Original Article

Outcome of Non-drainage Scleral Buckling in Primary Rhegmatogenous Retinal Detachment

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Abstract

Introduction: Scleral buckling (SB) was the principal surgical intervention for patients with rhegmatogenous retinal detachment (RRD) until the development of pars plana vitrectomy. The study aims to evaluate the outcome of SB without subretinal fluid (SRF) drainage in RRD.

Materials and methods: A retrospective observational study was conducted at a tertiary eye care center. Charts of patients operated with SB without SRF drainage for RRD between January 2014 and December 2015 were evaluated. The main outcome measure was the primary reattachment rate at 1 month after single SB surgery. Other outcome measures were final reattachment rate after further intervention, visual improvement and relation of various parameters with retinal reattachment.

Results: One hundred and seventeen patients were included of which 90 (76.9%) were men. Mean age was 26.68±12.6 years (Range 9-60). All eyes were phakic. Only 1 patient had a macula on RD. The primary reattachment rate was 84.6% (n=99). Mean LogMAR (±SD) visual acuity (VA) improved from 1.92(±0.46) to 1.02(±0.42). Extent of RD, number of breaks, and type of break was found to have no association with retinal reattachment. Association between type of PVR and status of retina post buckling was found to be significant (p=0.026) with retinal reattachment seen in 100% in PVR-A and only 60% in PVR-C2. Final reattachment rate was 98.2%. Complications encountered were postoperative diplopia (n=1), suture granuloma (n=1) and buckle infection (n=2).

Conclusion: Scleral buckling without SRF drainage, an exclusively extra ocular procedure, is an effective and safe treatment modality for non-complicated RRD.

Key words: Scleral Buckling, Subretinal fluid drainage, Retinal detachment, Retinal reattachment, Non-drainage.

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Introduction

In 1904, retinal detachment (RD) was declared an untreatable condition at the International Congress in Paris (Sodhi, et al., 2008). Charles L. Schepens introduced scleral buckle technique for retinal detachment in 1951. Custodis introduced the surgery without subretinal fluid (SRF) drainage which was later developed by Lincoff raising the rate of successful outcomes for retinal detachment surgery close to 90% (Leaver, et al., 1975). Scleral buckling was the principal surgical intervention for patients with retinal detachment until pars plana vitrectomy(PPV) was developed as an alternative procedure by Robert Machemer in 1970 (Sodhi, et al., 2008).

The availability of smaller gauze instruments along with better viewing systems have made PPV easier for all. Lack of confidence in skills with the indirect ophthalmoscope and less time spent by mentors on scleral buckling training may be the reason that this technique is a less commonly used technique these days. Also drainage procedure during scleral buckling is associated with additional skills and complications. In this study, we tried to answer the question "What is the outcome of an extraocular surgery like scleral buckling without subretinal fluid drainage in the management of retinal detachment during this era of sutureless vitrectomy?".

Objective: To evaluate the outcome of an extraocular surgery like scleral buckling without subretinal fluid drainage in the management of rhegmatogenous retinal detachment.

Materials and methods

A retrospective observational study was conducted at Biratnagar Eye Hospital. Charts of patients who underwent scleral buckling without SRF drainage for rhegmatogenous retinal detachment by a single surgeon between January 2014 and December 2015 were evaluated. Exclusion criteria included those who required SB but SRF was too shallow to consider drainage and patients who could not complete 1 year follow up. A review of medical records was performed and data was recorded. Data included age, gender, time of presentation following development of symptoms (within a week, after 1 week), distribution of RD (superior, inferior, total), number of break (1, 2, more than 2), type of break (round hole, dialysis, horseshoe tear), PVR (Type A, B, C1, C2), preoperative and postoperative visual acuity (VA), intra operative and postoperative complications, post buckling retina status, time taken for absorption of SRF (within 1 week/ more than 1 week), causes of failed retinal reattachment, second surgery and retina status post silicone oil removal. The main outcome measure was the primary reattachment at 1 month after single buckling surgery. Other outcome parameters were final reattachment rate after further intervention and visual improvement. Visual improvement was defined as improvement of 2 or more lines of Snellen's visual acuity. Relation of various parameters with retinal reattachment was studied.

Ethical clearance was obtained from the institutional review board of Biratnagar eye hospital. Statistical analysis was done using SPSS 17.0. Continuous variables were expressed as the mean ± standard deviation and categorical variables were expressed as individual counts. Chi square test was used to find the association. Differences were considered statistically significant when the p value was less than 0.05.

Results

Out of 125 charts evaluated, 3 had inadvertent SRF drainage during surgery and 5 lost follow up. All scleral buckling procedures used a solid silicone circumferential explant with an encircling band and cryopexy around the breaks. No intraocular procedure like intravitreal injection of air, gas, or saline was done. One hundred and seventeen patients (eyes) were included of which 90 (76.9%) were men. Mean age of the patients was 26.68±12.6

years (Range 9-60). Only 6 patients presented within a week of onset of symptoms whereas the majority (94.87%) of them presented later. The demographic characteristics and preoperative clinical parameters are depicted in Table 1. All eyes were phakic. Only 1 patient had a macula on RD.

The anatomical success rate after single SB surgery at 1 month was 84.6% (n=99). None of these eyes showed retinal redetachment after primary anatomical attachment during 1year follow-up. All of these patients had complete SRF absorption within one week, mean time of absorption being 3.24±0.82 days. Mean LogMAR (±SD) visual acuity (VA) improved from 1.92(±0.46) to 1.02(±0.42). Visual improvement of 2 or more lines of Snellen VA was seen in 57.6%. Out of 18 patients who failed with primary procedure, 13 consented for and underwent PPV with silicone oil tamponade. Documented causes of failed retinal reattachment were: Missed/ New break-4, Preoperative PVR-9, inadequate buckle height-2, and Unexplained cause-3. Final reattachment rate was 98.2%.

Extent of RD, number of breaks, and type of break was found to have no association with retinal reattachment. Association between type of PVR and status of retina post buckling was found to be statistically significant (p=0.003) with retinal reattachment seen in 100% in PVR-A and only 60% in PVR-C2 (Table 2). Although type of break and retinal reattachment was found to have no significant association, retinal reattachment was seen in 94.87% eyes with retinal holes and only 73.33% eyes with retinal dialysis. Complications encountered were postoperative diplopia (n=1), suture granuloma (n=1) and buckle infection (n=2).

Table 1: Demographic characteristics and preoperative clinical parameters of study participants.

Variables		**Number**
Age in years [mean(±SD)]		26.68±12.6
Gender [*n* (%)]	Male Female	90 (76.9%) 27 (23.1%)
Time of presentation following development of symptoms [*n* (%)]	Within a week After 1 week	6 (5.13%) 111 (94.87%)
Distribution of RD [*n* (%)]	Superior Inferior Total	37(31.6%) 53(45.3%) 27(23.1%)
Type of Break [*n* (%)]	Round hole Dialysis Horse shoe tear	39(33.3%) 30(25.6%) 48(41.0%)
Number of break [*n* (%)]	1 2 More than 2	87(74.4%) 18(15.4%) 12(10.3%)
Preoperative Proliferative vitreo-retinopathy# [*n* (%)]	A B C1 C2	8(6.8%) 43(36.8%) 56(47.9%) 10(8.5%)
Preoperative visual acuity in LogMAR [Mean (±SD)]		1.92(±0.46)

Classification from the Retina Society Terminology Committee 1983 (Di Lauro, et al., 2016)

Table 2: Preoperative parameters and their association with retinal reattachment following non-drainage scleral buckling surgery

Variables	Post Buckling Retina Status [n (%)]		p value*
	Attached	Detached	
Distribution of RD			
Superior	31(83.8%)	6(16.2%)	0.85
Inferior	46(86.8%)	7(13.2%)	
Total	22(81.5%)	5(18.5%)	
Type of break			
Round hole	37(94.9%)	2(5.1%)	0.09
Dialysis	22(73.3%)	8(26.7%)	
Horse shoe tear	40(83.3%)	8(16.7%)	
Number of break			
1	72(82.8%)	15(17.2%)	0.34
2	16(88.9%)	2(11.1%)	
More than 2	11(91.7%)	1(8.3%)	
Preoperative Proliferative vitreo-retinopathy #			
A	8(100%)	0	0.003
B	40(93%)	3(7%)	
C1	45(80.4%)	11(19.6%)	
C2	6(60%)	4(40%)	

* = chi-square test with statistically significant at $p<0.05$;

Classification from the Retina Society Terminology Committee 1983 (Di Lauro, et al., 2016)

Discussion

The management of retinal detachment has undergone remarkable evolution from the time of inoperability to the present era of scleral buckling, pneumatic retinopexy and sutureless vitrectomy. Symptomatic RD is an indication for surgical treatment. Although trend is towards PPV for the surgical management of RRD, there is no consensus regarding the best treatment modality

Mean age of the patients in the present study was 26.68±12.6 years and all eyes were phakic. This is in support of the fact that scleral buckling is the preferred procedure in younger patients with clear lenses (Noori, et al., 2016).

Anatomical success has remarkably improved with modern vitreoretinal surgical techniques, but the visual outcome is not yet satisfactory. In this study, the mean LogMAR (±SD) visual acuity (VA) improved from 1.92(±0.46) to 1.02(±0.42) following retinal reattachment post buckling. The limited visual improvement in our study could be attributable to the uniformly late presentation of patients with predominantly macula off RD. A study by Diederen et al has shown worse visual outcome if scleral buckling is performed after more than 6 days of macular detachment, and mean postoperative VA (in logMAR) was 0.86±0.30 (8/60 Snellen equivalent) in eyes with macular detachment longer than 6 weeks (Diederen, et al., 2007). Duration of retinal detachment has been consistently associated with postoperative visual acuity following retinal reattachment surgery (Doyle, et al., 2007) (Kim, et al., 2013) (Mitry, et al., 2013). Preoperative visual acuity has also been found to be associated with final

visual outcome following retinal reattachment procedure (Doyle, et al., 2007) (Friberg & Eller, 1992) (Liu, et al., 2006) (Rishi, et al., 2014) (Wong, et al., 2014). Some studies have shown preoperative factors, like disruption of retinal morphology and irreversible damage to photoreceptors, as important determinant of postoperative visual acuity (Delolme, et al., 2012) (Schocket, et al., 2006) (Wakabayashi, et al., 2009). Studies have shown persistence of subfoveal fluid following scleral buckle procedure. This might reduce diffusion of nutrients and oxygen to photoreceptors causing damage to the photoreceptor outer segment and result in poor visual outcome (Schocket, et al., 2006) (Cavallini, et al., 2007). Conversely, no association was found between persistence of subretinal fluid and final visual outcome by Seo and his colleagues (Seo, et al., 2008).

Clinical studies on PPV and scleral buckling have failed to demonstrate advantage of one over other in terms of anatomical success (Adelman RA, Parnes AJ, Sipperley JO, Ducournau D European Vitreoretinal Society (EVRS) Retinal Detachment Study Group D , 2013) (Sun, et al., 2012) (Thelen, et al., 2012). In a study by Wong et al, the primary anatomical success of scleral buckling and final anatomical success in macula off RRD was found to be 84.6% and 97.4% respectively, similar to results of our study. Also they found no difference in the anatomical success between PPV and scleral buckling alone (Wong, et al., 2014). Rishi et al reported primary reattachment rate of 91.2% following non-drainage scleral buckling procedure (Rishi, et al., 2014). Haritoglou et al. and Sasoh et al. reported primary success rate of 84.7% and 91.2% respectively (Haritoglou, et al., 2010) (Sasoh, et al., 2005). We could also achieve a comparable outcome with primary anatomical success rate of 84.6% following scleral buckling without SRF drainage, an absolutely extra ocular procedure.

All eyes achieving primary anatomical success (84.6%) showed complete SRF absorption within 1 week, mean time of absorption being 3.14 days in our study. Similar study by Rishi et al. found that complete absorption of SRF was seen in 75% eyes within 1 week and in 86% eyes within 6 weeks (Rishi, et al., 2014). Although some studies have reported correlation of SRF absorption with patients' age, subretinal precipitates, and duration and extent of RD (O'Connor, 1973) (Chignell, 1974); others have found no such association (Rishi, et al., 2014).

Preoperative PVR has been reported in various studies as a significant risk factor for anatomical failure following retinal reattachment surgery (Afrashi, et al., 2005) (Pastor, et al., 2008) (Rishi, et al., 2014). Similarly, preoperative PVR followed by missed or new breaks was documented as the most common cause of failed retinal reattachment in our study. However, missed break was the commonest cause of failure in a study by Jalali et al (Jalali, et al., 2005). Unlike Ahmadieh et al. and Shah et al., our study did not find an association between extent of RD and retinal reattachment (Ahmadieh, et al., 2000) (Shah, et al., 2018). Similar to the findings of Pastor and Noori with their colleagues, we did not find any association between number of breaks and retinal reattachment (Pastor, et al., 2008) (Noori, et al., 2016). However, multiple retinal breaks were associated with complex intraoperative scenarios as reported by Afrashi et al (Afrashi, et al., 2005). As reported by Noori J and his coworkers, type of break was found to have no association with retinal reattachment even in our study (Noori, et al., 2016).

Although SRF drainage has been found to play a critical role in the success of scleral buckling surgery in some studies, the results are heterogenous (Mahdizadeh, et al., 2008) (Feltgen, et al., 2013). Both drainage and non-drainage scleral buckling procedures have

shown similar reattachment rates (Chignell, 1974) (O'Connor, 1973). Complications associated with drainage procedure include subretinal hemorrhage, vitreoretinal incarceration, retinal perforation, choroidal detachment and ocular hypotony (Malagola, et al., 2015). Subretinal hemorrhage following SRF drainage and not SRF drainage per se has been found to be associated with failed scleral buckling surgery (Noori, et al., 2016). Advantage of non-drainage technique lies in preventing these intraoperative and postoperative complications associated with trans-choroidal drainage (Editorial, 1975). However, presence of extensive pre-retinal fibrosis around or close to the break may lead to failure of non-drainage surgical procedure by hindering spontaneous apposition of retinal break to the buckle (Leaver, et al., 1975). This could have been the reason for poor outcome in eyes with PVR C in our study.

Complications encountered in our study were postoperative diplopia, suture granuloma and buckle infection which has also been reported by other studies (Malagola, et al., 2015) (Noori, et al., 2016) (Shah, et al., 2018). None of the patients developed complications like retinal incarceration, choroidal detachment, subretinal hemorrhage and vitreous hemorrhage encountered in several other studies (Noori, et al., 2016) (Rishi, et al., 2014) (Shah, et al., 2018).

Scleral buckling is advantageous with respect to early return to activity, preservation of lens and low risk of iatrogenic break. It is devoid of cumbersome post-operative positioning and restriction in travel. Non-drainage buckling procedure, being an exclusively extraocular procedure, is not likely to have SRF drainage related complications and endophthalmitis.

The limitation of this study is its retrospective nature which could have also induced potential selection bias for opting scleral buckling procedure in these patients.

Conclusion

Scleral buckling without SRF drainage, an exclusively extra ocular procedure, is an effective and safe surgical modality for the treatment of non-complicated RRD with a high success rate.

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