

Focus



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Pterygium Surgery

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Pterygium is a relatively frequent condition where a wing-shaped fold of conjunctiva with fibrovascular tissue invades the superficial cornea. The condition is often preceded with degenerative changes occurring in the interpalpebral bulbar conjunctiva such as pingueculum.

The prevalence of pterygium varies from 1 to 15% depending on the geographical location of the population under analysis¹. The main risk factors are the total exposure to ultra-violet (UV) light and increasing age¹. One plausible hypothesis for its pathogenesis is that the effects of UV radiation causes actinic change in the conjunctiva layers, resulting in abnormal growth². This growth may be exacerbated by hot, dry or windy environmental conditions. Those patients with lifestyles that have greater exposure to these conditions e.g. outdoor pursuits and residence in sunny environments, have a greater risk of developing pterygia^{1,2}.

The main clinical considerations are the effect of the pterygium on the patient's vision, the possibility of malignant change, the presence of ocular irritation and cosmetic appearance to the patient. These factors will determine whether surgery is justified.

Malignant change: If a patient presents with a 'pterygium' and the lesion affects the temporal limbal margin or has gelatinous appearance, or the head is surrounded by translucent/frosted-appearing epithelium with suggestion of pagetoid spread, then exclusion of an underlying diagnosis of carcinoma in situ (Bowen's Disease) is necessary. As it can be difficult to determine such changes by direct clinical examination (especially in redo surgery), it is vital that all pterygium excision samples are sent for histopathological diagnosis for exclusion of malignant change. One report suggested about 10% of pterygium show changes consistent with ocular surface squamous epithelial neoplasia³. Thus for patients with recognisable malignant changes prior to surgery, the clinician should consider referral to an ocular surface neoplasia specialist for further management.

Prevention?: So far there is no proven method of prevention of pterygium, but limiting exposure to UV light, to dry and dusty environments could help progression. Protection from these factors can be achieved by wearing protective eyewear that has good ultraviolet blockage. Close-fitting wraparound sunglasses can help for these purposes as they protect the eyes from both radiation and air borne particulate matter.

When to operate?: Surgery was not undertaken until absolutely necessary in the past, due to the high recurrence rates, up to 40%, in particular with recurrent pterygia⁴.

Over past decade significant improvements in outcomes from pterygium surgery have been made. This is largely related to the widespread adoption of conjunctival auto-grafting, reducing the rate of recurrence to <10%^{5,6}.

As a pterygium progresses it approaches the visual axis and may lead to a reduction in visual acuity as it may cross the centre of the cornea. The progression may be very slow over several years or rapid over several months. An advanced pterygium, which involves the visual axis, is associated with a poorer visual and cosmetic outcome with higher rates of recurrence.

Because of the reduction in recurrence rates, the threshold for surgery has reduced and earlier surgery using the latest techniques should be considered. However, patient's expectations have been replaced with concerns of post-operative scarring, comfort and final cosmetic outcome. These factors should be discussed with the patient prior to any surgical intervention.

If the pterygium causes symptoms of ocular irritation or appears unsightly then it is reasonable to consider surgery irrespective of its size. It may be better to operate earlier.

Pterygium surgery techniques: The main problems with pterygium surgery are the problems with post-operative recurrence and scarring. There are also risks from surgically induced astigmatism and the consequent effect on uncorrected vision.

The aim for the surgery is remove the pterygium in such a way that regrowth does not occur. The key objectives of surgery are to:

1. Remove the pterygium completely and ensure histological diagnosis.
2. Reduce the risk of corneal scarring.
3. Reduce the effects on astigmatism.
4. Achieve rapid post-operative corneal epithelial healing.
5. Reduce the chances of recurrence.
6. Reduce the chances of post-operative scarring.
7. Achieve a comfortable post-operative recovery period with minimal levels of inflammatory activity.

Simple excision with direct closure and bare sclera technique Simple excision and direct closure of the conjunctiva carries a high risk of recurrence. Although the rate of recurrence will

depend on the size of the lesion, the rate of recurrence can be as high as 90%⁶. In the bare sclera technique, an exposed area of sclera is left and allowed to fill the bare area by scarring, which in turn acts as a barrier to pterygium regrowth, while allowing the cornea to re-epithelialise before any regrowth reaches the limbal area. Despite the theoretical advantages of this procedure and the potential of combining adjunctive therapy such as beta irradiation, mitomycin C and human amniotic membrane grafting, the method is associated with recurrence rates as high as 40%⁶.

Primary pterygium excision with conjunctival autografting using fibrin glue: The main developments in pterygium surgery in the last ten years have been the widespread use of auto conjunctival grafting, especially of limbal autoconjunctival grafting and the use fibrin tissue adhesives⁴⁻⁶. When these are combined, the recurrence rates can fall to below 10% with additional reductions in post-operative scarring and improvements in patient comfort⁶.

Cases are performed under local anaesthetic (using peribulbar or retrobulbar anaesthesia). However, in younger/nervous patients, general anaesthesia is used.

Surgically, the pterygium base, limbal margins are first marked. The area within the marks is injected with local anaesthetic containing adrenaline under the conjunctiva. This injection allows the pterygium to 'balloon-off' the ocular surface. The pterygium covering the corneal area is separated from the corneal tissue using a lamellar corneal blade, aiming to leave the remaining anterior corneal surface as smooth as possible. Blunt dissection is then used to lift the pathological area over the sclera. Minimal cautery is applied to any bleeder vessels. The total amount of cautery is kept to a minimum; in order to reduce cautery associated scarring. Only the fibrovascular tissue within the pterygium is excised, keeping any Tenon's and caruncle tissue that is left undisturbed.

The dimensions of the deficit in the conjunctival limbal area and bulbar areas are measured and a similar size of limbal conjunctival autograft is measured. The typical harvest site is the superior bulbar conjunctiva. A distinctive marking system is used to allow the surgeon to distinguish between the epithelial and stromal surface of the graft as well as the limbal posterior margins of the graft.

A 27-gauge needle attached to a small syringe containing local anaesthetic with adrenaline is inserted outside the area to be harvested with needle placed just below the conjunctival surface. The anaesthetic is then injected so the potential graft tissue 'balloons-up'. The graft tissue is gently dissected so that a thin, even layer of conjunctival graft tissue is removed. The limbal area of the graft up to clear cornea is dissected off the cornea limbus, taking care not to buttonhole the conjunctiva or go too deeply into the corneal limbus.

Use of fibrin glue: Fibrin glue was shown to reduce recurrence rates, post-operative discomfort and surgical time. Fibrin glue is a blood-derived product that consists of two components: fibrinogen and thrombin. When the two components are mixed, fibrinogen is activated by the thrombin and converted to fibrin, which acts as the tissue adhesive. In addition to the adhesive effect, fibrin also reduces intraoperative bleeding and post-operative inflammation. With the significant reduction in the operating time, this can easily offset the cost of the glue.

Technique to apply the glue: The glue is mixed as separate components and kept at 37°C until use. Each component is drawn up separately in labelled 1ml syringes just before use (attached with 27G needle). Thrombin is applied to the exposed area of sclera/subtenon's tissue from excised pterygium. The auto-conjunctival graft is then positioned 'sunny side down' over the cornea (i.e. with epithelial side down), taking care to flatten it out as single untwisted layer of tissue. Fibrinogen glue

(one drop) is applied to the graft, where the drop will spread evenly over its stromal surface. The whole graft is picked up with non-toothed corneal forceps and then positioned and 'ironed out' over the exposed sclera, ensuring the correct orientation of the graft tissue, making sure it is epithelial side-up, limbal areas of the graft appose the limbal recipient site etc. It takes approximately 10 seconds before the glue sticks, so this manipulation has to be done in this time i.e. before the glue sets! After the graft is stuck, then to the non-limbal edges of the graft, single drops of fibrinogen are placed between the graft-recipient junctions to seal the graft host junction.

What happens if the glue is set and the graft not in an optimal position?: If the graft is misplaced and glued in the wrong position or orientation, then the graft can be 'peeled off' and glue over the host site removed. The process of applying the glue in two components is redone until a satisfactory surgical result is achieved.

The optimal temperature for glue setting is 37°C; if the ambient temperature is lower or the glue components are cooler, it will take longer for the glue to set.

Application of adjunctive therapy - Mitomycin C: This is used for patients at high risk of recurrence or scarring, including under 40 years of age, previous surgery, long-term use of eyedrops, double pterygium, and patients with high risk of keloid. Mitomycin C 0.04mg/ml is applied to the exposed sub-tenon's layer and the sub-conjunctival area with at least 2mm surrounding the area of the original pterygium. This is applied using 1mm X 1mm surgical sponge pieces, which are placed over this area. Counts should be made of the number of sponges placed, so that none are retained in the eye post-operatively.

At the end of the procedure, topical antibiotic and steroid ointment is applied with an eye pad. The patient is given a course of topical antibiotic and steroid ointment for approximately one month. Clinical follow-up is made at one month post-operatively, ensuring the histopathological results are at hand. Patients are advised to take three days off work to allow for post-operative pain and discomfort.

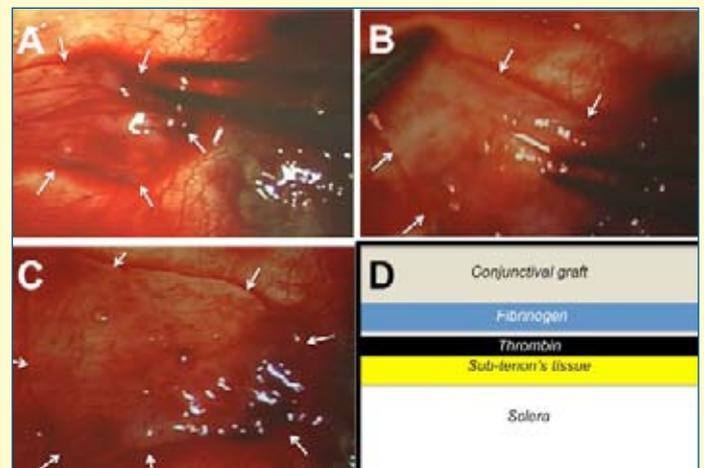


Figure 4. Adhesion of autograft to recipient site. A) Autograft is turned with epithelial side-up and orientated so that limbal area of donor area (purple mark on photo) is placed in a similar location to the recipient site (white arrows edges of conjunctival auto-graft). B) The autograft is then 'ironed-out' so that it covers the maximal area in the recipient site., this should be done within 10 seconds C) The edges of the graft are apposed to the host margins and spots of fibrinogen components are applied to seal the edges. D) Autograft Glue Sandwich: Layer arrangement of tissue and fibrin glue components, thrombin should ideally placed first on the base and fibrinogen on top, this allows more controlled glue adhesion.

- References:
1. Saw SM, Tan D. Pterygium: prevalence, demography and risk factors. *Ophthalmic Epidemiology* 6(3):219-28, 1999
 2. Coroneo MT, Di Girolamo N, Wakefield D. The pathogenesis of pterygia. *Current Opinion in Ophthalmology* 10(4):282-8, 1999
 3. Hirst LW, Axelsen RA, Schwab I. Pterygium and associated ocular surface squamous neoplasia. *Archives of Ophthalmology* 127(1):31-2, 2009
 4. Rathalingam V, Eu AL, Ng GL, Taharin R, John E. Fibrin adhesive is better than sutures in pterygium surgery. *Cornea*. 29(5):485-9, 2010
 5. Koranyi G, Seregard S, Kopp ED. Cut and paste: a no suture, small incision approach to pterygium surgery. *British Journal of Ophthalmology* 88(7):911-4, 2004
 6. Pan HW, Zhong JX, Jing CX. Comparison of Fibrin Glue versus Suture for Conjunctival Autografting in Pterygium Surgery: A Meta-Analysis. *Ophthalmology* 118(6):1049-54, 2011