Original Article

Visual Outcomes After Pars Plana Vitrectomy in Fresh versus Longstanding Rhegmatogenous Retinal Detachment: A Prospective Observational Study

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Abstract

Background: Rhegmatogenous retinal detachment (RRD) is a vision-threatening condition requiring urgent surgical intervention. The timing of surgery may influence postoperative visual outcomes. **Objective:** To compare visual outcomes after pars plana vitrectomy (PPV) in fresh RRD (<3 months duration) and longstanding RRD (>3 months duration) cases. **Methods:** A prospective observational study was conducted at the National Institute of Ophthalmology and Hospital, Dhaka (June 2022–May 2023). Ninety patients aged 20–75 years with RRD were enrolled and divided into Group I (fresh RRD, n=50) and Group II (longstanding RRD with proliferative vitreoretinopathy ≤ grade B, n=40). All underwent PPV with silicone oil tamponade. Best-corrected visual acuity (BCVA) was measured preoperatively and at 45 days postoperatively, converted to logMAR for analysis. Statistical tests included chi-square and unpaired t-test; $p<0.05$ was considered significant. **Results:** The mean preoperative BCVA was 1.4 ± 0.6 logMAR in fresh RRD and 2.4 ± 0.6 logMAR in longstanding RRD ($p<0.001$). At 45 days, mean BCVA improved to 0.7 ± 0.5 in fresh RRD versus 1.7 ± 0.4 in longstanding RRD ($p<0.001$). Anatomical success (retinal reattachment) was comparable between groups (fresh: 88.9%, longstanding: 86.1%). **Conclusion:** PPV in fresh RRD yields significantly better postoperative visual outcomes than in longstanding RRD, despite similar anatomical success rates. Early surgical intervention is critical to optimizing visual recovery.

Keywords: Pars plana vitrectomy, rhegmatogenous retinal detachment, visual outcome, proliferative vitreoretinopathy, silicone oil tamponade

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Introduction

Rhegmatogenous retinal detachment (RRD) is an ophthalmic emergency characterized by the separation of the neurosensory retina from the retinal pigment epithelium due to retinal breaks1. The global incidence is estimated at 6–18 per 100,000 people per year, with higher rates in older individuals, those with myopia, or after cataract surgery[2].

Without appropriate diagnosis and prompt treatment, a number of mechanisms can causes blindness in the affected eye. Several surgical Options are available for RRD. By the time, in RRD, complex changes occur in which the retina and vitreous and interact with one another and is characterised by the creation of a retinal hole. Nutrition to photoreceptor cells will be compromised after retinal detachment and photoreceptor cells of the retina will experience apoptosis and degeneration once the posterior

pole is affected. After that, the pigment cells and fibroblasts will proliferate abnormally and, causing irreversible harm to visual function. Blindness occurs if it is not treated soon[7].

There are two types treatments for retinal detachment one is non-incisional procedures and another is incisional procedures. Pneumatic retinopexy as well as laser are two non-incisional techniques that can still be used in some rhegmatogenous retinal detachment (RRD) treatment. In comparison to incisional surgery, non-incisional techniques are employed less frequently by the vitreoretinal surgeon. Scleral buckling (SB) and pars plana vitrectomy (PPV) are two most popular repair techniques. These treatments can either be carried out separately or in combindly[8].

Surgical repair is essential to prevent irreversible photoreceptor loss[3]. The advent of pars plana vitrectomy (PPV) has revolutionized RRD repair by allowing removal of vitreous traction, endolaser photocoagulation, and internal tamponade[4].

Duration of detachment is a critical determinant of visual recovery[5,6]. Fresh RRD (<3 months) is more likely to retain macular function, whereas longstanding RRD (>3 months) often leads to irreversible photoreceptor degeneration[7].

This study compared visual and anatomical outcomes following PPV in fresh versus longstanding RRD in a tertiary hospital of Bangladesh, aiming to inform surgical timing and patient counselling.

Materials & Method

This prospective observational study was conducted at the Department of Vitreo-Retina, National Institute of Ophthalmology and Hospital, Dhaka, Bangladesh, from June 2022 to May 2023. The study population was patients aged 20-75 years who present with Rhegmatogenous Retinal Detachment admitted in NIO&H for pars plana vitrectomy under the department of vitreo-retina, NIO&H. They were divided into two groups-Group I: Fresh RRD — detachment within three months of symptom onset &Group II: Longstanding RRD — detachment >3 months with PVR ≤ grade B. Exclusion Criteria was exudative or tractional retinal detachment, PVR ≥ grade C, significant cataract, optic atrophy, glaucoma, uveitis, vitreous hemorrhage, pediatric patients, and other ocular conditions limiting visual potential. All patients with Rhegmatogenous Retinal Detachment had ophthalmic examination, including Best Corrected Visual Acuity by Snellen's chart then it was converted to log MAR chart, slit-lamp biomicroscope to see eye lids, eyelashes, cornea, conjunctiva, pupil, and lens. Measurement of intraocular pressure with Goldmann applanation tonometer and peripheral retinal examination will be done for proliferative vitreoretinopathy changes, retinal degeneration, retinal breaks (number, type & quadrants) and status of macula, whether detached or not. B-scan and OCT was done wherever required. Measurement of IOP with applanation tonometer and peripheral retinal examination was done. All patients underwent three-port microincision PPV (23G/25G) under local anesthesia. Procedures included core and peripheral vitrectomy, identification and endolaser treatment of retinal breaks, fluid–air exchange, and silicone oil tamponade. Combined phacoemulsification with IOL implantation was performed when indicated. Primary outcome: Change in BCVA (logMAR) at 45 days and 3 months postoperatively. Secondary outcomes: Anatomical success (retinal reattachment) and postoperative complications.

Statistical Analysis: The Statistical Package for Social Sciences (SPSS), version 26 was used to conduct the statistical analyses (SPSS Inc., Chicago, Illinois, USA). The mean ± standard deviation was used to express continuous data, whereas n (%) was used to express categorical variables as frequencies and percentages. Cross tabulation displays the results of the chi-square test, which is used to analyze categorical variables. An unpaired t-test was used to analyze the mean difference between the groups for continuous variables. Considered statistically significant are P values less than 0.05.

Results

Table -I: Comparison of age of the patients between two groups (n=90)

Age of the respondents	Fresh RRD N (%)	Longstanding RRD N (%)	p-value
< 35 years	16 (32.0)	6 (15.0)	0.170 a
35-50 years	15 (30.0)	14 (35.0)	
51 years and above	19 (38.0)	20 (50.0)	
Age (Mean±SD)	43.74± 16.6	50.05± 13.8	0.056b
Total	50 (100)	40 (100.0)	

a Chi square test
b unpaired t test

Table -I illustrates the age comparison of patients between fresh RRD and longstanding RRD cases. The mean age of the longstanding RRD group was higher (50.05±13.8) compared to the fresh RRD group (43.74±16.6), with no statistically significant difference observed ($p \geq 0.05$).

Table -II: Comparison of age of the patients between two groups (n=90)

Sex of the respondents	Fresh RRD N(%)	Long standing RRD N (%)	p-value
Male	26 (52.0)	25 (62.5)	0.318a
Female	24 (48.0)	15 (37.5)	
Total	50 (100.0)	40 (100.0)	

a Chi square test

Table -II presents a comparison of the gender distribution among the patients. In the Fresh RRD group, slightly over half, 26 individuals (52.0%), were male, while 24 (48.0%) were female. In the longstanding RRD group, a majority of the respondents, 25 individuals (62.5%), were male, with only 15 (37.5%) being female. This observation did not yield statistically significant differences ($p \geq 0.05$).

Table -III: Comparison of preoperative findings by groups

Pre-operative findings	Fresh RRD N (%)	Long standing RRD N (%)	p-value
(Mean±SD) Duration of RRD (in days)	35.3±15.9	115.2±22.3	<0.001b
(Mean±SD) Pre operative Visual acuity	1.4±0.6	2.4±0.6	<0.001b

b unpaired t test

Table -III presents a comparison of preoperative findings between two groups. The average duration of rhegmatogenous retinal detachment (RRD) in the fresh RRD group was notably shorter than that in the longstanding RRD group, and this difference held statistical significance ($p=<0.05$). Additionally, the mean preoperative visual acuity in the long-standing RRD group is severely impaired than that of the fresh RRD group with high significance ($p<0.001$).

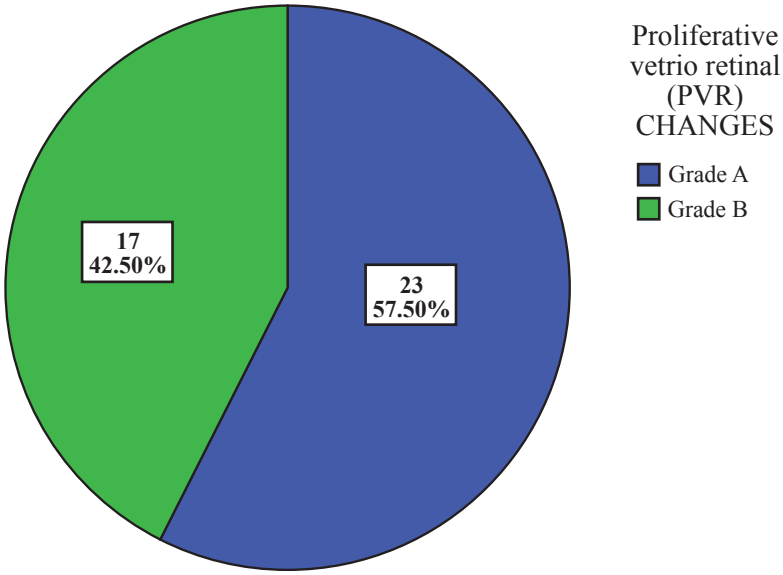

Figure -1: Frequency distribution of PVR changes among longstanding RRD. (n=40)

Figure -1 indicates that within the longstanding rhegmatogenous retinal detachment (RRD) group, the majority, comprising 23 individuals (57.5%), exhibited grade A type of proliferative vitreoretinopathy (PVR) changes, while 17 individuals (42.5%) displayed grade B type of PVR changes.

Table -IV: Comparison of post operative status of retina between two groups (n=90)

Post operative status of retina	Fresh RRD N (%)	Longstanding RRD N (%)	p-value
Attached	45 (90.0)	36 (90.0)	1.000a
Detached	5 (10.0)	4 (10.0)	
Total	50 (100.0)	40 (100.0)	

a Chi square test

Table -IV illustrates the comparison of postoperative retinal status between the two groups. In both the fresh rhegmatogenous retinal detachment (RRD) and longstanding RRD groups, 90.0% of the retinas were successfully reattached, while 10.0% remained detached ($p \geq 0.05$).

Table -V: Comparison of post operative VA by groups

Post operative findings	Fresh RRD N (%)	Longstanding RRD N (%)	p-value
(Mean±SD) Visual acuity at 45	0.7±0.5	1.7±0.4	<0.000a

a Chi square test

Table -V presents a comparison of postoperative observations between the two groups. The mean visual acuity of rhegmatogenous retinal detachment (RRD) in the fresh RRD group (0.7±0.5) was notably better than that in the long-standing RRD group (1.7±0.4), and this difference held statistical significance (p=<0.05).

Discussion

Rhegmatogenous retinal detachment (RRD) is a disorder that can result in blindness and ocular morbidity. If not effectively treated, nearly all Rhegmatogenous retinal detachments result in total blindness. Pars plana vitrectomy is now the most popular choice for treating RRD. The popularity is due to the rapid advancements in vitrectomy tools and systems, such as smaller instruments and improved ways to see inside the eye. These enhancements have combined to increase surgeons' confidence and their capability to perform retinal surgery effectively. Pars plana vitrectomy are widely accepted as a surgical technique due to significant reduction of the perioperative and postoperative complications.

In this study the average age was 46.54 years with range (20-75) years. The mean age of the long-standing RRD group was higher (50.05±13.8) compared to the fresh RRD group (43.74±16.6), with no statistically significant difference observed ($p \geq 0.05$). In the Fresh RRD group, 52.0% individuals were male, while 48.0% were female. Results confirm that early surgical intervention in fresh RRD yields better functional outcomes than in longstanding RRD, despite similar anatomical success rates. This aligns with previous studies, which reported that visual prognosis worsens significantly with increasing duration of macular detachment[5,6]. The poorer visual outcome in longstanding cases is likely due to photoreceptor apoptosis, disruption of the ellipsoid zone, and Müller cell gliosis after prolonged detachment[7]. Even with successful reattachment, these structural changes limit functional recovery[8].

Anatomical reattachment rates in our study were high in both groups, consistent with global reports of 85–95% success for PPV[4,9]. The comparable rates across fresh and longstanding cases highlight advances in surgical instrumentation[10,11], but also emphasize that anatomical success alone is insufficient as a surgical endpoint. Longer operative times in longstanding cases reflect increased complexity, often due to extensive PVR and multiple breaks[12].

Cataract was the most common complication, occurring in around one-third of eyes, as similarly reported by other studies[13,14]. From a public health perspective, these results underscore the need for patient education on early presentation, especially in rural areas where delays are common[2].

Conclusion

PPV for fresh RRD yields significantly superior visual outcomes compared to longstanding RRD, with similar anatomical success rates. Early detection and timely surgery are essential to optimize postoperative vision.

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