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# Indications and outcomes of scleral buckle removal: a hospital-based study

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## Abstract

**Introduction:** Scleral buckling is an extraocular surgery for rhegmatogenous retinal detachment. Scleral buckle may require removal due to complications like infection, exposure, diplopia, recurrent retinal detachment, buckle migration, or severe pain. This study aimed to find out the indications and outcomes of scleral buckle removal in a tertiary eye hospital in Nepal.

**Method:** This retrospective study was conducted at Biratnagar Eye Hospital, Nepal, from Jan 2021 to Apr 2025. Patients undergoing scleral buckle removal with attached retina at removal and a minimum of three months follow-up were included. Indications for removal, interval between primary surgery and explantation, microbiological profile, and postoperative complications were recorded. Anatomical outcome was defined as an attached retina at final follow-up. Functional outcome was defined as maintained or improved vision. Descriptive analysis, n(%) and mean±SD, and visual acuity before and after removal were compared using the Wilcoxon signed-rank test. A $p<0.05$ was considered significant.

**Result:** Thirty eyes of thirty patients were analysed, mean age 33.61±12.75 years, males 27(90%). Common indication was buckle exposure with infection in 26(86.7%). The interval between implantation and removal was 74±49 months. Culture positivity was seen in 17(56.7%); Staphylococcus aureus in 13(76.5%). Postoperative retinal redetachment occurred in 1(3.3%), scleral thinning in 8(26.7%). Mean visual acuity was 1.34±0.50 LogMAR at removal and 1.35±0.50 at final follow-up (p=0.321). Anatomical success was achieved in 29(96.7%) and functional success in 29(96.7%).

**Conclusions** Buckle exposure with infection was the common indication for scleral buckle removal. Anatomical and functional outcomes were favourable with a low redetachment rate.

## How to cite

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## Introduction

Scleral buckling and pars plana vitrectomy are the most common methods of retinal reattachment.[1] Many studies have compared these two approaches for the treatment of uncomplicated rhegmatogenous retinal detachment, but there is still no consensus on the best technique.[1–4] Scleral buckling may be technically challenging and require prolonged surgical time, but it is usually associated with a low risk of ocular complications, less expense, and has comparable outcomes when compared with pars plana vitrectomy.[5,6]

Scleral buckling is an extraocular and non-invasive surgery. However, it has its own complications for which it sometimes needs to be explanted. Indications for scleral buckle explantation include infection, exposure, diplopia, recurrent retinal detachment, buckle migration, and severe pain.[7–11]

Buckle explantation can also be associated with complications such as scleral thinning, scleral perforation, and endophthalmitis, but the most dreaded complication is redetachment of retina. Studies have reported the risk of redetachment ranging from 0% to 50%, which mostly occurs during the first three months after buckle removal.[12–15]

There have been few studies on outcomes of buckle surgery from Nepal, but data regarding its complications, especially indications and outcomes of buckle explantation, are lacking. The present study intends to fill this gap by presenting the indications and outcomes of scleral buckle removal in a tertiary eye hospital of Nepal.

## Method

This was a retrospective hospital-based study conducted at Biratnagar Eye Hospital, Nepal. The study was carried out from Jun 2021 to May 2025. Medical records of all consecutive patients who underwent scleral buckle removal surgery from Jan 2021 to Apr 2025 were reviewed.

Patients with attached retina at the time of scleral buckle removal and minimum three months of follow-up after removal were included. Patients with previous history of vitrectomy or previous retinal detachment surgery on the same eye; previous scleral buckling or encircling surgery for retinal detachment due to aetiologies other than rhegmatogenous, such as retinopathy of prematurity, trauma, and tractional cases; and those cases where buckle sutures were trimmed or removed without removal of buckling material were excluded from the study.

Ethical approval was obtained from the Institutional Review Committee of Biratnagar Eye Hospital (Approval number: BEH-IRC-138/2025, dated 5 Aug 2025). The study adhered to the Declaration of Helsinki.

Enumerative sampling method was used. All eligible patients during the study period were included. Since this was a descriptive study, sample size was not calculated. A structured proforma was used to collect data from hospital electronic medical records.

Demographic data were obtained from electronic medical records. Indication for scleral buckle removal, time interval between primary scleral buckle surgery and its removal, and site of buckle exposure were recorded. Conjunctival swab and exposed buckles were sent for Gram stain, KOH mount, and culture sensitivity. Postoperative complications after scleral buckle removal and visual acuity before scleral buckle removal and at final follow-up were recorded.

Clinical infection was defined as presence of inflammatory signs including redness, pain, and purulent discharge. Favourable anatomical outcome was defined as attached retina at last follow-up. Favourable functional outcome was defined as maintained or improved vision by at least one line on Snellen's visual acuity chart.

Variables studied included age and gender as independent variables; and indications for removal, interval between surgery and

removal, culture positivity, postoperative complications, anatomical outcome, and functional outcome as dependent variables.

Visual acuity was measured using Snellen chart and converted to logMAR (Logarithm of the Minimum Angle of Resolution) units for statistical analysis using the following conversion: counting fingers = 1.7, hand motion = 2.0, light perception = 2.3, no light perception = 3.

Data were entered in Microsoft Excel and analysed using IBM SPSS Statistics. Descriptive parameters were presented as mean±SD for continuous variables and number (percentage) for categorical variables. Visual acuity before and after removal was compared using Wilcoxon signed-rank test. A p-value less than 0.05 was considered statistically significant. To ensure data accuracy, all entries were double-checked with original medical records. Standard microbiological techniques were followed for culture and sensitivity.

## Result

A total of thirty eyes of thirty patients were included in the study. The majority were male (90%) with mean age of 33.61±12.75 years. Mean interval between buckle implantation and removal was 74±49 months. All removed buckles were silicone, Table 1.

The primary indication for explantation was buckle exposure with infection (86.7%), followed by suture exposure with discharge (10%) and exposure without discharge (3.3%), Table 2. Temporal quadrant was the most common site of exposure (60%), Table 1.

No intraoperative complications occurred. Postoperatively, scleral thinning was noted in 26.7% and retinal redetachment in one patient (3.3%), Table 3. The single redetachment case occurred 25 days post-removal in a patient whose primary surgery was done elsewhere five years prior.

Culture positivity was observed in 56.7% of cases, with Staphylococcus aureus being the predominant organism (76.5%), Table 4.

Visual acuity remained stable, with mean logMAR of 1.34±0.50 at removal and 1.35±0.50 at final follow-up (p=0.321). Anatomical success (attached retina) was achieved in 96.7% and functional success (maintained/improved vision) in 96.7% of patients.

**Table 1. Demographic and clinical characteristics of patients with scleral buckle removal, n=30**

| Characteristic | n(%) |
|---|---|
| **Gender** | |
| Male | 27(90) |
| Female | 3(10) |
| **Age group** | |
| <30 years | 12(40) |
| >30 years | 18(60) |
| **Site of buckle exposure** | |
| Temporal | 18(60) |
| Nasal | 10(33.3) |
| Inferior | 2(6.7) |
| **Presentation after primary surgery** | |
| ≤3 months | 1(3.3) |
| >3 months | 29(96.7) |
| **Culture positivity** | 17(56.7) |

**Table 2. Indications for scleral buckle removal, n=30**

| Indication | n(%) |
|---|---|
| Buckle exposure with discharge | 26(86.7) |
| Buckle exposure without discharge | 1(3.3) |
| Suture exposure with discharge | 3(10) |

**Table 3. Postoperative complications observed after scleral buckle explanation (removal) (removal), n=30**

| Complication | n(%) |
|---|---|
| Retinal detachment | 1(3.3) |
| Scleral thinning | 8(26.7) |

**Table 4. Organisms identified from the buckle in culture, n=17**

| Organism | n(%) |
|---|---|
| Staphylococcus aureus | 13(76.5) |
| Streptococcus species | 2(11.8) |
| Klebsiella pneumoniae | 1(5.9) |
| Pseudomonas aeruginosa | 1(5.9) |

## Discussion

In this study, common indication for scleral buckle removal was buckle exposure with infection in 26(86.7%) cases. Anatomical success was achieved in 29(96.7%) patients and functional success in 29(96.7%), with only 1(3.3%) retinal redetachment following buckle removal.

Our findings are comparable to other studies in the literature. Scleral buckling is an established method of treating rhegmatogenous retinal detachment. In the era of microincision vitrectomy surgery, scleral buckle surgeries have relatively declined despite comparable outcomes.

Similar to many studies from South Asia, gender disparity was evident in this cohort, with males accounting for more than 90% of the cases.[16–18] The reason may be due to a gender disparity in utilization of eye care services in Nepal.[19]

Buckle surgery is usually performed in selected cases of rhegmatogenous retinal detachment. The mean age of patients undergoing buckle removal was 33.61 years, similar to a study conducted at the same hospital a few years earlier where the mean age of patients undergoing primary scleral buckle surgery was 26.68±12.6 years.[16] In another study conducted in the western part of Nepal, the mean age of patients undergoing primary scleral buckle surgery was 54.28±13.49 years.[17] This variation may be due to difference in study period and geographic location of the study site.

There have been many different indications of scleral buckle removal in the literature. Some studies have noted pain alone as the indication for buckle removal in their group of patients.[7,12] Other studies reported various indications, but buckle exposure and infection remained the most common cause of scleral buckle removal.[18] The findings of this study are consistent with those reports, with buckle exposure with infection being the predominant indication. In another study, buckle exposure without clinical infection was the most common indication for removal of the scleral buckle.[20] To prevent this complication, it is important to properly cover the buckle material with Tenon's capsule and conjunctiva along with trimming of the edges of the silicone tire to reduce its sharpness.[20] On the other hand, it has been noted that not every eye with buckle exposure warrants removal, with one report following a one-eyed patient with buckle exposure in the seeing eye for 11 years without removing the explant.[21] The

decision to remove the scleral buckle may rely on patient characteristics like age, comorbid conditions, and status of the other eye.[22]

The mean interval of buckle implantation and its removal in this study was 74±49 months with range of 3 to 204 months, which was similar to another study where mean interval was 60.79±50.78 months.[18] Out of these, one patient had scleral buckle removal within three months and 29 presented after three months of scleral buckle implantation. This suggests that eyes undergoing scleral buckling should undergo regular ocular examinations, even if they are asymptomatic, so that asymptomatic buckle exposures may not be missed until they become infected.

All the buckles, after their removal, were sent for culture and sensitivity. Culture positivity of explanted buckle as reported in literature ranges from 0% to 33%.[22] In this study, 17(56.7%) were culture positive with a single organism. This higher rate may be due to inclusion of conjunctival smear and sutures used for buckle surgery being sent for culture and sensitivity. Of the 17 eyes with positive culture, scleral buckle material was the source of identification of microorganism in 15(88.2%) eyes, buckle sutures were the source in one(5.9%) eye, and conjunctiva in 1(5.9%) eye. Like in many studies, Staphylococcus species was the most common organism isolated.[18,23,24]

Several complications can occur after buckle removal, such as scleral thinning, scleral perforation, and endophthalmitis, but the most dreaded one is the recurrence of retinal detachment. Various risk factors for recurrence of retinal detachment are combined surgery with pars plana vitrectomy, presence of vitreous traction, shorter scleral buckle duration after placement, retinal tears as opposed to holes, and unrecognized retinal breaks at the time of scleral buckling.[22] The rate of recurrent retinal detachment after removal of a presumed infected scleral buckle varies from no increased risk to 50%.[22] In this study, redetachment occurred in one(3.3%) patient, which was lower than in another study where redetachment was 6.86% and another where it was 11.8%.[18,20] This difference may be due to difference in the duration of study and the number of patients undergoing scleral buckle removal. Recurrent retinal detachment developed within a month of scleral buckle removal in this study, which was similar to other studies.[18,20]

In this study, the patient who had redetachment after buckle removal had primary surgery done five years prior and developed redetachment within 25 days of removal, similar to another study where redetachment occurred in the first month of scleral buckle removal.[18] This shows that patients undergoing scleral buckle removal should be followed up at short intervals for at least the first three months, but long-term follow-up is also required even though the probability of late occurrence of retinal redetachment seems to be low.

The limitations of this study include its retrospective nature, small sample size, and relative decrease in buckling procedures after the invention of microincision vitrectomy surgery, which is the reason for the small sample size in this study. As most of the patients had buckle implanted in other centres, there was lack of details about the primary surgery which prevented analysis of the causative factors of buckle infection. A minimum follow-up of three months was taken, which is in line with studies showing maximum redetachment occurring within the first three months; however, retinal detachment recurrence during the later stage may have been missed, potentially biasing the rate of retinal redetachment.

## Conclusion

We found that buckle exposure with infection was the most common indication for scleral buckle removal. Anatomical and functional outcomes were favourable with low rate of retinal redetachment. Scleral thinning was the most common postoperative complication. Since buckle exposure can occur even in the late postoperative period, patients require long-term regular follow-up with careful ocular examination for infection and extrusion of the buckle.

## Author contribution

Concept design: AM; Literature search: AM; Data collection: AM; Data analysis: AM; Draft manuscript: AM; Final manuscript and accountability: AM

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## Conflict of interest

None

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## Supplementary material

Data and supplementary material that support the findings of this study are available from the corresponding author upon reasonable request.

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