Limbal versus Conjunctival Autograft Transplantation for Advanced and Recurrent Pterygium

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Purpose: To compare the safety and efficacy of limbal versus conjunctival autograft transplantation for treating advanced and recurrent pterygia.

Design: Randomized, prospective clinical trial.

Participants: Seventy-nine patients with advanced primary or recurrent pterygia treated by conjunctival (n = 36) or limbal–conjunctival (n = 43) autograft transplantation.

Intervention: Twenty-four eyes with primary and 12 eyes with recurrent pterygia underwent free conjunctival autograft transplantation (group A), and 28 eyes with primary and 15 eyes with recurrent pterygia underwent limbal–conjunctival autograft transplantation (group B).

Main Outcome Measures: Recurrence of pterygium and complications.

Results: With a 3-year minimum of follow-up, 2 cases of primary (8.3%) and 4 cases of recurrent (33.3%) pterygia in group A showed recurrence. No patients in group B developed recurrence.

Conclusions: In this study both techniques were effective in cases of advanced primary pterygia with no statistically significant difference. Limbal transplantation appeared more effective than free conjunctival transplantation for treatment of recurrent pterygia (P < 0.05). Ophthalmology 2002;109:1752–1755 © 2002 by the American Academy of Ophthalmology.

Despite the various surgical procedures that have been described for the treatment of pterygium, recurrence remains a significant problem after surgical excision. Recurrence rates range from 24% to 89% after simple excision with bare sclera technique.1,2 Adjunctive therapies aiming at suppressing regrowth of subconjunctival tissue, such as β-irradiation, thiotapec, and topical postoperative mitomycin C, have succeeded in decreasing the number of recurrences to between 0% and 12%.2–4 However, serious complications are associated with these methods of treatment, such as disfiguring skin depigmentation, cataract formation, severe secondary glaucoma, uveitis, corneal perforation, and scleral necrosis, resulting in perforation and secondary endophthalmitis.4–6 An intraoperative single dose of low-concentration mitomycin C was effective in reducing recurrence while diminishing the risk of serious complications.7 However, long-term risks of mitomycin C are still unknown, and corneoscleral melt, although rare, was reported after a single dose of intraoperative mitomycin C.8

In 1985, Kenyon et al9 described their procedure of conjunctival autograft for the management of recurrent or advanced pterygium with a low recurrence rate of 5.3%. Although more time consuming, this surgical technique was found to be safe and effective in reducing the number of recurrences while avoiding the risk of potentially serious complications.10,11 However, studies performed in high-risk populations observed higher recurrence rates using the same surgical technique.12

With the establishment of the limbal location of corneal epithelial stem cells, it was suggested that healthy limbal epithelium acts as a junctional barrier to conjunctival migration onto the corneal surface.13,14 Also, pterygium was speculated to represent a “local limbal deficiency.”15 Accordingly, inclusion of limbal epithelium in the conjunctival graft for pterygium surgery would achieve better anatomic and functional reconstruction after pterygium removal and, by restoring barrier function of the limbus, could reduce recurrence. Limbal autograft transplantation has been used successfully for treating chemical, thermal, or contact lens-associated corneal injury.16 The method has been reported to be more effective for establishing a healthy ocular surface than conjunctival transplantation in rabbits.17 Recent studies have reported the effectiveness of limbal conjunctival autograft transplantation in the prevention of recurrence of pterygia.18,19

I am not aware of any study comparing the efficacy of conjunctival with that of limbal autografting for pterygium. I conducted this prospective randomized study to evaluate the efficacy and safety of including the limbus in the con-
Materials and Methods

Between January 1995 and April 1997, 86 eyes of 86 consecutive patients meeting eligibility criteria were enrolled in this study. All patients were younger than 40 years (range, 27–39 years) and were followed up for a minimum of 36 months (range, 36–63 months). Criteria for eligibility were: a pterygium extending at least 3 mm beyond the limbus, no other ocular surface pathologic features or infection, and no collagen vascular disease.

Complete ocular examination was carried out and institutional review board approval and informed consents were obtained before enrollment in the study. All operations were performed under the operating microscope on an outpatient basis by the same surgeon (MFAF).

The surgical technique used was based on the one described by Kenyon et al. The operations were performed under peribulbar anesthesia with lidocaine hydrochloride 2% and 0.5% bupivacaine. A solid lid speculum was used to expose the surgical field. Two 7.0 silk traction sutures were placed in the superior and inferior episcleral–limbal area to improve exposure. The conjunctiva was marked 5 mm from the limbus. Westcott scissors were used to excise the pterygium from the surrounding conjunctiva. The body of the pterygium was lifted from the conjunctival surface, and the head of the pterygium was then peeled or scraped from the corneal surface with a no. 64 Beaver (Becton Dickinson, Waltham, MA) or a similar blade. Lamellar keratectomy was not performed when the pterygial tissue was removed from the cornea. Any episcleral scarring was removed, and, in cases of preexisting restriction of ocular motility, the scar tissue was dissected carefully from the medial rectus muscle. Bleeding was controlled using minimal cautery.

At this stage, using a random number table with blocked randomization, patients were randomly assigned to undergo either free conjunctival autograft transplantation (group A) or limbal–conjunctival autograft transplantation (group B). The main difference between the two groups was inclusion of the limbus in the conjunctival autograft in group B.

The conjunctival graft was dissected from the superotemporal bulbar conjunctiva. A caliper was used to measure the area of conjunctiva and limbus resected with the pterygium. The intended graft area (1 mm larger than the area resected in the pterygium site) was marked in the superotemporal zone with a gentian violet marker pen. Dissection began with the use of conjunctival scissors and forceps from the fornix to approximately 1.5 mm from the limbus, keeping Tenon’s capsule intact.

In the case of limbal–conjunctival transplantation (group B), an adjustable diamond knife set at a depth of 100 µm was used to create a superficial circumferential incision in the cornea 0.5 mm from the limbus, equal in length to the resected limbus. This step was performed before harvesting the conjunctival flap. As soon as the conjunctival part was dissected, limbal dissection was carried forward to include 0.5 mm of peripheral cornea with the conjunctival graft. The free graft was placed in the correct orientation onto the scleral bed using a paper template.

The limbal and conjunctival sides of the graft were sutured to the recipient bed with interrupted 10.0 nylon and 10.0 Vicryl (Ethicon, Edinburgh, UK), respectively. The area of the graft was left with Tenon’s capsule exposed. After surgery, a pressure patch was used for the first 72 hours, and patients were treated with topical dexamethasone and tobramycin solutions on a tapered regimen (six times daily, tapering over 2 months). Patients were evaluated and photographed on postoperative days 1, 7, 14, and 30, then every 3 months for the first year, and then every 6 months.

Recurrence of pterygia was defined as any fibrovascular proliferation encroaching more than 1 mm onto the cornea from the original pterygium site. Fisher’s exact test was used to analyze recurrence rates, and a P value less than 0.05 was considered significant.

Results

Seven patients were excluded because their follow-up was less than 1 year because they left the country. Results of 79 patients with advanced primary or recurrent pterygia were included in this study. Of them, 76 were males (96%) and 3 were females (4%), with a mean age of 33 years (range, 27–39 years). The mean follow-up period was 49 months (range, 36–63 months). Patients’ data are shown in Table 1. No statistically significant differences existed between the two groups in preoperative characteristics or duration of follow-up.

Group A comprised 36 patients, 24 with advanced primary pterygia and 12 with recurrent pterygia, who underwent conjunctival autograft transplantation. Group B comprised 43 patients, 28 with advanced primary pterygia and 15 with recurrent pterygia, who had limbal–conjunctival autograft transplantation.

Corneal epithelial defects healed within 4 days and graft sites within 10 days in both groups. All grafts showed mild transient edema, and no operative or postoperative complications were encountered in either group.

Visual acuity improved by two lines or more in 28% of patients in group A and 37% of patients in group B.

In group A, the mean size of pterygium was 3.9 mm (range, 3.2–5.5 mm). Of the 36 patients in the group, 6 cases of pterygia showed recurrence (16%). Of the 6 recurrences, 2 occurred in patients with primary pterygia (8%) and 4 occurred in patients with recurrent pterygia (33%). Three recurrences occurred within the first year and one occurred after 26 months. Two recurrences from primary and two from recurrent pterygia remained stationary, with encroachment of the cornea of 1.5 mm or less, and needed no further interference. The remaining two recurrences were reoperated with limbal–conjunctival autograft transplantation with no recurrence and were not included in group B.

Table 1. Patient Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Group A (Conjunctival)</th>
<th>Group B (Limbal)</th>
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</thead>
<tbody>
<tr>
<td>Total number of patients</td>
<td>36</td>
<td>43</td>
</tr>
<tr>
<td>Male</td>
<td>34</td>
<td>42</td>
</tr>
<tr>
<td>Female</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Age (mean ± SD)</td>
<td>32.67 ± 3.57</td>
<td>33.73 ± 3.67</td>
</tr>
<tr>
<td>Duration of follow-up (months)</td>
<td>36–63</td>
<td>50</td>
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<tr>
<td>Pterygium type</td>
<td></td>
<td></td>
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<tr>
<td>Primary</td>
<td>24 (67%)</td>
<td>28 (65%)</td>
</tr>
<tr>
<td>Recurrent</td>
<td>12 (33%)</td>
<td>15 (35%)</td>
</tr>
<tr>
<td>Size of pterygium (mm)</td>
<td>3.9</td>
<td>4</td>
</tr>
<tr>
<td>Range</td>
<td>3.2–5.0</td>
<td>3.0–5.5</td>
</tr>
<tr>
<td>Previous surgery in recurrent cases</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simple excision</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Simple excision + mitomycin-C</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Unknown</td>
<td>4</td>
<td>3</td>
</tr>
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</table>

SD = standard deviation.
In group B, the mean size of pterygium was 4.0 mm (range, 3.0–5.5 mm). Of the 43 patients in the group, no pterygia showed recurrence (Table 2).

Fisher’s exact test to compare recurrence rates between group A and group B, regardless of the type of pterygium, showed a statistically significant difference with \( P = 0.007 \). Further analysis of recurrences in primary pterygia (two recurrences in group A versus none in group B) showed no statistically significant difference between the two groups (\( P = 0.208 \)). And comparing the recurrences in the recurrent pterygia (four recurrences in group A versus none in group B), we found a statistically significant difference between the two groups with \( P = 0.028 \). No significant association between recurrence and age of patient was found.

### Table 2. Recurrences in Both Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>No Recurrence</th>
<th>Recurrence</th>
<th>( P ) Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group A</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Conjunctival), 36 Patients</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>6</td>
<td>0.007</td>
</tr>
<tr>
<td>Primary pterygium</td>
<td>22</td>
<td>2</td>
<td>0.208</td>
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<tr>
<td>Recurrent pterygium</td>
<td>8</td>
<td>4</td>
<td>0.028</td>
</tr>
<tr>
<td><strong>Group B</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Limbal), 43 Patients</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>43</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Primary pterygium</td>
<td>28</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Recurrent pterygium</td>
<td>15</td>
<td>0</td>
<td></td>
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</tbody>
</table>

Discussion

In our prospective, randomized study, we found limbal–conjunctival autograft transplantation more effective than conjunctival autograft alone in prevention of recurrence after pterygium excision. Although no recurrence was seen in the limbal–conjunctival autograft group, both techniques were effective in cases of advanced primary pterygium, with no statistically significant difference (\( P = 0.208 \)). In case of recurrent pterygia, limbal–conjunctival autograft was more effective in preventing recurrence than conjunctival autograft, with a statistically significant difference (\( P = 0.0282 \)).

Since the report by Kenyon et al\(^9\) of low recurrence associated with conjunctival autografting after pterygium excision, the method became one of the procedures of choice for the surgical management of pterygium. However, prospective, randomized studies of conjunctival autografting after pterygium have shown higher recurrence rates (16%–39%) in high-risk populations.\(^12,20–22\)

Different investigators reported variable recurrence rates after limbal autografting for pterygium. In a long-term study, Pulve et al\(^23\) observed two recurrences in a group of 70 patients with pterygia (62 primary; 8 recurrent) who underwent limbal–conjunctival autograft transplantation, with a mean follow-up of 45 months. Shimazaki et al\(^24\) noted minimal subconjunctival tissue invasion (less than 1 mm) in 2 of 27 patients with advanced and recurrent pterygia followed up for a mean of 11 months after limbal–conjunctival autograft transplantation. Rao et al\(^25\) reported 2 recurrences (3.8%) in a group of 53 (36 primary; 17 recurrent) pterygia after a mean follow-up of 18.9 months after limbal–conjunctival autograft transplantation. Gris et al\(^26\) performed limbal conjunctival transplantation for repeatedly recurrent pterygia, and none of the seven patients showed signs of recurrence after a minimum follow-up of 14 months. In a group of 41 cases of recurrent pterygia, Mutlu et al\(^27\) reported a 14.6% recurrence rate with a minimum follow-up of 15 months.

Both conjunctival and limbal–conjunctival autograft transplantation are technically demanding and time consuming, and paying attention to surgical details such as complete removal of episcleral scar tissue, harvesting a graft of proper size and free of Tenon’s tissue, and meticulous dissection and handling of the graft tissue is important. Recurrence and graft failure were related to lack of surgical experience in performing limbal and conjunctival grafting by several authors\(^23–26\) and to inadequate postoperative antiinflammatory therapy.\(^24\)

We found limbal–conjunctival autograft transplantation safe and effective in preventing recurrence of advanced and recurrent pterygia in a uniform group of a high-risk population (mainly young males). The method provides excellent cosmetic results and avoids vision-threatening complications associated with use of other adjunctive therapies like \( \beta \)-irradiation or mitomycin C administration. Further prospective randomized studies involving a larger group of patients, especially of those with recurrent pterygia, are required to support the findings of this study.

### References

13. Dushku N, Reid TW. Immunohistochemical evidence that
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