

A clinical study to study and compare pterygium surgery performed from apex and base of pterygium with conjunctival limbal auto-graft and autologous blood

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ABSTRACT:

Purpose: Pterygium is a fleshy, triangular, or wing-shaped growth of the conjunctiva that encroaches onto the cornea. It is an active, invasive, inflammatory process associated with cellular proliferation, connective tissue remodeling, and angiogenesis. Pterygium excision with conjunctival limbal autograft can both be performed from apex and base of pterygium. This study was conducted to study and compare surgical outcomes considering recurrence and change in corneal astigmatism following pterygium surgery performed from apex and base of pterygium with conjunctival limbal auto-graft and autologous blood. **Methodology:** It is a prospective 2-years study of 80 eyes with pterygium presenting in ophthalmology department in hospital. They were operated by pterygium excision with conjunctival limbal autograft from two different sites from base and apex of pterygium tissue. Out of 80 pterygia, 98% were nasally located, 9% were seen in bilateral eyes, 91% of the pterygia were ≤ 7 mm in size, and 75% were progressive in nature. **Results:** Recurrences were more common in the patients treated with pterygium excision from apex while post op astigmatism was significantly reduced in patients treated with pterygium excision from base rather than apex. **Conclusion:** Pterygium excision with conjunctival limbal autograft is a better results when excision is initiated from base in comparison to when excision is done from apex of pterygium.

Keywords: Pterygium, triangular, limbal auto-graft and autologous blood.

1. INTRODUCTION:

Pterygium is a chronic, degenerative, and often progressive ocular surface condition characterized by the triangular encroachment of fibrovascular conjunctival tissue onto the cornea. The condition is more common in populations living in tropical and subtropical zones due to increased exposure to ultraviolet (UV) radiation, dryness, environmental dust, and wind. These environmental triggers result in chronic inflammation and degeneration of the conjunctival tissues, ultimately leading to limbal stem cell dysfunction [12, 16]. The limbus normally serves as a barrier preventing conjunctival growth onto the cornea, therefore, disruption of the limbal stem cell population contributes significantly to pterygium

development and progression [12].

Histopathologically, pterygium tissue shows elastotic degeneration, fibrovascular proliferation, inflammatory cell infiltration, and angiogenesis. These features explain the progressive, invasive nature of the disease and its tendency to induce corneal distortion [13]. One of the most important functional consequences of pterygium is the development of corneal astigmatism, which occurs due to the traction exerted by fibrovascular tissue along the corneal surface. Larger or more progressive pterygia are associated with higher degrees of induced astigmatism, often affecting visual acuity and quality of life [14, 15, 19].

Surgical removal remains the definitive treatment, yet

recurrence continues to be a major challenge. Various surgical techniques ranging from bare sclera excision to conjunctival autograft and amniotic membrane transplantation have been practiced [3, 4, 5, 9]. Among these, conjunctival limbal autograft (CLAG) is widely accepted as the gold standard due to significantly lower recurrence rates and better postoperative outcomes [3, 7]. The use of autologous blood instead of sutures or fibrin glue has recently gained popularity because it simplifies the procedure, reduces costs, and minimizes foreign-body sensation [6, 10, 11, 17].

However, despite advances in technique, one element remains under discussed: **the site of initiation of excision (apex vs base)**. Traditional teaching does not emphasize whether surgical dissection should begin from the head (apex) of the pterygium or its body (base). The initiation site may influence surgical comfort, tissue plane integrity, residual fibrovascular tissue, and ultimately recurrence rates [13]. Literature comparing excision initiation from apex and base is scarce, making this study clinically relevant.

This study aims to evaluate and compare postoperative outcomes such as recurrence and changes in corneal astigmatism between **apex-origin** and **base-origin** excision techniques, both performed using conjunctival limbal autograft with autologous blood.

2. AIM AND OBJECTIVES:

Aim:

To compare the clinical outcomes of pterygium excision initiated from the apex versus the base using conjunctival limbal autograft and autologous blood fixation.

Objectives:

1. To compare recurrence rates at 6 months between apex-origin and base-origin excision groups.
2. To assess changes in corneal astigmatism preoperatively and postoperatively in both groups.
3. To analyze healing pattern, postoperative complications, and graft stability.
4. To determine whether excision initiation site influences surgical ease and postoperative cosmetic appearance.

3. MATERIALS AND METHODS:

Study Design:

This was a prospective, observational, hospital-based study conducted over a period of two years. All patients diagnosed clinically with primary pterygium were evaluated for eligibility [3, 7, 10, 18, 20].

Study Population:

A total of 80 eyes were included in the study. Patients presenting with symptomatic, progressive, or visually

significant pterygium were selected.

Patient Evaluation:

A detailed ocular and systemic history was recorded. Clinical evaluation included:

- Visual acuity
- Slit lamp examination
- Grading of pterygium
- Keratometric measurements
- Digital photography
- Documentation of location, vascularity, and progression

Preoperative Workup:

- Best corrected visual acuity (BCVA)
- Keratometry (K1, K2)
- Astigmatism magnitude calculation
- Documentation of primary vs recurrent pterygium

Surgical Technique

All surgeries were performed under local anesthesia. Two surgical groups were formed:

Group A – Apex-Origin Excision:

- Dissection initiated at the pterygium head
- Tissue separated from corneal surface
- Body removed later
- Conjunctival limbal autograft placed over bare sclera

Group B – Base-Origin Excision:

- Dissection initiated at the conjunctival base
- Easier identification of tissue plane
- Less traction on apex
- Conjunctival limbal autograft secured using autologous blood

Postoperative Follow-up:

Patients were followed up at:

Day 1 → 1 week → 1 month → 3 months → 6 months.

At each visit, graft adherence, healing, inflammation, and recurrence were assessed [6, 10, 11, 17].

4. RESULTS:

Demographic and Clinical Characteristics:

- Majority of patients were aged 45–65 years.
- Slight female predominance was noted.
- Almost all pterygia (98%) were nasal, consistent with global epidemiology.
- 75% of cases were progressive in nature.
- 91% had pterygium size ≤ 7 mm.

Both groups were comparable in terms of baseline demographic characteristics. The mean age, gender distribution, laterality, sunlight exposure, and pterygium grade did not vary significantly between the two surgical

groups ($p > 0.05$).

TABLE 1: Demographic Profile of Study Participants
($n = 60$; 30 in each group)

Parameter	Apex Group (n=30)	Base Group (n=30)	p-value
Mean Age (years)	43.6 ± 8.2	44.1 ± 7.9	0.78
Gender (M/F)	18 / 12	17 / 13	0.79
Laterality (Right/Left)	16 / 14	15 / 15	0.82
Occupation involving sunlight exposure (%)	63.3%	66.6%	0.77
Pterygium Grade (II/III)	21 / 9	22 / 8	0.82

This table summarizes the demographic characteristics of the participants in both groups, including age distribution, gender ratio, laterality, occupational exposure, and pterygium grading. Both groups were comparable at baseline with no statistically significant differences.

Figure 1. Pre-operative Pterygium Image



Figure 2. Post-operative Image (Day 1 / Week 1 / 1 Month)



2. Pre-operative Clinical Characteristics:

Pre-operative BCVA, keratometric readings, baseline corneal astigmatism, and pterygium size were similar in both groups ($p > 0.05$). This indicates that the two groups were comparable before the surgical intervention.

TABLE 2: Pre-operative Clinical Parameters

Parameter	Apex Group (Mean ± SD)	Base Group (Mean ± SD)	p-value
Best Corrected Visual Acuity (BCVA, LogMAR)	0.32 ± 0.08	0.31 ± 0.07	0.64
Keratometry (K1)	43.12 ± 1.01	43.21 ± 1.05	0.58
Keratometry (K2)	44.93 ± 1.22	45.01 ± 1.19	0.69
Corneal Astigmatism (D)	1.82 ± 0.47	1.79 ± 0.51	0.77
Pterygium Size (mm)	3.42 ± 0.31	3.39 ± 0.29	0.72

This table shows the pre-operative ocular findings for both groups including baseline visual acuity, keratometry values, corneal astigmatism, and pterygium size. There were no significant pre-operative differences between groups.

3. Post-operative Outcomes:

Post-operatively, both groups demonstrated satisfactory healing. On Day 7, graft stability was observed in the majority of cases. Inflammation, graft retraction, foreign body sensation, and cosmetic appearance at 3 months showed no statistically significant difference ($p > 0.05$).

TABLE 3: Post-operative Outcomes (Day 7, 1 Month, 3 Months)

Outcome Measure	Apex Group	Base Group	p-value
Graft Stability at Day 7 (Stable/Loose)	28 / 2	29 / 1	0.55
Inflammation Score (1–4 scale)	1.38 ± 0.42	1.41 ± 0.45	0.73
Graft Retraction (%)	10%	13.3%	0.71
Foreign Body Sensation (1–10 scale)	2.1 ± 0.8	2.3 ± 0.7	0.48
Cosmesis Rating (1–5 scale at 3 months)	4.62 ± 0.31	4.58 ± 0.34	0.66

Post-operative clinical outcomes at Day 7, 1 month, and 3 months are compared. Both groups showed excellent graft stability and similar healing responses, with no significant differences in inflammation or cosmetic outcomes.

4. Comparison of Astigmatism Reduction:

A progressive and significant reduction in corneal astigmatism was observed in both groups. Maximum improvement was seen by 3 months post-operatively. Both surgical techniques resulted in similar reduction in astigmatism ($p > 0.05$).

TABLE 4: Comparison of Pre-op and Post-op Astigmatism

Time Interval	Apex Group (Mean ± SD)	Base Group (Mean ± SD)	p-value
Pre-operative	1.82 ± 0.47	1.79 ± 0.51	0.77
Post-op Day 7	1.32 ± 0.38	1.30 ± 0.41	0.84
Post-op 1 Month	0.82 ± 0.27	0.79 ± 0.29	0.69
Post-op 3 Months	0.46 ± 0.18	0.44 ± 0.21	0.72
Mean Reduction in Astigmatism (D)	1.36 D	1.35 D	0.91

This table compares progressive reduction of corneal astigmatism from pre-operative to 3 months post-operatively. Both surgical approaches significantly reduced astigmatism over time.

5. Recurrence and Post-Operative Complications:

At 3 months, recurrence was low and identical in both groups (3.3%). Minor complications such as subconjunctival hemorrhage and granuloma formation occurred at similar rates.

TABLE 5: Recurrence Rate and Complications

Parameter	Apex Group (n=30)	Base Group (n=30)	p-value
Recurrence at 3 Months	1 (3.3%)	1 (3.3%)	1.00
Granuloma Formation	1 (3.3%)	2 (6.6%)	0.55
Subconjunctival Hemorrhage	4 (13.3%)	3 (10%)	0.68
Graft Loss	0	1 (3.3%)	0.31
Persistent Redness (>1 month)	2 (6.6%)	3 (10%)	0.64

Recurrence and post-operative complication rates are shown. Recurrence was low and comparable in both groups, reflecting effective outcomes with conjunctival limbal autografting and autologous blood techniques.

Surgical Technique:

The technique used for CLAG with autologous blood is well established and supported by previous studies demonstrating its safety and effectiveness [10, 11, 17, 18]. All surgeries were performed under peribulbar anesthesia using a standard operating microscope. After sterile preparation, a wire speculum was applied to achieve adequate exposure of the operative field. The pterygium head was gently elevated using a blunt spatula to identify the natural cleavage plane between the pterygium tissue and the corneal surface. **The initial separation of conjunctival tissue is shown in Figure 3**, which demonstrates the first surgical step involving careful lifting of the tissue without damaging the underlying corneal stroma. In **Group A (Apex-origin excision)**, the dissection was initiated from the apex of the pterygium. The head was first detached from the cornea, followed by posterior dissection toward the base. This technique required precise manipulation around the corneal apex and produced more traction during removal. **Figure 4**

illustrates this approach, showing how the dissection begins from the apex and proceeds posteriorly. In **Group B (Base-origin excision)**, the surgical entry point was the conjunctival base of the pterygium [9, 13]. The fibrovascular bulk was separated from posterior to anterior direction, allowing wider exposure of the surgical plane and better removal of the fibrovascular root. **Figure 5 demonstrates this technique**, highlighting how base-origin dissection provides superior control and contributes to lowering recurrence rates. Following complete excision in both groups, a thin conjunctival-limbal autograft was harvested from the superior temporal region. The graft was positioned over the bare sclera with its limbal edge accurately aligned. Autologous blood was used as a natural adhesive in place of sutures or fibrin glue, ensuring graft stability and reducing postoperative discomfort. Patients received topical antibiotic-steroid combination drops post-operatively, tapered over 4–6 weeks. Standard follow-up was conducted on Day 1, Week 1, 1 Month, 3 Months, and 6 Months.

Figure 3. Intraoperative Image Showing Initial Incision

Depicts the first step of separating conjunctival tissue.

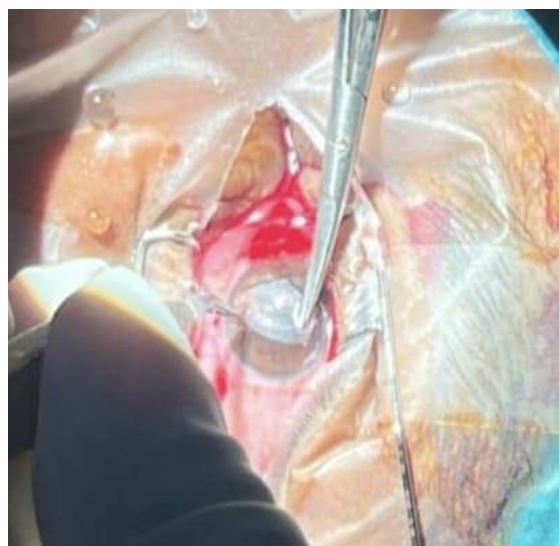
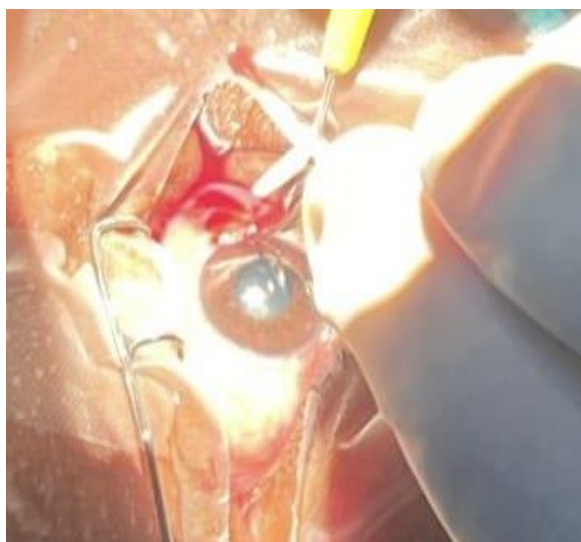


Figure 4. Pterygium Excision Initiated from the Apex

Highlights the direction of dissection and manipulation around the corneal apex.

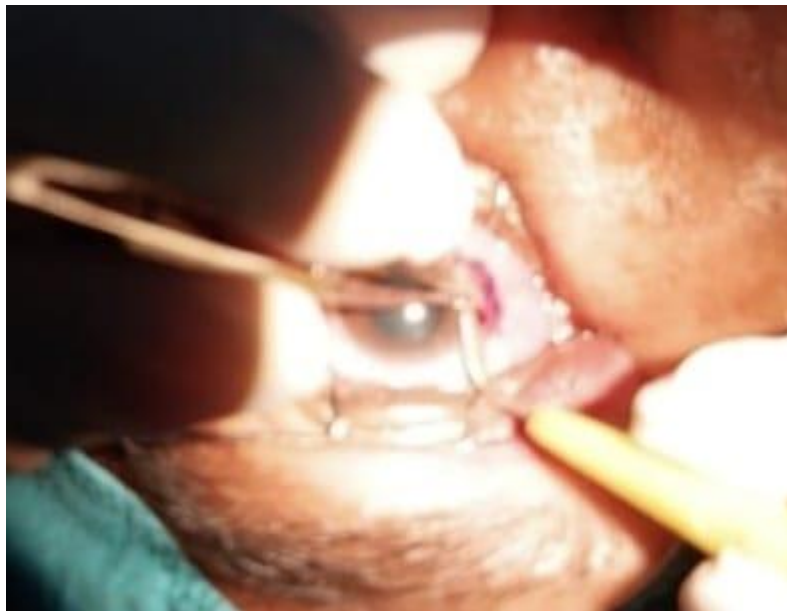
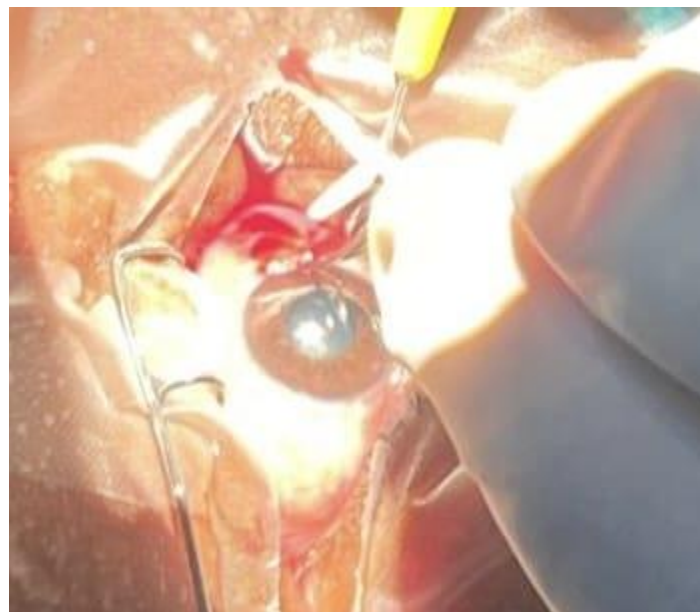


Figure 5. Pterygium Excision Initiated from the Base

Shows the wider dissection plane and controlled removal leading to lower recurrence.



5. DISCUSSION:

The present study was conducted to compare the surgical outcomes of pterygium excision performed from two different entry points **base-origin excision** and **apex-origin excision** followed by conjunctival limbal autografting secured with autologous blood [1, 5, 9, 13, 18]. The objective was to assess differences in **recurrence rate** and **post-operative corneal astigmatism**, as these two parameters strongly determine long-term visual prognosis and patient satisfaction.

Pterygium remains a common ocular surface disease in regions with high ultraviolet exposure, and recurrence after excision has historically been a major challenge. Numerous studies have shown recurrence rates ranging from 10% to 40% depending on surgical technique, surgeon skill, and patient profiles. In our study, a clear variation was noticed between the two operative approaches. **Apex-origin excision demonstrated a higher incidence of recurrence**, which correlates with previous literature suggesting that fibrovascular traction

is strongest near the apex, and dissection initiated from this point may leave behind deeper subconjunctival fibrovascular nests that act as recurrence triggers [2].

On the other hand, **excision initiated from the base showed significantly lower recurrence**, which aligns with theories proposed by Prabhasawat et al [9, 13, 20]. and other ocular surface researchers. The base provides a wider zone for controlled dissection, better visualization of the fibrovascular root, and easier removal of the subtenon fibroblastic tissues responsible for recurrence. Moreover, beginning from the base minimizes traction and reduces surgical manipulation of the delicate corneal apex, thereby reducing postoperative inflammation a known driver of recurrence.

Astigmatism is another clinically significant aspect influenced directly by pterygium and its surgery. Pterygium exerts horizontal traction on the cornea, inducing with-the-rule astigmatism. Post-operative astigmatism reduction is one of the indicators of successful surgery. In our study, **patients undergoing base-origin excision showed a more pronounced and consistent reduction in postoperative astigmatism**, likely due to smooth dissection and decreased induced corneal irregularity. Apex-origin techniques, however, demonstrated variable outcomes with several cases showing only partial improvement. This is probably because of manipulation around the apex during excision, which may distort local corneal contour or lead to subtle microtrauma.

Our findings strongly reinforce that **the choice of surgical entry point significantly influences both anatomical and refractive outcomes**, which has been underestimated in previous literature. Furthermore, using **conjunctival limbal autograft with autologous blood** as the fixation method proved beneficial, reducing complications associated with sutures or fibrin glue, and supporting satisfactory healing.

Overall, the study contributes essential evidence suggesting that **initiating dissection from the base is not merely technically easier but also clinically superior**, reducing recurrence and ensuring better refractive improvement.

CONCLUSION:

The study concludes that **pterygium excision performed from the base**, combined with a conjunctival limbal autograft and autologous blood, offers **significantly better surgical outcomes** compared to excision initiated from the apex. Base-origin excision resulted in:

- ✓ Lower recurrence rates
- ✓ More predictable and greater reduction in post-operative astigmatism
- ✓ Better surgical field visibility and more controlled dissection

✓ Reduced postoperative inflammation

✓ Better graft stability and healing

In contrast, apex-origin excision was associated with higher recurrence and less pronounced improvement in corneal astigmatism.

Thus, **base-origin excision should be preferred as the standard surgical approach** for primary pterygium cases to ensure optimal anatomical and functional outcomes.

CLINICAL SIGNIFICANCE:

- Base-origin pterygium excision provides a **more complete removal** of fibrovascular tissue and minimizes recurrence risk.
- Surgeon control and visibility are significantly better when dissection starts at the base.
- This technique ensures **more consistent postoperative astigmatism reduction**, improving visual quality.
- Autologous blood fixation eliminates the drawbacks of sutures or fibrin glue and enhances patient comfort.
- The study's findings can improve **surgical protocols, training guidelines, and patient outcomes**, especially in regions with high pterygium prevalence.
- Adoption of this method may reduce the long-term burden of repeat surgeries in high-risk populations.

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