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SIMPLE ENCIRCLING SCLERAL BAND FOR UNCOMPLICATED RETINAL DETACHMENT

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Abstract

***Introduction*:** Report the surgical and visual outcome of using a narrow band in encircling scleral buckling for selected rhegmatogenous retinal detachment (RRD).

Methods: A retrospective case series review of 16 patients with primary RRD treated with encircling scleral buckling using a narrow band 240 (2.5 mm) in KMN Eye Care from June 2018 to June 2020.

***Results*:** A total of 16 eyes in 16 patients with RRD underwent encircling scleral buckling with a narrow silicone band 240 (2.5 mm) without any additional tire or sponge. All patients have myopic eyes, with the mean pre-operative best-corrected visual acuity (BCVA) is less than 0.50. The primary success rate of retinal reattachment was 81.25%. Three patients had retinal re-detachment within one month post-surgery, and 2 patients had persistent sub-macular fluid, despite retinal reattachment. In patients with retinal reattachment, the BCVA showed improvement better than 0.5 at 1-month follow-up (9 patients, 69.2%). Spherical equivalent changes before and after scleral buckling were -1.90 D.

Conclusion: Narrow encircling scleral buckle surgery can be considered an effective and safe technique in selected RRDs, including anteriorly located, multiple, or invisible retinal breaks. A further, large-size randomized controlled study is needed to confirm its efficacy.

Keywords: encircling scleral buckling, narrow band, rhegmatogenous retinal detachment
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INTRODUCTION

Scleral buckling (SB) has several advantages over pars plana vitrectomy (PPV), including early visual rehabilitation and prevention of cataract progression. Encircling procedures are indicated in cases with a small atrophic hole or breaks anterior to the equator, shallow and slow progressing detachment, multiple breaks in different quadrants,

diffuse vitreoretinal pathologic conditions such as extensive lattice or vitreoretinal degenerations, early proliferative vitreoretinopathy (PVR), suspected and undetectable anterior breaks, retinal dialysis with incipient retinal detachment and young age. In younger aged patients, the indentation from the encircling buckling effect releases the vitreous traction, while the formed or less liquefied vitreous may function as bio-tamponade internally by preventing the fluid passage through the retina break. [1-3]

Encircling SB technique may cause several complications such as extraocular muscle restrictions and lid retraction, chronic severe band pain, malposition, exposure, intrusion, infection, induced myopia, and glaucoma. This technique may also interfere with choroidal circulation. One solution to reduce complications and extensive manipulation of periocular and orbital tissues during encircling is by using a narrow band rather than a wide silicon tire. [4-6]

Using a narrow silicone band provides several advantages including more anterior suturing, less need for pulling on muscle, and reduced dissection of perimuscular sheaths needed for more exposure. There are only a few studies that reported the use of narrow bands for the encircling technique.[7] In this study, we evaluate whether 240 band encirclements would be sufficient to treat primary rhegmatogenous retinal detachment (RRD) since it is easier and less traumatic compared to wider bands, such as solid silicone tires.

METHODS

This retrospective case series reviews patients with primary RRD treated with encircling scleral buckle procedure using a narrow band 240 (2.5mm) in KMN Eye Care from June 2018 to June 2020.

The indication for surgery was all eyes that had recent onset primary RRD (less than 14 days) and had peripheral or unseen breaks. All patients underwent pre- and post-operative evaluation including Snellen best-corrected visual acuity (BCVA), non-contact tonometry, slit-lamp biomicroscopy, and indirect ophthalmoscopy. Wide field fundus photographs using OPTOS® were also taken for all cases. Patient data including age, gender, symptoms, retinal detachment onset, BCVA, intraocular pressure (IOP), lens status, number of breaks, the extension of detachment, macular status, PVR grades, retina, and macula reattachment status, and perioperative complications were documented.

RESULTS

This study includes a total of 16 eyes of 16 patients. The mean age was 32 years with 56.25% of female patients. The mean pre-op best-corrected visual acuity (BCVA) is < 0.50 Snellen. All patients have myopic condition, with five of them having high myopia. Two patients had prior cataract surgery, and two patients had a history of retinal detachment in the fellow eye. The location of detachment was mostly inferotemporal (62.5%) extending to the macula.

Table 1. Demographic and Clinical Characteristics

Variable		Total (16)
Sex		
	Male	7 (43,75%)
	Female	9 (56,25%)
Mean age		32 years
Eye		
	OD	8 (50%)
	OS	8 (50%)
Refractive status		

	Low myopia (≤-6.00 D)	11 (69%)
	High myopia (>-6.00 D)	5 (31%)
Lens		
	Phakic	14 (87,5%)
	Pseudophakic	2 (12,5%)
Number of Breaks		
	unknown	3 (18,75%)
	one	8 (50%)
	two	4 (25%)
	multiple	1 (6,25%)
Extension of Detachment		
	Superotemporal	5 (31,25%)
	Inferotemporal	10 (62,5%)
	Superonasal	0 (0%)
	Inferonasal	1 (6,25%)
Macula		
	On	6 (37,5%)
	Off	10 (62,5%)
Fellow Eye history of retinal detachment		
	Yes	2 (12,5%)
	No	14 (87,5%)

The demographic and clinical characteristics of the patients are presented in Table 1. All patients underwent encircling scleral buckling with a narrow silicone band 240 (2.5 mm) without any additional tire or sponge. Subretinal fluid drainage and cryotherapy were done based on intraoperative findings. Cryotherapy was performed in 15 cases (93,75%) and subretinal fluid drainage was performed in 12 cases (75%). The intraoperative details are presented in Table 2.

Table 2. Intraoperative Procedure

Variable	Value
Cryotherapy	
yes	15 (93,75%)
no	1 (6,255%)
Subretinal fluid drainage	
yes	12 (75 %)
no	4 (25 %)

The success rate of primary retinal reattachment was 81.25%. Three patients had retinal re-detachment within 1-month post-surgery. In two patients with retinal reattachment, there was persistent submacular fluid, in which subretinal fluid drainage had been performed on both patients that only need observation and did not required re-surgery. The relationship between retina reattachment and clinical characteristics is shown in Table 3.

The normality test for IOP data using Shapiro-Wilk found that the data were not normally distributed, so a different test was carried out using the Wilcoxon Signed Rank Test. Based on the results of the Wilcoxon Signed Rank Test calculation, a P value of 0.132 was obtained, where this shows that there is no statistically significant difference between intraocular pressure before and after evacuation of silicone oil.

Table 3. Relation between retina reattachment and clinical characteristic

Variable	Total	Reattachment	
		yes	no
	16 (100%)	13 (81,2%)	3 (18,7%)
Lens status			
phakic	14 (87,5%)	12 (85,7%)	2 (14,3%)
pseudophakic	2 (12,5%)	1 (50%)	1 (50%)
Number of Breaks			
unknown	3 (18,75%)	2 (66,7%)	1 (33,3%)
one	8 (50%)	5 (62,5%)	3 (37,5%)
two	4 (25%)	2 (50%)	2 (50%)
multiple	1 (6,25%)	1 (100%)	0 (0%)
Break location			
Superotemporal	5 (31,25%)	4 (80%)	1 (20%)
Inferotemporal	10 (62,5%)	8 (80%)	2 (20%)
Superonasal	0 (0%)	0 (0%)	0 (0%)
Inferonasal	1 (6,25%)	1 (100%)	0 (0%)
Subretinal Drainage			
Yes	12 (75%)	10 (83,3%)	2 (16,7%)
No	4 (25%)	4 (100%)	0 (0%)

Table 4. Postoperative visual acuity

Variable	1 day		1 week		1 month	
retina reattachment	**BCVA <0.5**	**BCVA >0.5**	**BCVA <0.5**	**BCVA >0.5**	**BCVA <0.5**	**BCVA>0.5**
no (3 eyes)	2 (66,7%)	1 (33,3%)	2 (66,7%)	1 (33,3%)	2 (66,7%)	1 (33,3%)
yes (13 eyes)	13 (100%)	0 (0%)	6 (46,2%)	7 (53,8%)	4 (30,8%)	9 (69,2%)

Visual acuity changes are presented in Table 4, with most cases in the reattachment group (69.2%) showing vision improvement better than the 0.5 Snellen chart. The refraction changes between preoperative and postoperative are shown in Table 5. These changes are based on the examination done in the first month after scleral buckling surgery. The mean spherical equivalent change before and after scleral buckle surgery is -1.9D.

Intra and postoperative complications were not identified from all medical records.

Table 5. Preoperative and Postoperative Spherical Equivalent changes

	Pre	Post (1 month)	Δ
Mean spherical equivalent (SE)	-5.32	-7.23	1.90

DISCUSSION

Primary scleral buckling is an established surgical technique in RRD treatments, especially in RRDs with no visible retinal breaks, eyes with several retinal breaks in multiple quadrants, myopia, and PVR of grade B or less.[7] The Primary Retinal Detachment Outcomes study showed the anatomical success of primary scleral buckle surgery in phakic eyes with moderately complex RRD was 91.7%, with final anatomic success in 99.4% of cases.[9]

A meta-analysis of randomized controlled clinical trials comparing PPV with scleral buckling surgery for simple RRD showed no significant difference in the effect between groups on the results of primary retinal reattachment rate, improvement of visual acuity after surgery, and final anatomical success rate. PPV was found to frequently cause complications namely the development or progression of cataracts and new or iatrogenic breaks.[10] Radice et al.[11] reported 94% of the primary anatomical surgical success of noncomplex primary RRD, and 100% of final anatomical success at 12 months after scleral buckling surgery, cryopexy, subretinal fluid drainage, and air tamponade. The scleral buckle procedure also tends to remain stable and cost-effective.[7,9,11]

Encircling scleral buckle is a technique of using an encircling silicone band of 2 to 4 mm in height. The main advantage of using this procedure is to have a buckling effect for 360 degrees, which helps to reduce vitreoretinal tractions and to treat multiple breaks, peripheral degenerative areas, and in cases where no identifiable breaks are found.[7,12] Wide buckles (i.e. tires) are most commonly used as encircling buckles, in addition to narrow bands.[13-15] However, wide buckles have been reported to be more difficult to apply and may cause impaired choroidal blood flow. The mechanical force created by the wide encircling buckle is greater towards the anatomical and functional properties of the eyeball. A recent study reported encircling SB with wide buckles is related to an increase in the luminal and stromal area of the choriocapillaris and increased subfoveal choroidal thickness.[16] Ocular movement disorders are also a main complication after scleral buckling surgery with wide tires.

The use of narrow bands, on the other hand, is reported to give fewer disruptions of the globe anatomy and less manipulation of orbital tissue, compared to wide tires. Banaee et al.[7] reported a single operation success rate of 69.2% using narrow encircling band in cases with unseen retinal breaks. They reported narrow bands to support the vitreous base adequately and provide tamponade for eyes with small intranasal breaks or without visible retinal breaks.[12] Similar rate is also found in a study by Kocaoglan et al[13], achieving a success rate of 62.2% in using encircling buckling with narrow band.

In our study, encircling buckling with a narrow band is performed in cases with anterior single or multiple breaks and cases without visible retina break, with the extension of detachment mostly in the inferotemporal region toward the macula. Primary retinal reattachment was 81.25%. To achieve this successful retinal reattachment, attention is needed to completely relieve the vitreous traction by placing the encircling band just at the equator of the eye globe. This position corresponds with the tear location, at the anterior or periphery, regardless of the number of tears. Table 3 shows that most cases achieved single surgical anatomic reattachment no matter with location and number of tears. Surgical failures are usually related to not addressing these factors cautiously. The applicability of this technique hinges on the location of the retinal breaks and the severity of proliferative vitreoretinopathy (PVR). When faced with a less severe PVR and retinal breaks situated more anteriorly, this approach remains a viable consideration

There were three patients with redetachment on one-month follow-up after surgery. One of which was pseudophakic. Shah et al.[17] reported significantly better anatomical outcome was observed in phakic patients than in pseudophakia patients as in this study, although the majority were phakic eye. Patients with better preoperative visual acuity also have significantly better anatomical outcomes. There were two patients with persistent subretinal fluid (SRF) followed by redetachment in one-month follow-up. The incidence of localized sub-macular fluid after SB surgery for RD has been reported in the literature in a prospective observational cohort series.[18]

The following are reasons for the persistent SRF in SB surgery: the macular microcirculation blood flows were lower in scleral buckle surgery, choroidal blood flow has been reported to be reduced in scleral buckling, and inflammation induced by compression of the scleral buckling may stimulate subretinal fluid accumulation. Persistent subretinal fluid after successful scleral buckling surgery may influence the final BCVA or anatomic attachment. However, other studies reported that SRF gradually disappeared in most cases within 1 year after surgery.[19-21] In the three patients with redetachment, re-vitrectomy with retina laser photocoagulation and silicone oil or gas tamponade was later performed.

Visual acuity improvement is mostly achieved in those with reattached retina, more than 50% achieved BCVA better than 0.5 Snellen charts. On the contrary, failure attachment did not compromise the initial visual acuity, which indicates a safe procedure, with minimal deterioration.

The spherical equivalent change before and after scleral buckling in this study is -1.9 D. Nassaralla et al.[22] reported the mean spherical equivalent change in eyes undergoing encircling scleral buckle alone was -1.00 D. The probable mechanism for the change of refractive error is the elongation of the globe due to pressure of the equatorial band. Most studies have found induced myopia after scleral buckling surgery.[22,23] However, myopic changes seem less with the encircling narrow band as in this study.

The limitations of our study were the small sample size and the short follow-up time, with only one-month follow-up in all patients involved. Further randomized controlled trial is needed to observe the anatomical stability, and post-operative visual acuity changes, and to further conclude the effectiveness of using narrow bands rather than wide bands.

CONCLUSION

In summary, encircling scleral buckles using narrow bands may be considered an effective and safe technique in managing selected cases, such as anteriorly located breaks, multiple breaks, and invisible breaks. The primary success rate is 81.25% while eliminating complications of wide bands.

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