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Effectiveness of Inferior Conjunctival Autograft In Primary Pterygium Surgery

[1*]Dr (Maj) Prajakta Dandekar,MBBS,DNB, [2]Dr (Maj Gen) Sagarika Patyal SM, DO, MBBS, MS

[1](Ophthalmology)-Military Hospital Gwalior;
[2](Ophthalmology) -Army Hospital Research And Referral, Delhi.
*Corresponding Author: *Dr (Maj) Prajakta Dandekar,MBBS,DNB*

Abstract
Aim*:To assess the effectiveness of inferior conjunctival autograft with respect to recurrence rates in the management of primary pterygium.*
Methods: *100 patients with primary nasal pterygium of >2mm in horizontal diameter without any other ocular or systemic disease were included in the study. Under peribulbar anaesthesia, patients underwent pterygium excision. All patients underwent inferior conjunctival autografting using sutureless glueless technique. Patients were followed up on 1st day, 1month, 3 months, 6months and 1 year.*
Results*: Out of 100 patients, M:F = 68:32, post operatively 55 patients had vision improvement, 45 patients had static vision . 03 patients of inferior conjunctival autograft had recurrence of Grade 1 in 1 month, 03 patients had retracted graft requiring repositioning, 01 patient had graft edema on the 1st post op day. Recurrence rate was 3%.*
Conclusion: *This method is highly efficient in terms of post op patient symptoms, safety, efficacy, economy and low recurrence rates and is preferred because the superior bulbar conjunctiva is intact for eventual future surgical intervention.*

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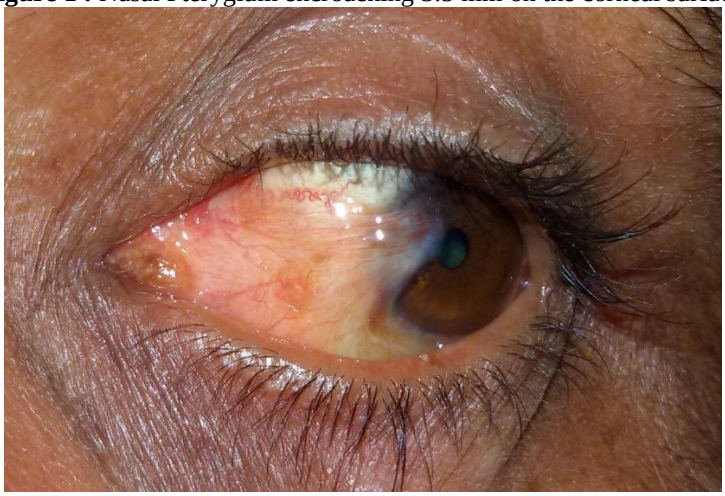
I. Introduction

Pterygium, derived from the ancient Greek word "pterygos", denoting a wing, is a triangular, fibrovascular degenerative condition of sub-epithelial tissue which proliferates as a vascularised granulation tissue invading the cornea and destroying the superficial layers of the stroma and Bowman's membrane, the whole being covered by conjunctival epithelium. Pterygia can vary from small, atrophic quiescent lesions to large aggressive, rapidly growing fibrovascular lesions that can distort the corneal topography and in advanced cases they can obscure the optical centre of the cornea. [1,2]

Figure 1 : Nasal Pterygium encroaching 3.5 mm on the corneal surface



There is no medical management and surgical removal is the preferred method of treatment. Various techniques have been tried in past from simple excision to use of adjunct therapies such as β irradiation,

Thiotepa, 5-FU, and Mitomycin C with varied recurrence rates [3]. Recurrence of pterygium is closely associated with corneo-limbal stem cell deficiency[4]. Spaeth *et al* introduced the surgical technique of using conjunctival auto graft for covering bare sclera after pterygium excision [5]. Conjunctival auto graft with limbal stem cell transplantation has shown promising results with low recurrence rate.[6]

Pterygium occurs mainly in the 20- 70 s age group who are more exposed to sunlight but is also seen among the elderly population who may have developed it earlier but have delayed their treatment [7]. During pterygium surgery, conjunctival autograft is usually obtained from the supero-temporal area and this area is most commonly used for filtering surgeries as well as for shunt surgeries in Glaucoma. Elderly patients who undergo conjunctival autograft from the superior quadrant of the eye especially the temporal area and need glaucoma surgery later have in effect a poorer conjunctival cover in this area.

Conjunctival cover is essential to the formation of a good functioning bleb in glaucoma surgery and if this area is kept untouched the success of glaucoma surgery can be helped. Majority of the limbal stem cell niche is present in the superior quadrant since it is covered with the eyelid. Various procedures like conjunctival limbal stem cell transplantation - in CLET , SLET , Living related CLET require stem cells from the limbal stem cell niche, obtained from superior as well as inferior limbal stem cells, in severe deficiency of limbal stem cells post chemical injury. In pterygium, to prevent recurrences and/or reconstruct surgically induced conjunctival cicatrization, additional concepts have been proposed. These include: (1) reconstruction of the limbal barrier to block pterygium reinvasion and (2) reconstruction of the conjunctival area lost by excessive surgical resection and scarring. For the treatment of advanced or recurrent cases, these factors must take precedence over the concept of noninvasive surgery. Keeping the above facts in mind, the inferior conjunctival autograft was used to cover the bare sclera in pterygium surgery & to see whether there was any difference in recurrence of pterygium as apposed to superior conjunctival autograft. It was proposed to evaluate the effect of pterygium surgery with inferior conjunctival autograft[8,9].

II. Aims And Objectives

Aim : To evaluate the effect of pterygium surgery with inferior conjunctival autograft .
Objective : To evaluate the recurrence rate with this new procedure.

III.

IV. Material And Methods

Study Design

Total study sample consisted of 100 patients with primary pterygium reporting to the Eye Department . During the period from March 2014 to March 2016 all patients reporting to the hospital with primary pterygium in the age group of 20-70 years were recruited in the study after obtaining informed consent. A comprehensive evaluation of patients was undertaken including patient's age, gender, medical and ocular history, visual acuity assessment, slit lamp examination and anterior segment photography.

Inclusion Criteria

Patients of pterygium of both sexes attending Eye OPD were included in the study

Exclusion Criteria

Following patients were excluded from the study:
- Lacrimal apparatus active diseases
- Patients with trichiasis , entropion , ectropion
- Recurrent pterygium
- Allergic conjunctivitis

Preoperative medication

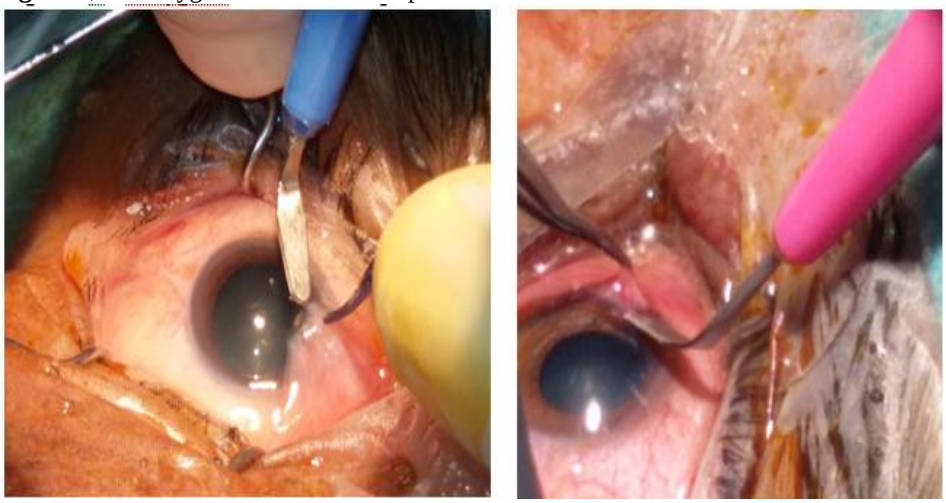
All patients underwent routine investigations and a pre-anaesthetic check up. Pre-operative Ciprofloxacin eye drops (0.3%) were instilled 3 times a day for one day.

Surgical Technique

All patients were operated under peribulbar block with mixture of 2.5 ml each of 2% Lignocaine and 0.5% Bupivacaine. The involved eye underwent standard ophthalmic sterile preparation and draping. Then eye was exposed for surgery using lid speculum. Superior rectus bridle suture was not applied for any case.

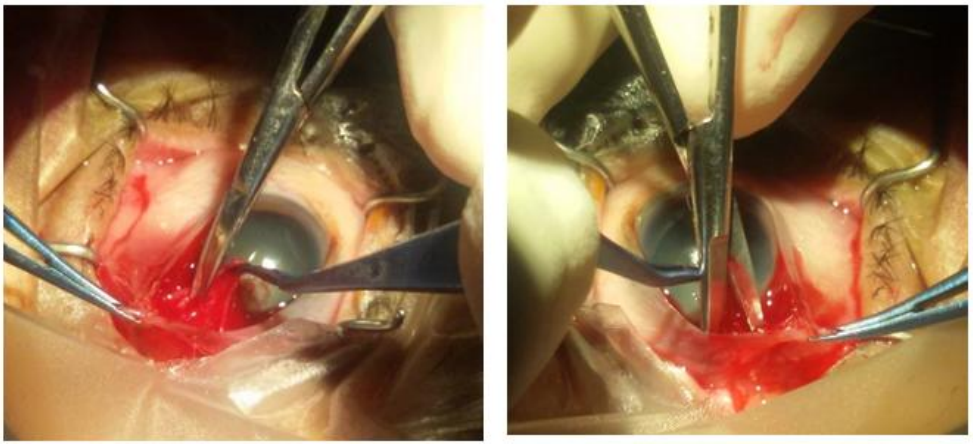
Beginning one mm ahead of the head of the pterygium, a crescent blade was used to separate the head of the pterygium from the cornea ensuring the removal of the complete tissue beyond the limbus .

Figure 2,3 : Pterygium head is lifted up and excised with a crescent knife from the cornea



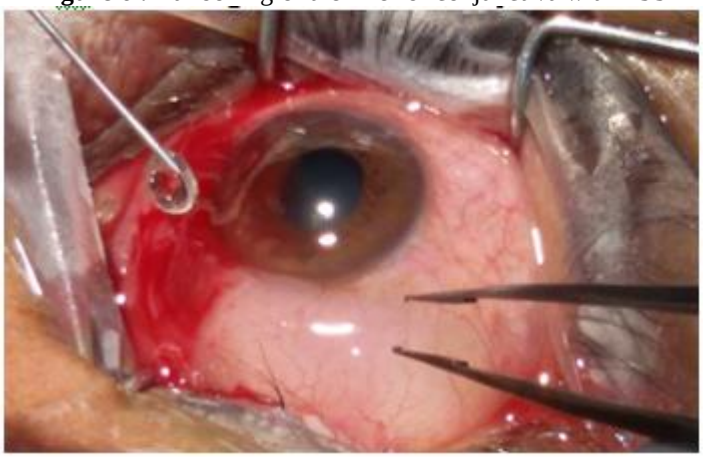
The subconjunctival pterygium tissue was separated from the conjunctiva till as far into the medial canthus ensuring no injury occurred to the medial rectus. The conjunctiva at the farthest ends of the pterygium was incised and the pterygium tissue was excised. Then the head of the pterygium was excised .The limbus was cleaned and smoothened and all extraneous tissue was excised. No cautery was used to cauterise any blood vessels and blood was allowed to remain in the area of pterygium excision.

Figure 4,5 : Separation of the subconjunctival tissue from the conjunctiva



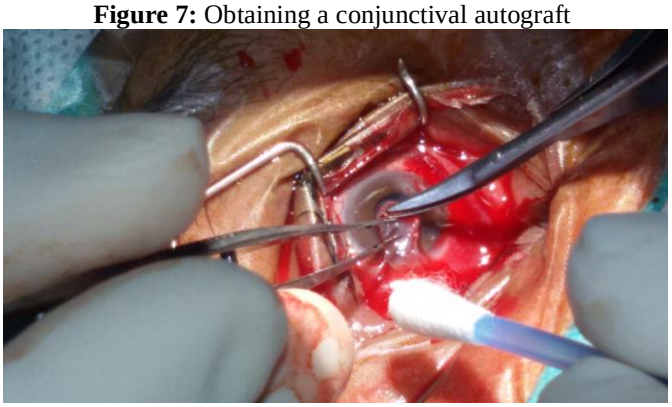
The area of conjunctival defect was measured with callipers. 1ml of balanced salt solution was injected into the donor inferior conjunctiva to balloon out the area and separate it from the underlying Tenon's tissue.

Figure 6 : Ballooning of the inferior conjunctiva with BSS



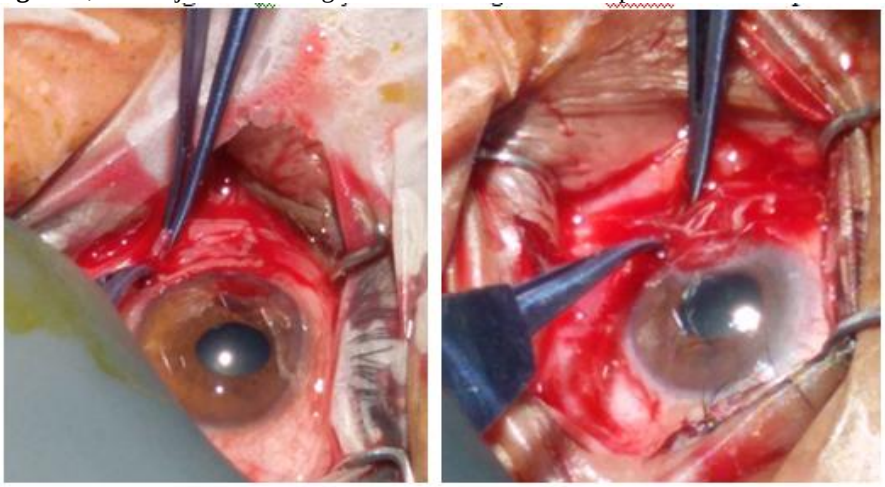
A free conjunctival limbal auto graft measuring 0.25mm size larger than the defect was obtained from the infero-temporal quadrant of the bulbar conjunctiva including the limbal area, care being taken to prevent buttonholing of conjunctiva .

Figure 7: Obtaining a conjunctival autograft



The dissected graft was gently pulled to the area of bare sclera. Care was taken to prevent graft roll over. Proper orientation was maintained, with the epithelial side up and limbal edge towards limbus and the graft was firmly affixed to the bare area with the patients own blood . The graft was carefully smoothened over the entire bare sclera and the cut edges of the graft and the original conjunctiva were gently pressed together by tying forceps to ensure that the tissues were firmly adherent to one another. The microscope light was focused on the operated area for a minimum of 2-3 minutes to ensure that the graft was firmly adherent to the sclera bed. Wherever the graft showed movement, extra time was given under the microscope light to make the graft firmly adherent.

Figure 8,9 : Conjunctival autograft with limbal stem cells placed to cover the defect



The eye was patched for 24 hrs after instilling a drop of 0.5% Moxifloxacin.
The patch was opened on the 1st postoperative day and eyedrops Ciprofloxacin with Dexamethasone and Carboxy Methyl Cellulose qid was advised. Patient was advised to wear dark glasses.
Postoperative follow up of the patients was carried out for 1 year.
Plan of follow up :
1st postoperative visit on day 1
2nd postoperative visit after 1week from the date of surgery
3rd visit after 1 month from the date of surgery
4th visit after 03 months from the date of surgery
5th visit after 06 months from the date of surgery
6th visit 01year from the date of surgery

The following variables were noted in post-operated patients.

Time taken for surgery
Patients symptoms
Sub-conjunctival haemorrhage
Foreign body sensation
Change of vision after surgery
Graft edema
Graft apposed, retracted, lost
Recurrence

All surgeries were carried out by one surgeon.

IV Statistical Analysis

Data were entered into SPSS version 16 and were expressed as the frequency, percentage, mean, standard deviation, and range, as applicable.

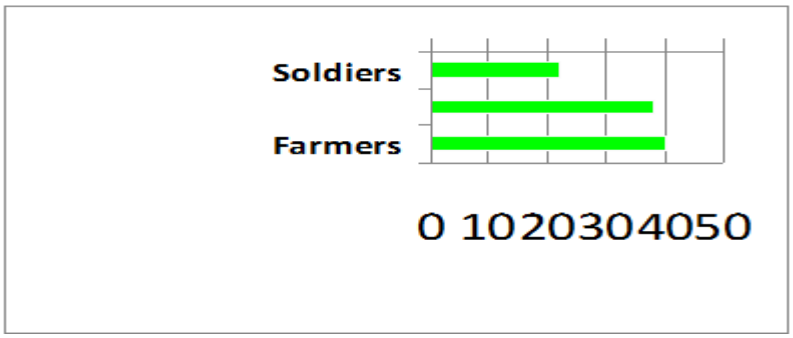
V. Results

A total of 100 patients were included in the study, 68 male and 32 female patients . demographic and baseline characteristic are shown in the table.

Table 1 : Baseline characteristics

Age range	20-70 yrs
Male	68
Female	32

Graph 1 : Occupation



Surgical time : The time taken for surgery was an average of 8.15 mins.

Post op vision - 55 patients appreciated vision improvement on Snellen's chart and 45 reported no change in visual status.

Graph 2 : Post op vision status

Recurrence : 03 patients had recurrence of grade 1 in 1st month. Recurrence rate was 3.0%.

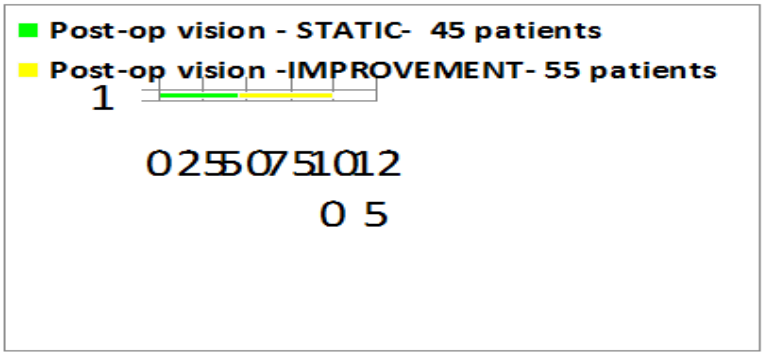
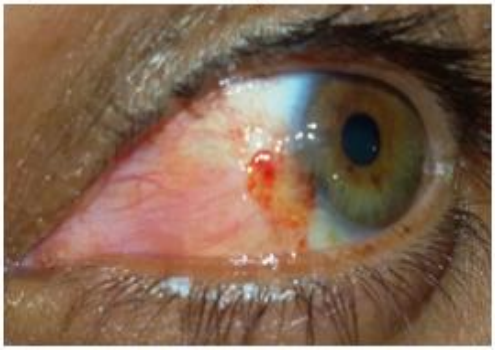


Figure 10: Vessels at limbus POD1, sutureless glueless technique

Graft edema : one patient was found to have graft edema on the first post op day which eventually reduced over a week.

Figure 11: Graft edema POD1

Figure 12: Resolved graft edema PO 1week



Graft retraction : 03 patients had retracted graft on the 1st post op day which required repositioning under the microscope.

Conjunctival scarring at the donor site was present in 2 patients . There was no symblepharon formation or restriction of up gaze.

VI. Discussion

Pterygium is one of the commonest conditions encountered by an Ophthalmologist in an Eye OPD especially in the dusty and hot places of North India due to exposure to ultraviolet radiation. Excision of pterygium by surgical means still results in a substantial number of recurrences. The quest of the Holy Grail of the perfect surgery for pterygium is still on. The ideal pterygium surgery should achieve three principal goals; a low recurrence rate, absence of complications and satisfactory cosmesis.

The methods for preventing recurrence are :

Beta irradiation with Strontium-90 has been used at doses from 1000-7000 cGy. Recurrence rate is 10%.[10]

Thio-TEPA (Triethylene phosphoramide), an alkylating agent was the first to be used, showed recurrence rate of 0-8% [11]

i. Intra-operative & topical Mitomycin C (MMC) 0.2mg/ml, reported recurrence in the range from 3% to 43%.[12,13,14]

ii. Argon laser and Excimer laser have been used for keratectomy during pterygium surgery showing recurrence rate of 12 %.[15]

iii. Amniotic membrane to cover the bare area of the sclera has also been tried world over with recurrence rate of 37%.[16]

iv. Limbal stem cell conjunctival autograft shows a recurrence rate of 2-9%.[17]

Conjunctival autograft with limbal stem cells to cover the bare area of the sclera was a significant breakthrough in the modalities of pterygium surgery. The stem cell niche, or microenvironment consisting of cellular and extracellular components, is hypothesised to prevent stem cell differentiation and thus regulates their fate. When a stem cell divides asymmetrically, one daughter may leave the niche to enter a differentiation pathway under the influence of different environmental stimuli. The limbus differs from cornea both anatomically and functionally and hence could differentially determine stem cell fate. Within the limbal region of the cornea, the LESC niche is thought to be located within the palisades of Vogt (PV) – an undulating region

of increased surface area. The palisades are highly pigmented with melanocytes and are infiltrated with Langerhan's cells and T-lymphocytes. The melanin pigmentation is thought to shield LESCs from damaging ultraviolet light and the resultant generation of reactive oxygen species.[18] The deep undulations of the Palisades of Vogt at the limbus provide LESC with an environment that protect them from shearing forces (Gipson, 1989). Furthermore the crypts described by Shortt et al, predominantly occur on the superior and inferior cornea where they are normally covered by the eye lids.

In this study, 03 out of 100 cases showed Grade 1 recurrence as per classification. Grade 1 – normal appearing operative site. Grade 2 – fine episcleral vessels in the site extending to the limbus .Grade 3 – additional fibrous tissues in site. Grade 4 – actual corneal recurrence.[19] The inferior conjunctival autograft donor area also did not show any untoward effect . Corneal epithelial cells are self-renewing: the squamous epithelial cells renew themselves every seven days. The corneal limbal stem cells (LSC) are made up of non-keratinizing stratified squamous epithelium located at the basal layer of the epithelium in the transition zone between corneal and conjunctival epithelial cells. LSC prevent the conjunctival epithelium from invading upon the corneal epithelium. They are also thought to provide the source for corneal epithelial renewal. Partial LSC deficiency that is symptomatic with irritation, reduction in vision, and signs of conjunctivalization of the cornea, requires mechanical debridement of the conjunctival epithelium from the corneal surface with frequent follow-up (Dua et al., 1994). This allows the corneal epithelium to heal into the debrided area.

Figure 13 : post op 1 month

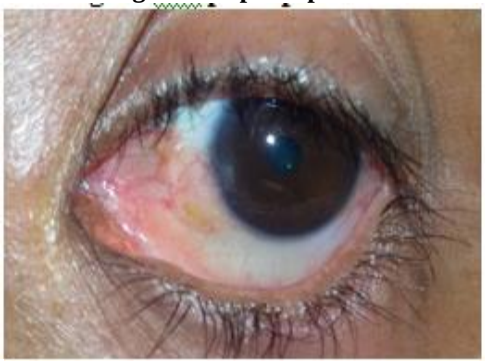
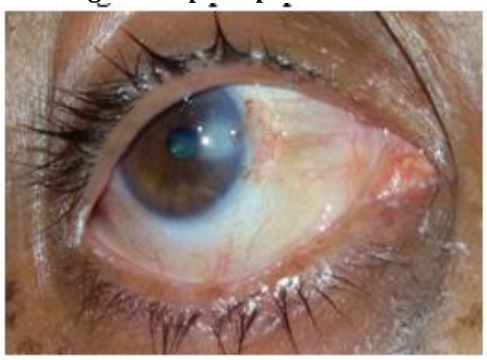


Figure 14: post op 6 months



Success of pterygium excision followed by inferior conjunctival autografting has been described by Syam et al.The mean follow-up duration was 27 months. Recurrence was 3.3%. Conjunctival scarring was found at the donor site in 36.6%. [20] In our study, we found similar recurrence rate with 12 months follow up. Kim et al, performed the procedure by making a flap of the inferior conjunctiva after excision of the pterygium, and transposing it to make a covering for the bare sclera and donor site as a barrier to pterygium tissue. During a mean follow-up period of 20 months, recurrence rate was 5.6%. [21]

Koc et al [22] demonstrated that autografting from superior or inferior sites in primary pterygium cases showed no significant difference in recurrence rate, but in recurrent pterygia, autografting from the inferior site resulted in a significantly ($p = 0.166$) higher likelihood of recurrence. Ti et al [23] and Adamis et al [24], reported that most recurrences following conjunctival autografting tend to occur within 6 months of surgery. In our study, with a follow up of 12 months, 03 patients had recurrence of grade 1 in 1st month. Recurrence rate was 3.0%, making it a promising technique.

VII. Conclusion

Sutureless and glue free limbal conjunctival autografting following pterygium excision with conjunctival auto-graft transplantation from the inferior bulbar conjunctiva is highly efficient in terms of post op patient symptoms, safety, efficacy, economy and low recurrence rates and is preferred because the superior bulbar conjunctiva is intact for eventual future surgical intervention.

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