Limbal-Conjunctival Autograft Transplantation for the Management of Primary Pterygium

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Abstract

***Purpose*:** To investigate the efficacy of limbal-conjunctival autografting technique in patients with primary pterygium

***Methods*:** Fifteen eyes of 15 patients with primary pterygium underwent surgery for the removal of pterygium with limbal-conjunctival autograft. After the pterygium excision, the limbal portion of the graft was oriented and sutured to the limbus at the recipient bed with the epithelial surface upside. Recurrence was defined as fibrovascular tissue extension of more than one mm onto the cornea in the area of previously excised pterygium.

***Results*:** With a mean follow-up period of 8 months, no recurrences or serious complications were recorded among our patients.

***Conclusion*:** Pterygium excision followed by limbal-conjunctival autograft is a safe and very effective way of treating primary pterygium.

***Keywords*:** limbal-conjunctival autograft transplantation, primary pterygium, limbal stem cell graft, conjunctival graft

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Introduction

Pterygium is a fibrovascular, wing-shaped encroachment of conjunctiva onto the cornea. Ultraviolet light-induced damage to the limbal stem cell barrier with subsequent conjunctivalization of the cornea is the currently accepted etiology.[1,2] Pterygium is a worldwide condition with a ''pterygium belt'' between the latitudes 30˚ north and south of the equator.[3] Simple excision carries a high recurrence rate ranging from 24%-89%.[4] Addition of various concentrations of mitomycin C (MMC) has been reported to be effective in preventing recurrence.[5-7] However, MMC may result in devastating complications such as scleral necrosis and microbial infections.[8-10]

Another alternative adjunct is conjunctival graft (CG).[6-11] The limbal epithelium acts as a junctional barrier to conjunctival overgrowth and pterygium is considered to represent a ''local limbal deficiency''.[12] The inclusion of limbal epithelium in CG would restore the barrier function of the limbus. Recent studies have reported the effectiveness of limbal-conjunctival autograft transplantation (LCAUT) in the prevention of pterygium recurrence.[13-15]

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We therefore set out to conduct a prospective study to assess the effectiveness of this procedure among the patients with primary pterygium.

Methods

In a prospective study from April 2005 to December 2006, 15 eyes of 15 patients with primary pterygium were assigned to undergo excision of pterygium followed by LCAUT in *Farabi* Eye Hospital, *Tehran*. Patients with primary pterygium (without any previous surgery) with pterygium extension of more than 2 mm who had symptoms of ocular discomfort or cosmetic complaints were included. Patients with previous ocular surgery for any causes such as glaucoma and cataract surgery, secondary pterygium due to ocular trauma such as chemical burn and pseudopterygia were excluded.

The study was done in accordance with the declaration of *Helsinki.* Before surgery informed consent was taken from all of the patients. All of the surgeries were performed by one surgeon (MRKh).

Surgical procedure

The surgical technique was similar in all cases. Peribulbar anesthesia with 2% lidocaine and bupivacaine 0.25% (2/1) was applied to all patients. The excision consisted of the shearing of pterygium head and dissection of the body from the overlying conjunctiva. Subconjunctival pterygium tissue was excised to achieve as clear a margin as possible. The abnormal corneal epithelium and the superficial fibrovascular scar tissue were stripped off by blunt dissection. The calibrated diamond knife was set to 100 µm (an allowance of 50 µm was made for the lack of epithelium) and a bed, corresponding in dimensions to the donor explants, was fashioned at the recipient site.

The donor tissue consisted of corneal-limbal-conjunctival explants that were harvested from the superior limbus of the same or fellow eye. Autograft contained 0.5 mm of the clear cornea and 3-4 mm of adjacent bulbar conjunctiva. The length of the autograft was equal to the excised limbus at the pterygium site. A front running double edged calibrated diamond knife was set to 100 µm. The knife was used to make a circumferential corneal incision, parallel to the limbus, and two radial incisions, extending from either end of the circumferential incision to the limbus. An angled beveled blade was used to (lamellar) dissect the 100 µm of corneal tissue and the dissection was extended to include the limbal tissue and emerge beyond the limbus, under the conjunctiva. Two millimeters of conjunctiva, attached to the corneal and limbal explants along the limbal border, were then excised. The donor tissue was then sutured onto the recipient eye with two interrupted 10-0 nylon sutures at the corneal margin and two along the scleral edge of the explant.

Postoperative treatment consisted of topical chloramphenicol and betamethasone ophthalmic drops, four times daily for the first 2 weeks. Steroids were then tapered rapidly. Frequent artificial tears were also used.

All patients were followed daily or every other day until corneal epithelialization was completed then, 1 and 3 weeks, 1, 3 and 6 months later. Recurrence was defined as growth of fibrovascular tissue of more than 1 mm over the cornea in the area of previous pterygium excision.

Results

From April 2005 to December 2006, 15 eyes of 15 patients with primary pterygium were assigned to undergo excision of pterygium followed by LCAUT. The demographic and clinical details are summarized in table 1.

Table 1. Demographic and clinical data of patients with primary pterygium

Mean age (years)	45.6
Age range (years)	29-59
Sex	
Male	8
Female	7
Laterality	
Right	9
Left	6
Follow-up (months)	8 (6-12)
Mean size of pterygium extension (mm)	3.3 (1.7-4.3)
Mean size of autograft (mm)	5.36 (5-6)

The mean age of the 15 patients (8 males, 7 females) was 45.6 years (range: 29-59 years). All patients had primary pterygium. Average extension across the limbus was 3.3

mm (range: 2.5-5.0). The size of the limbal-conjunctival autograft varied from 1.5-3 o'clock hours. The mean postoperative follow up was 8 months (range: 6-12 months).

In this series of patients median follow-up time was 8 months. No intraoperative complications occurred. Postoperatively, the limbal grafts started epithelial outgrowths within the first 2 days and the whole corneal surface was completely epithelialized within 10 days, in all cases. There was no infection, limbal graft failure, or slippage of tissue. The epithelium was stable, without recurrence of epithelial defects, transparent, and smooth. There was no corneal neovascularization. No scleral thinning, necrosis, or any other visually significant complications were encountered in our patients. Recurrence of pterygium was not seen in our patients.

In the donor eyes there were no intraoperative complications, refractive changes, chronic inflammation, persistent epithelial defects, or corneal neovascularization.

Discussion

Limbal deficiency, or loss of corneal stem cells, is associated with conjunctivalization of the corneal surface, primary and recurrent pterygium, recurrent and persistent epithelial defects, chronic inflammation, scarring, and ulceration of the cornea. Early methods of reconstruction of the ocular surface included conjunctival transplantation and keratoepithelioplasty. Conjunctival transplantation was based on the theory of transdifferentiation of conjunctival epithelium into cornea-like epithelium.[16-18] However, we now know that conjunctival epithelial transdifferentiation (that is, a morphological, biochemical, and physiological transformation of conjunctival epithelium into corneal epithelium) does not occur,[19,20] and conjunctival transplantation to reconstruct the corneal surface in patients with corneal stem cell deficiency has been abandoned. Keratoepithelioplasty was proposed by Thoft[21] as another alternative to reconstruct the ocular surface in patients with corneal stem cell deficiency. In this technique, lenticules of peripheral corneal epithelium with superficial stroma were grafted. Subsequently, the same author modified the technique to include limbal tissue, acknowledging the importance of stem cell transplantation in these conditions, for a successful long term outcome. Limbal transplantation, as proposed by *Kenyon* and *Tseng,*[22] is probably the best current option for ocular surface reconstruction in patients with total corneal stem cell deficiency.

Localized corneal stem cell dysfunction as loss of limbal barrier against conjunctival invasion has been proposed as a pathogenic factor in pterygium growth and recurrence. Multiple surgical approaches have been used to treat pterygia as simple excision results in severe fibrous tissue regrowth. To treat this disorder both suppression of subconjunctival fibrosis and reconstruction of the limbal barrier are important. Intraoperative or postoperative antifibrotic agents have been used to reduce the probability of recurrence of pterygium.[23,24] Autologous limbal transplantation[25] and amniotic membrane transplantation (AMT)[26] have been proposed as a valid option in recurrent cases. In this study, pterygium excision supplemented with LCAUT appeared to be successful after mid-term follow-up.

Limbal autografts have been used in treating monocular chemical or thermal burn, aniridia, conjunctival squamous cell carcinoma, recurrent or advanced pterygia, and contact lens associated ocular surface abnormality.[6,22,27] Limbal autografts have been used successfully to correct limbal dysfunction, acting as a barrier against conjunctival invasion of the cornea and supplying stem cells of the corneal epithelium. In the treatment of chemical burns and other traumatic conditions, the limbal grafts are obtained from the unaffected eye. This type of limbal transplantation does not weaken total limbal function; instead it transfers healthy limbus to the affected area. Some authors believe that a limbal graft need not necessarily cover the entire area of excision.[25] Use of small limbal grafts may lessen concerns about adverse postoperative consequences in the donor area. Simultaneous limbal autograft transplantation may not be necessary in less severe cases; however, a recent study reported that amniotic membrane transplantation alone resulted in further recurrence in 37.5% of eyes treated for recurrent pterygium.[28]

Our study included 15 eyes of 15 patients with primary pterygium that all of them treated with primary excision and LCAUT. No

recurrence occurred in our cases. No major complication, intraoperatively or postoperatively, was seen in our study. *Shimazaki* et al[25] reported 7.4% recurrence with this procedure in patients with pterygium. In other report by *Kilic* and *gurler*[29] recurrence rate was 7%. Recurrence rate with this technique has been reported between zero and 10%.[13-15,30-35] Although many treatment approaches have been proposed for treatment of primary pterygia such as primary excision with bare sclera, excision and CG, excision and AMT, excision and applying MMC, but recurrence rate with some of these modalities are high, and on the other hand some have devastating complications such as scleral perforation and necrosis, secondary glaucoma, corneal perforation, cataract formation, iritis and irreversible damage to stem cells.[24,32,36]

Conclusion

According to our study findings, it seems that LCAUT is a safe and very effective procedure in the treatment of primary pterygium. Although this technique primarily has been used as a modality in the treatment of recurrent pterygia, but we recommend it in primary cases without any previous surgery to decrease the recurrence and also primarily decrease the need for second procedure in recurrent cases.

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