ECRONICON OPEN ACCESS

EC OPHTHALMOLOGY
Research Article

Anatomical and Functional (Surgical) Outcome of Scleral Buckling Surgery for Primary Rhegmatogeneous Retinal Detachment in the Era of Vitrectomy

Ruchi Shrestha[1]*, Ritesh Kumar Shah[2], Purushottam Joshi[3], Sadhana Sharma[3] and Sarmila Acharya[1]

[1]*Department of Vitreoretina, Reiyukai Eiko Masunaga Eye Hospital, Banepa, Kavre, Nepal*

[2]*Department of Vitreoretina, Mechi Netralaya, Kakarvitta, Jhapa, Nepal*

[3]*Department of Vitreoretina, Mechi Eye Hospital, Birtamod, Jhapa, Nepal*

***Corresponding Author:** Ruchi Shrestha, Department of Vitreoretina, Reiyukai Eiko Masunaga Eye Hospital, Banepa, Kavre, Nepal.

Received: September 29, 2021; **Published:** November 29, 2021

Abstract

Introduction: Scleral buckling technique is gradually disappearing with the advent of pars plana vitrectomy and its improved techniques. Despite of this, it is a highly successful technique that can provide superior results to pars plana vitrectomy with reduced co-morbidity The main purpose of this study is to determine anatomical and functional outcome of scleral buckling surgery using segmental encirclage and factors affecting the outcome of surgery.

Methods: This is a retrospective case series study of 59 eyes of 59 patients that underwent scleral buckling surgery using segmental encirclage done by a single surgeon over a period of 1 year and with minimum 3 months follow up. The outcome of surgery was determined by the BCVA (Best Corrected Visual Acuity), anatomical success and complications after surgery.

Results: The mean age was 43.88 ± 16.27 years (R; 12 - 73 years). 47 (79.70%) were male and 12 (20.30%) were female. Primary anatomical success was achieved in 76.3%. Significantly better anatomical outcome was observed in phakic patients and patients with better preoperative best corrected visual acuity whereas presence of total retinal detachment was associated with poor anatomical outcome. There was 71.2% significant improvement of functional outcome in terms of post-operative visual acuity.

Conclusion: Despite of the advancements in the era of vitrectomy, scleral buckling is still a good surgical option for rhegmatogeneous retinal detachment in young patients, phakic patients, macula on and partial retinal detachments and patients with better preoperative visual acuity.

Keywords: *Retinal Detachment; Scleral Buckle; Segmental Encirclage; Vitrectomy; Anatomical Outcome; Visual Outcome*

Introduction

Scleral buckling is one of the most effective methods of treating rhegmatogeneous retinal detachment over past 60 years, but the techniques of scleral buckling has remained unchanged. Scleral buckling technique is gradually disappearing with the advent of pars plana vitrectomy and its improved techniques. Scleral buckling is a highly successful technique that can provide superior results to pars plana vitrectomy with reduced co-morbidity when it is done with careful selection of patient and good orientation of retina tears [1].

The principal of retinal detachment surgery is to find and seal all the breaks which were first contributed by Jules Gonin. Ernst Custodis did the first segmental scleral sponge exoplant surgery 60 years ago [2]. Charles Schepens discovered binocular indirect ophthalmoscope

with a scleral depressor and modified the scleral buckling technique [3] and Harvey Lincoff first used cryotherapy for treating retinal detachment [4].

There are various factors that determine the success and outcome of scleral buckling surgery including lens status, onset of symptoms, ocular trauma, preoperative visual acuity and extent of retinal detachment.

Aim of the Study

The aim of this study is to determine anatomical and functional outcome of scleral buckling surgery using segmental encirclage and factors affecting the outcome of surgery.

Materials and Methods

This is a retrospective case series study of 59 eyes of 59 patients that underwent scleral buckling surgery using segmental encirclage done by a single surgeon over a period of 1 year and with minimum 3 months follow up**.** Tractional retinal detachment, exudative retinal detachment, retinal detachment with proliferative vitreoretinopathy, traumatic retinal detachments, recurrent retinal detachments and advanced cataract obscuring the fundus were excluded from the study. One eye out of 60 eyes (patient) was excluded from the study due to lost follow up at 1 month. The study was approved by institutional review committee of Mechi Eye Hospital and has been performed in accordance with Declaration of Helsinski.

Various parameters including age, sex, laterality, duration of symptoms, extent of retinal detachment, number of retinal breaks, lens status, status of macula (on/off), pre-operative/post-operative visual acuity, pre-operative/post-operative intraocular pressure and intraoperative use of vitreous adjuvants were recorded. The statistical analysis was done by SPSS (Version 20, SPSS Inc., Chicago, IL, USA).

Surgical technique: The operating eye was anesthetized by peribulbulbar block. Under aseptic precaution, painting and draping of eye was done. Lid sutures were placed and 360-degree conjunctival peritomy with tenon capsule dissection was done. The four recti muscles were separated, and 4.0 silk sutures were placed underneath. Transscleral cryotherapy or laser photocoagulation was applied to treat detectable breaks. A 240 band was passed beneath the scleral tunnels as encirclage. Segmental buckle (276/279 silicon tire) were sutures to sclera with 5.0 polyester. A scleral incision was made based on location of detachment for subretinal fluid drainage. 0.3 cc air/perfluropropane were injected. Lastly conjunctiva was then closed with 8.0 vicryl suture.

The anatomical outcome (success) was defined as by the post-operative retinal attachment for a period of 3 months. The functional outcome (success) was determined by the improvement in at least 2 lines of Snellen's visual acuity chart postoperatively.

Results and Discussion

A total of 59 patients with retinal detachment including 79.70% male and 20.30% female were enrolled in our study. The demographic details of which are depicted in table 1.

Variables	Values
Gender (n, %)	
Male	47 (79.70%)
Female	12 (20.30%)
Mean age in years, x ± sd (range)	43.88 ± 16.27 years (R; 12-73 years)
Age in years (n, %)	
< 25	8 (13.60%)
26 - 45	24 (40.70%)

46 - 65	21 (35.60%)
> 65	6 (10.20%)
Affected eye (n, %)	
OD	34 (57.60%)
OS	25 (42.40%)
Status of Lens (n, %)	
Phakic	43 (72.90%)
Pseudophakic	16 (27.10%)
History of ocular trauma (n, %)	
Yes	11 (18.60%)
No	48 (81.40%)
Duration of symptoms in days, x ± sd (range)	113.15 ± 201.09 (R; 2-900)
Status of macula	
On	15 (25.40%)
Off	44 (74.60%)
Total retinal detachment (n, %)	19 (32.20%)
No. of breaks	
1	39 (66.10%)
2	16 (27.10%)
> 3	4 (6.80%)
Intravitreal C3F8/air use	
Yes	29 (49.20%)
No	30 (50.80%)
Anatomic outcome	
Retina attached	45 (76.30%)
Residual RD	14 (23.70%)
BCVA of affected eye, x ± sd	
At presentation	1.64 ± 0.51 log MAR (R; 0.48-2.30)
Postoperative 3 months	1.03 ± 0.49 log MAR (R; 0.00-1.77)

Table 1: *Demographic profiles of cases with retinal detachment who underwent scleral buckling surgery.*

Primary anatomical success with single surgery was 76.30% patients. Significantly better anatomical outcome was observed in phakic patients ($p < 0.01$) and patients with better preoperative best corrected visual acuity ($p = 0.01$). Presence of total retinal detachment was associated with poor anatomical outcome ($p < 0.01$). Gender, duration of symptoms, positive history of trauma, number of breaks, intraoperative use of intravitreal C3F8 or air, and status of macula were not significantly associated with the final anatomical outcome (Table 2).

Variables	Total	Retina attached	Residual RD	P-value
Number of eyes	59	45	14	
Age in years, x±sd (years)	43.88 ± 16.27	43.62 ± 16.32	44.71 ± 16.71	P = 0.83 (a)
< 25	8	7	1	
26 - 45	24	16	8	P = 0.09 (b)
46 - 65	21	19	2	
> 65	6	3	3	
Gender (M/F)	47/12	38/7	9/5	P = 0.10 (b)
Symptoms in days	113.15 ± 201.09	113.27 ± 192.81	112.79 ± 233.64	P = 0.99 (a)
Preoperative BCVA	1.64 ± 0.51 log MAR	1.54 ± 0.53 log MAR	1.93 ± 0.36 log MAR	P = 0.01* (a)
Total RD	19	5	14	P < 0.01* (c)

History of trauma	11	7	4	P = 0.43 (c)
No of breaks (1, > 2)	39/20	30/15	9/5	P = 0.55 (c)
Status of macula (on/off)	15/44	10/35	5/9	P = 0.32 (c)
Lens status (phakia/pseudo-phakia)	43/16	37/8	6/8	P < 0.01* (b)
Intravitreal I3F8/air	29	25	4	P = 0.08 (b)
Presence of myopic error	35	30	5	P = 0.01* (b)
Cryo/laser used	23/36	16/29	7/7	P = 0.36 (c)

Table 2: *Anatomical outcome of the scleral buckling according to preoperative clinical characteristics. (a= Independent Sample t-Test, b= Chi-Square Test, c= Fisher's Exact Test). (*=p-value less than 0.05 is considered statistically significant).*

There was a significant improvement of visual acuity after scleral buckle surgery including cases with residual detachment (p = 0.04). Postoperative visual outcome according to duration of symptom was not statistically significant (Table 3).

Duration of Symptoms in Days	BCVA < 0.50 log MAR	BCVA > 0.50 log MAR	P-value
1-7	1	7	
8 - 30	4	24	P = 0.49
> 30	6	17	
Total	11	48	

Table 3: *Final visual outcome 3 months after scleral buckling in patients with anatomical success according to duration of symptom.*

Although the status of macula had no significant effect on anatomical outcome, postoperative visual acuity was remarkably better in macula on retinal detachment cases (p = 0.04). Mean BCVA in the macula on and off cases was 0.81 ± 0.60 log MAR and 1.10 ± 0.46 log MAR, respectively. There was significant improvement in preoperative visual acuity from 1.64 ± 0.51 log MAR (R; 0.48 - 2.30) to 1.03 ± 0.49 log MAR (R; 0.00 - 1.77) 3 months postoperative. The overall functional success rate in terms of visual acuity was 71.2%.

Postoperatively, temporary rise in IOP above 21 mm of Hg was seen in 28 eyes (47.50%) and all were adequately controlled by topical anti glaucoma medication. The mean age of patients with postoperative raised IOP was less (43.07 ± 18.04 years) than those with normal IOP (44.61 ± 14.77 years) but was not statistically significant (p = 0.35). Similarly, the use of intravitreal gas or air was not significantly associated with raised IOP (p = 0.26). Other complications included vitreous hemorrhage (2.70%) and buckle infection (6.80%), vitreous haze (11.90%), retinal incarceration (15.30%) and epithelial defect (11.90%).

Discussion

Scleral buckling is one of the most successful methods for treatment of uncomplicated retinal detachments and macula-off retinal detachments avoiding the complications of primary vitrectomy [5]. Despite of the advances in vitrectomy era, it is still a recommended technique in young phakic patients with non-liquefied vitreous and minimal proliferative vitreoretinopathy [6,7].

The primary success of scleral buckling surgery in our study is determined by various factors like lens status and better preoperative best corrected visual acuity while presence of total retinal detachment was associated with poor anatomical outcome. On the contrary, gender, duration of symptoms, positive history of trauma, number of breaks, intraoperative use of intravitreal C3F8 or air, and status of

macula were not significantly associated with primary outcome. Mustard study is one of the large studies that have determined various factors affecting the primary success [5]. Similarly in our study although the status of macula had no significant effect on anatomical outcome, postoperative visual acuity was remarkably better in macula on retinal detachment cases in our study. Other studies also showed that the anatomical outcome was influenced by were lens status, preoperative visual acuity, and extent of retinal detachment [8].

Although the status of macula had no significant effect on anatomical outcome, postoperative visual acuity in terms of functional outcome was remarkably better in macula on retinal detachment cases. Postoperative visual outcome according to duration of symptom was not statistically significant. The mean duration of presentation of symptoms was 113.15 ± 201.09 days. In other studies, the mean duration of presentation was 8.1 ± 15.1 months, 16.6 ± 44.7 weeks (range: 0.3 - 240) [6,8]. Similarly, another study showed the mean duration of the presentation was 4.71 (± 8.45) months [9]. Few studies showed that early presented symptom was associated with higher success rate in contrast to our study [5].

The overall success rate in terms of anatomical outcome was 76.30% which was slightly lower but similar to overall success rate of all 4325 MUSTARD patients being 83.98%.[5]. Some other studies have shown success rate over 90% [10,11]. Similar studies done in Nepal showed similar but slightly higher success rate of 80.4% and 84.9% than our study [8,9]. The physiological success rate of scleral buckling in one study done in Nepal was 73.9% in terms of 2 lines in improvement of visual acuity [9]. In our study, we achieved a similar physiological success rate of 71.2%% in terms of 2 lines in improvement of visual acuity.

The complication of temporary rise in IOP above 21 mm of Hg was seen in 28 eyes (47.5.%) which were adequately controlled by topical anti glaucoma medication in our study. Temporary postoperative rise in IOP in another series in Nepal was remarkably high (33.3%) as our study but it was also controlled by anti-glaucoma medication [8]. Elevated IOP after scleral buckling surgery has been reported ranging from 3.3% to 16% [12-14]. The other complications included vitreous hemorrhage (2.70%) and buckle infection (6.80%), vitreous haze (11.90%), retinal incarceration (15.30%) and epithelial defect (11.90%) in our study.

Proliferative vitreoretinopathy is considered the most common cause of anatomical failure of scleral buckling surgery [15-19]. The most common cause of failure of scleral buckling surgery in our study was also proliferative vitreoretinopathy. 85.7% (12 out of 14) cases failed due to proliferative vitreoretinopathy and 14.3% (2 out of 14) failed due to new retinal break.

Conclusion

Despite of the advancements in the era of vitrectomy, scleral buckling is still a good and safe surgical option for rhegmatogeneous retinal detachment in young patients, phakic patients, macula on and partial retinal detachments and patients with better preoperative visual acuity.

Conflict of Interest

The authors declare that they have no conflict of interest.

Bibliography

1. Aijing Wang and Martin P Snead. "Scleral Buckling: A brief historical overview and current indications". *Graefe's Archive for Clinical and Experimental Ophthalmology* 258 (2020): 467-478.

2. E Custodis. "Treatment of retinal detachment by circumscribed diathermal coagulation and by scleral depression in the area of tear caused by imbedding of a plastic implant". *Klin Monatsblatter Augenheilkd Augenarztl Fortbild* 129.4 (1956): 476-495.

3. CL Schepens. "Progress in detachment surgery". *Transactions-American Academy of Ophthalmology and Otolaryngology* 55 (1951): 607-615.

4. HA Lincoff., *et al*. "Cryosurgical treatment of retinal detachment". *Transactions-American Academy of Ophthalmology and Otolaryngology* 68 (1964): 412-432.

5. Uelen S Amler., *et al*. "Outcome of surgery after macula-off retinal detachment - results from MUSTARD, one of the largest databases on buckling surgery in Europe". *Acta Ophthalmologica* 90.5 (2012): 481-486.

6. Ghasemi Falavarjani K., *et al*. "Scleral buckling surgery for rhegmatogenous retinal detachment with subretinal proliferation". *Eye* 29 (2015): 509-514.

7. Yao Y., *et al*. "Scleral buckling procedures for longstanding or chronic rhegmatogenous retinal detachment with subretinal proliferation". *Ophthalmology* 113 (2006): 821-825.

8. Shah RK., *et al*. "Factors Affecting the Outcome of Scleral Buckling Surgery for Primary Rhegmatogenous Retinal Detachment". *Hindawi Journal of Ophthalmology* (2018): 4.

9. Singh S., *et al*. "Reviving the lost art of scleral bucklingsurgery for rhegmatogenous retinal detachment: evaluation of risk factors of detachments, poor physiological outcomes and perspective from a developing country". *Therapeutic Advances in Ophthalmology* (2019): 1-7.

10. JC Pastor., *et al*. "Surgical outcomes for primary rhegmatogenous retinal detachments in phakic and pseudophakic patients: the Retina 1 Project report 2". *British Journal of Ophthalmology* 92.3 (2008): 378-382.

11. Kovacevic A Radosavljevic., *et al*. "Anatomical and functional factors influencing the results of scleral buckling procedure for macula-off rhegmatogenous retinal detachments". *Vojnosanitetski Pregled* 74.3 (2017): 212-218.

12. Y Bardak., *et al*. "Scleral buckling results in rhegmatogenous retinal detachment". *Ret-Vit* 14 (2006): 201-204.

13. F Afrashi., *et al*. "Conventional buckling surgery or primary vitrectomy with silicone oil tamponade in rhegmatogenous retinal detachment with multiple breaks". *Graefe's Archive for Clinical and Experimental Ophthalmology* 242.4 (2004): 295-300.

14. D Miki., *et al*. "Comparison of scleral buckling and vitrectomy for retinal detachment resulting from flap tears in superior quadrants". *Japanese Journal of Ophthalmology* 45.2 (2001): 187-191.

15. Hooymans JM., *et al*. "Formation of proliferative vitreoretinopathy in primary rhegmatogenous retinal detachment". *Documenta Ophthalmologica* 100 (2000): 39-42.

16. Lewis H., *et al*. "Causes of failure after initial vitreoretinal surgery for severe proliferative vitreoretinopathy". *American Journal of Ophthalmology* 111 (1991): 8-14.

17. The Retina Society Terminology Committee. "The classification of retinal detachment with proliferative vitreoretinopathy". *Ophthalmology* 90 (1983): 121-125.

18. Kroll P., *et al*. "Pathogenesis and classification of proliferative Diabetic vitreoretinopathy". *Ophthalmologica* 221 (2007): 78-94.

19. Rodriguez de la Rua E., *et al*. "Clinical risk factors for postoperative proliferative vitreoretinopathy (PVR). A prospective study". *Archivos de la Sociedad Española de Oftalmología* 78 (2003): 91-97.

Volume 12 Issue 12 December 2021