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A pterygium is characterized by excessive fibrovascular proliferation on the exposed ocular surface and is thought to be caused by increased ultraviolet light exposure from climatic factors and aggravated by microtrauma and chronic inflammation from environmental factors.

Notwithstanding the multifactorial pathogenesis, surgery forms the mainstay of treatment. Despite the description of more than a 100 medical and surgical techniques, recurrence is the most often observed complication after treatment of pterygium. The rate of recurrence not only rises up to 80% but also, each new recurrence may cause loss of conjunctiva and extraocular muscle movement or scar formations. Complaints of the patients increase and corneal involvement accelerates.

The recurrence rate varies greatly not only among different surgical procedure but also between different groups performing the same procedure (TABLE- 15). In addition to demographic and ethnic difference, the amount of supepthelial fibrovascular tissue removed might be a major contributory factor to this variation. Barraquer, in the first introduction to conjunctival autograft to pterygia, emphasized the importance of such tissue removal and defined it as in an area greater than the pterygium itself.

Studies have indicated that a pterygium occurs as a result of localized limbal dysfunction (Dushku, Reid). The corneal epithelium undergoes a constant process of cell renewal and regeneration. Cells in its uppermost layer are continuously desquamated and lost into the tear film, and must be replaced by cell proliferation. Therefore it is endowed with a proliferative reserve in the form of multipotent stem cells located in the basal limbal epithelium. The limbal stem cells serve as a proliferative barrier between
Conditions that significantly damage the limbal stem cells can result in an invasion of conjunctival epithelium on to the corneal surface (conjunctivalisation). This process results in a thickened, irregular, unstable epithelium, often with secondary neovascularisation and inflammatory cell infiltration. Epithelial defects are common in the conjunctivalised corneal surface and may lead to corneal ulceration, scarring, and loss of vision. Defects in renewal and repair of ocular surface as a result of limbal stem cell deficiency are now known to cause varying ocular surface morbidity including persistent photophobia, repeated and persistent surface breakdown and overt conjunctivalisation of the cornea in conditions like pterygium. The success of conjunctival autografting techniques that include limbal tissue in the graft in treating primary and recurrent pterygia to provide for the limbal stem cell deficiency has been highlighted (Dua).

The recurrence rate for bare sclera excision has been upto 89% (Chen) while that with the adjunctive use of the mitomycin-C has be reported to be 5.9 to 42.9 % (Lam). The use of Amniotic Membrane Transplantation (AMT) has been also been studied for pterygium treatment and a study comparing AMT with conjunctival Autografting in recurrent pterygia reported a significantly higher recurrence rate after AMT (37.5%) compared to Conjunctival Autografting (9.1%)(Prabhasawat). In bare sclera techniques and its widely accepted modifications, it is supposed that the reepithelialization of the denuded cornea will be accomplished before recovering of the bare scleral area by conjunctival epithelium. Anduse and Merrit reported on patients with recurrent pterygia who underwent the standard bare sclera technique and 35% of these patients showed recurrence. Vaniscotte et al investigated 102 cases with pterygia retrospectively and
Interpreted that by applying only bare sclera technique to the recurrent cases, inevitably caused secondary recurrence. Adjunctive therapies to standard surgical techniques including Thiotepa (Joselson and Muller 1966), β irradiation (Keize et al, 1987; MacKenzie et al 1991), Mitomycin C (Singh 1989) have been suggested to stop or slow the fibrovascular progression of conjunctiva over the cornea. Although successful results with recurrent cases, as low as 2-15% have been reported, there are severe sight threatening complications other than recurrence that are hardly manageable.

In 1963 Kunitomo and Mori first used Mitomycin-C to treat pterygia with a dose of 0.4 mg/ml four daily for one to two weeks. Hayasaka et al demonstrated the efficiency and safety of a lower dose (0.2 mg/ml twice daily for 5 days) with a recurrent of 6.9% after follow up to 3 to 8 years. However, several reports have described worrisome complications from Mitomycin-C therapy including scleral ulceration and calcification, corneoscleral, ciliary body, and vitreoretinal toxicity, uveitis and glaucoma. Seferomalacia has been reported with doses as low as 0.4 mg/ml once daily for 2 days. Almost all those patients had severe pain and photophobia.

Conjunctival autografting for pterygia was adopted from Thoif's use of conjunctival transplantation for chemical burns. Published recurrence rate of pterygium after excision with conjunctival autografts have ranged widely from 2% to 35%. The great variation in recurrence rate may be due to surgical techniques and experience, definition of recurrence and patient population characteristics. Age is also an important factor is recurrence after conjunctival autografting. The mean age of patients with recurrence in the study by Lewallen was 29 yrs while that in the study by Simona was 38 yrs. These studies showed high recurrence rates of 16% and 35% respectively. Complications involved in Conjunctival autografting tend to be
less severe and are rarely sight threatening. Currently the main prejudices against autografting are the expertise and time required for the procedure.

On clinical impression, greater inflammation preoperatively led to higher recurrence rate and the two appeared to be linked as supported by the age controlled analysis in this present study. No recurrence occurred after excision of Gr. I (atrophic) pterygia; the recurrence rate among patients with Gr. III (inflamed or actively growing) pterygia (2 of 8 patients, 25%) was much more than that of patients with Gr. II (Non inflamed) pterygia (1 of 22 patients, 4.5%).

The time of recurrence has been described as within 2 to 6 months (Starck). In a retrospective study Sebban and Thrist reported the average time of recurrence after removal of primary pterygia by different technique to be 13.2 months.

Because of the large conjunctival defect remaining after excision of pterygium especially the recurrent ones, it has been proposed to cover the bare sclera with a variety of material like skin grafts, mucous or amniotic membranes. These graft materials were considered as both a mechanical barrier to prevent the progression of conjunctiva and as a biological cover to decrease inflammation, but were not applied widely because aesthetic results were not acceptable to the patients and there were considerable recurrence rates. (Vaniscotte et al 1986). In Conjunctival autografting, the bare sclera after excision of primary or recurrent pterygia is covered by the graft taken from the superior temporal bulbar conjunctiva from the same or the other eye. Since there has been no pterygium case with a location at the superior temporal quadrant, localized hypofunction of the limbal stem cells has been considered responsible for pterygium.
Elshnig proposed a similar technique in management of pterygium for the first time in 1926 (Rosenthal 1953). The reinvestigation of the conjunctival autograft technique was begun with Thofts (1977). Barraquer described conjunctival autografting in (1980), Dowlet and Laflamme (1981) reported 7.7% recurrence. The first comprehensive report on conjunctival autograft transplantation was presented by Kenyon et al (1985) with a reported recurrence of 5.3 % (3/57) in patients with recurrent and advanced pterygia. But this study emanated from Boston where the ultraviolet levels are relatively low. A similar survey from the Caribbean (Lewallen 1989) using the same techniques as Kenyon, revealed a 16% recurrence rate (3/19) indicating that a higher recurrence rate may exist in populations with ongoing exposure to high ultraviolet levels. They also stated that there was a significant association between age and sex. Youth was also found to be a risk factor for recurrence in a study in Israel (Zaiberman 1976).

It has been suggested that lipoid degeneration in the cornea is an inhibiting factor to pterygium growth, based on observations that pterygia do not cross an arcus senilis to any great extent. The presence of increasing amounts of lipoid degeneration with age might explain in part the strong association found between age and recurrence. This present study also shows similar high recurrences in males and younger age group patients (Tables 3, 4, 13 & 14)

The success of conjunctival Limbal autografting can be explained by the following factors.

1. Conjunctival transdifferentiation might be a result of poor nutrition of the epithelial cells on the graft when compared to the conjunctival flaps in the wound healing process. Conjunctival flaps supplied by a vascular system in addition to diffusion proliferate rapidly. While the
conjunctival graft supplied only by diffusion should display metaplasia.

2. Behaviour of conjunctival graft as a biologic cover causes a decrease in inflammation and vascularization.

3. In addition to rapid regeneration of corneal epithelium by means of transient amplifying cells, the corneal epithelium integrity and the constitution of the barrier function to prevent the growth of conjunctival epithelium over cornea, have been maintained by limbal stem cells.

The various techniques of excision available for pterygia may be evaluated with reference to three principle criteria: safety (freedom from sight threatening complications); visual acuity (the effect of treatment on vision in the absence of complications); and efficacy (freedom from recurrence).

Complications from pterygium excision and conjunctival auto grafting in this study were infrequent and easily rectified by further minor surgery. This concurs with a previous discussion of the spectrum of complications associated with this technique by Starck et al. In contrast with adjunctive topical chemotherapy or radiotherapy, no sight threatening complications have been reported.

Pterygia may compromise vision either by direct obscuration of the visual axis or more commonly, through irregular astigmatism- induced either by distortion of the cornea or the axial tear film. Conjunctival grafts heal rapidly and would be unlikely to worsen induced astigmatism. Visual acuities were unchanged or improved in all but one of the patients reviewed here. Random variation in acuity between examinations may partly explain the observed loss of one line of unaided acuity in one case in this present
study, at 3 months after surgery, who was asymptomatic and had no signs of recurrence. Pterygium excision with any technique may induce astigmatic changes however, particularly, if care is not taken to dissect the pterygium away form the cornea in a superficial plane. Significant induced astigmatism, with a commensurate deterioration in unaided visual acuity, frequently follows pterygium excision with lamellar keratoplasty. Lamellar keratoplasty is none the less considered the treatment of choice for recurrence in the presence of a degenerate, avascular scleral bed after irradiation. A free conjunctival graft is likely to become necrotic in the situation.

Recurrence rates reported for pterygium excision with conjunctival autografting are generally low. Variations in the results from a given technique may be influenced by a number of factors including; variations with techniques, the proportion of recurrent cases operated on, differences in postoperative medication, the age and location of the population studied, the length of follow up, and the definition of recurrence employed. Although late recurrences may occur, prospective observations indicate that the majority will appear within the first 3 months. A minimum follow period of 6 months should thus avoid a signification underestimation of the recurrence rate. Topical steroid and antibiotic medications were used routinely after surgery. Starck et al commented on the importance of taking a graft of adequate size. The observation of cases in which a pterygium appeared to have recurred around the edge of the graft (out flanking) suggests that larger grafts help to protect form recurrence. Conjunctival grafts of up to 15 x 15 mm can be taken with impunity. We observed no significant scarring or loss of conjunctival motility at the donor sits where the conjunctiva is simply closed by a single suture.
### Table 15: Published Rates of Pterygium Recurrence after Excision and Conjunctival Autografting

<table>
<thead>
<tr>
<th>Authors</th>
<th>Location</th>
<th>No. of cases</th>
<th>Recurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dowlut (1981)</td>
<td>Canada</td>
<td>15</td>
<td>8%</td>
</tr>
<tr>
<td>Kenyon (1985)</td>
<td>Boston</td>
<td>57</td>
<td>5%</td>
</tr>
<tr>
<td>Lewallen (1989)</td>
<td>St Kitts</td>
<td>19</td>
<td>16%</td>
</tr>
<tr>
<td>Singh (1990)</td>
<td>Los Angeles</td>
<td>13</td>
<td>8%</td>
</tr>
<tr>
<td>Mrzyglod (1990)</td>
<td>Poland</td>
<td>41</td>
<td>3%</td>
</tr>
<tr>
<td>Koch (1990)</td>
<td>Essen</td>
<td>13</td>
<td>8%</td>
</tr>
<tr>
<td>Simona (1990)</td>
<td>Geneva</td>
<td>14</td>
<td>35%</td>
</tr>
<tr>
<td>Allan (1993)</td>
<td>Perth</td>
<td>93</td>
<td>6.5%</td>
</tr>
<tr>
<td>Tan (1997)</td>
<td>Singapore</td>
<td>78</td>
<td>1.2%</td>
</tr>
<tr>
<td>Rao (1998)</td>
<td>Chennai</td>
<td>53</td>
<td>3.8%</td>
</tr>
</tbody>
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