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Effect of surgical modality on visual outcomes for young patients with primary rhegmatogenous retinal detachments: a retrospective cohort study

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ABSTRACT

Objective To examine outcomes of different surgical modalities for correcting primary rhegmatogenous retinal detachments in patients younger than 50 years of age.

Methods and analysis A single-centre, retrospective, cohort study of 754 patients who underwent retinal surgery at the University of Virginia Hospital between 1 July 2012 and 1 July 2020 was conducted. Exclusion criteria were patients less than 18 or over 50 years of age, repeat detachments, second eyes of patients with bilateral detachments and follow-up less than 3 months. A multivariate regression model was used to compare overall outcomes in patients.

Results 86 patients met inclusion criteria and of those, 38 (44%) underwent vitrectomy, 22 (26%) underwent scleral buckling, 13 (15%) underwent pneumatic retinopexy and 13 (15%) underwent combined scleral buckle and vitrectomy repair. Comparison of eye-level parameters among the procedure groups shows difference with respect to macular involvement ($p<0.05$) but not regarding clock hour involvement or giant tear status ($p>0.05$). Preoperative visual acuity was superior in the scleral buckle group compared with vitrectomy ($p<0.001$). Mean postoperative visual acuity improved with all procedures and all repair procedures had comparable rates of complication. The mean overall anatomical success rate was 73% (n=63) and comparable among all modalities.

Conclusions Vitrectomy, scleral buckle, pneumatic retinopexy or combined procedures are viable repair options for rhegmatogenous retinal detachments in patients younger than 50 years of age. Selection of the repair modality should be guided on baseline clinical features of the patient and detachment.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Rhegmatogenous retinal detachment (RRD) is a surgical emergency that becomes increasingly more common with advanced patient age.
⇒ There have been few studies examining outcomes of scleral buckling, pars plana vitrectomy and pneumatic retinopexy in young patients due to lower incidence of retinal detachment in this cohort.

WHAT THIS STUDY ADDS

⇒ Vitrectomy, scleral buckling, pneumatic retinopexy and combined repairs are viable options without differences in intraocular pressure or complication-related outcomes.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This study supports the notion that all four repair procedures have a role in anatomical reattachment of RRD in younger patients.
⇒ Surgical planning to correct RRD in patients <50 years of age should include assessment of other clinical factors in picking surgical modality as opposed to relying on patient age alone.

INTRODUCTION

Rhegmatogenous retinal detachment (RRD) is a serious condition which is caused by separation of the neurosensory retina from the underlying retinal pigment epithelium.[1] Surgical interventions for RRD include scleral buckling (SB), pars plana vitrectomy (PPV), pneumatic retinopexy (PR) or a combination of these techniques.[2] Vitrectomy tends to be the first-line surgery for RRD in patients ≥50 years of age while SB is often considered the first-line surgery for patients <50 years of age. This approach is predicated on the presence or absence of posterior vitreous detachment (PVD) at the time of repair, where patients who do not yet have PVD may be preferentially treated with SB while those with a PVD may undergo repair with either PPV or SB.[3]

Thus far, many studies have explored the efficacy of surgical procedures in repairing RRD and the anatomical success rates of these procedures are overall similar.[4–7] Given that ageing and PVD are major risk factors for retinal detachment, sample sizes for young

(<50 years of age) patients are under-represented in these studies and the effect of age on RRD outcomes remains less clear.[8 9] Some studies have indicated that older age is associated with worse outcomes,[10] while others have shown younger patients have worse outcomes or that there is no difference between the two populations.[11–13]

There have been few studies comparing outcomes of SB, PPV and PR in young patients given the relative rarity of primary RRDs in younger patients. Election of treatment options for young patients tend to ultimately revolve around surgeons' preference or facilities'availability.[3] A recent French single-centre case series in 111 eyes in 99 patients aged 18–40 demonstrates a common preference for SB (n=66, 59%) procedures in this population. Cataract progression in this study was noted only in patients receiving their second or third vitrectomy repair (n=3, 2.7%).[14] Combined SB–PPV is traditionally reserved for more complex surgical cases, including patients with Stickler's syndrome due to their vitreous abnormalities. However, vitrectomy technology continues to develop, offering smaller gauge instrumentation, wide-angle viewing systems and better illumination, and PPV alone may reasonably become an increasingly popular option in this cohort, offering a quicker procedure, less pain and shorter recovery compared with SB.[15]

Currently, it remains unclear how young age effects primary RRD repair and evidence comparing surgical approaches in this population is lacking. This study seeks to add to the limited data on primary RRD repair outcomes in a real-world setting in patients younger than 50 years of age by examining safety and efficacy of each treatment approach with focus on visual acuity, intraocular pressure (IOP) measurements, and complication rates.

METHODS

Data set characteristics

A single-centre, retrospective, cohort study of 754 patients who had underwent retinal surgery at the University of Virginia Hospital between 1 July 2012 and 1 July 2020 was conducted. Data collection and analysis were performed in concordance with the University of Virginia Institutional Review Board. This research adhered to the tenets of the Declaration of Helsinki and was conducted in accordance with regulations set forth by the Health Insurance Portability and Accountability Act.

Data collection

Variables collected included patient demographics, ocular history, clinical characteristics, surgical and pharmacological treatments received and postoperative complications. Inclusion criteria were patients aged 18–50 undergoing primary repair of RRD at the University of Virginia within the study period. Exclusion criteria were patients less than 18 or over 50 years of age, repeat detachments, second eye in patients with bilateral detachments and follow-up less than 3 months (figure 1). Patients with Stickler's or other syndromic retinal detachments were included in this study, but those with inherent retinal disease that would affect their visual acuity outcome and retinal integrity such as retinitis pigmentosa and X-linked retinoschisis were excluded. Patient were placed into four groups based on the surgical procedure used including PR, SB, vitrectomy or combined vitrectomy and SB. As only primary repairs were included in this study, outcomes of repeat surgeries after initial failed repair were not considered.

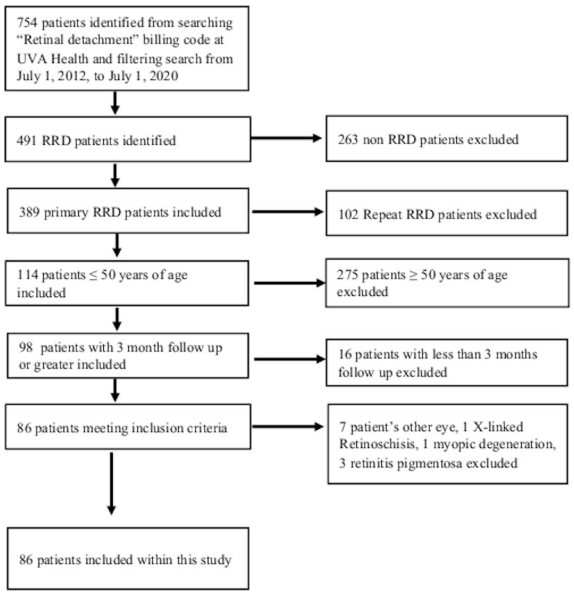

Figure 1 Flow sheet demonstrating number of patients excluded by each exclusion criterion. RRD, rhegmatogenous retinal detachment; UVA, University of Virginia.

Statistical analyses

Data summarisation

Categorical patient characteristics are summarised by empirical frequencies and empirical relative frequencies. Ordinal and continuous scaled patient characteristics are summarised by the mean and SD of the empirical distributions.

Baseline characteristics and postoperative complication

Pearson's exact tests and Fisher's exact tests were used to compare the frequency distributions of the patient baseline characteristics between patients with different surgical procedures performed. A $p \leq 0.05$ significance level was defined as the criterion null hypothesis rejection.

Visual acuity analyses

Visual acuity was assessed on the logMAR scale. Using a standardised protocol, Snellen scale visual acuity was converted to logMAR equivalents. Visual acuity classifications of count fingers, hand motion, light perception and no light perception were converted to 2.0, 2.4, 2.7 and 3.0, on the logMAR scale, respectively.[16] Measurements of visual acuity were obtained preprocedure, and

postoperatively on days 1 and 7 and months 1, 2, 3, 6 and 12 postprocedure, as well as at final visit.

Preprocedure visual acuity was compared between the four different procedures (ie, PPV, SB, PR or combined (SB–PPV) by way of one-way analysis of variance. An F-test was used to test the global null hypothesis that the mean preprocedure visual acuity was the same irrespective of the procedure.

Postoperative visual acuity and the change in post visual acuity was compared between the four different procedures (ie, PPV, SB, PR or SB–PPV by way of a linear mixed model (LMM). The LMM was specified so that age adjusted mean visual acuity could be compared between the four different procedures at each postoperative visual acuity assessment time point (days 1 and 7, and months 1, 2, 3, 6 and 12 postprocedure). Hypothesis testing was conducted via a set of age adjusted differences in the LMM least squares mean. Per set of between-procedure comparisons, a global contrast of means was first conducted to test the null hypothesis that the mean visual acuities of the two procedures (eg, vitrectomy vs SB) did not differ at any of the postoperative assessment time points. If this global hypothesis was rejected at the p≤0.05 significance level, then a set of linear contrasts were constructed to identify at which postoperative visual acuity assessment time points the mean visual acuities differed between the two procedures. A Bonferroni corrected significance level of p≤0.05 was used as the null hypothesis rejection criterion for the post-operative visual acuity assessment time point between-group comparisons.

Final postoperative visual acuity was compared between the four different procedures via one-way analysis of covariance (ANCOVA). The between-procedure comparisons of final visual acuity were standardised to a common length of follow-up time and a p≤0.05 significance level was used as the null hypothesis rejection criterion.

Age related postoperative change in visual acuity (ie, logMAR) was assessed at 3, 6 and 12 months postprocedure via an LMM analysis. For the LMM analysis, patients were split into three equally spaced age category groups for statistical comparison based on the global distribution frequencies: <30 years, 30–40 years and >40 years. Postoperative changes in mean visual acuity were compared between the three different patient age group via a set of linear contrasts of the LMM least-squares means.

Comparisons of final visual acuity between the three different age groups of patients was conducted via one-way ANCOVA. The between-procedure comparisons of final visual acuity were standardised to a common length of follow-up time and a p≤0.05 significance level was used as the null hypothesis rejection criterion.

Post-operative complication

Pearson's exact tests and Fisher's exact tests were used to compare the frequency distributions of the postoperative complications between patients with different surgical procedures performed. A p≤0.05 significance level was defined as the criterion null hypothesis rejection. All p values reported in the results represent Bonferroni-corrected values.

RESULTS

Patient and operation characteristics

Of the 754 patients whose chart were reviewed, 86 patients met inclusion/exclusion criteria and were included in this study (figure 1). Patient demographics and history were characterised in (table 1). Overall, 53 patients were men (61.6%), and 33 patients were women (38.4%) with mean age 36.5±9.7 (median 37 years). Relevant baseline history included prior cataract surgery in 21 patients (23.2%), glaucoma in 10 patients (11.6%) and macular oedema in 4 patients (4.65%). The retinal detachments were found to have multiple tears in 21 cases (24.4%), macular involvement in 54 cases (62.8%) and giant tears in 7 (8.14%) cases. Recent injury or associated trauma was reported in 11.6% of cases (n=10).

Of the 86 study participants, vitrectomy was performed in 38 (44.2%), SB in 22 (25.6%), PR in 13 (15.1%) and combined SB and vitrectomy in 13 cases (15.1%). Tamponade agents used included SF6 (n=5, 13.9%), C3F8 (n=19, 50.7%) and silicone oil (n=14, 36.8%) in patients undergoing vitrectomy alone compared with C3F8 (n=7, 53.8%) or silicone oil (n=6, 46.2%) in patients undergoing combined repair. Silicone oil ultimately was removed in 5 (35.7%) of vitrectomy cases and 3 (50.0%) of combined cases at mean time 14.62±13.66 and 10.19±7.72 months, respectively. A total of five eyes in the vitrectomy and combined SB and vitrectomy groups had previously undergone vitrectomy prior to this study due to either vitreous haemorrhages or globe ruptures. The presence of prior cataract surgery was more prevalent in patients undergoing vitrectomy (p=0.010) and combined repair (p=0.019) compared with SB alone. Comparison of eye-level parameters among the four procedure groups shows greater proportion of cases with macular involvement being treated with vitrectomy (p-0.024) or combination repair (p=0.015) compared with PR. There was also a greater proportion of multiple tears in eyes undergoing combined repair compared with vitrectomy (p=0.014) and PR (p=0.006). No baseline significant differences were found regarding giant tear status or clock hour involvement (p>0.05).

Visual acuity

Visual acuity outcomes of patients undergoing detachment repair with vitrectomy versus SB alone were specifically compared in our statistical analysis. These groups were chosen given the relative paucity of patients undergoing of PR and combined repair procedures performed in this study. Mean postoperative visual acuity is described in (table 2). Mean preoperative visual acuity was worse in patients undergoing vitrectomy (logMAR 1.61, Snellen 20/814) compared with SB (logMAR .95, Snellen 20/178) (p<0.001). Age-adjusted comparison reveals trends towards superior final visual acuity in the SB group without statistical significance (p=0.055)

Table 1 Patient demographic information, ocular history and detachment characterstics

		Overall	Vitrectomy (n=38)	Scleral buckle (n=22)	Pneumatic retinopexy (n=13)	Combined scleral buckle and vitrectomy (n=13)
Demographics	Male	53 (61.6%)	30 (78.9%)	12 (54.5%)	4 (30.8%)	7 (53.0%)
	Female	33 (38.4%)	8 (21.1%)	10 (45.5%)	9 (69.2%)	6 (46.2%)
	Mean age	36.5±9.7	38.4±9.6	31.1±8.2	38.4±10.7	36.8±9.7
	Age 18–29	23 (26.7%)	7 (18.4%)	8 (36.4%)	3 (23.1%)	5 (38.5%)
	Age 30–39	25 (29.1%)	11 (28.9%)	10 (45.5%)	3 (23.1%)	1 (7.6%)
	Age 40–50	38 (44.2%)	20 (52.6%)	4 (18.2%)	7 (53.8%)	7 (53.8%)
Patient history	Prior vitrectomy	3 (3.49%)	2 (5.26%)	0 (0%)	0 (0%)	1 (7.69%)
	Prior glaucoma surgery	3 (3.49%)	2 (5.26%)	0 (0%)	0 (0%)	1 (7.69%)
	Prior cataract surgery*	21 (23.2%)	13 (34.2%)	1 (4.54%)	2 (15.4%)	5 (35.7%)
	Uveitis	7 (8.14%)	5 (13.2%)	0 (0%)	2 (15.4%)	0 (0%)
	Prior ocular injury	7 (8.14%)	5 (13.9%)	1 (4.54%)	0 (0%)	1 (7.69%)
	Macular oedema	4 (4.65%)	4 (10.5%)	0 (0 %)	0 (0%)	0 (0 %)
	Glaucoma	10 (11.6%)	5 (13.2%)	2 (9.09%)	1 (7.69%)	2 (15.4%)
Detachment characteristics	Multiple tears*	21 (24.4%)	4 (11.0%)	7 (31.8%)	4 (33.3%)	6 (46.2%)
	Macular involvement*	54 (62.8%)	26 (68.4%)	13 (59.1%)	4 (30.8%)	11 (84.6%)
	Giant tear	7 (8.14%)	5 (13.2%)	0 (0%)	0 (0%)	2 (15.4%)
	1–3 clock hour involved	36 (58.1%)	11 (40.7%)	10 (66.7%)	6 (60.0%)	9 (90.0%)
	4–7 clock hours involved	22 (35.5%)	14 (51.9%)	4 (26.7%)	3 (30.0%)	1 (10.0%)
	≥8 clock hours involved	4 (6.45%)	2 (7.41%)	1 (6.67%)	1 (10.0%)	0 (0%)

*Global p<0.05.

. Improvement in visual acuity from baseline was calculated using the final visual acuity. Global comparisons from baselines revealed significant changes from preoperative visual acuity for both vitrectomy (p<0.001) and SB groups (p=0.002). However, at the 12 months postoperative endpoint specifically, only the vitrectomy cases were found to have significant pre-to-post visual acuity change. Segregated visual acuity analysis of vitrectomy versus

Table 2 Mean postoperative visual acuity in patients receiving pars plana vitrectomy and scleral buckle procedures

	Vitrectomy					Scleral buckle					Significance† Vitrectomy vs scleral buckle
	n	Mean (logMAR)	SD (logMAR)	Snellen	Significance*	n	Mean (logMAR)	SD (logMAR)	Snellen	Significance*	
Preoperative	38	1.61	0.73	20/814	–	22	0.95	0.84	20/178	–	<0.001
POM3	31	1.23	0.75	20/339	0.050	20	0.68	0.64	20/95	1.000	0.027
POM6	30	1.10	0.80	20/251	0.011	16	0.77	0.73	20/117	0.567	0.077
POM12	26	1.05	0.80	20/224	0.012	12	0.52	0.47	20/66	0.422	0.254
Final visit	38	1.19	0.98	20/309		22	0.58	0.73	20/76		0.055
	Global comparison—any change from preoperative: <0.001					Global comparison—any change from preoperative: 0.002					

*Within-group comparison from baseline.
†Between-group comparisons between operative procedure.
POM, postoperative month.

SB repair based on macular involvement is described in online supplemental table 1. Additional visual acuity outcomes for PR and combined SB and vitrectomy repair are detailed in online supplemental table 2.

Patient age was also evaluated as an independent predictor of visual outcome across all procedures and did not identify significant differences in final mean postoperative visual acuity among age groups (table 3). However, less improvement in visual acuity from baseline was observed at the final visit for patients age 18–29 (−0.15±0.54) compared with those >40 years old (−0.67±0.75) (online supplemental table 3)). Regarding patient age as a predictor in SB outcomes, specifically, no significant differences in mean postoperative visual acuity or amount of improvement from baseline was found comparing patients from different age categories.

Other factors considered in the evaluation of visual outcomes included average surgical duration and characteristics of the retinal detachment itself such as the presence of inferior detachment, multiple tears or giant tears. None of these variables were found to significantly influence the mean postoperative visual acuity and degree of visual acuity improvement from baseline throughout the follow-up period.

IOP

IOP was compared across the four procedure groups preoperatively, throughout the 1-year postoperative period, and at final visit. No significant differences were observed among patients undergoing vitrectomy, SB, PR or combined SB and vitrectomy with respect to mean preoperative IOP, postoperative month 12 IOP or final visit IOP.

Complications

Postoperative complications identified in this study included re-detachment, need for second surgery, development of cystoid macular edema (CME), epiretinal membrane (ERM) or cataract. Complication risks were evaluated with respect to operative procedure (table 4). All repair procedures had equal rates of postoperative complication (p>0.05). Re-detachment occurred in 23 cases (26.7%) overall at mean time 5 months postoperative and was mostly attributable to development of proliferative vitreoretinopathy (n=7), or new breaks or tears (n=6). Re-operation was pursued in 91% of these cases whereas second surgery was deferred for the others due to either the physician's decision to monitor or patient preference. While no statistical differences were observed in re-detachment rate (p=0.598) or time until re-detachment (p=0.383) among the four repair procedures, vitrectomy (n=8, 21.1%) and combined repair (n=3, 23.1%) trended towards lower rates of re-detachment compared with SB (n=7, 31.8%) and PR (n=5, 38.5%). Severe detachment indicators such as multiple tear status, giant tear status, inferior tear status and surgical duration were also evaluated as predictors of complications with respect to each operative procedure

Table 3 Visual outcomes in patients undergoing any rhegmatogenous retinal detachment repair separated by age group

	Patient age group													
	18–29					30–39				40–50				
	n	Mean (logMAR)	SD (logMAR)	Snellen	Significance*	n	Mean (logMAR)	SD (logMAR)	Snellen	Significance*	n	Mean (logMAR)	SD (logMAR)	Snellen	Significance*
Preoperative	23	1.13	0.75	20/269	–	25	1.01	0.77	20/204	–	38	1.32	0.78	20/417	–
POM3	23	1.01	0.84	20/204	0.815	23	0.94	0.77	20/174	0.561	28	0.76	0.73	20/115	<0.001
POM6	16	1.1	0.73	20/251	0.385	19	0.71	0.66	20/102	0.177	23	0.76	0.7	20/115	<0.001
POM12	23	1.04	0.81	20/129	0.719	23	0.94	0.68	20/174	0.038	30	0.85	0.74	20/141	<0.001
Final visit	23	0.8	0.75	20/126		25	0.6	0.69	20/79		38	0.64	0.7		<0.001

*Within-group comparison from baseline.
POM, postoperative month.

Table 4 Postoperative complications in patients receiving vitrectomy, scleral buckle and pnuematic retinopexy

		Re-detachment	CME	ERM	Cataract
Procedure	Vitrectomy	8 (21.1%)	4 (10.5%)	10 (26.3%)	12 (48.0%)
	Scleral buckle	7 (31.8%)	0 (0)	1 (4.54%)	3 (14.3%)
	Pneumatic retinopexy	5 (38.5%)	0 (0)	1 (7.7%)	2 (22.0%)
	Combined	3 (23.1%)	1 (7.7%)	3 (23.1%)	5 (62.5%)

Percentages calculated based on total number of patients undergoing each procedure. For cataracts, only phakic patients considered.
CME, Cystitis Macular Edema; ERM, Epiretinal Membrane.

(online supplemental table 4) with no statistical significances observed.

DISCUSSION

In our population of patients aged 18–50 years, each intervention was found to have favourable visual acuity and safety outcomes, given the proper surgical procedure was selected for treatment. Age less than 30 appears to be a negative prognostic indicator for visual improvement from baseline overall. The overall anatomical success rate was 73.2% without statistical difference among repair procedures.

Evidence-based approach for treatment of primary RRD repair in younger patients remains a challenge as patients under 50 years have traditionally been undersampled in the past surgical outcomes analyses. Various parameters may factor into selection of optimal repair procedure for patients under 50 years of age including the presence or absence of PVD, age, lens status, chronicity of detachment, presence of proliferative vitreoretinopathy, location and number of retinal breaks, surgeon comfort or facilities' availability. Analysis of our cohort reveals superior baseline visual acuity among patients selected for SB repair versus vitrectomy, which may be related to fewer PVDs in the SB group. Lack of PVD may lead to slower progression of detachment which may delay damage to photoreceptors. IOP and complication rates analyses did not find significant safety differences among PPV, SB, PR or SB–PPV. While efficacy analysis of PR and SB–PPV is limited in this study due to smaller sample sizes (n=13), the overall outcomes in this study appear relatively comparable among the four procedures with the rate of detachment being equivalent if not lower in patients undergoing vitrectomy and combined repair, provided that the proper surgical procedure was selected for treatment. Surgeries planned for RRD in younger patients should be guided based on presenting clinical features rather than age alone.

Our results for patient outcomes are similar to those found in the limited literature comparing these surgical treatment options specifically in patients younger than 50 years of age. The re-detachment rate of 26.7% observed in this study is quite high compared with adults emphasising the worse visual prognosis in younger patients after RRD, but value is similar and consistent with the 33.3% (n=37) anatomic failure rate for primary repair observed in a recent retrospective case series of eyes undergoing retinal detachment repair in patients age 18–40.[14]

While we did not find a difference in the rate of postoperative cataract formation between SB and vitrectomy, a recent study evaluating surgical outcomes with SB or PPV in younger patients with RRD with a mean age of 33.0±11.8 years reported a higher incidence of postoperative cataracts following PPV while all else was similar.[3] A higher proportion of PPV cases in our cohort had already undergone cataract surgery previously, suggesting increased use of this approach when cataract progression is no longer a concern. A recent retrospective study evaluating over 600 eyes found higher anatomical success rates in pseudophakic eyes with PPV alone compared with SB alone, although they did not evaluate these findings in younger patients specifically.[17]

In comparison to a retrospective analysis evaluating SB versus PPV for RRD repair in patients under 50 years of age from Japan,[3] we report similar superior preoperative and final visual acuity in the SB group compared with PPV with similar preference for PPV in patients with macular involvement. In addition, we describe outcomes for PR and SB–PPV repair and find no difference in postoperative visual outcome between SB–PPV versus PPV alone, consistent with the findings in a different previous study looking at RRD repair outcomes in vitrectomy versus combined repairs.[18] Notably, however, this study evaluated patients less than 40 years of age. In our study using a cut-off of 50 years of age, we found less postoperative improvement from baseline visual activity for patients less than 30 years of age in comparison to those older than 40 years of age, across all procedures, which would be helpful for counselling patients on visual outcomes. Further separating out this age difference may also allow for identifying other characteristics that need to be taken into consideration for what postoperative outcomes can be expected for individual patients.

Several limitations exist with this study including its retrospective design. As only the small minority of PPV cases occur in younger adults, appropriate sample size remains a challenge in this study considering only about one in eight reviewed charts met criteria for primary RRD repair in a patient aged 18–50 years old. With a total sample size of 86 eyes, our study remains low-powered and warrants future studies of larger sample size to further evaluate outcomes.

Our aim in this study was to characterise a real-world experience for treating retinal detachment in younger patients which may be inherently different from older population. Thus, we chose to include traditionally atypical RRD cases such as Stickler's patients, traumatic retinal detachment, those with prior globe rupture, vitreous haemorrhage or giant tears in this study in order to provide a practical depiction of the spectrum of retinal detachment in patients between the age of 18 and 50. While these cases may not represent standard primary RRD repair in the general population, we felt inclusion of these cases highlights a unique features and considerations for RRD repair in our cohort, as younger age is typically associated with both higher incidence of traumatic retinal detachments, iant retinal tears, and abnormal vitreoretinal interface.

It is also important to consider that repair selection was made based on individual clinical features of both patient and detachment. While, the decision to perform combined repair over PPV alone may be obvious in certain cases such as in patients with Stickler's syndrome, the specific clinical features and thought processes contributing to the surgeons' decision to perform combined SB and vitrectomy versus vitrectomy alone may not always be evident for each specific case in this retrospective review. Further research may continue to explore and compare the available surgical modalities for RRD repair in young patients and evaluate potential contributors to poor outcomes in this group such as high myopia or syndromic retinal detachments.

CONCLUSIONS

In conclusion, in our cohort of young patients similar anatomical outcomes were seen in patients undergoing vitrectomy, SB, PR and combined procedures which all appeared to be viable repair options when guided by clinical features of detachment, even in this young age group.

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Contributors RTD devised the study, collected data and contributed to the analysis, discussion, main interpretation of results and writing of the manuscript. OE assisted with data collection and contributed to writing of the manuscript. ABN assisted with data collection and contributed to writing of the manuscript. JDB assisted with data collection and contributed to writing of the manuscript. JTP assisted with data collection and contributed to writing of the manuscript. Y(E)S devised the study and contributed to the analysis, discussion, main interpretation of results and writing of the article and is responsible for the overall content as guarantor, accepting full responsibility for the finished work and the conduct of the study, having had access to the data, and controlled the decision to publish.

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