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Factors Influencing Visual Outcome after Surgery for Retinal Detachment

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ABSTRACT

Aim: To identify the prognostic factors associated with good visual outcome after surgery for retinal detachment in a series of 103 eyes.

Materials and methods: Data were obtained from the case files of patients who had retina re-attachment surgery for rhegmatogenous retinal detachment between June 2006 and December 2007 at the Eye Foundation Hospital, Lagos, Nigeria. The factors associated with good visual outcome were analysed using multiple logistic regression.

Results: A hundred and three eyes of 103 patients were evaluated. There were 80 males and 23 females with ages ranging from 10 to 69 years and a mean age of 46.1 ±14.1 years. Preoperatively, 82 eyes (79.6%) had visual acuity (VA) worse than 3/60. In 78 eyes (75.7%), the macula was off, giant tears were seen in 9 eyes (8.7%), proliferative vitreoretinopathy (PVR) of grade C-1 and worse was seen in 30 eyes (29.1%). Primary anatomic re-attachment was achieved in 83 eyes (80.5%), while final anatomic success was achieved in 93 eyes (90.2%). A good visual outcome was achieved in 40 eyes (38.8%).

Three factors favourably affected visual outcome and were of statistical significance in the multiple logistic regression analysis, viz absence of advanced PVR grade C-1 and worse (p=0.015), preoperative VA 6/60 and better (p=0.037), and primary anatomic success (p=0.052).

Conclusion: A good visual outcome after surgery for rhegmatogenous retinal detachment is favourably influenced by preoperative VA of 6/60 and better, absence of PVR of grade C-1 and worse, as well as the achievement of primary anatomic success.

Key words: rhegmatogenous retinal detachment, optical coherence tomography

INTRODUCTION

Rhegmatogenous retinal detachment (RRD) is a relatively common cause of sudden loss of vision in many populations. Complex and timely surgical intervention is usually required to achieve anatomic re-attachment. Despite this intervention, visual recovery remains less satisfactory in many instances.[1-3] Many studies have reported a number of factors associated with visual recovery after surgery for RRD. Some of these include: duration of macula off, timing of the repair of RRD, preoperative visual acuity of 6/60 and better and extent of retinal detachment.[1-9] Shallow macular-on detachments are considered to have better likelihood of good visual outcome.[4] The extent of preoperative proliferative vitreoretinopathy (PVR) is another important variable. Eyes with PVR grade C-1 and worse are considered to have worse prognosis for visual recovery and are also more likely to have multiple surgical interventions.[9]

No matter how difficult it is to predict visual outcome after surgery for retinal detachment, some form of predictive variables are needed for patient counselling before surgery. Patients are mainly concerned with the amount of vision possible after surgery. Optical coherence tomography (OCT), when used postoperatively, reveals that there are definite morphologic changes in the macula of patients with repaired macula-off RRD.[10,11] These changes are likely to affect the photoreceptor function and thus reduce postoperative vision.

Presentation of RRD in Africa is generally late and is often associated with complex pathology.[9] This also results in less favourable visual outcomes and less patient satisfaction. As a result of this, a review of the outcome of surgery for all the patients who had surgery for RRD within the stipulated period was done to evaluate the factors that were associated with good visual outcome. This will help in patient counselling; allowing patients to have realistic postoperative visual expectations.

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AIM

To identify prognostic factors associated with good visual outcome after surgery for retinal detachment in a series of 103 eyes.

MATERIALS AND METHODS

A retrospective non-comparative interventional case series was done in patients who had surgery for RRD at the Eye Foundation Hospital, Lagos, between June 2006 and December 2007. Eye Foundation Hospital, located in Lagos, within the South Western geopolitical region of Nigeria is one of the few hospitals with full-range vitreoretinal surgical facilities. Many referrals are received from different parts of the country as well as sub-Saharan Africa for vitreoretinal surgery. Three full-time vitreoretinal surgeons work in the retina unit called the Eye Foundation Retina Institute.

Data obtained from case files of patients who presented within the stipulated period were analysed. All evaluated eyes had a minimum of three months follow-up. Preoperatively, they had anterior segment evaluation with the slit lamp biomicroscope, intraocular pressure evaluation by applanation tonometry, pupillary light reaction and posterior segment evaluation with the binocular indirect ophthalmoscope. Fundus charts were drawn in all patients while only 45 (43.7%) patients had fundus photographs preoperatively. All surgeries were performed by three of the authors, who used either a sclera buckling procedure (SB) or a three-port pars plana 20G vitrectomy (3PPV) with internal tamponade (silicon oil or C_3F_8 gas in a single case), or a combination of both. No pneumatic retinopexy was done during the period under review. Indications for vitrectomy included proliferative vitreoretinopathy (PVR), large breaks, posterior breaks and multiple breaks that would be difficult to close with a sclera buckle, or when there was an internal search for pathology or a need to remove vitreous debris, traction bands, or when a peeling of PVR membranes was required. Perfluorocarbon liquids were also used when required.

Primary anatomic success was defined as retina re-attachment following the first surgery and maintained for at least 3 months without additional surgical interventions. Final anatomic success was defined as attached retina at least 3 months after the latest intervention, regardless of the number of interventions. Visual outcome was defined as the best corrected visual acuity at least 2 months after the last operation. A visual outcome of 6/60 and better was considered good.

Proliferative vitreoretinopathy (PVR) in this study, was classified using the 1983 Retina Society classification as follows:[12]

- Grade A (minimal): vitreous haze, vitreous pigment clumps
- Grade B (moderate): wrinkling of the inner retina surface, rolled edges of retina breaks, retina stiffness and venous tortuosity.
- Grade C (marked): full thickness fixed retina folds affecting 1 quadrant (C-1), 2 quadrants (C-2), or 3 quadrants (C-3).
- Grade D (massive): fixed retina folds in 4 quadrants, D-1 wide open funnel shaped, D-2 narrow funnel shape, D-3 closed funnel, optic nerve head not seen. For this study, a PVR grade of C-1 and above was considered as advanced.

Information obtained was analysed with a chi-square test using the Epi Info software. Continuous variables were summarized using mean and standard deviations, while discrete variables were summarized using percentages. Data summaries were presented with frequency tables. P values below 0.05 were considered statistically significant. Stepwise multiple logistic regression was used to determine adjusted odds ratios for factors affecting visual outcome. Potential associated factors analysed include patient's age, sex, absence of preoperative PVR (grade C1 or worse), and presence of giant retina tears, type of surgery performed, lens status, macula on or off, preoperative vision of 6/60 and better, primary anatomic success and the presence of non rhegmatogenous complications.

RESULTS

A total of 103 eyes of 103 patients was evaluated; 51(49.5%) of the evaluated eyes were the right .There were 80 (77.7%) male and 23 (23.3%) female patients with ages ranging from 10 to 69 years and a mean of 46.1 ± 14.5 years. A high percentage (70.9%) of the patients were above the age of 40 (table 1) and all patients were of African descent.

Preoperative Characteristics

Visual acuity (VA) in 82 eyes (79.6%) was worse than 3/60, while 7 eyes (6.8%) had VA of 3/60 but worse than 6/60, 7 eyes (6.8%) had VA of 6/60 but worse than 6/18 and 6 eyes (5.9%) had VA of 6/18 and better (table 2). In 78 eyes (75.7%) the macula was affected by the retinal detachment. The eye was phakic in 91 eyes (88.3%), while 12 eyes (11.7%) were non phakic (aphakia and pseudophakia). Giant retina tears were seen in 9 eyes (8.7%) and proliferative vitreoretinopathy (PVR) of grade C-1 and worse was seen in 30 eyes (29.1%). Preoperatively, 37(35.9%) contralateral eyes had retina breaks requiring prophylactic laser

photocoagulation, and 10 eyes (10.3%) had old end-stage retinal detachment. Cataracts precluding detailed retinal evaluation was seen in 4 eyes (3.8%), 5 contralateral eyes (5.1%) were phthisical or had prosthetic eyes, while 9 eyes (8.7%) had other retinal pathologies like diabetic retinopathy, sickle cell retinopathy and vitreous haemeorrhage. In 10 contralateral eyes (10.3%), the retina was detached but thought to still be amenable to surgery.

Table 1. Age and sex distribution of patients

Age (year)	Sex		
	Male	Female	Total
10-19	2	2	4
20-29	11	3	14
30-39	9	3	12
40-49	21	4	25
50-59	18	6	24
60-69	19	5	24
Total	80	23	103
Mean age	46.5 ± 14.2	44.7 ± 15.8	46.1 ±14.5
Student t statistic = 0.52, p-value = 0.61			

Table 2. Comparing pre and postoperative visual acuity

Visual acuity	Pre-operative number of eyes (%)	Visual outcome (Post-operative) number of eyes (%)
Worse than 3/60	82 (79.6)	51 (49.5)
>3/60 to <6/60	7 (6.8)	11 (10.7)
6/60 to <6/18	7 (6.8)	31 (30.1)
6/18 and Better	6 (5.9)	10 (9.7)
Total	103	103

Surgery

Four different types of surgical interventions were done. Combined 20G 3 port pars plana vitrectomy (3PPV) with silicon oil exchange and sclera buckling (SB) was done in 11eyes (10.7%) while only sclera buckle with or without the drainage of subretinal fluid was done in 14 (13.6%) eyes, 77eyes (74.8%) had 3PPV with silicon oil exchange, while 1 eye (0.9%) had 3PPV with C3F8 gas for tamponade (figure 1). Cataract extraction with implants was done in 12 eyes (11.6%), 3 eyes (2.9%) combined with silicon oil removal, 8 (7.7%) as separate procedures before and after silicon oil removal and 1 eye (0.9%) after sclera buckling procedure.

Follow-up

The duration of follow up was between 3 and 24 months, with a mean duration of 8.3±5.9 months. Only 17.5% of eyes were followed up for more than 12 months (table 3). All patients included in the study had at least 3 months follow-up.

Table 3. Duration of follow-up

Duration of FU (months)	Frequency	Percent
≤6	49	47.6
7-12	34	33.0
>12	17	16.5
Inadequate records	3	2.9
Total	103	100.0
Mean	8.3 ± 5.9	

Anatomic Outcome

Primary anatomic success was achieved in 83 eyes (80.5%) while final anatomic success was achieved in 93 (90.2%) eyes.

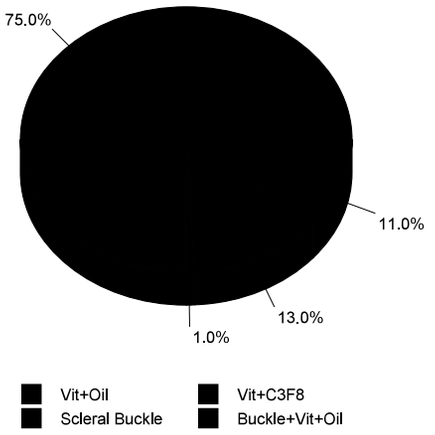

Figure 1. Percentages of surgery performed

Visual Outcome

Visual outcome was analysed in patients with a minimum of 2 months follow-up after their last surgery. Visual acuity was worse than 3/60 in 51 eyes (49.5%), while11 eyes (10.7%) had VA of 3/60 but worse than 6/60, 31 eyes (30.1%) had VA of 6/60 to worse than 6/18, and 10 eyes (9.7%) had VA 6/18 and better (table 2). Compared to 88 eyes (87.1%) that had VA worse than 6/60 preoperatively only 59 eyes (58.4%) had visual outcome worse than 6/60. A visual acuity of 6/60 or better was defined as a good visual outcome. This was achieved in 40 eyes (38.9%). When compared to preoperative visual acuity, visual outcome improved in 61 eyes (59.2 %), remained the same in 28 eyes (27.5%) and was worse in 14 eyes (13.7%). Simple logistic regression was used to determine adjusted odds ratios for factors affecting good visual outcome. The potential associated factors analysed

included patient age, sex, absence of preoperative PVR (grade C1 or worse), presence of giant retinal tear, type of surgery performed, lens status, macula status (on or off), preoperative vision of 6/60 and better, primary and final anatomic success and presence of nonrhegmatogenous complications (table 3). Only 4 factors that were of statistical significance on simple logistic regression were included in the multiple logistic regression analysis. These include absence of PVR grade C-1 and worse, scleral buckle surgery, preoperative VA of 6/60 and better and achievement of primary anatomic success (tables 4 and 5).

Table 4. Simple logistic regressions of visual outcome on other variables

Variable	Odd ratio	95% CI	p-value
Age	0.9861	0.9582 – 1.0149	0.3404
Sex	0.5033	0.1968 – 1.2872	0.1518
Duration of follow up	0.9802	0.9113 – 1.0545	0.5921
Eye affected	0.8482	0.3828 – 1.8796	0.6851
Macular on	1.6552	0.5269 – 5.1991	0.3882
Non-phakic eye	0.7500	0.2102 – 2.6764	0.6576
Presence of giant tear	2.5000	0.5415 – 11.5413	0.2404
Buckle +3PPV+ Oil	0.6371	0.1547 – 2.6231	0.5323
3PPV + Oil	0.4480	0.1770 – 1.1338	0.0901
Buckle only	4.8333	1.3980 – 16.7101	0.0128
Absence PVR grade C-1 and worse	9.5143	2.6475 – 34.1919	0.0006
Pre-operation VA of 6/60 and better	6.7816	1.7429 – 26.5390	0.0060
Presence of complication	0.7969	0.3495 – 1.8174	0.5894
Primary anatomic success	7.7727	1.6962 – 35.6171	0.0083
Final anatomic success	6.6226	0.8074 – 53.3190	0.0783

Table 5. Multiple logistic regression of visual outcome on the explanatory variables

Variable	Odd ratio	95% CI	Z-statistic	p-value
Intercept	–	–	-3.7441	0.0002
Scleral buckle only	3.1147	0.8147 – 11.9070	1.6605	0.0968
Absence of PVR grade C-1 and worse	5.2763	1.3790 – 20.1884	2.4293	0.0151
Pre-operation VA of 6/60 and better	5.1216	1.0994 – 23.8592	2.0807	0.0375
Primary anatomic success	4.8383	0.9827 – 23.8201	1.9285	0.0526

Absence of PVR grade C-1 and worse (p=0.015), preoperative VA of 6/60 and better (p=0.037) and achievement of primary anatomic success (p=0.052) significantly affected visual outcome positively.

DISCUSSION

Preoperative visual acuity was a main clinical variable evaluated in many studies[1,5,13,14] and, similar to our study, preoperative visual acuity of 6/60 and better was associated with good visual outcome. This clinical variable can be very useful for patient counselling in units where OCT and other more sensitive equipment are not available, this should however be done with caution as there are other significant clinical and pathologic variables.

Three major surgical techniques were used — 3PPV with silicon oil exchange, combined 3PPV with silicon oil and SB, and SB alone with or without drainage of subretinal fluid. C3F8 gas was used for tamponade after 3PPV in only one eye. The choice of surgical technique was individualized to the patient. No stereotyped guidelines were enforced. This is in keeping with a number of studies that show that none of the procedures is particularly superior to the other in all types of RRDs.[15-20] The choice of technique has to be related to the associated pathology. Since SBs are routinely done in other institutions around the country, most patients referred to our facility are those who require pars plana vitrectomy. This probably accounts for the high rate of 3PPV in our study (74.8 %), this value is, however, also similar to that seen in a European and an African study.[22,9] SBs in our series of patients was used basically for uncomplicated retina detachment. Hence, on simple logistic regression analysis, it was initially of statistical significance, but was not sustained on further multiple regression analysis.

The Retina Society classification of PVR[12] was employed uniformly in the PVR classification for the study and PVR grade C-1 and worse was considered as advanced. Advanced PVR was seen in a relatively higher proportion of the patients (29.1%) in this study, when compared to a similar study carried out in Africa (17.5%).[9] Only 38.9% of the eyes examined achieved good visual outcome when compared with 63.9% in the related African study. It should however be noted that this study had a high percentage (75.7%) of macula-off RRD preoperatively and that a higher percentage of eyes had poor VA preoperatively. A total of 87.1% of eyes at presentation had VA worse than 6/60 when compared to 61.1% postoperatively in the visual outcome group. This represents an improvement of about 25%. Both studies also had similar final anatomic success rates, 90.2% in this study compared to 88.2% in the African study. These findings show that anatomic success is not the only requirement for full visual recovery after surgery for RRD; many other factors need to be evaluated.

At what time during retinal detachment does irreparable damage affecting visual outcome occur to the retina? Studies evaluating the timing of retina repair[1, 5, 6] have suggested a safe period of 3 to 7 days when a retina can be safely repaired without significant loss of postoperative vision. Late presentation and complex pathology, which is the hallmark of presentation[9, 22-25] in this environment will most likely have affected the visual outcomes in this study. Primary anatomic success, referred to as first operation anatomic success in a recent study, offered patients a better chance of achieving visual success than re-operations in patients with giant tears, PVR and proliferative diabetic retinopathy.[2] These important predictive factors have been emphasized in this study as one of the 3 main factors influencing visual outcome after surgery for retinal detachment.

Primary anatomic success is sometimes related to the surgeon's skill and experience as well as the complexity of the associating pathology. The primary anatomic success of 82% obtained in this study is comparable with many studies in both developed and developing countries[9, 18, 21, 22] and is positively correlated with good visual outcome. Primary anatomic success may be the only factor that is to a certain extent under the control of the surgeon. With good patient selection and thorough preoperative and intraoperative procedures, better primary anatomic success rates can be achieved. Emphasis should also be placed on early detection and presentation to prevent development of complex pathology as the eye attempts to heal itself.

The retrospective design of our study introduced a few limitations, since only the information available in the case files were analysed. A few important factors such as the presumed duration of retinal detachment, the degree of associated inflammation and recent changes in symptoms were not detailed enough in many files for proper analysis. However, a lot of important information was obtained in the study.

CONCLUSION

Good visual outcome after surgery for rhegmatogenous retinal detachment is favourably influenced by preoperative VA of 6/60 and better, absence of PVR of grade C-1 and worse, as well as the achievement of primary anatomic success.

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