

Amniotic Membrane Transplantation versus Conjunctival Autograft for Pterygium: A Narrative Review

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Abstract

Pterygium is a common ocular-surface disorder in which fibrovascular conjunctival tissue extends across the limbus onto the cornea. Chronic ultraviolet exposure is the most consistently reported environmental risk factor, although age, outdoor occupation, latitude, wind, dust, and ocular-surface irritation also contribute. To compare conjunctival autograft (CAG) and amniotic membrane transplantation (AMT) after pterygium excision, with emphasis on recurrence, healing, complications, and clinical indications. This narrative review synthesizes the references supplied in the original manuscript and additional peer-reviewed literature identified for this revision. Results: CAG generally provides lower recurrence than AMT, particularly at six months and in recurrent disease, but it consumes healthy conjunctiva. AMT is useful when conjunctiva must be preserved, when the defect is large, or when ocular-surface reconstruction is required. CAG is usually preferred for routine primary pterygium, whereas AMT remains a valuable alternative in selected patients. Surgical technique, case selection, postoperative care, and adequate follow-up strongly influence outcomes.

Keywords: Amniotic membrane transplantation, Conjunctival autograft, Limbal stem cells, Ocular surface, Ophthalmic surgery, Pterygium, Recurrence, Ultraviolet radiation.

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Introduction

Pterygium is a triangular, wing-shaped fibrovascular proliferation of conjunctiva that crosses the limbus and advances onto the cornea. It is often nasal, may be bilateral, and can cause irritation, redness, cosmetic concern, tear-film disturbance, irregular astigmatism, and reduced vision when it approaches or covers the visual axis.^[1-5] The condition is strongly associated with cumulative ultraviolet radiation, especially in people who spend substantial time outdoors.^[6,7] The lesion is commonly described as having a cap or head on the cornea, a neck at the limbus, and a body on the conjunctiva. Its pathogenesis is multifactorial and includes limbal epithelial dysfunction, extracellular-matrix remodeling, inflammation, angiogenesis, and altered expression of matrix metalloproteinases.^[1-4] A pterygium may be observed when symptoms are mild, but surgery is considered for progressive growth, significant astigmatism or visual impairment, recurrent inflammation, restricted ocular motility, or unacceptable cosmesis.^[8,9]

Simple excision leaving bare sclera is associated with

substantial recurrence and is generally not preferred. Current graft-based approaches include CAG and AMT, with adjuncts such as fibrin glue, conjunctival sutures, or selected use of mitomycin C.^[10-11] Anatomical components of a pterygium and typical nasal corneal extension is shown in [Figure 1].

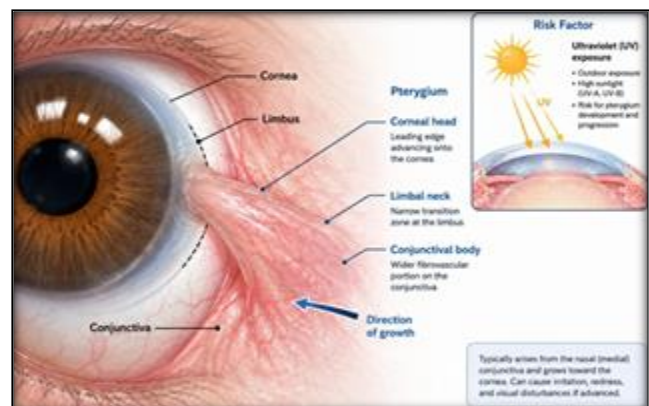


Figure 1: Anterior eye: Nasal Pterygium

SURGICAL TECHNIQUES

Conjunctival auto graft

Following excision of the pterygium and meticulous removal of fibrovascular tissue, a thin graft is harvested from superior bulbar conjunctiva, usually with a small strip of limbal tissue when appropriate. The graft is transferred to the recipient bed with correct orientation and secured using sutures or fibrin glue. Careful dissection is important: excessive tissue removal may create scarring, while an oversized or improperly oriented graft may increase postoperative inflammation or graft-related complications.^[12]

CAG has two practical advantages: it restores conjunctival coverage and may provide a barrier against conjunctival re-encroachment at the limbus. Its main limitation is the use of healthy conjunctiva, which may matter in bilateral disease, extensive conjunctival scarring, or patients likely to require future glaucoma filtration surgery.^[8,9]

Amniotic membrane transplantation

AMT uses processed human amniotic membrane placed over the excised area and secured with sutures or adhesive. The membrane acts as a biologic substrate that supports epithelialization and may reduce inflammation, fibrosis, and surface discomfort.^[13] AMT is especially useful when the conjunctival defect is large, when conjunctiva should be conserved, or when the ocular surface requires additional

reconstruction. The principal concern is recurrence. AMT alone may provide less effective suppression of fibrovascular regrowth than CAG, particularly in recurrent or aggressive pterygium. The choice of membrane preparation, orientation, fixation, and postoperative anti-inflammatory regimen may also influence results.^[11,13]

Comparative Evidence

The evidence does not support treating CAG and AMT as interchangeable in every clinical situation. The Cochrane review by Clearfield and colleagues included 20 randomized controlled trials involving 1,947 eyes from 1,866 participants. At three months, recurrence differences were not statistically significant overall; at six months, CAG was associated with a 47% lower recurrence risk than AMT. The difference was more pronounced in recurrent pterygium.^[14,15] Individual randomized evidence has similarly reported higher recurrence after AMT than after CAG, although recurrence estimates vary considerably with surgical technique, follow-up duration, disease severity, and the definition of recurrence.^[16] A more recent systematic review and meta-analysis found no statistically significant difference between AMT and CAG in some pooled analyses, while CAG combined with mitomycin C showed a marked reduction in recurrence; these findings should be interpreted alongside the risks of mitomycin C and the heterogeneity of included studies.^[17]

Table 1: Practical comparison of CAG and AMT after pterygium excision

Feature	Conjunctival autograft	Amniotic membrane transplantation
Recurrence	Usually lower, especially at 6 months and in recurrent disease. ^[12,14]	Often higher when used alone, but estimates vary. ^[12,14]
Conjunctival preservation	Consumes healthy conjunctiva.	Preserves conjunctiva for future surgery.
Healing and surface support	Provides tissue coverage and a limbal barrier.	Supports epithelial healing and may reduce inflammation and scarring. ^[8,10]
Common role	Preferred for many routine primary cases.	Useful for large defects, bilateral disease, recurrent cases with limited conjunctiva, or glaucoma-surgery candidates.

Complications and Postoperative Care

Early postoperative symptoms may include pain, foreign-body sensation, photophobia, conjunctival hyperemia, chemosis, and graft edema. Potential complications include graft displacement or loss, granuloma, infection, persistent epithelial defect, scarring, dellen, symblepharon, and recurrence. Limbal stem-cell deficiency is an important differential diagnosis when epithelialization is delayed, particularly after extensive limbal surgery.^[18]

Postoperative management commonly includes topical antibiotic prophylaxis for a limited period, topical corticosteroid treatment with tapering according to inflammation, preservative-free lubricants, and sun and wind protection. Follow-up should continue beyond the early healing period because recurrence may become clinically evident months after surgery. (Figure 2).^[19] Patients should be advised to use wraparound ultraviolet-protective eyewear and avoid direct environmental irritants where possible.^[7,19]

Discussion

For most primary pterygia requiring surgery, CAG offers the best balance between durable surface coverage and lower recurrence. AMT should not be viewed simply as an inferior

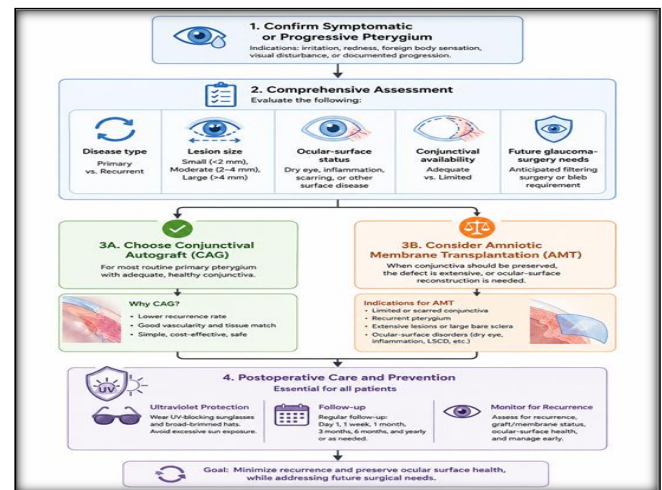


Figure 2 Suggested clinical decision pathway for selecting CAG or AMT

substitute: its value lies in situations where conjunctival conservation or ocular-surface rehabilitation is more important than achieving the lowest recurrence rate with a single technique. This distinction is particularly relevant in patients with glaucoma, previous conjunctival surgery,

bilateral lesions, or extensive surface defects.^[8,10]

The literature remains limited by inconsistent definitions of recurrence, short follow-up, variation in excision technique, and differences in postoperative medication. Recurrence is also affected by ultraviolet exposure, patient age, lesion morphology, inflammation, and surgeon experience.^[5,6] Therefore, comparisons should be expressed with appropriate caution, and clinical decisions should be individualized rather than based on a single pooled estimate.

Conclusion

CAG is generally the preferred grafting technique for primary pterygium because it is associated with lower recurrence and good cosmetic and functional outcomes. AMT remains an important option when conjunctiva must be preserved or when a large ocular-surface defect requires biologic support. The final choice should account for disease severity, recurrence status, available conjunctiva, future glaucoma surgery, surgeon expertise, and patient-specific risk factors.

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