Original Article

Strategy for the Management of Rhegmatogenous Retinal Detachment with Proliferative Vitreoretinopathy

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Purpose: To device a strategy for the proper surgical management of rhegmato-genous retinal detachment with proliferative vitreoretinno-pathy.

Material and Methods: This prospective study was carried out in the ophthalmology department of Sir Ganga Ram hospital. In this study, twenty-five cases were selected. The cases were divided into three groups according to the surgical techniques.

In the first group, scleral buckling was done. In the second group, pars plana vitrectomy was done and silicone oil was used for internal tamponade. In the third group pars plana vitrectomy with internal as well as external tamponade was done. Follow-up was for a minimal of six months.

Results: Anatomical attachment was achieved in 84% cases. With grades B and C we had 100% results. Regarding functional results, the final visual acuity was > 6/60 in 12% cases. It was between 1/60 and 6/60 in 52% and perception and projection of light or finger counting in 28% cases. Projection became faulty in two cases, which developed extensive PVR post-operatively. There were few post-operative complications. Cellophane maculopathy was seen in 8% cases and secondary glaucoma due to post-operative uveitis in 4% cases. 16% had retinal re-detachment and macular pucker was observed in 4% cases. There were 8% cases in which posterior sub-capsular opacities were seen. No gross complications were seen in 60% cases.

Conclusion: Cases of PVR grade B can be well managed with scleral buckling procedures. In patients who present with PVR grade C, the chances of further progression of the proliferative process are highest. Eyes with PVR grade D were once considered as blind eyes are well managed with pars plana vitrectomy, air-fluid exchange and with external or internal tamponade.

The evolution of retinal detachment operation is one of the most remarkable chapters in the history of ophthalmology. Gonin's[1] operation for repair of the detached retina ranks with Daviel's cataract extraction and Von Graefe's iridectomy for acute glaucoma as the three greatest surgical treatments for blindness. Retinal detachment with proliferative vitreoretinopathy (PVR) is not a single

disease entity rather it consists of cascades of events, so that sometimes it becomes very difficult to mark boundaries between its different grades. The objective of the study is to device a strategy for the proper surgical management of the disease.

MATERIAL AND METHODS

The study was carried out in the ophthalmology department of Sir Ganga Ram Hospital during the year 1997-1998. It involved the analysis of patients attending the hospital with retinal detachment complicated by PVR. Throughout the study, Retina Society Grading1983[2] was followed. However, for the purpose of reference, up-dated classification of PVR is also mentioned in each case.

As we were usually encountered with grades B, C and D, so, only these cases were included. A total of twenty five cases were studied and five cases were selected for each grade i.e., grades B, C, D1, D2 and D3. Once the patient was admitted in the ward, following care-taking steps were taken:

1. Ocular and systemic history
2. Visual acuity testing
3. Slit-lamp biomicroscopic examination
4. Applanation tonometry.
5. Fundus examination with indirect ophthalmoscope and Goldmann 3-mirror or Mainster lens for minor details.
6. Fundus drawings

The details of fundus examination of patients are shown in (Table 1-3).

Surgical Procedures

Depending upon the type of surgical procedure, the cases were divided into three groups.

Group 1: Cases in which retinocryopexy and scleral buckling were done.

Group 2: Cases in which pars plana vitrectomy with internal tamponade (with silicone oil) was performed.

Group 3: Cases in which pars plana vitrectomy with internal and external tamponade was carried out.

Instrumentation and surgical procedures for group 1:

This group included four patients with PVR grade B and one patient with PVR grade C.

They underwent scleral buckling procedure with drainage of the subretinal fluid under general anesthesia.

Retinocryopexy was done to the retinal breaks and the areas of lattice degeneration. A double row was applied just posterior to the breaks. Most patients underwent a segmental silicone sponge or 360^{o} encirclement was done in rest of the patients of this group.

Instrumentation and surgical procedures for group II:

In this group pars plana vitrectomy with silicone oil was carried out in all cases.

Instrumentation and surgical procedures for group III:

In this group, pars plana vitrectomy was performed with internal as well as external tamponade. Pars plana vitrectomy and scleral buckling procedures were exactly the same as for group I and group II.

Post operative inflammatory reaction was controlled with topical steroids. Topical antibiotic therapy was given to prevent the infection. The patients were followed up for at least 6 months.

RESULTS

Results of group I

In this group, retinocryopexy and scleral buckling procedures were performed in five patients. Anatomical attachment was achieved with the primary procedure in 100% cases. 80% cases had final visual acuity between 1/60 and 6/60 while 20% cases had more than 6/60 (Table 2).

Cellophane maculopathy was the only complication, which was encountered in this group. It was seen in two cases (40%).

Results of group II

In this group pars plana vitrectomy was performed. Details are shown in table 3. Anatomic results were 100 % in this group. The only complication seen in this group was raised intraocular pressure (IOP) and post operative anterior uveitis (seen in only one patient). Topical ß-blockers with steroids and carbonic anhydrase inhibitors were given for one week. The reaction in anterior chamber settled and IOP returned

to normal. Anti Glaucoma therapy was stopped and steroids were tapered off.

Results of group III

There were a total of twelve patients in whom pars plana vitrectomy was performed with external as well as internal tamponade. Three patients with retinal dialysis were also included in the same group. For details refer to table 4. Final re-attachment was achieved in eight patients (66.7%). In six out of these eight (75%), retina was attached with the primary surgery. While, in rest of the two (25%) cases, multiple surgeries were required to achieve the results.

Table 1: Clinical data of group 1

Cases	Eye	Retinal detachment	Breaks	PVR	Status of other eye	Corrected Visual Acuity	
						Pre-operative	Post- operative
Case 1	Right	Sub-total (1-11 O'clock)	7 and 10 O'Clock + Scattered areas of lattice	B	Retina attached. 6 flat holes inferiorly. + Lattice degeneration on temporal side	FC	6/60.
Case 2	Right	Total	5 O'Clock	B	NAD*	PL+ PR+	4/60.
Case 3	Left	Total	5 O'Clock	B	NAD*	HM	6/60.
Case 4	Right	Sub-total (3 - 8 O'Clock)	A row of large retinal breaks from 4-7 O'Clock + scattered areas of lattice.	B	Scattered areas of Lattice	6/36.	6/60.
Case 5	Right	Sub-totat (3-8 O' Clock)	A large break at 6 O'Clock with fibrous cuff.	C	NAD*	FC	6/18.

FC = Finger Counting
HM = Hand movements
PL+PR+ =Perception and Projection of light
NAD =No abnormality detected

Table 2: Clinical data of group II

Cases	Eye	Breaks	PVR	Status of other eye	Corrected Visual Acuity	
					Pre-operative	Post- operative
Case 1	Right	A horse-shoe tear at 6 O'Clock. 5 small breaks in line from 11-1 O'Clock at the periphery.	D1	No perception of light	FC	3/60.
Case 2	Left	4,7 and 1 O'Clock	C	NAD	PL+ PR+	6/36.
Case 3	Left	macular hole	D3	Macular degeneration	PL+PR+	FC
Case 4	Left	2 breaks quadrilateral in shape at 10 O'Clock	C	Pthisical	FC	6/60.
Case 5	Left	MACULAR HOLE	D2	NAD	PL+PR+	6/60.
Case 6	Right	10 O'CLOCK	D3	NAD	PL+PR+	6/36.

Case 7	Right	Two macular holes, one of them exactly at fovea.	D3	NAD	PL+PR+	PL+PR+
Case 8	Right	A large operculated horse-shoe tear at 10 O'Clock. Another small break just anterior to it.	C	Posterior staphaloma. Myopic degeneration	PL+PR+	6/60.

FC = Finger Counting
HM = Hand movements
PL+PR+ =Perception and Projection of light

Table 3: Clinical data of group III

Cases	Eye	Breaks	PVR	Status of other eye	Corrected Visual Acuity	
					Pre-operative	Post- operative
Case 1	Right	5 O' Clock	D1	Myopic degeneration. Areas of lattice + paving stone degeneration	PL+ PR+	6/60.
Case 2	Left	Inferomedial to the disc at 7 O'Clock	C	NAD	PL+ PR+	1/60.
Case 3	Left	5 O'CLOCK	D2	Long standing R.D. with PVR D2	FC	1/60.
Case 4	Left	350^{o} dialysis.Superior retina inverted and folded upon itself. Disc was hidden behind the fold. Choroid was visible in three quadrants.	B	Pthisis bulbi	PL+ PR+	FC
Case 5	Right	At 1,3,4,6,7,9 and 11 O'Clock in the periphery	D2	Pthisis bulbi	PL+ PR+	HM
Case 6	Left	Macular Hole	D1	Long standing R.D with PVR-D_2	PL+ PR+	1/60.
Case 7	Left	Two breaks at 10 O'Clock. Another small break at 5 O'Clock	D3	Retinal reattachment surgery already done. Retina attached	PL+ PR+	FC
Case 8	Left	Multiple breaks from 1-5 O' Clock. Areas of lattice from 9-11 O'Clock	D3	Total R.D. with PVR D2	PL+ PR+	PL+ PR faulty
Case 9	Left	A large temporal dialysis from 7-8 O'Clock (270o)	D1	NAD	PL+ PR+	1/60.
Case 10	Left	An operculated break at 6 O'Clock. Area of lattice with multiple breaks from 12-1 O'Clock. A giant tear at 7-8 O'Clock	D2	Pthisis bulbi	HM	FC
Case 11	Right	Two operculated breaks at 6 O'Clock	D2	NAD	FC	FC
Case 12	Right	A large temporal dialysis from 7-11 O'Clock	D1	Areas of white without pressure in the superonasal quadrant.	PL+ PR+	PL+ PR faulty

RD = Retinal detachment

FC = Finger Counting
HM = Hand movements
PL+PR+ = Perception and Projection of light

Anatomical attachment was not achieved in four (33.33%) cases. Macular pucker was seen in only one case; the patient with retinal dialysis of 350°. The early post-operative visual acuity was 6/36, because of macular pucker it dropped to finger counting. Significant posterior sub-capsular opacities were noticed in two patients. Both of them had post traumatic retinal dialysis. Irrigation and aspiration was done in these cases.

Table 4: Anatomic and functional results

PVR	Anatomical Results %	Functional Results n (%)
B	100	PL+PR+/HM/FC (20) 1/60 to 6/60 (80) >6/60 (0)
C	100	PL+PR+/HM/FC (0) 1/60 to 6/60 (60) > 6/60 (40)
D1	60	PR faulty (20) 1/60 to 6/60 (80) >6/60 (0)
D2	80	PL+PR+/HM/FC (60) 1/60to 6/60 (40) >6/60 (0)
D3	80	PL+PR+/HM/FC (60) 6/60 (20) PR faulty (20)

Table 5: Percentage of complications

Complications	No. of cases n (%)
Cellophane maculopathy	2 (8)
Anterior uveitis and secondary glaucoma	1 (4)
Re-detachment	4 (16)
Macular pucker	1 (4)
Posterior sub-capsular opacities	2 (8)
No gross complication observed	15 (60)

DISCUSSION

Surgical management of rhegmatogenous retinal detachment with PVR involves marching up a step ladder of history taking, ocular and systemic examination and reaching to a most suitable surgical strategy which can bring optimal visual functioning to the patient.

In this study twenty-five cases of PVR were studied. Regarding the epidemiological data, retinal detachment with PVR was more common in teen age group. There were 12 patients (48%) who were under 20 years of age, 7 cases (28%) were between 20-40 and only 6 patients (24%) were above 40 years. The most common cause of retinal detachment in teen ages was trauma. 40% patients had history of ocular injury either recent or remote. All these patients were less than 40 years.

Depending upon the type of surgical procedure, the cases were divided into three groups. In group I, retinocryopexy was done and external tamponade with silicone sponge was sufficient to attach the retina. Four patients of PVR grade B and one patient of PVR grade C were included in this group.

In group II, pars plana vitrectomy was done in all cases and silicone oil was used for internal tamponade. Different studies have shown that silicone oil has better retinal attachment rates when compared with SF6 and air.

In group III, pars plana vitrectomy with internal as well as external tamponade was done. In these cases retinocryopexy and scleral buckling was preceded by pars plana vitrectomy.

These techniques were modified where and when required, e.g., Perfluorocarbon liquid (D-K line) was used in one case of retinal dialysis of 350°. Cases with very extensive PVR as well as two other cases of retinal dialysis were managed without perfluoro-carbon for financial reasons.

Considering the anatomical results, final retinal attachment was achieved in 21 cases (84%). In 19 patients (76%), retina was attached with primary surgery either with scleral buckling or pars plana vitrectomy or both. In two cases (8%), multiple procedures had to be tailored to achieve the required results.

If the results are defined in terms of grades of PVR, it is seen that the anatomical results are 100% with grades B and C, 60% for D1 and 80% for D2 and D3. It can be compared with the results of Pournaras CJ and Donati G[8] in which retinal attachment was achieved in 79% cases of grade B and 47% cases of grade C after one surgical procedure.

Functional results depend upon a number of different factors including, pre-operative visual acuity, condition of macula, macular hole, amount of PVR, age of the patient and duration of retinal detachment. In our setup patients usually present late. Although anatomical results were excellent, functional results were not very promising because of the late medical consultation by the patients.

Final visual acuity after 6 months was > 6/60 in 3 cases (12%). It was between 1/60 and 6/60 in 13 patients (52%), perception and projection, hand movements or finger counting in 7 cases (28%) and 2 cases (8%) resulted in faulty projection.

One of the patients in whom macula was attached at admission, the post-operative visual acuity was 6/6 during the second week. After six months it dropped to 6/18 because of cellophane maculopathy. Similarly, the other case in which macula was attached at admission had post-operative visual acuity of 6/24 which was 6/60 after six months because of cellophane maculopathy. It is interesting to mention here that cellophane maculopathy was not seen in cases in which macula was detached although macular pucker was observed in one case of retinal dialysis of 350^0. This observation of cellophane maculopathy is similar to the study done by Uemura A[9] who compared pre-operative detached macula cases with intact macula cases. He found that the occurrence of epimacular membranes was higher in intact macula cases; being 68% at 12 months after surgery.

Silicone oil was the only substance, which was used for internal tamponade. There is a wealth of information available pertaining to the complications of silicone oil, which are described by many surgeons; e.g. complicated cataract, secondary glaucoma, keratopathy and retinal toxicity. There are people who prefer to remove silicone oil after few months. According to Harry Willshaw, liquid silicone oil should be removed in every case if possible[10]. But in my study, no such complications were encountered during the six months follow-up. So, it seems reasonable not to remove silicone oil until and unless some complication occurs. Posterior sub-capsular opacities developed in two cases, which were managed through extracapsular cataract extraction.

Pars plana vitrectomy is an invasive procedure and chances of post-operative uveitis are always there. This problem was seen in only one case, which was tackled with steroidal and non-steroidal anti inflammatory agents. Secondary glaucoma was also seen in this patient and it was managed with ß-blockers.

The most serious of all complications was inferior retinal redetachment. It was seen in two cases of PVR grade D. Initially, pars plana vitrectomy with silicone oil was done. Silicone oil because of its upward buoyancy, provided sufficient tamponade to the superior retina but the inferior retina remained detached. On fundus examination, epi-retinal membranes were found to be causing traction. Epi-retinal membrane peeling was carried out and segmental scleral buckle was applied to the inferior retina. Retinal attachment could not be achieved. This revealed that silicone oil tamponade was insufficient in cases of inferior retinal detachment. All those cases in which either there was an inferior retinal detachment or cases of total retinal detachments with inferior breaks, scleral buckling was performed for external tamponade with or without pars plana vitrectomy depending upon the grade of PVR.

Bonnet M[11] states that the incidence of post-operative PVR in rhegmatogenous retinal detachment has decreased, but it seems that it is still the most important cause of retinal re-detachment, specially anterior PVR if it remains undetected during the first surgical procedure.

In any case of PVR, the usual surgical strategies include: sealing of retinal breaks, removal of epi-retinal membranes and pars plana vitrectomy, performing retinectomy at the site of retinal stiffening and applying scleral buckle

But there are some cases in which, even after all these heroic procedures, sub-retinal fibrosis and retinal shortening continues and there is no hope of retinal attachment. If multiple surgical procedures are

performed in these cases, there is rather acceleration of the proliferative process. As the clinical spectrum of the disease is becoming more obvious and the thoughtful speculation on its pathogenesis is increasing, it is hoped that there will be some solution to this detrimental problem.

CONCLUSIONS

Proliferative vitreoretinopathy is a multi-faceted disease with different modes or grades of presentation. There are no hard and fast rules, which can be applied to the surgical management of these grades, rather each patient is an individual case and surgical strategy would depend upon a number of factors.

This study of twenty-five cases of rhegmatogenous retinal detachment with proliferative vitreoretinopathy has led to draw certain conclusions.

Cases of PVR grade B can be well managed with scleral buckling procedures.

In patients who present with PVR grade C, the chances of further progression of the proliferative process are highest.

The cases which needed PPV with internal as well as external tamponade were patients of RD with PVR grades C and D, having inferior breaks, all cases of retinal dialysis and patients with extensive sub-retinal fibrosis.

Inferior retinal detachments sometimes prove to be a lifelong sentence. Complications related to silicone oil are not seen within the first six post-operative months.

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REFERENCES

1. **George FH, Edward BM, Edward WDN.** Retinal detachment, A manual: Am Acad of Ophthalmol. 1979; 10-3.
2. **Harry W**. Practical ophthalmic surgery.1993; 140.
3. **Schepens Charles L.** Retinal detachment and allied diseases. 1983; 1: 410.
4. **Petersen J.** The physical and surgical aspects of silicon oil in vitreous cavity. Graefes Arch Clin Exp. Ophthalmol. 1987; 225: 452.
5. **Lucke K.** Silicon oil in surgery of complicated retinal detachment. Ophthalmology. 1993; 90: 215-38.
6. **Machmer R.** The importance of fluid absorption, traction, intraocular currents and chorioretinal scars in the therapy of Rhematogenous retinal detachment. Am J Ophthalmol. 1984; 98: 681.
7. **Kennedy CJ, Parker CE, McAllister IL.** Retinal detachment caused by retinal dialysis. Aust NZJ Ophthalmol. 1997; 25: 25-30.
8. **Fournaras CJ, Donati G.** Intraocular surgery for secondary retinal detachment in PVR. Klin-Monatsbi-Augenheiled.1995; 206: 339-42.
9. **Uemura A.** Development of epimacular membrane following rhegmatogenous retinal detachment surgery. Nippon Ganka Gakkai Zasshi. 1994; 98: 994-7.
10. **Harry W.** Practical ophthalmic surgery.1993; 155.
11. **Bonnet M, Guenoun S, Yaniali-A, et al.** Has the incidence of post-operative PVR in rhegmatogenous retinal detachment decreased? J Fr Ophthalmol. 1996; 19: 696-704.
12. **Harry W.** Practical ophthalmic surgery. 1993; 150-62.