of RR nor the type of intraocular tamponade has a statistically significant relationship (*P*-value = 0.882 and 0.329, respectively) with the occurrence of recurrent RD (Tables 3 and 5). There were three (8%) cases of epimacular membranes (macular pucker) formation which were peeled at the time of silicone oil removal.

Functional outcomes

Preoperative BCVA was light perception with bad projection in 35 (92%) eyes and HM in three (8%) eyes. At six months postoperatively, 23 (60.5%) eyes had their BCVA improved and attained a final BCVA of ≥4/60. However BCVA remained stable in seven (18.5%) eyes, and worsened in eight (21%) eyes. No patient attained postoperative BCVA better than 6/36.

Sixty percent of eyes that underwent RR of <180° (six out of 10) and 60.7% of eyes that underwent RR of ≥180° (17 out of 28) achieved postoperative improved BCVA.

Table 4 Anatomic and visual outcomes at six months (n = 38)

Retinal attachment, number (%)	29 (76.3)
Postoperative BCVA, number (%)	
Improved	23 (60.5)
Stable	7 (18.5)
Worse	8 (21.5)
Postoperative complications, number (%)	
Recurrent retinal detachment	7 (18.42)
Hypotony	5 (13)
Epimacular membranes	3 (8)

Abbreviation: BCVA, best corrected visual acuity.

Table 5 Anatomical and functional outcomes in relation to the type of intraocular tamponade

		Siliconized eyes n = 25	Gas-filled eyes n = 13	Total	Chi-square	
					X^2	*P*-value
RRD	RRD (n = 7)	3 (11.53)(12)	4 (33.33)(30.76)	7 (18.42)	0.950	0.3296
	No RRD (n = 31)	22 (88.46)(88)	9 (66.66)(69.23)	31 (81.57)		
IOP	Hypotony (n = 5)	4 (16)	1 (7.69)	5 (13)	0.045	0.8314
	Normal IOP (n = 33)	21 (84)	12 (92.31)	33 (87)		

Abbreviations: RRD, recurrent retinal detachment; IOP, intraocular pressure.

The extent of RR have no influence on the ultimate postoperative BCVA (*P*-value = 0.968) (Table 5).

Hypotony

Five (13%) eyes had postoperative IOP of ≤5 mmHg at six months follow-up. Although four eyes out of them are siliconized, from the statistical point of view, hypotony was shown to not be associated with the type of intraocular tamponade used (*P* = 0.831) (Table 5).

Subsequent surgeries

Seven (18.4%) eyes had repeated RR with revision of vitrectomy which involved an extension of the previously placed RR after peeling off reproliferated ERMs at the posterior edge of the retinotomy incision. In these eyes treated for recurrent RD, the macula was detached in all cases and the extent of RD ranged from two to three quadrants. Fifteen (39.4%) eyes had augmentation of the peripheral retinal photocoagulation, including those that underwent silicone oil removal during the study period.

Ten (26.3%) eyes had the silicone oil removed after a mean time of 7.4 ± 3.47 (range 5–14) months from silicone oil injection. All eyes had augmentation of the peripheral retinal photocoagulation with completely stable, flat retina prior to silicone oil removal. Indications for silicone oil removal were one or more of the following: secondary glaucoma, keratopathy, and silicone oil emulsification (fish eggs in the superior retina, or overt droplets of silicone oil in the anterior chamber). Silicone oil removal was as complete as possible.

Discussion

The indications for RR have not changed much over time. Basically, it is indicated whenever intractable traction prevents the retina from apposing effortlessly to the retinal pigment epithelium. This occurs most often with anterior PVR, major subretinal proliferation, high myopia with loss of retinal elasticity, some cases of proliferative vasculopathies like diabetic retinopathy, and penetrating trauma, particularly with retinal incarceration.[31]

Several factors may have contributed to the need for an RR, but anterior PVR that resulted in foreshortening of the retina (despite removal of preretinal and tractional forces) was the most common indication in the current and other studies.[6–25]

The decision to perform an RR or retinectomy is usually made during surgery after complete membrane removal. If the retina is cut or excised before complete membrane removal, further membrane removal will be more difficult and may result in unnecessarily large retinal defects or residual membranes, which may lead to redetachment of the retina.[29] Circumferential RRs are preferred to radial RRs. In the face of circumferential traction, an RR that adequately relieves traction may extend too far posteriorly into the posterior pole.[8] The anterior flap of the retinotomy is avascular and nonfunctional. Excision of the retina anterior to a large retinotomy is recommended so that fibrin and cellular proliferation do not rejoin the cut edge of the retina or proliferation from the anterior flap does not produce traction on the ciliary body. Failure to extend the retinotomy into normal retina or to excise the anterior flap may allow recurrent proliferation and contraction to redetach the retina.[27–29]

Tseng et al reported that removal of the lens is not mandatory in all cases of PVR,[25] in distinction to the Quiram et al suggested technique that radical anterior base dissection routinely includes removal of the native lens or intraocular lens.[6]

In the current study, a total of 20 (52.6%) eyes underwent combined lensectomy and vitrectomy while the remaining were three (8%) aphakic eyes and 15 (39.5%) pseudophakic 15 (39.5%). The current study found that, 76.3% of 38 eyes ultimately attained and sustained anatomic retinal attachment at last examination (at least six months). These figures compare favorably with previous reports of retinectomy surgery that achieved final success rates of 47%–93%.[6–14,16–18,20,21] Seventy nine percent of attached and 60.5% of all eyes undergoing a RR obtained BCVA of at least 4/60 after six months. The level of vision obtained at six months may be a predictor of long-term visual function.[25] However, BCVA remained stable in seven (18.5%) eyes, and worsened in eight (21%) eyes. No patient attained postoperative BCVA better than 6/36. Grigoropoulos et al in their series reported that visual acuity improved in 138 eyes (45%), remained the same in 73 eyes (24%), and became worse in 89 cases (29%).[7] The current study and previous reports[10,25] investigated the effect of size and location of RR on visual acuity and likelihood of anatomic reattachment and showed no statistically significant relationship between them, in contrast to Han et al and Grigoropoulos et al that considered retinotomy size a risk factor against recovering visual function.[7,12] Overall, the postoperative visual function most probably reflects the extent and severity of the preoperative disease.[25] The current study highlighted the significant association between the size of RR and the degree of preoperative anterior PVR ($P < 0.001$). Grigoropoulos et al[7] found a statistically significant association between postoperative visual acuity of 6/24 or better and tamponade duration, removal of silicone oil, total extent of retinectomy, and preoperative visual acuity. It appears that eyes with better postoperative visual acuity are more likely to have had a shorter tamponade period, a smaller retinectomy, good preoperative visual acuity, and removal of silicone oil. However, these individual factors associated with good visual outcome may in general reflect less advanced PVR pathology and hence less extensive retinectomy and less prolonged tamponade. Although the current study did not investigate the effect of prior operations on visual acuity and likelihood of anatomic reattachment, previous reports[7,25] showed evidence of association between the number of previous operations and retinal attachment (fewer operations having a better outcome $P = 0.05$). The Silicone Study concluded that silicone oil and C3F8 gas were equally effective as tamponade for eyes undergoing retinotomy in repeat vitrectomies for PVR.[16] The current study found that neither the size of RR nor the type of intraocular tamponade has statistically significant relationship with the occurrence of recurrent RD (Table 3 and 5). Previous reports[6,7,25] found that silicone oil tamponade resulted in considerably higher initial anatomic success rates than gas tamponade in eyes receiving retinotomy. The Silicone Study reported that eyes not undergoing retinotomy in general attained similar or better final vision than eyes that did.[16]

Regardless of anatomic outcome, eyes attaining the best postoperative BCVAs were those that had the best initial visual acuities, the lowest rates of prior operations and lens extractions, the highest median IOP, and the lowest rates of hypotony at baseline.[25,34] The current study reported final reattachment success rate of 29 of 38 (76.3%) eyes at last examination (at least six months). The cause of recurrent RD was reproliferation of epiretinal membranes at the posterior edge of the retinotomy incision, which was associated with retinal rolling and macular detachment. Gupta et al[30] reported severe inferior retinal folding such that it scrolls into the macular area in 1.97% of 254 patients undergoing RR and silicone oil insertion. Haut et al[21] reported that 16% of 37 patients with RRs had epiretinal membranes at the posterior edge of the retinectomy, which was associated with some retinal rolling but the macula remained attached. Jacobs et al[8] reported one case of nasal retinal rolling at the time of surgery. The current study reported 18.4% recurrent RD due to reproliferation of epiretinal membranes at the posterior edge of the retinotomy incision, which was associated with retinal rolling and macular detachment. Possible mechanisms for the production of this complication could be persistent activation of PVR despite flattening of the retina in the early postoperative period.[30]

Post-vitrectomy hypotony is a well-recognized postoperative complication in eyes after PVR surgery.[12–15,33–37] RR incisions have been theorized to expose areas of bare retinal pigment epithelium that facilitate the absorption of intraocular fluid, predisposing eyes to hypotony.[2] The clearance of radioactive water from the vitreous in rabbit eyes was studied by Moseley et al in the early 1980s.[38] Foulds made the observation that the retinal pigment epithelium was not necessary for retinal reattachment and that the bulk flow of water was sufficient to keep the retina apposed.[39] It was Kirchhof and Ryan however, who went on to identify the neurosensory retina as the main barrier to water outflow in 1993.[40] With the courage of his conviction, Kirchof went on to publish the use of retinotomy and retinectomy to lower IOP on the first nine patients in 1994.[41] Joussen et al demonstrated the safety and efficacy of retinectomy as an IOP-lowering procedure for intractable glaucoma with a five-year follow up.[37]

The Silicone Study reported significantly higher rates of postoperative hypotony in gas-treated eyes compared with silicone-treated eyes and a reduction in rates of hypotony in eyes receiving an RR and silicone oil.[16] In the current study, five (13%) eyes had postoperative IOP of $\leq$5 mmHg at six months follow-up. Although four eyes out of them are siliconized, hypotony was shown to be not significantly associated with the type of intraocular tamponade used ($P = 0.831$). However, a previous report of Tseng et al[25] found that eyes treated with retinotomy and silicone oil had the highest rates of severe anterior PVR (grade C type 5, involving >12 clock hours), where damage to the ciliary body by the pathologic process or by repeated operations may result in hyposecretion and subsequent hypotony. In eyes receiving both RR and silicone oil, higher IOPs and a lower proportion of hypotony are found where a native lens or intraocular implant is absent. Removal of the lens or intraocular implant may be considered for those eyes at greatest risk of hypotony.[34] The reasons for this finding are likely multifactorial. The lens may act as a physical barrier, impeding thorough dissection of tractional membranes at the anterior vitreous base, especially where extensive anterior proliferation is present. A cataractous lens or opacified and fibrotic capsule may compromise the view of the surgical field. The lens may contribute to postoperative hypotony even when adequate, thorough anterior dissection is achieved. For example, the lens and the capsule may serve as a scaffold for reproliferation along the ciliary body, disrupting aqueous dynamics. Fibrosis of the capsule may cause secondary traction on the ciliary body and may contribute to its dysfunction, as found by other investigators with ultrasound biomicroscopy.[43,44] An intact lens diaphragm may impede a near total removal of the anterior cortical vitreous; subsequent placement of longer-term vitreous tamponades and substitutes (gas and silicone oil) may compact mechanically the anterior gel, causing ciliary body dysfunction.[34]

Conclusion

This study is limited by its retrospective non-comparative nature and by the relatively small number of subjects recruited for the study. Nonetheless, the study highlights the effect of retinotomy incisions on outcomes in PVR surgery. It was found that eyes that needed extensive RR (≥180°) are those who had preoperative advanced degree of anterior PVR ($P < 0.001$). Neither the size of RR nor the type of intraocular tamponade has a statistically significant relationship ($P = 0.882$ and 0.329, respectively) with the occurrence of recurrent RD. There were no statistically significant correlations between the size of RR and the following variables: recurrent RD, BCVA, Iatrogenic retinal breaks, and intraoperative hemorrhage. Hypotony was shown to not be associated with the type of used intraocular tamponade ($P = 0.831$). RR and retinectomy can improve the curative effect of complicated RD. However, there are potentially serious complications of these maneuvers and they should not be performed if less aggressive measures will suffice.

Disclosure

The author reports no conflicts of interest in this work.

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