Original Article

Outcome of pars plana vitrectomy in patients with retinal detachments secondary to retinal vasculitis

Reema Bansal, Bruttendu Moharana, Deeksha Katoch, Vishali Gupta, Mangat R Dogra, Amod Gupta

Purpose: Retinal detachments (RD) secondary to retinal vasculitis are highly complex. We report the clinical profile and outcome of vitrectomy in RDs secondary to retinal vasculitis in terms of intraoperative findings, final anatomical, and functional outcome. **Methods:** In a retrospective review of 68 patients (6 with bilateral RD; 74 eyes) undergoing pars plana vitrectomy (PPV) between 2000 and 2015 for vasculitic RD, tractional RD was present in 50 (67.57%) eyes and combined RD in 24 (32.43%) eyes. **Results:** The mean age was 31.54 ± 9.95 years (62 males, 6 females). Fibrovascular proliferations (FVPs) involved major vascular arcades (22.98%), optic disc (10.81%), both arcades and disc (20.27%), peripheral retina (32.43%), and arcades with peripheral retina (13.51%). A total of 14 (18.92%) eyes had retinal folds, of which 9 had macular drag. Of 24 eyes with combined RD, 3 (12.5%) eyes had macular hole, 15 (62.5%) eyes had the primary retinal break anterior to equator, and 6 (25%) eyes had the primary break posterior to equator. Twenty-one (28.38%) eyes had iatrogenic retinal breaks. Thirty-eight (51.35%) eyes required an internal tamponade [gas in 31 (81.57%) eyes and silicon oil in seven (18.42%) eyes]. A scleral buckle was additionally required in 26 (35.14%) eyes. Postoperative complications included vitreous hemorrhage (27.03%), re-RD (12.16%), and iris neovascularization (9.46%). The median follow-up was 18 months (range 6-122 months). Sixty-eight (91.9%) eyes achieved final anatomical success. Fifty-two (70.27%) eyes had ≥2 lines visual improvement. **Conclusion:** Vasculitic RDs are complicated by tractional/combined RDs, peripherally located FVPs, retinal folds and iatrogenic retinal breaks, and carry a moderate prognosis.

Key words: Combined retinal detachment, pars plana vitrectomy, retinal vasculitis, rhegmatogenous retinal detachment, tractional retinal detachment

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Outcome of ischemic retinal vasculitis is adversely affected by several factors like macular ischemia, and ischemic complications like vitreous hemorrhage, fibrovascular proliferations and tractional retinal detachment (RD). Although the medical management (systemic corticosteroids, laser photocoagulation of ischemic areas and treatment of underlying systemic disease, if any) is the mainstay of therapy for active retinal vasculitis, surgical intervention in retinal vasculitis is usually undertaken for nonclearing vitreous hemorrhage.[1-4] Tractional retinal detachment (TRD), or combined tractional and rhegmatogenous retinal detachment (combined RD) are infrequent but sight-threatening sequelae of retinal vasculitis. They affect not only the visual outcome adversely, but also pose significant surgical challenges. There is scantly information on the outcome of pars plana vitrectomy (PPV) in eyes with RD secondary to retinal vasculitis (or vasculitic RD), with majority of reports describing vitrectomy in vitreous hemorrhage or epiretinal membrane.[1-5]

We report intraoperative characteristics of RD and anatomical and functional outcome of PPV in patients presenting with vasculitic RD.

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Methods

Of all patients undergoing PPV between June 2000 and June 2015 for complications of retinal vasculitis, those with TRD or combined RD were retrieved and reviewed retrospectively from the clinical chart records of the uveitis clinic of a tertiary care center in North India. The diagnosis of RD secondary to retinal vasculitis (vasculitic RD) was made in the presence of TRD or combined RD if there was evidence (clinical or angiographic) of unilateral or bilateral occlusive vasculitis (active or healed). In eyes with significant vitreous hemorrhage, the diagnosis of co-existing RD was made by a pre-operative ultrasound B-scan, which was confirmed as being secondary to retinal vasculitis intraoperatively by the presence of features of healed retinal vasculitis (vascular sheathing or sclerosed vessels).

Patients with following inclusion criteria were studied:

1. Presence of TRD or combined RD with or without vitreous hemorrhage secondary to retinal vasculitis
2. Patients completed at least 6 months of follow up after surgery

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3. There were complete clinical records at the baseline and all follow up visits including best corrected visual acuity (BCVA), intraocular pressure (IOP), slit lamp biomicroscopic examination before and after pupillary dilatation, posterior segment examination, indications for surgical interventions, details of surgery, per operative and postoperative complications.

Patients with following criteria were excluded from the study:

1. Patients with other possible causes of vitreous hemorrhage or tractional RD, such as proliferative diabetic retinopathy (PDR) or retinal vascular occlusions
2. History of a previous vitreoretinal surgery.

A written informed consent was obtained from all patients prior to PPV, as a routine pre-operative protocol. The study was carried out in accordance with the tenets of the Declaration of Helsinki. Institute Ethics Committee approval was obtained to conduct the retrospective study.

Following the surgery, as per the post-operative protocol in our clinic, the patients were followed on the next day, 3rd or 4th post-operative day, at 1 and 2 weeks, and at 1, 3, and 6 months after primary surgery. Additional follow-ups were advised at the surgeon's discretion and postoperative course of the patient.

Baseline, preoperative information retrieved from the medical records included age, sex, laterality, and etiology of retinal vasculitis, BCVA, IOP, status of the lens (phakic, pseudopahkic, aphakic), slit lamp examination, presence of any iris neovascularization (INV), evidence of preoperative laser photocoagulation, vitreous hemorrhage, and TRD or combined RD as the primary indication for surgery. Preoperative use of intravitreal bevacizumab was also noted.

Surgical technique

All patients underwent standard three-port PPV (20-/23- or 25-gauge). Following clearing of the vitreous hemorrhage, the RD (TRD or combined RD) was assessed in terms of location of FVP and extent of RD [whether in the central fundus + 'near' periphery of fundus, or in the 'middle' (Equator) + 'far' periphery of fundus], number of quadrants involved in combined RD (total, subtotal or localized), and the number and location of primary retinal break (s) in combined RD. An intraoperative detailed evaluation of the RD was followed by removal of the FVP by delamination/segmentation, application of diathermy to the fibrovascular tufts, endolaser photocoagulation, cryotherapy (whenever required), and/or internal (gas or silicon oil) tamponade, with or without scleral buckling. In patients with cataract dense enough to preclude intraoperative visibility, PPV was combined with phacoemulsification and posterior chamber intraocular lens (IOL) implantation.

Surgical notes

As a routine, the surgical notes of our patients include details of surgical steps, intraoperative findings such as type of RD (TRD or combined RD), number of quadrants involved in combined RD (total if all four quadrants are involved, subtotal if two or three quadrants are involved, and localized if less than two quadrants is involved), location/extent of FVP, presence of retinal folds (with or without macular drag), number and location of primary and iatrogenic retinal breaks, retinectomy if performed, and type of internal (gas or oil) or external tamponade.

The central retina corresponds to macula, about 5.5 – 6 mm in diameter, which is bordered by the major temporal arcades. The peripheral retina is arbitrarily divided into belts of near (about 1.5 mm wide), middle (or equator, about 3 mm wide), far (equator to ora serrata), and extreme periphery (ora serrata and pars plana).[6] For the purpose of anatomical description of important findings, such as location of FVPs, retinal breaks, etc., We categorized the locations of FVPs along the major vascular arcades, with or without optic disc involvement (peripapillary) as being located in 'central fundus and near periphery of fundus', and those involving the equator or extending anterior to it as being located in 'middle and far periphery of fundus'.

Postoperative information included BCVA at 6 months follow-up, IOP, status of lens (phakic clear, phakic cataract, pseudophakic, aphakic), and fundus details. Early postoperative complications (early) included persistent vitreous hemorrhage or rebleeding, raised IOP, and retinal redetachment. Late complications, such as cataract, raised IOP, retinal redetachment, epiretinal membrane, iris neovascularization, subretinal fibrosis, macular hole, foveal atrophy, and retinal ischemia were noted. Details of subsequent surgery (if any) and management of complications were also noted.

The BCVA was measured using the Snellen's visual acuity chart. The postoperative BCVA was compared with preoperative BCVA and analyzed as improved (by at least two lines), unchanged or worsened BCVA.

Statistical analysis

For statistical purposes, the Logarithm of minimum angle of resolution (LogMAR) equivalents of Snellen's BCVA was used. Since the BCVA in many of the eyes belonged to severe visual impairment (including blind range such as counting fingers or less), we used LogMAR 2.3 for 'counting fingers', LogMAR 2.7 for 'hand motion, and LogMAR 3 for 'light perception'.[7] Paired *t* test was used to compare the pre- and post-operative BCVA in the affected eyes. Continuous variables included age and BCVA (LogMAR). Categorical variables included gender, pre-operative laser photocoagulation, pre-operative intravitreal bevacizumab, presence of co-existing vitreous hemorrhage, presence of combined RD, presence of single or multiple retinal breaks, pre- or post-equatorial location of breaks, FVP involving or sparing optic disc, presence of anterior proliferative vitreoretinopathy (PVR), iatrogenic break (s), internal tamponade (gas or oil), perfluorocarbon liquid (PFCL) used, use of retinectomy, combined scleral buckling, combined cataract surgery, and postoperative complications, such as vitreous hemorrhage/retinal redetachment/neovascular glaucoma (NVG), etc.

Results

There were 74 eyes (68 patients) who underwent PPV for TRD or combined RD secondary to complications of retinal vasculitis. There were 62 males and 6 females. The mean age was 31.54 ± 9.95 years (range 10-56 years). Of 68 patients with vasculitic TRD, 24 had unilateral disease and 44 had the fellow eye involved in the form of retinal vasculitis or

vasculitic TRD. In 6 of these 44 patients, the fellow eye also had vasculitic TRD. In the rest 38 patients, the fellow eye had an evidence of 'active' retinal vasculitis in 10 [Fig. 1a-c] and 'healed' retinal vasculitis in 28 patients. These 10 patients with 'active' retinal vasculitis in the fellow eye (and vasculitic TRD in the study eye) first received oral corticosteroids as the primary therapy for retinal vasculitis. Once the active vasculitis (in the fellow eye) showed clinical resolution, the eye with vasculitic TRD underwent PPV and the patients were on tapering dose of oral corticosteroids at this time. None were on immunosuppressive agents at the time of undergoing PPV. The etiology of retinal vasculitis could be established in 26 patients. Of these, tuberculosis (TB) was associated in 19 patients, Behcet's disease in three, viral in two, and sarcoidosis and syphilis in one patient each [Table 1]. The diagnosis of 'viral' etiology in two patients was made in the presence of corroborative evidence of a positive immunoglobulin G (IgG) for VZV upon relevant laboratory work up. One of these had evidence of healed vasculitis (sheathed vessels) and patches of healed retinitis in the periphery in the fellow eye. Twenty-five eyes had undergone laser photocoagulation prior to vitrectomy.

Table 1: Demographic and preoperative features of patients (or eyes) who underwent pars plana vitrectomy for vasculitic tractional or combined retinal detachment

Clinical variables	Number (%)
Total patients	68
Total eyes	74
Age (years)	
Mean±S.D.	31.54±9.95
Range	10-56
Gender	
Male	62 (91.2%)
Female	6 (8.8%)
Etiology of vasculitis	
Idiopathic	42 patients (61.8%)
Tubercular (presumed/confirmed)	19 patients (27.9%)
Behcet's disease	3 (4.4%)
Viral	2 (2.9%)
Presumed sarcoid	1 (1.5%)
Syphilis	1 (1.5%)
Laterality of retinal detachment	
Bilateral	6
Unilateral	62
Laterality of vasculitis	
Bilateral	44
Unilateral	24
Indications for surgery	
Tractional RD	50 (67.57%)
Combined RD	24 (32.43%)
Vitreous hemorrhage	50 (67.57%)
Initial BCVA	
6/12 or better	5 (6.8%)
6/12-6/60	26 (35.1%)
<6/60	43 (58.1%)
Follow-up (months)	
Mean±S.D.	23.4±21.4
Median	18
Range	6-122

S.D.=Standard deviation; RD=Retinal detachment

Sixteen eyes received a single intravitreal injection of 1.25 mg of bevacizumab within four weeks prior to PPV. A total of 50 (67.57%) eyes had tractional RD, whereas 24 (32.43%) eyes had combined RD. Vitreous hemorrhage of varying density was present in 50 (67.57%) eyes. At initial presentation, a BCVA of 6/12 or better was present in 5 (6.8%) eyes, 6/12-6/60 in 26 (35.1%) eyes, and less than 6/60 in 43 (58.1%) eyes.

Table 2 lists the intraoperative findings. Seventy-one (95.95%) eyes underwent PPV alone, two (2.7%) eyes underwent pars plana lensectomy with PPV, and one (1.35%) eye underwent a combined procedure of phacoemulsification and IOL implantation with PPV. The predominant location of the FVP was along the major vascular arcades in 17 (22.98%) eyes [Fig. 2], optic disc in 8 (10.81%) eyes, involved both the arcades and optic disc in 15 (20.27%) eyes, at the equator/anterior to equator in 24 (32.43%) eyes, and extended from the arcades into the peripheral retina in 10 (13.51%) eyes [Fig. 3]. In relation to central and peripheral retina, this implied that the FVP was located in 'central fundus + near periphery of the fundus' in 40 (54.05%) eyes, and in 'middle (equator) + far periphery of the fundus' in 34 (45.95%) eyes. Of 24 eyes with combined RD, the extent of RD was total (involving all four quadrants) in 9 (37.5%) eyes, subtotal (involving at least two but less than four quadrants) in 9 (37.5%) eyes, and localized (less than two quadrants) in six (25%) eyes. Intraoperatively, retinal folds were found in 14 (18.92%) eyes, of which nine had severe traction on the macula causing a macular drag. The retina was found atrophic in nine (12.16%), and severe anterior PVR was seen in three (4.05%) eyes. In 24 eyes with combined RD, three (12.5%) eyes had a macular hole, the primary retinal breaks were located posterior to equator in six (25%) eyes and anterior to equator in 15 (62.5%) eyes. A single primary break was found in 20 (83.4%) eyes, two breaks in two (8.3%) eyes, and multiple (more than two) breaks in two (8.3%) eyes.

Iatrogenic retinal breaks occurred in 21 (28.38%) eyes. Partial retinectomy was required in three (4.05%) eyes. The PFCL was used in two eyes. The subretinal fluid (SRF) could be drained adequately through the existing retinal break (primary or iatrogenic) in 15 eyes, whereas nine eyes required creation of a separate retinotomy for complete SRF drainage. Besides the conventional 360° scatter laser photocoagulation, cryotherapy was additionally applied to peripheral retinal breaks in ten eyes. An internal tamponade with gas (C3F8/SF6) gas was done in 31 (73.8%) eyes and with silicon oil in 7 (16.7%) eyes. Scleral buckling was additionally done in 26 (35.14%) eyes.

The median follow-up was 18 months (mean 23.4 ± 21.4 months, range 6-122 months). Postoperative complications [Table 3] included vitreous hemorrhage (20 eyes, 27.03%), raised IOP (12 eyes; 16.21%), retinal re-detachment (9 eyes; 12.16%), epiretinal membranes (7 eyes; 9.5%), iris neovascularization (7 eyes; 9.5%), foveal atrophy (7 eyes; 9.5%), and cataract (4 eyes; 5.4%). A post-operative macular hole developed in two (2.7%) eyes.

Following primary PPV, a total of 19 (25.7%) eyes underwent re-surgery for various indications, such as retinal re-detachment (8 eyes), cataract (9 eyes), glaucoma (filtering surgery in one eye), and epiretinal membrane peeling along with silicon oil removal (one eye). Of nine eyes with retinal re-detachment after primary PPV, eight underwent

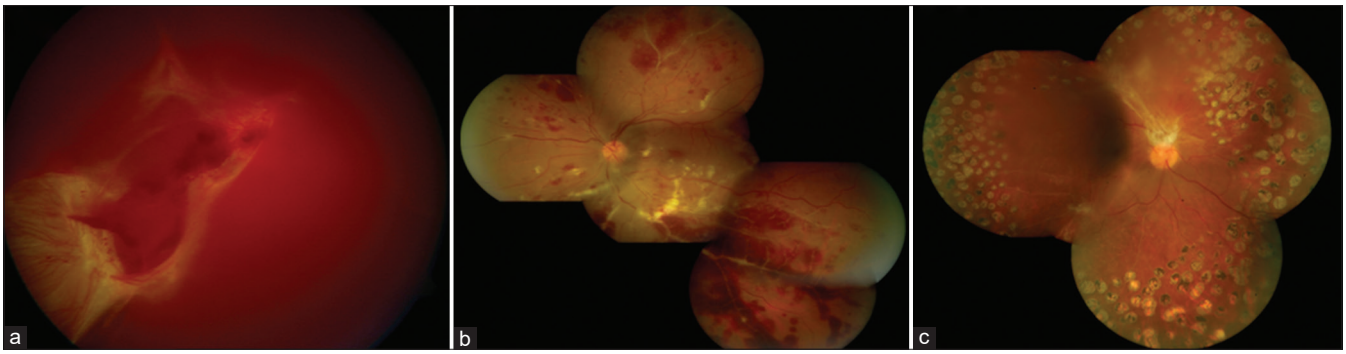

Figure 1: Right eye fundus photograph (a) of a 35-year-old male showing tractional retinal detachment with dense vitreous haemorrhage, and left eye (b) showing active retinal vasculitis. Three years following pars plana vitrectomy and endolaser photocoagulation in the right eye (c), the final visual acuity was 6/9

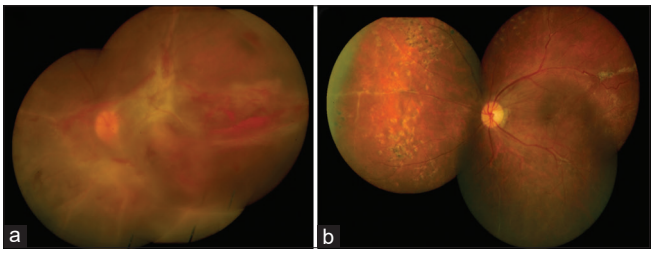

Figure 2: Fundus photograph of a 30-year-old female showing vasculitic tractional retinal detachment in the left eye with counting fingers vision before vitrectomy (a) and 10 months following surgery (b) with visual acuity 6/36

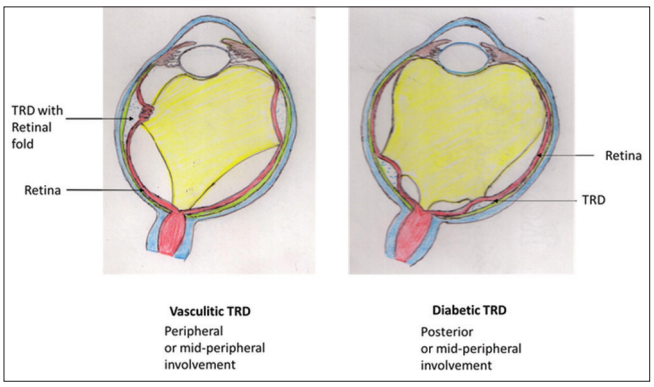

Figure 4: Schematic diagram showing the comparison of retinal involvement in vasculitic TRD versus diabetic TRD

re-surgery (PPV was combined with phacoemulsification in three eyes, and combined with pars plana lensectomy and retinectomy in one eye). One eye had an extremely poor prognosis, for which the patient refused re-surgery. Of eight eyes undergoing re-surgery, two eyes showed anatomical failure, and had persistent RD. Two (2.7%) eyes developed NVG, and one eye developed phthisical changes. One eye underwent glaucoma filtering surgery. Additionally, nine eyes underwent phacoemulsification with intraocular lens implantation during the post-operative follow-up. At 6 months follow-up, visual acuity improved by at least two lines in 52 (70.27%) eyes, was unchanged in 13 (17.57%) eyes, and worsened in 9 (12.16%) eyes [Table 4].

As nine eyes required resurgery, primary anatomical success was achieved in 65 (87.84%) eyes. Final anatomical

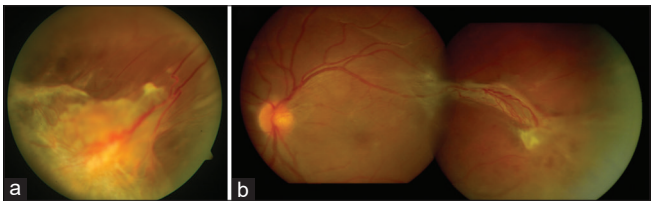

Figure 3: Fundus photograph of a 30-year-old male with retinal detachment following tubercular vasculitis showing a peripheral retinal fold with fibrovascular proliferation in the right eye (a) and a temporal retinal fold in the left eye (b)

success (after including eyes with re-surgery) was achieved in 68 (91.89%) eyes. One patient refused re-surgery, two had persistent RD after re-surgery (of which one patient did not return for follow-up after developing a re-detachment following re-surgery), two developed NVG and one patient developed phthisical eye.

Discussion

The current study provides the clinical presentations, visual as well as structural outcomes at 6-month follow-up following PPV for vasculitic TRD or combined RD. We chose to assess the outcome of surgery at 6 months because the favorable visual and anatomical results at 6 months following PPV for complications of PDR are believed to continue to remain stable or improve for as long as 5 years after the surgery.[8] Besides, an early stabilization of visual outcomes is known to change little over long-term follow-up.[4]

Frequent involvement of the peripheral retina in retinal vasculitis, particularly in ischemic type, results in retinal neovascularization elsewhere and/or on the optic disc. The neovascular buds grow from the peripheral retinal blood vessels, proliferate to form a fibrovascular complex, which contracts to exert traction by the vitreous on this fibrovascular tissue and the underlying retina, causing a TRD.[5] Because of the peripheral ischemia, the vascular epicenters of the FVPs are located in peripheral fundus in these eyes.[5,9,10]

Tractional RD occurs more commonly in a number of other ocular pathologic conditions that are characterized by progressive retinal ischemia, such as PDR, retinopathy of prematurity (ROP), and less commonly sickling hemoglobinopathies, or retinal venous obstructions. According to the Diabetic Vitrectomy Study Group, TRD was defined as

Table 2: Intraoperative findings of 74 eyes showing the details of fibrovascular proliferations, extent of retinal detachments, and location of retinal breaks

Intra-operative findings	Number (%)
Type of surgery	
PPV alone	71 (95.95%)
PPL + PPV	2 (2.70%)
Phaco + PPV	1 (1.35%)
Location of fibrovascular proliferation in relation to central and peripheral fundus	40 (54.05%)
Central fundus + 'Near' periphery of fundus	34 (45.95%)
'Middle' (Equator) and 'Far' periphery of fundus	
Detailed distribution of fibrovascular proliferation	
Along major vascular arcades	17 (22.98%)
Peripapillary	8 (10.81%)
Both (major vascular arcades+peripapillary)	15 (20.27%)
Equator/anterior to equator	24 (32.43%)
Along major vascular arcades with peripheral extension	10 (13.51%)
Combined retinal detachment	24
Total (4 quadrants) RD	9 (37.5%)
Subtotal (2 or 3 quadrants) RD	9 (37.5%)
Localized ($\leq$1 quadrant) RD	6 (25.0%)
Retinal fold (s)	14 (18.92%)
Macular drag due to retinal folds	9 out of 14
Atrophic retina	9 (12.16%)
Severe anterior PVR	3 (4.05%)
Retinal breaks	
Primary retinal breaks anterior to equator	15 (62.5%)
('Middle' + 'Far' periphery of fundus)	6 (25%)
Primary retinal breaks posterior to equator	3 (12.5%)
(Central fundus + 'Near' periphery of fundus)	20 (83.4%)
Macular hole	2 (8.3%)
Single primary break	2 (8.3%)
Two primary breaks	21 (28.38%)
Multiple breaks	3 (4.05%)
Iatrogenic breaks	
Retinectomy	
Internal tamponade	38 (51.35%)
Gas	31 (81.57%)
Silicon oil	7 (18.42%)
Scleral Buckling as adjunct	26 (35.14%)

retinal elevation at least four disc areas in extent, at least part of which was within 30° of the center of the macula, or retinal elevation less than four disc areas if one or more vitreoretinal adhesions causing elevation of the retina were present within 30° of the center *and* in the presence of active new vessels or fresh vitreous hemorrhage.[11] Tractional RD is usually caused by a partial posterior vitreous detachment (PVD) and secondary contracture of the posterior vitreous surface. The cortical vitreous in these eyes becomes adherent to the underlying retina in some areas, causing traction.

In TRD secondary to PDR, the affected areas usually involve the peripapillary retina, the vascular arcades, and/or the macula. In TRD secondary to retinal vasculitis, the affected areas are much more peripheral and are often accompanied by thick retinal folds as seen in our cases, making the surgery more challenging [Fig. 4]. Peripheral tractional sequelae are known to coexist with seemingly uncomplicated vitreous hemorrhage due to retinal vasculitis.[2] The outcomes are compromised by intraoperative (bleeding and iatrogenic breaks) and postoperative complications (bleeding and re-detachments). The immediate goal of PPV is to restore vision by clearing the ocular media including removal of vitreous hemorrhage and cataract if required, removal of tractional forces by cutting the posterior vitreous surface and separating the epiretinal proliferation from the retina, stabilize the neovascular process by endolaser photocoagulation, and reattachment of the retina.

In TRD secondary to PDR, the detached retina usually is confined to the posterior fundus and infrequently extends more than two-thirds of the distance to the equator.[10] When combined with a rhegmatogenous detachment, the retinal breaks are near the area of fibrovascular tissue, usually in the posterior pole.[12] In contrast, a large number of our patients of vasculitic RD [34 eyes (45.95%)] had FVPs in middle (equator) and far periphery of the fundus. Of these, the FVPs were primarily located in periphery in 24 (32.43%) eyes and were additionally found as peripheral extensions of the FVPs along major vascular arcades in ten (13.51%) eyes. Limited access to these adhesions coupled with a close proximity of the anterior edge of the vitreoretinal adhesion to the vitreous base makes it difficult to excise the vitreous around the attachment. The dissection is further compromised in phakic eyes. Scleral buckling is required in such eyes to relieve peripheral residual traction, and in more advanced cases, a relaxing anterior retinectomy may be indicated. We performed encirclage with scleral buckling in more than one-third of eyes (35.14%) to treat unrecognized anterior retinal breaks, to reduce the chance of later RD resulting from peripheral retinal breaks and support the vitreous base in cases with incomplete vitreous base dissection.

A combined (traction-rhegmatogenous) RD results from progressive fibrosis and traction severe enough to produce a retinal break, and progresses rapidly. In our 24 cases of combined RD secondary to vasculitis, 15 (62.5%) eyes had the primary retinal breaks located anterior to equator, commonly within the thick retinal folds. This is in contrast to the combined RD complicating severe PDR where the retinal breaks are usually located posterior to the equator, adjacent to or underneath the areas of FVP. In our series, six (25%) eyes had retinal breaks posterior to the equator. In both types of combined RD, however, these are difficult to identify preoperatively due to their small size, obscuration by vitreous hemorrhage, thick FVP, or retinal folds.[13] These are usually small, oval or slit-like. Prompt surgery is indicated with a guarded prognosis irrespective of the macular involvement.

The role of vitrectomy in Eales' disease has been reported by several studies over the last three decades.[1-5] Generally, satisfactory results have been claimed by most of these studies since majority of the patients reported had vitreous hemorrhage as the primary indication for vitrectomy. El-Asrar *et al*. reported vitrectomy results in 15 eyes with Eales' disease of which 11 had unresolving vitreous hemorrhage.[1] Only four eyes in their study additionally had TRD of which two required silicon oil tamponade with relaxing retinectomy in one eye. All four eyes underwent encircling scleral buckling, with complete anatomical success in four eyes. Shukla *et al*. reported vitrectomy results in 71 eyes (49 eyes with vitreous hemorrhage with/without epiretinal membranes and 22 eyes

Table 3: Postoperative complications

Post-operative complications	Number (%)
Vitreous hemorrhage	20 (27.03%)
Raised intraocular pressure	12 (16.21%)
Retinal re-detachment	9 (12.16%)
Re-surgery	
Retinal re-detachment	19 (25.7%)
Cataract + IOL	8 (10.8%)
Glaucoma filtering surgery	9 (12.16%)
Epiretinal membrane peeling	1 (1.35%)
(along with silicon oil removal)	1 (1.35%)
Epiretinal membrane	7 (9.5%)
Iris neovascularization	7 (9.5%)
Foveal atrophy	7 (9.5%)
Cataract	4 (5.4%)
Macular hole	2 (2.7%)
Neovascular glaucoma	2 (2.7%)
Persistent RD after re-surgery	1 (1.35%)
Pre-phthisical	1 (1.35%)

Table 4: Final visual and anatomical outcome after vitreous surgery in 74 eyes

Final outcome parameters	Number (%)
Change in visual acuity at 6 months	
Improvement by ≥2 Snellen's lines	52 (70.27%)
Unchanged	13 (17.57%)
Worsened	9 (12.16%)
Final anatomical success	
Primary	65 (87.84%)
Secondary	68 (91.89%)

with RD) with Eales' disease, of which 11 eyes (15.49%) were surgical failures (including six eyes with inoperable RD).[2] A total of 5 of these 11 eyes underwent primary PPV for vitreous hemorrhage and six for RD. Better visual and anatomical outcomes are achieved with an aggressive treatment of ischemic vasculitis, full panretinal photocoagulation, and an early vitrectomy at the stage of vitreous hemorrhage.[1] A high rate of iris neovascularization (9.5%) post-operatively in our series was related to the more advanced stage (TRD) of the disease being operated.

They reported anatomical improvement in 84.5% and functional improvement in 76% eyes, and concluded that good surgical outcomes were possible even in the presence of tractional sequelae. They attributed the surgical failures to the presence of tractional membranes in the peripheral retina, which are difficult to peel. We found primary anatomical success in 87.84% eyes and secondary anatomical success in 91.89% eyes. Functional improvement (by ≥ 2 Snellen's lines) was seen in 70.27% eyes in our series. This is in contrast to the older belief that overall, poor outcomes have been associated with preoperative or intraoperative RD in Eales' disease, when vitrectomy was performed after long waiting periods of vitreous hemorrhage without the modern surgical equipment few decades ago. Intraoperative lensectomy was performed frequently. In our series, only two (4.1%) cases required lensectomy. The role of retinectomy in severe cases of PVR and advanced cases of PDR is well known.[14,15] In a study of 304 eyes undergoing retinectomy for complex RDs by Grigoropoulos *et al*., 18 (6%) eyes had TRD or combined RD, which included 15 eyes with PDR, one eye with Eales' disease, one eye with idiopathic vasculitis, and one eye with unknown cause.[16] Our study includes three (4.05%) eyes that required retinectomy in the localized quadrant for severe anterior PVR. Two eyes received silicon oil tamponade and one eye C3F8 tamponade, with encircling band in all three eyes. One eye developed re-RD and underwent re-surgery with silicon oil tamponade. All three eyes had a final anatomical success with attached retina.

In contrast to the general description of peripheral location of the disease in Eales' disease, Majji *et al*. observed the epiretinal membranes in posterior pole in idiopathic vasculitis, similar to membranes of other vascular disorders like PDR or venous occlusions.[5] They differentiated the epiretinal membranes of vasculitis from those of PDR or vascular occlusions in terms of histopathological features. Our study suggests peripheral locations as the preferential sites for these membranes secondary to vasculitis. This is contrary to the posteriorly located diabetic TRDs.

Our study has typical limitations of being retrospective, non-consecutive and lacks comparison. Majority of the cases included 20 G PPV. However, as the microincision vitreous surgery evolved, some of the later cases in the series were subjected to 23- or 25 G PPV, depending upon the surgeon's choice (20 G PPV in 49 eyes, 23 G PPV in 10 eyes, and 25 G PPV in 15 eyes). Optic disc pallor is affected by pan retinal photocoagulation. As about one-third (24 out of 74) of the eyes had undergone some degree of pan retinal photocoagulation for treatment of ischemic retinal vasculitis before undergoing PPV, we did not assess this variable pre-operatively or post-operatively as the pan retinal photocoagulation dose cause a mild increase in optic disc pallor. While the previous studies of vitrectomy for complications of retinal vasculitis mainly included eyes with vitreous hemorrhage, and only a few eyes with TRDs, our study offers the largest series of TRDs exclusively secondary to retinal vasculitis.

The pathophysiology of TRDs or CRDs in various vitreoretinal disorders is highly complex, making their surgical management extremely challenging. As the development of TRD in retinal vasculitis occurs in very advanced course of the disease with varying degrees of irreversible ischemic sequelae, PPV remains the primary therapy in these eyes that have already undergone irreversible structural and functional damage, and should not be delayed after a thorough pre-operative assessment, planning, and counselling. Our series analyzes the features of tractional sequelae of retinal vasculitis such as the type of retinal detachments (tractional or combined rhegmatogenous/tractional), intraoperative findings like location and extent of FVP, location of primary breaks, retinal folds, incidence of complications and reports results of vitrectomy in terms of final anatomical and visual outcome.

Conclusion

We found that vasculitic TRD was often complicated by combined RD, peripheral FVPs, retinal folds and iatrogenic retinal breaks. Majority of the eyes, however, had a good anatomical and functional outcome following PPV. The additional anatomical variations in vasculitic TRDs, when

compared to diabetic TRDs, warrant careful pre-operative planning including patient counselling and surgical planning, as well as post-operative monitoring.

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Conflicts of interest

There are no conflicts of interest.

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