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Anatomical and Functional Outcome of Retinal Detachment Surgery

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Abstract

Objective: To study the anatomical status and functional outcome of Pars Plana Vitrectomy surgery in rhegmatogenous retinal detachment (RRD) at a tertiary eye care center in India.

Material, Patients and Method: This is a prospective, noncomparative, consecutive, interventional study of rhegmatogenous retinal detachment managed with Pars Plana Vitrectomy surgery performed in the Regional Institute of Ophthalmology, Prayagraj, India. 40 patients of 40 eyes (26 phakic 65%, 14 pseudophakic 35%) with retinal detachment were treated by primary pars plana vitrectomy with 6 months of follow-up.

Result: A total of 40 patients (40 eyes) were operated, 18 males and 2 females, with age, ranges from 17 years to 90 years. After surgery, anatomically retinal reattachment was achieved in 40 (100%). Improved best-corrected visual acuity (BCVA) was seen in 38 (90%) patients, whereas in 2 (5%) patient BCVA was not improving and deteriorated from pre-operative in another 2 (5%) patient. There was no significant difference was found in the pseudophakic and phakic eye in functional outcome.

Conclusion: Rhegmatogenous retinal detachment is one of the common causes of visual impairment and blindness. Timely surgical management with Pars Plana Vitrectomy surgery can give good anatomical and visual outcome.

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INTRODUCTION

A rhegmatogenous retinal detachment (RRD) occurs when at least one retinal tear allows vitreous humor to penetrate the subretinal space and separate the neurosensory retina from the underlying retinal pigment epithelium.[1] Incidence of RRD has been reported between 6.3 and 17.9% 100,000 population and demonstrates significant geographical variation.[2] Risk factors for retinal detachments are blunt trauma, myopia, increasing age, history of diabetes and history of previous complicated cataract surgery.[3] The main surgical approaches for retinal detachments are pars plana vitrectomy (PPV) with retinopexy ± intravitreal tamponade, scleral buckle, a combination of vitrectomy and scleral buckle, and less commonly pneumatic retinopexy.[4,6] This paper aims to review primary rhegmatogenous retinal detachments in

a tertiary care centre of northern India over 1 year from December 2019 to December 2020 and assess the primary reattachment rate (anatomical success) and physiological success (BCVA) after surgery and up to 6 months of follow-up. Lens, macular status and extent of breaks were also examined as a determinant of surgical success.

MATERIAL AND METHODS

It was a prospective, hospital-based study from December 2019 to December 2020 conducted at a tertiary care center in Prayagraj.[7] Northern India after taking clearance from the institutional ethical committee and was according to the Helsinki of declaration. This case series consisted of 40 eyes of 40 patients. Parameters recorded in these study are the laterality of surgery, gender of the patient, duration of symptoms, age of the patient, macular attachment status at presentation, visual acuity at presentation, location of the retinal breaks or tears, number of clock hours of retina involved in the detachment, type of procedure undertaken, type of anesthesia administered (local or general), length of stay in the hospital, perioperative complications, previous cataract surgery, history of trauma, high myopia (axial length recorded as greater than 24 mm) and the surgical and visual outcome of the patients at 6 months post-procedure. Primary anatomical success was defined as the retina being documented as flat at 6 months post-procedure (under oil or otherwise) by fundal examination using an indirect ophthalmoscopy and/or slit lamp and a Volk lens no further retinal surgical intervention for detachment during those 6 months. Best-corrected visual acuity (BCVA) was assessed at presentation to the hospital, pre-operative and again at 1 week and 1, 3- and 6 months post-procedure (Figure 1). BCVA was recorded in the patient's medical notes in the Snellen format in metres. All data were recorded onto Microsoft Excel for analysis purposes. Statistical analysis was performed using Microsoft Excel in conjunction with the Data Analysis ToolPak Add-in feature and Prism 7© for Windows. This study was approved by the Mater Misericordiae University Hospital Institutional Review Board (IRB) conducted by the declaration of Helsinki and the Irish Data Protection Act.[8,9]

Inclusion Criteria

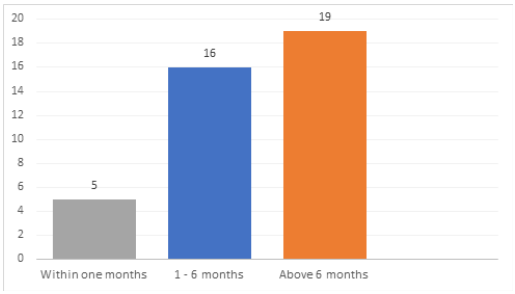
All primary rhegmatogenous retinal detachment patients above 10 years of age.

Exclusion Criteria

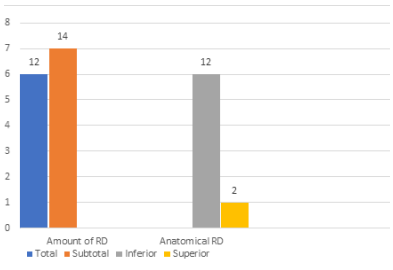
Were previous retinal detachment surgery, tractional or exudative retinal detachment, old RD, macular pathology and central serous retinopathy with RD, proliferative vitreoretinopathy (Grade-C), central choroiditis and retinal vasculitis.

RESULTS

There was a total of 40 eyes of 40 patients with a mean age of 51.276 ± 17.3056, ranging from 17 to 90 years. Male 36 (90%) outnumbered female 4 (10%) patients, with the involvement of the right eye 36 (65%) predominating the left 14 (35%). History of cataract surgery was present in 14(35%). Of the retinal breaks, horseshoe tear was the commonest 26 (65%), followed by retinal hole 12 (30%) and retinal dialysis 2 (5%). Patients present with total RD 12(30%), subtotal RD 14(35%), inferior RD 12(30%), superior in 2(5%), and macula was detached in 92%. At the end



Graph 1: Distribution of study subjects according to duration of RD



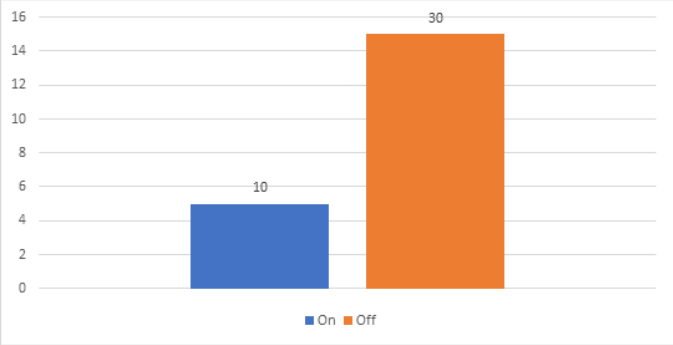
Graph 2: Anatomical Type of Retinal detachment in study participants

Table 1: Distribution of study subjects according to duration of RD

Duration	*No. of patients*	*Percentage (%)*
One month	5	12.5
1 – 6 Months	16	40
Above 6 months	19	47.5

Table 2: Distribution of study subjects according to types of retinal detachment

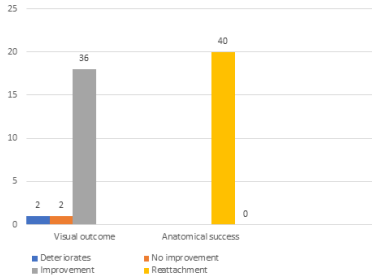
Types of rd			*Number of patients*	*Percentage (%)*
Amount of rd		Total	12	30
Subtotal			14	35
Anatomical rd	Inferior		12	30
	Superior		2	5



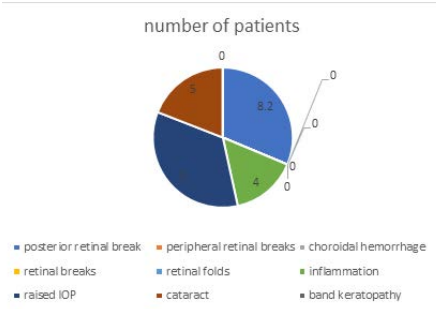
Graph 3: Shows the distribution of macular status in retinal detachment patients in which the macula is on in 10 (25%) and off in 30 (75%). In our study total and subtotal RD are more that's why macula is detached in most of the patients.

of 6 months, the retina was attached in 40 (100%). The final BCVA improved in 90% of the cases, remained same in 5%, while another 5% showed further deterioration in comparison with the initial BCVA at the time of presentation (Table 1). None of the patients underwent a second surgery (Graph 1). RD, retinal detachment; UCVA, uncorrected visual acuity; BCVA, best-corrected visual acuity; PL, perception of light; NPL, no perception of light. SPSS software was used for statistical analysis.

Table 1 shows time duration of patients from diagnosis to surgery, in our study within one-month surgery done in 5 (12.5%) patients, in between 1–6 months 16 (40%) patients, and after 6 months operate 19 (47.5%) patients. Due to covid-19 time and more patient load, RD surgery delays occur.



Graph 4: Shows the distribution of postoperative visual outcome on Snellen chart where vision deteriorates in 2 (5%), no improvement was seen in 2 (5%), and improvement was seen in 36 (90%) patients but anatomical success is seen in 40 (100%) patients.



Graph 5: Shows the distribution of intra-operative and postoperative complication in which inflammation present in 4 (10%), raised IOP in 9 (22.5%) and cataract in 5 (12.5%) patients.

Table 2 shows the distribution of types of RD based on amounts of RD where total RD is 12 (30%), subtotal RD is 14 (35%) and based on anatomical RD (Graph 2) where inferior RD is 12 (30%) and superior RD is 2 (5%).

Discussion

RRD is a potentially blinding ophthalmic condition caused by a separation of the neurosensory retina (NSR) from the underlying retinal pigment epithelium (RPE) associated with accumulation of fluid within this potential space. RRD was considered the untreatable condition in the past until the introduction of SB by Charles Schepens in 1951.[10] Improvements continued in the surgical techniques with the introduction of pars plana vitrectomy (PPV) by Robert Machemer in 1970 and PR by Hilton and Grizzard in 1986.[11] At present, all three techniques are used successfully for the treatment of RRD, with primary success rates of up to 90%.[12] Despite comparable success rates, with the modernization of vitrectomy machines, the introduction of wide-angled viewing system and smaller gauge

Table 3: Distribution of study subjects according to status of macula

Macula	*Number Of Patients*	*Percentage (%)*
Attached	10	25
Detached	30	75

Table 4: Distribution of study subjects according to postoperative anatomical success and functional outcomes of patients.

Physiological Outcome	*Patients*	*%*	*Anatomical outcome*	*Patients*	*%*
Deteriorates	2	5	Reattached	40	100
No improvement	2	5	Detached	Nil	0
Improvement	36	90			

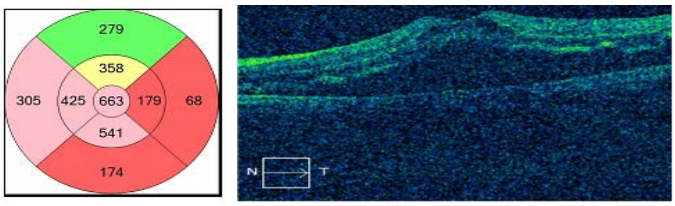


Figure 1: Pre-operative OCT image of retinal detachment patient.

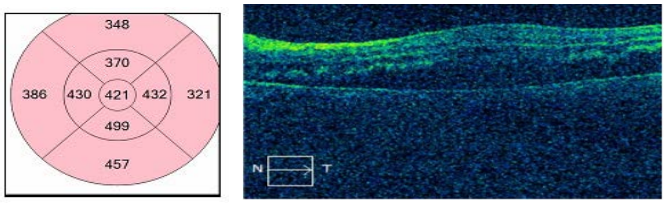


Figure 2: One week after, eye filled with silicon oil.

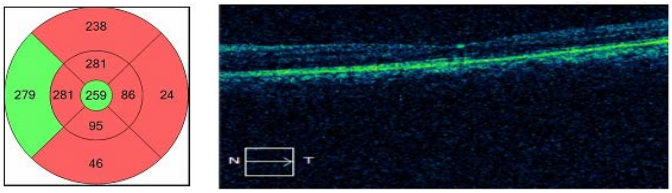


Figure 3: Complete reattachment of the retina after six months.

instrument, PPV is the choice of RD surgery for many vitreoretinal surgeons. The modern vitreoretinal surgery with primary Vitrectomy is limited by higher surgical cost and a longer learning curve. The use of intraocular tamponade in the form of gas, oil or heavy liquid requires postoperative head positioning for good surgical results. But it may not be feasible in all patients, particularly in children and mentally compromised individuals. Also, an additional procedure is needed like the removal of silicone oil or heavy liquid and the rate of cataract formation is higher with PPV (Figure 2).[13] PR also requires the use of intravitreal injection of gas along with cryotherapy or laser therapy to treat the retinal breaks followed by postoperative positioning of the head where there is always an anticipation of the additional procedure if the patient compliance fails. PR is usually limited to cases where one or more retinal breaks are located within one-clock hour retinal arc in the upper two-thirds of the retina and significantly clear media to rule out the presence of other retinal breaks.[14] The fundamental principle of RRD surgery is the release of the vitreoretinal traction and there is an obvious difference in achieving this goal between SB and PPV. Releasing this traction internally with PPV may be more difficult in young individuals

Table 5: Distribution of study subjects according to inta – operative and postoperative complications of patients

Complications		*No. of patients*	*Percentage (%)*
Intra-operative complication	*Posterior retinal breaks*	*0*	*0*
	Peripheral retinal breaks	*0*	*0*
	Choroidal hemorrhage	*0*	*0*
	Retinal breaks	*0*	*0*
	Retinal folds	*0*	*0*
Postoperative copmlication	*Inflammation*	*4*	*10*
	Raised iop	*9*	*22.5*
	Cataract	*5*	*12.5*
	Band keratopathy	*0*	*0*

with a formed vitreous body with no detachment of the posterior cortical vitreous.[15] This could result in iatrogenic retinal breaks, increasing the risk for PVR. An external approach with placement of a buckle element, thereby relieving the vitreous traction and supporting the retinal break(s) without the direct manipulation of a tight vitreoretinal adhesion, has several advantages, with decreased risk and morbidity. SB still seems to surpass Vitrectomy in the treatment of phakic RRD.[13] Pseudo phakic RRD has been associated with poorer prognosis as compared to phakic detachments.[16] This has been attributed to lower pre-operative visual acuity, higher incidence of total and macula-off RDs, and less frequent identification of retinal breaks (Graph 3 Table 3). In our study, pseudophakic RRDs comprised 35% of the total cases but these eyes did not differ from their phakic counterparts in terms of anatomical and visual outcomes. In the PARD study, pseudophakic/aphakic eyes were randomized to primary Vitrectomy or scleral buckling but no significant difference was found in the anatomical success rates after 6 months.[17] The primary success rate of our study was 100%. Chronicity of RD has been reported as a poor prognostic indicator for reattachment surgery.[18] The duration of RD was more than 3 months in 70% of eyes in our study. Factors that seem to hinder retinal reattachment in these eyes are retinal shortening and high viscosity of the sub-retinal fluid (Figure 3). Presence of multiple retinal breaks is an additional risk factor for the development of PVR,[19] which is again a risk for failure of primary surgery. Pre-operative PVR of more than grade C1 and multiple retinal breaks are the predictive factors that influence retinal reattachment.[20] Functional improvement in visual status was noted in 36 cases (90%), 2 cases (5%) remained the same and 2 cases (5%) revealed deterioration in final BCVA (Graph 4 & 5). Although anatomical success rates have improved considerably since PPV was introduced, and there is little evidence that postoperative visual acuities have improved as a result of the technique. This is because postoperative visual acuity continues to depend primarily on pre-operative factors, most of which are beyond the control of the surgeon. The visual outcome depends primarily upon the extent of macular damage caused by the detachment. In most series, 37% to 56% of successfully treated eyes obtain a postoperative vision of at least 20/50 (6/15) (Table 4 & 5).[21] Comparatively, the poorer visual outcome in cases of RD with macula-off following PPV is due to more macular damage than in RD with macula-on.[22] We had 75% cases with macula-off but most of the cases had visual improvement by 2 to 3 lines. Macular detachment also has been found to adversely affect anatomic outcomes of surgery.[23] Limitation of this study is that it was a noncomparative study. Comparative trials with a greater number of patients and longer follow up is need to consolidate the result.

CONCLUSION

RRD is a common cause of blindness which can be managed in recent days by PPV with Endotemponade. The results of our prospective case series seem to indicate that the applied strategy of decision making in cases with rhegmatogenous retinal detachments lead to the high success rate in terms of permanent retinal reattachment and excellent functional outcome (BCVA).

CONFLICT OF INTEREST

None

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