Letter to the Editor

Clinical Manifestations and Surgical Outcomes of Primary Rhegmatogenous Retinal Detachment in Patients < 30 Years of Age with High Myopia*

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Primary rhegmatogenous retinal detachment (RRD) is a major cause of visual impairment. Extensive studies have shown that high myopia is a significant risk factor for RRD[1]. A bimodal age distribution of RRD has been reported in Chinese populations, with a major peak in the group of 60–69 years old and a smaller peak in the group of 20–29 years old[2]. A study in China has revealed a similar distribution and further indicated that the proportion and number of patients with RRD and high myopia peaked at the age range of 20–29 years[3]. Correspondingly, a high prevalence of myopia has been reported in Asians aged 20–29 years[4]. Thus, patients < 30 years with RRD and high myopia require special attention. However, limited studies have been conducted on RRD in young individuals with high myopia. Therefore, this study aimed to describe the clinical characteristics and surgical outcomes of patients < 30 years with RRD and high myopia. Furthermore, we focused on various factors that may correlate with surgical outcomes.

This retrospective, single-center, observational study was performed at the Eye and ENT Hospital of Fudan University, Shanghai, China. The medical records for patients ≤ 30 years with high myopia [spherical equivalent (SE) ≤ –6 D or axial length ≥ 26.00 mm] who underwent primary RRD surgery performed by a single senior surgeon (X.H.) from June 2014–December 2018 were consecutively reviewed. This study adhered to the tenets of the Declaration of Helsinki and was approved by the Medical Ethical Committee of the Eye and ENT Hospital of Fudan University. Furthermore, written informed consent was obtained from each patient or their legal representative before the surgery. Patients with a minimum postoperative follow-up period of 6 months were included in this study. The exclusion criteria were retinal detachment (RD) caused by trauma, uveitis, traction, or other congenital abnormalities, such as familial exudative vitreoretinopathy, retinopathy of prematurity, Stickler syndrome, or Marfan syndrome. Patients with a history of ocular surgery for the affected eye within 1 year were also excluded.

The patients underwent either scleral buckling (SB) or pars plana vitrectomy (PPV). The surgical approach was chosen based on clinical and anatomical features and determined at the discretion of the surgeon (X.H.). Generally, eyes with localized RRD associated with small anterior holes or retinal dialysis and without severe PVR are treated with SB. In contrast, the indications for vitrectomy include poor fundal view, severe PVR, and giant or posterior retinal breaks. During SB, patients underwent segmental buckling alone or in combination with encircling buckling using silicone tires. During PPV, patients underwent standard 23-gauge vitrectomy (Constellation; Alcon Laboratories, Fort Worth, TX, USA) using air, perfluoropropane (C3F8), or silicone oil (SO) endotamponade. Anatomical outcome measures included primary anatomical success (PAS), defined as a completely attached retina after the first surgery at the last follow-up, and final anatomical success (FAS), defined as a completely attached retina at the end of the follow-up period, regardless of the number of surgeries. PAS and FAS were considered only after the removal of the intraocular SO in cases involving SO endotamponade.

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Data collected from patient medical records included age, sex, axial length, refractive error, symptom duration, pre- and postoperative best-corrected visual acuity (BCVA), pre- and postoperative intraocular pressure (IOP), lens status, RD extent, RD maximum height (defined as the distance from the peak of RD to the wall of the eye, as measured using B-ultrasound), macular status (as determined by clinical examination or optical coherence tomography), retinal tear number, proliferative vitreoretinopathy (PVR) presence, endotamponade usage, and postoperative complications.

Data were analyzed using statistical software (SPSS version 18; IBM Corporation, Armonk, NY, USA). The comparison of pre-operative and postoperative BCVA was performed using the Wilcoxon signed-rank test. Pearson's chi-square test or Fisher's exact test was used to compare the clinical characteristics between the two groups. The correlations between pre-operative and postoperative BCVA were analyzed using Spearman's correlation coefficient. Multivariable logistic regression analysis was performed to identify the factors associated with surgical outcomes. A *P*-value < 0.05 was considered to be statistically significant.

This study included 85 eyes of 76 patients aged < 30 years with high myopia. The characteristics of the study participants are summarized in Supplementary Table S1, available in www. besjournal.com. The high incidence of bilateral involvement (20.1% of 76 patients) was a notable feature of our patient cohort, with figures ranging from 0%–26% (mean, 9%) in previous reports[5]. This discrepancy may be related to the different inclusion criteria and the limitation to patients < 30 years with primary RRD and high myopia. Genetic susceptibility factors influence the development of high myopia at a young age, leading to abnormal characteristics of vitreoretinal development, such as the earlier occurrence of vitreous liquefaction and heightened risk of retinal degeneration.

The clinical characteristics of patients with RRD and their respective features are shown in Table 1. In our study, round holes were the predominant type of retinal break; however, horseshoe and giant tears were observed in 22 (25.8%) and 6 (7.1%) eyes, respectively. Retinal tears often result from vitreoretinal traction during a posterior vitreous detachment (PVD), suggesting the occurrence of PVDs in this population. PVD has been detected using optical coherence tomography in young patients with high myopia[6].

Visual acuities before surgery and at the last visit are summarized in Table 2A. Our results showed that 41 (48.2%) and 79 (92.9%) eyes achieved 20/40 and 20/200 or better visual acuity, respectively, at the last follow-up, and the visual outcomes in our study were favorable compared to the findings of previous reports[7]. Furthermore, Tsai et al. have reported that 26 (50.0%) and 42 (82.6%) eyes with RRD in the pediatric population achieved a BCVA of 20/40 and 20/200 or better, respectively[7], and 24.3% of highly myopic eyes had a final BCVA of 20/200 or worse. According to the logistic regression analysis (Table 2B), a macula-off status and PVR grade of C or D were the two pre-operative factors significantly associated with poor visual outcomes in our study, similar to the findings of previous studies[5]. Fortunately, favorable anatomical outcomes can be achieved with surgery for primary RRD in young patients with high myopia. The PAS and FAS rates were 90.6% and 98.8%, respectively, similar to those reported previously[7].

The surgeries performed are listed in Tables 3–4. Under favorable conditions, SB continues to be the first-line treatment for young patients with RRD. Most patients (63.5%) were treated with SB, which is consistent with the current treatment strategy for RRD[5,7]. This is because strong vitreoretinal adhesions in most young patients make vitrectomy challenging, and the risk of complications, such as cataract formation and elevated IOP, increases after PPV. These complications reduce the quality of life of young patients with long remaining lifespans. Nevertheless, SB, a classical and less invasive surgery than PPV, remains an effective treatment for RRD in select cases, especially in young patients[7]. Moreover, Heimann et al. have showed that greater BCVA improvement was achieved in phakic eyes in the SB group than in the PPV group[8]. However, vitrectomy has been suggested for complicated cases involving media haze, severe PVR, and multiple or posterior breaks. In this study, our patient underwent a second surgery because of PVR.

Twenty-four (28.2%) eyes had postoperative ocular hypertension; among them, 10 (11.8%) eyes had transiently raised IOP, 13 (15.3%) had medically controlled ocular hypertension, and 1 (1.2%) underwent Ahmed glaucoma valve implantation surgery because of medically uncontrolled ocular hypertension. The incidence of ocular hypertension in our study was higher than that in previous reports[7]. In Tsai's study, 10 (6%) eyes had transient ocular hypertension, and

10 (6%) eyes had postoperative glaucoma[7]. In this study, multivariable logistic regression analysis (Supplementary Table S2, available in www.besjournal.com) showed that PPV was associated with greater odds of postoperative ocular hypertension (*OR* = 33.42; 95% *CI*, 2.15–520.52; *P* = 0.012). Two factors should be considered when interpreting this result: first, most of our PPV procedures were combined with SO tamponade, and previous studies have shown that ocular hypertension is a common postoperative complication of SO tamponade[9]; second, all patients included in our study were highly myopic, and high myopia is a risk factor for ocular hypertension after PPV[10]. In addition, 14 (16.50%) eyes had cataract formation, 13 cases of which occurred after PPV and cataract surgery was performed during follow-up.

Our study had certain limitations. First, it was a retrospective study with a limited number of patients. Moreover, selection bias may have existed because this was a single-center study and a single surgeon performed all surgeries. Despite these limitations, this study enriches the understanding of the clinical characteristics and surgical outcomes of primary RRD in patients < 30 years with high myopia.

The results revealed that good anatomical and functional outcomes can be achieved with surgery for primary RRD in patients < 30 years with high myopia. The macula-off status and PVR grade of C or D correlated with a greater likelihood of poor visual outcomes. PPV conferred a higher risk of postoperative ocular hypertension.

Table 1. General clinical characteristics of patients with rhegmatogenous retinal detachment and the respective features of patients undergoing SB and vitrectomy

Characteristics	No. of eyes (*n* = 85 eyes)	SB (*n* = 54 eyes)	PPV (*n* = 31 eyes)
Symptom duration (days, mean ± SD)	40.11 ± 70.91 (range, 2–360; median, 14)	55.04 ± 85.41	14.10 ± 9.48
Pathology, *n* (%)			
Single break	36 (42.4)	34 (63.0)	2 (6.5)
Single round hole	32 (37.7)		
Single horseshoe tear	4 (4.7)		
Multiple breaks	43 (50.6)	20 (37.0)	23 (74.2)
Multiple holes	25 (29.4)		
Multiple holes and tears	11 (12.9)		
Multiple horseshoe tears	7 (8.2)		
Giant retinal tear	6 (7.1)	0 (0)	6 (19.4)
Total	85 (100)	54 (100)	31(100)
Macula, *n* (%)			
On (fovea uninvolved)	22 (25.9)	19 (35.2)	3 (9.7)
Off (fovea involved)	63 (74.1)	35 (64.8)	27 (87.1)
PVR grade C or D	30 (35.3)	13 (24.1)	17 (54.8)
RD extent, *n* (%)			
1 quadrant	28 (32.9)	23 (42.6)	5 (16.1)
2 quadrants	32 (37.6)	26 (48.1)	6 (19.4)
3 quadrants	15 (17.6)	4 (7.4)	11 (35.5)
4 quadrants	10 (11.8)	1 (1.9)	9 (29.0)
Total, *n* (%)	85 (100)	54 (100)	31 (100)
Maximum height of RD (mm, mean ± SD)	3.37 ± 2.56†	2.46 ± 1.11	5.07 ± 3.49

Note. Data on the maximum height of RD in 83 eyes were available. PPV, pars plana vitrectomy; PVR, proliferative vitreoretinopathy; RD, retinal detachment; SB, scleral buckling.

Table 2A. Visual acuity before operation and at the last visit

BCVA	Mean Preoperative BCVA (*n* = 85)	Mean Final BCVA (*n* = 85)	*P*
LogMAR VA	1.16 ± 0.78	0.47 ± 0.47	< 0.001
Snellen VA			
≥ 20/40	16 (18.8%)	41 (48.2%)	
20/200–20/40	29 (34.1%)	38 (44.7%)	
< 20/200	45 (47.1%)	6 (7.1%)	

Note. BCVA, best-corrected visual acuity; logMAR, logarithm of the minimal angle of resolution; VA, visual acuity.

Table 2B. Multivariable logistic regression analysis of risk factors for a final postoperative BCVA worse than 20/40

Risk factor	*OR*	95% *CI*	*P*
Macula-off status	7.86	1.64–37.80	0.010
PVR grade C or D	3.51	1.04–11.90	0.044
RD extent			
1 quadrant	1.00		
2 quadrants	1.23	0.32–4.48	0.765
3 quadrants	2.25	0.27–18.73	0.452
4 quadrants	0.42	0.47–3.68	0.432
RD maximum height (mm)	1.03	0.80–1.33	0.835
PPV	0.58	0.14–2.42	0.459

Note. BCVA, best-corrected visual acuity; *CI*, confidence interval; *OR*, odds ratio; PPV, pars plana vitrectomy; PVR, proliferative vitreoretinopathy; RD, retinal detachment.

Table 3. RD surgery performed

RD surgery performed	No. of eyes, *n* (%)
Primary surgery	
SB	54 (63.5)
Segmental	49 (57.6)
Segmental + encircling	5 (5.9)
PPV	31 (36.5)
PPV + AIR	1 (1.2)
PPV + C3F8	8 (9.4)
PPV + SO	22 (25.9)
Second surgery	
PPV + AIR	1 (1.2)
PPV + C3F8	2 (2.4)
PPV + SO	5 (5.9)
Third surgery	
PPV + C3F8	1 (1.2)

Note. *N* = 85; C3F8, perfluoropropane; PPV, pars plana vitrectomy; SB, scleral buckling; SO, silicone oil; RD, retinal detachment.

Table 4. Additional surgical procedures performed during the follow-up period after the primary surgery

Additional surgery	No. of eyes, *n* (%)
SOR	26* (30.6)
Cataract surgery	14 (16.5)
LC + SOR	3 (3.5)
Phaco + SOR	1 (1.2)
Phaco + IOL + SOR	3 (3.5)
Phaco + IOL	7 (8.2)
Glaucoma filtering surgery	1 (1.2)

Note. *N* = 85; *The total number of eyes filled with silicone oil was 27. IOL, intraocular lens; LC, lensectomy; Phaco, phacoemulsification; SOR, silicone oil removal.

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