Purpose: To evaluate and analyze the outcomes of sutureless and glue-free limbal-conjunctival autografting in cases of primary as well as recurrent pterygium. Methods: This prospective interventional study was carried out between February 2019 and February 2020 at a tertiary care hospital in North India. A total of 70 patients with pterygium underwent sutureless and glue-free limbal-conjunctival autograft. The patients were divided into two groups: group 1 patients with primary pterygium (n = 45), group 2 patients with recurrent pterygium (n = 25). The patients were followed up till 12 months postoperatively. Results: The mean age of the patients in group 1 and group 2 was 37.04 ± 8.69 years and 32.52 ± 6.49 years, respectively (P = 0.04). Postoperatively, no recurrence was recorded in group 1. Recurrence was noticed in two patients (8%) of group 2. The BCVA changed from 78.73 ± 9.86 letters to 80.15 ± 7.29 letters (P = 0.45) and from 79.6 ± 6.44 letters to 79.8 ± 5.86 letters (P = 0.45) in group 1 and group 2, respectively. Graft edema was found in seven (15.53%) cases of group 1 and four (16%) cases of group 2. Graft retraction was found in two (4.44%) cases of group 1 and three (12%) cases of group 2. Conclusion: Sutureless and a glue-free limbal-conjunctival autograft is a safe and effective treatment option for primary as well as recurrent pterygium.

Key words: Limbal-conjunctival autografting, recurrent pterygium, sutureless and glue-free

Pterygium (derived from pterygium, ancient Greek word for wing) represents abnormal fibrovascular growth of the subconjunctival tissue which progresses toward the surface of the cornea. Localized limbal cell deficiency,[1] hereditary,[2] and increased exposure to ultraviolet radiation[3] are thought as the causative factors. Cosmetic disfigurement and chronic inflammation-causing symptoms are indications of its surgical removal.[4] Surgical removal is quite easy; however, recurrence is the leading cause of surgical failure. To combat recurrence, numerous surgical procedures, viz. basic excision with sliding and rotational flaps, conjunctival autografts, limbal-conjunctival autograft (LCAG),[5] amniotic membrane graft,[6] with or without surgical adjuncts like sutures, commercial fibrin glue,[7] topical chemotherapeutic agents (e.g., 0.02% mitomycin C and 5 fluoroouracil),[8-10] external beta irradiations, carbon dioxide/eximer laser, and thiotepa are being performed. None of the procedure has been proved to be 100% effective with variable postoperative recurrence rates. Conjunctival autograft with an adjunct agent is the procedure of choice.[11] A relatively new technique of sutureless and glue-free (SLGF) limbal-conjunctival autografting (LCAG) is getting momentum being relatively cheap, easy to perform, and has comparable results with most of the surgical techniques.

The purpose of our study was to evaluate and analyze the outcome of SLGF-LCAG after pterygium excision utilizing the patients' blood (which oozes out from excised pterygium bed), in cases of primary as well as recurrent pterygium in terms of postoperative recurrence and complications.

Numerous national and international studies have already compared the above-mentioned surgical technique; however, none described the role of the SLGF-LCAG technique in cases of recurrent pterygium. Also, we did not use any surgical adjunct for graft adherence (viz. suture, commercial fibrin glue, mitomycin C, and laboratory prepared autologous blood product).

Methods

This prospective interventional study was carried out on 70 patients out of which 45 had primary pterygium and 25 were recurrent pterygium with a history of previous pterygium excision once.

Inclusion criteria
Patients of all ages and either sex with primary nasal pterygium were included in the study.

Recurrent nasal pterygium—patient with a history of pterygium surgery (performed at least 1 year back) with visible growth crossing the limbus.
Exclusion criteria
Pre-existing glaucoma patients, the patients on anticoagulants, the patients with a history of previous ocular surgery within the last 6 months, the patients with lid and ocular surface disorders like blepharitis, dry eyes, symblepharon, double head pterygium, previous trauma, active infection, and atrophic pterygium; any retinal pathology requiring surgical intervention.

All surgeries were performed between February 2019 and February 2020 at a tertiary care hospital. The patients complained of symptomatic pterygium, viz. conjunctival congestion or redness, watering/tearing, growth over cornea with or without blurring of the vision, and cosmetic concerns were included in the study. All patients underwent a comprehensive ophthalmologic examination including best-corrected visual acuity, anterior segment evaluation by slit-lamp, measurement of intraocular pressure, ocular movements, and dilated fundus examination.

All surgeries were performed by a single surgeon after taking written informed consent in the patient’s language. The patients were divided into two groups: group 1 patients with primary pterygium and group 2 patients with recurrent pterygium. The goals of the pterygium surgery were complete excision of the pterygium tissue with the restoration of normal conjunctival anatomy and to prevent a recurrence. The patients were followed up on day 1, 1 week, 1 month, 3 months, 6 months, and 12 months. Success was defined as no recurrent pterygium 12 months after surgery. Any fibrovascular regrowth across the limbus was defined as a recurrence.

All surgeries were performed under local peribulbar anesthesia No patient required additional local anesthesia.

Surgical procedure
Simple pterygium excision was performed under peribulbar anesthesia (Lignocaine 2% + Bupivacaine 0.5% in a ratio of 3:2). After an eyelid speculum was inserted, thorough cleaning of the anterior surface was done using balanced salt solution [Fig. 1a]. Marking of Pterygium for dissection was done [Fig. 1b]. Infiltration anesthesia (0.5 cc of Lignocaine 2%) was used to balloon the pterygium separating it from the sclera [Fig. 1c]. The neck of the pterygium was then lifted with the help of fine-toothed forceps [Fig. 1d], while the head of the pterygium was gently avulsed from the cornea by using closed tips of a curved needle holder, holding the neck of the pterygium mass and keeping the same constant traction [Fig. 1e]. The subconjunctival pterygium tissue with the overlying conjunctiva and adjacent Tenon’s capsule was excised. Then the size of the bare sclera was measured with calipers and the area was documented in mm².

The conjunctival autograft was harvested from the inferotemporal quadrant. The graft was marked 1 mm larger in width and length than the recipient bed [Fig. 1f]. Bulbar conjunctiva was injected with 0.5 cc of Lignocaine 2% to facilitate the separation of the conjunctiva from the Tenon’s capsule, then [Fig. 1g], the limbal side was also marked before dissection of the graft with the help of a sterile marker pen. After making a small opening, blunt dissection was performed with Wescott scissors and the entire graft was made free from Tenon’s [Fig. 1h]. Once the dissection was complete till the limbus, we included limbal stem cells by making a small dissection beyond the limbus. Then, the edges of the graft were cut by Yanna’s scissors [Fig. 1i]. Care was taken to gently slide the graft to the recipient bed with

![Figure 1: Steps of SLGF–LCAG surgery. (a) Cleaning of anterior surface (b) Marking of pterygium (c) Ballooning of pterygium (d) Excision of pterygium (e) Avulsion of pterygium from corneal surface (f) Marking the graft (g) Separation of the graft from tenon by infiltration (h) Dissection of the graft (i) Spreading the graft over cornea after excision (j and k) Spreading out the graft over recepient area (l) Well adhered graft on completion of procedure](image)
the epithelial side up and keeping the limbal edge toward the limbus with the help of the forceps [Fig. 1j]. Then the graft was spread out over the recipient area with the help of two flat instruments, viz. the iris repositor [Fig. 1j and k]. Reassuring the graft adherence after removal of speculum before patching the eye [Fig. 1l]. The same procedure was followed for both groups.

Postoperatively, an eye patch was applied for 48 h. The postoperative medication included moxifloxacin with dexamethasone combination four times a day which was tapered over 4 weeks plus topical lubricating eye drops four times daily for 4 weeks. The patients were instructed to avoid dust, heat, direct sun exposure, and rubbing their eyes in case of postoperative itching. The patients were given dark glasses to reduce sun and Ultraviolet-B (UVB) exposure.

On postoperative follow-up, the primary postoperative outcome noted was the recurrence rate (any fibrovascular proliferation across the limbus) for both groups. The change in Best Corrected Visual Acuity (BCVA) and graft-related complications, viz. graft edema, graft retraction, graft loss, or cyst/granuloma were measured as secondary outcomes.

**Statistical analysis**

SPSS Software II was used for the statistical analysis (SPSS Inc., Chicago, IL, USA). The Wilcoxon matched-pairs test and Mann–Whitney U-test were used for comparative statistics and independent samples, respectively. A *P* value less than 0.05 was considered statistically significant.

**Results**

Our study comprises 45 patients in the primary pterygium group and 25 patients in the recurrent pterygium group. All underwent pterygium excision followed by a SLGF limbal-conjunctival autograft. The mean age of the patients in group 1 and group 2 was 37.04 ± 8.69 years and 32.52 ± 6.49 years, respectively with a *P* value of 0.04. There were 20 females (57%) and 25 males (43%) in group 1 and 9 females (36%) and 16 males (64%) in group 2 [Table 1]. The common indication of surgery was symptomatic pterygium and cosmetic concerns.

Postoperatively, no recurrence was recorded in the primary pterygium group (group 1). Recurrence [Fig. 2d–e] was only noticed in two patients (8%) of group 2 out of which one patient developed pterygium at the operated site (2.5 mm crossing limbus) as well as donor site (1 mm crossing the limbus) on 3 months of follow-up and one patient had a recurrence at 6 months of follow-up (measuring 0.5 mm crossing limbus).

Change in BCVA [Table 1]: In the primary pterygium group, there was a change in the BCVA from 78.73 ± 9.86 letters to 80.15 ± 7.29 Early Treatment Diabetic Retinopathy Study (ETDRS) letters (*P*-value = 0.45). In the recurrent pterygium group, the BCVA changed from 79.6 ± 6.44 to 79.8 ± 5.86 letters (*P*-value = 0.45). The change in BCVA was not statistically significant.

Graft-related complications [Table 1]:

Graft edema was found in seven (15.55%) cases of group 1 and four (16%) patients of group 2. It was mainly due to the residual Tenon’s tissue associated with the graft [Fig. 2a].

Graft retraction was found in two (4.44%) cases of group 1 and 3 (12%) cases of group 2. Graft retraction was managed conservatively and did not require any further surgical intervention [Fig. 2b].

Graft loss: None of the patients in either group had a loss of conjunctival autograft in the 12 months of the follow-up period.

Tenon’s cyst was noted in two (8%) patients of group 2, one patient developed Tenon’s cyst at the donor site. These were managed with cyst excision [Fig. 2c]. The patient of group 1 did not show such complications.

**Discussion**

Surgical techniques for the management of pterygium vary. The aim of the pterygium surgery is to excise the pterygium and prevent its recurrence. The surgical techniques have evolved from the simple bare sclera procedure to more complex approaches, such as amniotic membrane transplantation, lamellar keratoplasty, conjunctival autograft, with or without a limbal stem-cell transplant, conjunctival rotation surgery, and the use of fibrin glue. The adjuvant agents include beta irradiation, thiotaepa, mitomycin C (MMC), 5-fluorouracil, and daunorubicin.[12–15]

Bare sclera excision (BSE) is an old and obsolete technique with an unacceptably high recurrence rate (40–60%). To deal with the high recurrence rate of perioperative MMC,[16,17]

| Table 1: Summary of the demographic data and results |
|------------------------------------------------------|
| **Group 1 (Primary pterygium group)** | **Group 2 (Recurrent pterygium group)** |
| No of patients (*n*) | 45 | 25 |
| Male | 25 | 16 |
| Female | 20 | 09 |
| Age, range (years) | 24-54 | 22-45 |
| Age mean±SD | 37.0±8.69 | 32.52±6.49 |
| Recurrence, no. of patients (%) | Nil | 2 (8%) |
| Best-corrected visual acuity (ETDRS VAS±SD) |
| Baseline | 78.73±9.86 | 79.6±6.44 |
| Final | 80.15±7.29 | 79.8±5.86 |
| Graft-related complications |
| Graft edema | 7 (15.55%) | 4 (16%) |
| Graft retraction | 2 (4.44%) | 3 (12%) |
| Graft loss | 0 | 0 |
| Cyst | 0 | 2 (8%) |
preoperative subconjunctival injection, intraoperative application, and postoperative drops were used with Bare Sclera Excision (BSE) which yielded better outcomes, but the higher rate of complications made this procedure less favorable. BSE with beta irradiation has resulted in encouraging outcomes (13% recurrence); however, it has toxic and serious complications.

Pterygium excision with limbal-conjunctival autograft has been reported to be more effective with low recurrence but it may compromise the corneal stem-cell population. The adjunctive use of the amniotic membrane graft results in a low recurrence rate but it is costly.

Recently, fibrin glue is being used as an alternative to sutures for securing the conjunctival grafts. A study has reported a recurrence rate of 5.3% for glue versus 13.5% for sutures and suggested that the reason for less recurrence with glue was due to the immediate adherence of the graft and lack of postoperative inflammation which may inhibit the fibroblast ingrowth, and in turn, reduce the recurrence. However, the transmission of infectious agents such as parvovirus B19 and prions were associated with commercial preparations of fibrin glue. Furthermore, due to bovine protein aprotinin, the anaphylactic reaction has also been reported after the use of the fibrin sealant. Foroutan et al. prepared autologous fibrin glue in a laboratory setup. It was much safer but not widely used due to the time taken in the preparation of the glue and infrastructure cost.

The recent reports on SLGF-CAG by different Indian authors, such as Kurian et al., Singh et al., Choudhuri et al., Kulthe et al., Sharma et al., and Mitra, are very encouraging and comparable with our study. The reason for the recurrence in two patients (8%) in our study in the recurrent pterygium group could be attributed to the inadvertent inclusion of the Tenon in the graft or because of the aggravated tissue response related to the younger age of patients rather than because of the surgical method. The inclusion of the Tenon in the graft, graft edema, or subgraft hemorrhage has been linked with recurrence by several authors. Eye rubbing led to postoperative partial retraction at the third postoperative day in another patient (2%), who required re-surgery (2%) as similarly reported by Hall et al.

In our study, we report graft-related complications such as excess graft edema in seven (15.55%) and four (16%) patients in the primary and recurrent pterygium groups and could be attributed to the inadvertent inclusion of the Tenon in the graft, graft retraction was found in three patients in
recurrent pterygium group as compared to two (4.44%) in primary pterygium group, some amount of graft retraction is common because of graft shrinkage or ocular movement. Graft retraction does not need to be surgically addressed as long as the graft is secure in its place, and heals up well. Tenon’s cyst formation occurred in two (8%) patients in the recurrent pterygium group only. The main disadvantage of SLGF CAG is the risk of graft loss in the immediate postoperative period, if the graft is not adhered to during the intraoperative period with proper care, hence, we advise to patch the eye for at least 48 h, which leads to better adherence of the graft [Fig. 3], minimizes the chances of graft edema. The patient avoids rubbing the eye over the patch in the immediate postoperative period, and hence, the chances of graft loss are minimal.[28]

**Conclusion**

Numerous studies have been conducted to date to see the outcome of SLGF limbal-conjunctival autograft in cases of primary pterygium. We studied the effect of SLGF-LCAG in primary as well as recurrent pterygium. It is a safe, effective, economical, and less time-consuming procedure not only in primary pterygium but this technique is equally effective for recurrent pterygium. The surgical outcomes following SLGF-LCAG surgery are comparable to the most commonly performed suture limbal-conjunctival autograft with no postoperative suture-related complications, less patient discomfort, and greater patient satisfaction. However, a randomized multicenter trial with a larger cohort and longer follow-up is warranted to substantiate our findings.

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**Conflicts of interest**

There are no conflicts of interest.

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