

Clinical Paper

Outcome of primary rhegmatogenous retinal detachment surgery in a tertiary referral centre in Northern Ireland – A regional study

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Abstract

Purpose: To report the primary and final success, functional outcome and complication rates of patients with primary rhegmatogenous retinal detachment (RRD) who underwent retinal detachment surgery in a tertiary referral centre in Northern Ireland.

Venue: Vitreoretinal service, Royal Victoria Hospital, Belfast, Northern Ireland.

Methods: This is a retrospective case series of all patients who underwent primary RRD repair between 1st of January 2013 and 31st of December 2013. Charts were reviewed. Patients' demographics, overall primary and final success, functional outcome, complication rates were identified and recorded. Subgroup analysis according to lens status and foveal attachment was also performed.

Results: A total of 212 cases of primary RRD were included. Mean age at time of surgery was 56.6 years (range 9-90 years); 175(82.5%) had pars plana vitrectomy (PPV), 27 (12.5%), scleral buckle (SB) repair and 10 (5%) pneumatic retinopathy (PR). Overall primary and final success rate were 86% and 95.6% respectively. Overall mean visual acuity improved from 1.1 to 0.4 LogMAR postoperatively after a mean follow-up of 9 months. There was no significant difference in the primary success rate in relation to the baseline lens status ($\chi^2 = 3.4$, $P = 0.2$) and to the baseline macular status ($\chi^2 = 0.6$, $P = 0.7$). Presence of proliferative vitreoretinopathy (PVR) negatively affected the primary success rate ($\chi^2=7.2$, $P = 0.03$). Poor prognostic factors for success were PVR at presentation, inferior breaks and increasing number of detached quadrants.

Conclusions: This study demonstrates a success rate comparable with other centres with a low rate of final failure. Despite sub-specialism and the great advances in VR surgery, the biology of RRD dictates a failure rate. New therapies may improve results in the future.

INTRODUCTION

Rhegmatogenous retinal detachment (RRD) is the separation of the neurosensory retina from the retinal pigment epithelium (RPE) resulting from a tear or a hole in the retina.¹ Its incidence is about 1 in 10,000 per year¹ and more than 50% of RRDs occur spontaneously with no history of surgical or non-surgical trauma.²

Techniques for the management of RRD include scleral buckling, pars plana vitrectomy, pneumatic retinopathy, alone or in combination. Each of these techniques has its own profile of advantages and disadvantages. Retinal reattachment with a single procedure is recognized to be associated with better visual outcome.³ Rates for primary reattachment are reported between 85% - 90% in uncomplicated cases⁴⁻⁶ and 60% - 70%⁷ in high-risk eyes; approximately 5% of eyes have permanent anatomical and functional failure.⁸

A decade ago, the national audit of the outcome of primary RRD⁹ and other audits from vitreoretinal (VR) units in the UK showed that there has been an increase in the primary success rate with increased subspecialisation.¹⁰⁻¹¹ Since then, there is a paucity of published outcome data from VR units in the UK.

All VR surgeries in Northern Ireland (population 1.8 million) are carried out by the VR service of Royal Victoria Hospital in Belfast consisting of 6 retinal specialists who perform an average of 780 VR surgeries yearly of which RRD surgery comprises 30% of the workload.

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We conducted this study to provide contemporary data about retinal detachment surgery in a UK based unit and to determine if the primary success rate has changed over the last decade because of advances in retinal surgery. We also report the final visual outcome, complication rate and analysis of failure.

METHODS:

This is a retrospective case series of the outcome of primary RRD repair. A total of 212 eyes of 211 patients who underwent surgery for primary RRD from 1st of January 2013 to 31st of December 2013 were identified and included in this study. Data were retrieved from pre-designed VR audit sheets and patients' case notes.

The authors confirm that data collection conformed to all local policy at Belfast Health and Social Care Trust and this study was registered with the audit department (number 4588).

The main outcome measures were: 1) primary success defined as retinal reattachment with single operation and no residual intravitreal tamponade after 2 months, 2) final success defined as retinal reattachment with more than one operation and no residual silicone oil tamponade, 3) failure defined as persistent retinal detachment anywhere or retinal reattachment with long-term silicone oil tamponade and 4) final visual acuity after a minimum of 6 weeks of follow-up.

Cases of other types of retinal detachment or cases with previous history of vitreo-retinal procedures were excluded.

STATISTICAL ANALYSIS:

Data were analysed using the statistical packages for social sciences SPSS (version 22.0; SPSS, Inc., Chicago, IL). Descriptive statistics were generated for continuous variables and categorical variables. For statistical purposes, Best Corrected Visual Acuity (BCVA) was converted to the logarithm of the minimum angle of resolution (LogMAR). Cross tabulation with Pearson's chi square test was used to investigate the relation between the primary success rate with lens status at baseline, surgical procedure, baseline macular status and presence of PVR. Independent sample T-test was used to assess the difference in mean final BCVA by baseline status of macula, lens status, surgical procedure and presence of PVR. The chosen level of statistical significance was $P < 0.05$.

RESULTS:

Patient Demographics, Macular Status and Presenting Visual Acuity

Of the 212 eyes included, the mean age was 56.6 years (range, 9-90 years) with 66% male subjects and 51.5% right eyes. One patient presented with simultaneous bilateral retinal detachment. Table 1 shows a summary of pre-existing ocular history for RRD in our series. Table 2 summarises the characteristics of RRD at presentation.

The presenting BCVA was recorded in all cases with a mean

LogMAR of 1.1. The mean BCVA for the macula-on group was 0.2 compared to 1.6 in the macula-off group including 45 eyes with CF vision, 36 eyes with HM vision, 9 eyes with PL vision.

TABLE 1:

A summary of pre-existing ocular risk factors in retinal Detachment

Condition	(n) %
Previous Cataract Surgery	(51) 24.6%
Contralateral retinal detachment	(11) 5.19%
Myopia	(16) 7.5%
Laser refractive surgery	(7) 3.3%
Previous retinopexy (laser/cryopexy)	(4) 1.98%
Previous trauma	(5) 2.36%
Complicated cataract surgery	(2) 0.94%
Others	
• Stickler syndrome	(1) 0.47%
• Sickle cell retinopathy	(1) 0.47%
• Ocular albinism	(1) 0.47%

Surgical Technique

All cases were operated on by 6 consultant vitreo-retinal surgeons and 3 vitreo-retinal fellows under direct supervision. Overall, 82.5% (175) of the cases had pars plana vitrectomy (PPV), 12.5% (27) had scleral buckle (SB) and 5% (10) had pneumatic retinopexy (PR) as a primary procedure. Of those who had PPV as a primary procedure, 67% were operated by classic 20-gauge PPV and the remainder by 23-gauge trans-conjunctival sutureless technique. Two patients had combined cataract and PPV. Scleral buckles were circumferential in 55%, segmental in 38% and radial in 7%; 28% had subretinal fluid (SRF) drainage with buckling. PR as a primary procedure was only used in uncomplicated phakic detachments.

Phakic and pseudophakic eyes with retinal detachment were analysed separately. In the phakic group (161 eyes), 78% (126), 16% (25) and 6% (10) had PPV, SB and PR respectively. In the pseudophakic group (51 eyes), 96% (49) had PPV and 4% (2) had SB.

Primary and Final Success Rate

The overall primary success rate of retinal reattachment was 86% with a follow-up of 2 – 18 months. 31 patients (14%) required more than one procedure to reattach the retina. The average number of operations was 1.1 (range 1-4). There was no significant difference in the primary success rate between the 3 different surgical procedures with success rate of 86%, 85% and 80% for PPV, SB and PR ($\chi^2 = 0.6$, $P = 0.9$). There was no difference in the primary success between 20 and 23 gauge PPV. Patients with retinal dialysis (7) achieved 100% re-attachment rate with scleral buckling. Patients presenting



TABLE 2:

The characteristics of retinal detachment at presentation.

Characteristics	% Of cases
Phakic	75%
Macula attached	38%
Number of breaks	
• 1-3 breaks	58%
• 4-6 breaks	34%
• >7 breaks	8%
Types of retinal breaks	
• Giant retinal tear	1.4%
• Dialysis	3.3%
• Inferior breaks	12.3%
• Combined Schisis detachment	0.4%
• Myopic macular hole	0.4%
Proliferative vitreo-retinopathy (grade C and above)	20%
Total (4 quadrants) RRD	3.77%

with giant retinal tears (3) had 100% success rate with a planned 2-stage procedure using perfluorocarbon liquid (PFCL) as a short term postoperative tamponade, with PFCL removal and replacement by gas or silicone oil after 7 days.¹⁵

Lens status was analysed as a possible factor affecting success. In the phakic group, the overall primary success rate was 87% compared to 78.4% in the pseudophakic group and this was not statistically significant ($\chi^2 = 3.4$, $P = 0.2$).

There was no significant difference in the success rate in relation to the macular status ($\chi^2 = 0.6$, $P = 0.7$); primary success was higher for macula-on RRDs with 91.4%

TABLE 3:

Comparison of preoperative and postoperative BCVA in relation to the status of the macula at presentation.

BCVA: best corrected visual acuity. Postoperative BCVA has been measured at the last follow-up.

Macular Status		Preop BCVA (LogMAR)	Postop BCVA (LogMAR)
Macula ON	Mean	0.2	0.2
	N	81	81
	Std. Deviation	0.3	0.3
Macula OFF	Mean	1.6	0.6
	N	131	131
	Std. Deviation	0.9	0.6
Total	Mean	1.1	0.4
	N	212	212
	Std. Deviation	0.9	0.5

reattachment compared to 82.4% in macula-off group. Final success rate of 100% was attainable in the macula-on group compared to 92% for the macula-off group

The overall final success rate of retinal reattachment was 95.8% without silicone oil; an additional 3.7% (8 eyes) were reattached with silicone oil. Less than 1% (2 eyes) remained detached, 1 eye deemed inoperable and 1 eye for which re-operation was refused by the patient.

Eyes with a complicating factor (PVR grade C, inferior breaks and total retinal detachment) were analysed as a subgroup; primary success rate was 76%, 81%, 75% in the PVR, inferior breaks and total RRD groups respectively. Final success rate increased to 85.7% and 88.4% in the PVR and inferior breaks groups respectively but remained at 75% for the total RRD group. Hypotony and choroidal detachment at presentation (2 eyes) were also associated with poor outcome with long-term silicone oil in the eye and multiple surgeries. We found that the presence of PVR negatively affected the primary success rate ($\chi^2=7.2$, $P = 0.03$).

14% (31 eyes) were primary failures requiring further surgery. Reasons for failure were: missed or new break (16 eyes), PVR (11 eyes), inadequate retinopexy leading to re-opening of the primary break (7 eyes) and in 3 eyes the reason for re-detachment could not be identified.

POSTOPERATIVE VISUAL ACUITY:

Postoperative vision was recorded at the final follow-up visit. The overall mean improved from presenting BCVA of 1.1 to 0.4 at final review. In 131 eyes with macula-off RRD, the VA improved from a mean 1.6 to 0.6 including 5 eyes with CF, 2 eyes with HM vision, 2 eyes with LP and 1 eye with NPL vision. For eyes with a macula on RRD, VA remained at a mean of 0.2 postoperatively. In 27 eyes undergoing a SB, the VA improved from a mean of 0.7 at presentation to 0.4 at final review. For the 175 eyes with primary PPV, the mean presenting VA 1.2 improved to 0.5.

Tables 3 and 4 compare the pre- and post-operative vision in relation to the macular status and the surgical procedure. Table 5 summarises VA at final visit by baseline status of macula, lens status, surgical procedure and presence of PVR. Macular status at baseline and PVR presence at baseline were significantly related to final BCVA ($P = 0.04$ and $P = 0.03$, respectively).

COMPLICATIONS OF RETINAL DETACHMENT SURGERY:

There was no endophthalmitis or other major postoperative complication. One scleral buckle patient undergoing drainage sustained a localised subretinal haemorrhage which did not affect the macula. Of the vitrectomy subset, 18.3% (39) of eyes underwent cataract surgery during the follow-up period. 4.7% (10) eyes had temporary raised intra-ocular pressure (IOP) and 1.98% (4) patients continued to have persistent raised IOP with optic nerve damage requiring long-term glaucoma medications. Epiretinal membrane formation was



found in 1.98% (4) of patients.

DISCUSSION:

This study provides contemporary data about retinal

TABLE 4:

Comparison of preoperative and postoperative BCVA in relation to the surgical procedure.

BCVA: best corrected visual acuity. Postoperative BCVA has been measured at the last follow-up.

Procedure		Preop BCVA (LogMAR)	Postop BCVA (LogMAR)
Vitreotomy	Mean	1.2	0.5
	N	175	175
	Std. Deviation	1.0	0.6
Scleral buckle	Mean	0.7	0.4
	N	27	27
	Std. Deviation	0.6	0.3
Pneumatic Retinopexy	Mean	0.3	0.3
	N	10	10
	Std. Deviation	0.4	0.3
Total	Mean	1.1	0.5
	N	212	212
	Std. Deviation	0.9	0.5

detachment surgery in a tertiary referral centre in the UK a decade after the last UK national audit. The reoperation rate for primary RRD in our centre was 14% with single surgery. Primary and final success rates of retinal re-attachment were 86% and 95.5% in line with current standard of practice.

The trend in RRD surgery in the UK has changed over the last two decades. In the national audit of RRD surgery⁹, the vast

majority of cases (83%) underwent SB procedure and only 17% had PPV. The same findings were reported in a three cycles audit done by Johnson et al¹¹ over a 10-year period where the percentage of patients had PPV increased from 1% to 48%. Since these reports,^{9,11} the use of PPV in RRD surgery has been increasing as reflected in our series with 82% undergoing PPV. Sutureless small gauge vitrectomy (23G and 25G) has become progressively more popular despite some controversy about its use.¹⁷ At the time of this study, 33% of PPVs had undergone 23G sutureless PPV and there was no difference in the success rate between the classic 20G and 23G PPV. Neither of these UK-based audits^{9,11} reported using PR as a primary procedure for RRD which reflects the practice pattern of RRD in the UK. In our experience, PR is a useful technique with an 80% primary success rate in simple uncomplicated RRD i.e. phakic eye with either a single break or closely located breaks in the superior fundus with no PVR.

There is a wide agreement about the best approach for some types of RRD, but for most cases there is lack of an evidence base to make a well-advised choice of technique. For example, there is a clear evidence for PPV in complex retinal detachment i.e. cases complicated with PVR, trauma, GRT.¹² On the other hand, SB has a very high success rate in cases of round hole RRD and cases with anterior small breaks without much PVR.¹⁶ Controversy arises in the management of medium complexity RRD such as cases with multiple breaks, excessive vitreous traction and break size of over 1-2 clock hours, which are common. Advocates of vitrectomy argue that it can directly eliminate vitreous traction and media opacities particularly with the advances in surgical instrumentation and wide-angle viewing system. It also avoids SB-related complications, such as drainage problems, diplopia and infection of the implant; however, PPV carries its own risks and complications including high rate of cataract formation, iatrogenic breaks, postoperative positioning requirements and high cost of surgical instrumentation.

The Scleral Buckling Versus Primary Vitrectomy in RRD study (SPR study)¹³ has made a significant contribution to

TABLE 5:

Final BCVA at final review by baseline status of macula, lens status, surgical procedure and presence of PVR.

	Final BCVA (\pm SD)	Significance (P value)	95% Confidence Interval
Macula on (n=81)	0.2 \pm 0.3	reference	
Macula off (n=131)	0.6 \pm 0.6	0.04	-0.5 to 0.2
Phakic (n=161)	0.5 \pm 0.5	reference	
Pseudophakic (n=51)	0.5 \pm 0.6	0.3	-0.2 to 0.1
Vitreotomy (n=175)	0.5 \pm 0.5	reference	
Scleral buckle (n=27)	0.3 \pm 0.2	0.08	-0.07 to 0.2
Pneumatic retinopexy (n=10)	0.3 \pm 0.3	0.3	-0.04 to 0.4
PVR absent (n=144)	0.4 \pm 0.4	reference	
PVR present (n=42)	0.7 \pm 0.6	0.03	0.1 to 0.4



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the evidence base in RRD surgery. It was the first large prospective randomised clinical trial to compare outcomes of SB versus PPV in medium complexity cases. It concluded that there was a better improvement of VA with scleral buckling in phakic eyes and a high primary success rate using vitrectomy in pseudophakic eyes. Our results confirm their conclusion, though without statistical significance. We support the use of PPV for pseudophakic detachment with or without supplementary SB. Pseudophakic eyes having PPV had a primary success 78.4% and had a higher chance of needing final silicone oil fill. We attribute this to a tendency for late presentation of RRDs when the macula is already detached; in our series 63% of pseudophakic eyes presented with macula-off RRD and 13% presented with inferior breaks RRD, which may explain the late presentation and the tendency to have PVR. Pseudophakic eyes tend to have small breaks in the periphery and the view to the peripheral retina is often suboptimal because of capsular opacities and optical aberrations from the implant.

Our failure rate is consistent with the EVRS study report¹² and was associated with pre-operative risk factors including choroidal detachment, hypotony, PVR and total detachment, which are generally accepted as poor prognostic indicators for reattachment.¹⁴ Choroidal detachment and hypotony were found in 2 eyes of our series with poor final visual acuity of no perception of light and counting fingers.

A strength of this UK based study is that the results represent real world clinical data and it should help draft a contemporaneous benchmark for VR surgery for RRD especially within an era of revalidation and change in UK medical regulatory. This study has limitations because of its retrospective nature. We acknowledge a possible bias in this study which may have an effect on calculating re-operation rate; some cases of failed attachment occurring after 2013 may have not been included. However, we believe that this number is likely to be small as literature suggests that failure usually occurs within 3 months of primary surgery.¹⁵ Also, as the waiting time for surgery was not recorded in many cases, we could not conclude whether this had an impact on the anatomical and visual outcomes. However, in our centre, macula-on cases are operated on within 24-48 hours and macula-off cases operated on within a week.

To conclude, this study demonstrates comparable success rates to other centres where there is a specialist-led VR service. It reflects the current trend in RRD surgery for increasing usage of PPV. Despite sub-specialism and the great advances in VR surgery, the biology of RRD dictates a failure rate. New therapies may improve results in the future.

Authors have no financial interest to declare.

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