

Comparison of Clinical Efficacy of Three Surgical Methods in the Treatment of Pterygium

Chaoming Yu, Weiliang Liang, Yongyu Huang, Weiwen Guan

Department of Ophthalmology, Kaiping Center Hospital, Guangdong Province, China

Abstract

Purpose: To investigate and compare the efficacy of amniotic membrane transplantation, corneal limbus stem cell conjunctival transplantation and pedicle conjunctival flap transposition in the treatment of pterygium.

Methods: A total of 155 patients with pterygium were retrospectively analyzed; 53 cases who received amniotic membrane transplantation, 41 who underwent corneal limbus stem cells conjunctival transplantation, and 61 patients who had pedicle conjunctival flap transposition.

Results: Patients in the three groups had no significant differences in terms of age, times since surgery, or extent of pterygium extension onto the cornea (F : 1.194, 0.639, 0.140 respectively; all $P > 0.05$). A total of 137 out of 155 patients (88.4%) completed 6 months of follow up. The recurrence rates of pterygium for the three surgeries (amniotic membrane transplantation, corneal limbus stem cells conjunctival transplantation and pedicle conjunctival flap transposition) were 14.6%, 13.9% and 7.7%, respectively. No significant difference was identified when comparing the recurrence rate between any two groups (χ^2 : 0.008, 1.211 and 0.890; P : 0.593, 0.218 and 0.276). Five patients presented with postoperative complications, including 3 cases of sub-conjunctival hemorrhage, 1 case of amniotic membrane dissolution, and 1 case of conjunctival cyst, accounting for 3.64% of all participants.

Conclusion: These three surgical methods are equally effective in preventing the recurrence of pterygium after excision. (*Eye Science* 2011; 26:193–196)

Keywords: pterygium; amniotic transplantation; conjunctival transplantation; conjunctival flap transposition

Pterygium is a common ocular surface disease, frequently occurring in regions of mid- to high-latitude south of the equator with high solar radiation. Pterygium is mainly characterized as conjuncti-

val and subconjunctival tissue degeneration induced by photochemical damages and fibrovascular tissue hyperplasia. When proliferative tissues invade across the corneal limbus into the cornea, irregular astigmatism and vision loss could occur. Once proliferative tissues enter into the pupil, vision acuity is severely damaged¹. The pathogenesis of pterygium is so complicated that the underlying cause of the disease remains elusive. Surgical resection serves as the only approach to its treatment. However, the postoperative recurrence rate is relatively high, especially for affected eyes receiving repeated pterygium resection. The damages caused during previous operations possibly lead to an increased recurrence rate². In order to lower the recurrence rate of pterygium, ophthalmologic clinicians have adopted amniotic membrane transplantation, corneal limbus stem cell conjunctival transplantation, and pedicle conjunctival flap transposition as treatment. Previous studies revealed that these surgical means can decrease the postoperative recurrence rate of pterygium to various degrees^{3,4}. In this paper, we retrospectively analyzed 155 patients affected by pterygium who previously received amniotic membrane transplantation, corneal limbus stem cells conjunctival transplantation, and pedicle conjunctival flap transposition in our hospital, and compared the clinical efficacy among the 3 surgical methods.

Materials and methods

General information

We retrospectively analyzed clinical information from 155 patients (189 eyes) admitted to our hospital between August 2004 and August 2011 due to pterygium and recurrent pterygium; patients included 86 males and 69 females, aged from 27 to 68 years old with a mean age of 53.6 ± 10.5 years. The occu-

pations of the patients were as follows: 78 farmers, 57 workers, and 20 with other occupations. Inclusion criteria: ① incipient pterygium invading into the corneal limbus by more than 2 cm; ② recurrent pterygium invading into the corneal limbus by more than 1 cm; ③ subjects who chose amniotic membrane transplantation, corneal limbus stem cells conjunctival transplantation, or pedicle conjunctival flap transposition as a treatment option. Exclusion criteria: ① patients who received any intraocular operations and had a medical history of alternative conjunctival surgeries besides pterygium resection; ② patients with recurrent pterygium undergoing any implantation. If both eyes qualified, the right eye was chosen for further observations.

Surgical procedure

Pterygium resection: a. Alcaine was used three times for surface anesthesia and a 0.2 ml portion of 2% lidocaine was utilized for topical anesthesia via subconjunctival injection; b. The conjunctiva was cut open starting from the neck of the pterygium; the pterygium was fully separated from the normal conjunctiva, cornea, and sclera; c. Pterygium and degenerative tissues were resected, and hemostasis was performed to the maximal extent.

Amniotic membrane transplantation: the epithelial surface of the pretreated amnion⁵ was attached to the sclera exposure region, the amnion was incised into the shape and size similar to the sclera exposure region, and the amnion membrane and conjunctiva surrounding the sclera exposure limbus was sutured using 10-0 nylon suture and then fixed on a shallow sclera.

Corneal limbus stem cell conjunctival transplantation: 0.2 ml of 2% lidocaine was injected via the upper temporal subconjunctiva in pterygium-affected eyes; the conjunctiva was separated 1 mm from the corneal limbus; an arc-shaped graft was made along the corneal limbus reaching the corneal stroma; the epithelial surface of the graft was attached to the sclera exposure region; the graft and conjunctiva surrounding the sclera exposure limbus were discontinuously sutured using 10-0 nylon suture and then fixed on a shallow sclera. The sampling area of bulbar conjunctiva received no treatment.

Pedicle conjunctival flap transposition: 0.2 ml of

2% lidocaine was injected via the upper or lower subconjunctiva adjacent to the pterygium resection area, the bulbar conjunctiva was cut open 1 mm along the corneal limbus, equal in length to the sclera surface. The bulbar conjunctiva with a pedicle similar in size to the exposure area of a sclera, was selected. The pedicle was rotated at an angle of 90° around the sclera exposure area, the epithelial surface was placed upwards, and the transposition conjunctiva and conjunctiva surrounding the sclera exposure limbus were discontinuously sutured using 10-0 nylon suture and then fixed on a shallow sclera. The bulbar conjunctiva received no treatment. The transposition sampling area of the bulbar conjunctiva received no treatment.

Treatment efficacy

All participants were subjected to a 6 month follow-up. 1. Surgical success criteria: neither hyperaemia nor neoplasm was noted in the conjunctiva; the corneal surface was covered by epithelium; neither neovascularization nor pterygium grew; 2. Pterygium recurrence criteria: hyperaemia was observed in bulbar conjunctival tissues; proliferative and newly born vascular invasion; whether pterygium proliferated or not was deemed as pterygium recurrence.

Statistical analysis

SPSS 13.0 software was used for data analysis. Among three groups, the patients' ages, times of previous operations, and the length of the pterygium invading the cornea were statistically compared using ANOVA. The recurrence rates among the three groups were compared using a chi-square test. $P < 0.05$ was considered as significant difference.

Results

Among 155 patients, 53 (53 eyes) received amniotic membrane transplantation, 41 (41 eyes) underwent corneal limbus stem cell conjunctival transplantation, and 1 (63 eyes) were subjected to pedicle conjunctival flap transposition. No significant difference was found among the three groups in terms of ages, times of operations prior to enrollment, or the length of the pterygium invading the cornea ($F: 1.194, 0.639, 0.140$, all $P > 0.05$), as indicated in Table 1.

In total, 121 out of 155 participants accepted a 6-month follow-up; contact was lost with nineteen participants during this follow-up; fifteen were followed up with by phone (10 cases were transferred to upper-level hospitals due to recurrent pterygium; 5 patients had no neoplasm or red-eye symptoms for 6 months postoperatively and declined to receive follow-up). The overall postoperative conditions were

shown in Table 2. On the second day post-operation, 1 case in each group experienced hematocoele beneath the implant. In the amniotic membrane transplantation group, 1 case had dissolved amnion. The patients in the conjunctival transposition group had a conjunctival cyst 2 months after the operation. No statistical significance was noted when comparing the recurrence of pterygium between any two groups

Table 1 Comparison of preoperative clinical information in patients among three groups

	Sample size	Age (year)	Times of operation prior to enrollment (95%CI)	Length of pterygium invading into cornea (95%CI) mm
Amnion transplant group	53	51.9±11.0	1.81±0.94(1.55;2.07)	2.91±0.84(2.67;3.14)
Conjunctival transplant group	41	55.1±10.5	2.02±0.94(1.73;2.32)	2.85±0.99(2.54;3.17)
Conjunctival transposition group	61	54.0±10.0	1.93±0.89(1.71;2.16)	2.95±0.92(2.72;3.19)
Total	155	53.6±10.5	1.92±0.92(1.77;2.06)	2.91±0.91(2.77;3.05)
		$F=1.194, P=0.306$	$F=0.639, P=0.529$	$F=0.140, P=0.870$

Table 2 Comparison of postoperative conditions in patients among three groups

	Sample size	Contact-loss rate	Recurrence rate of pterygium	Surgical complications
Amnion transplant group	48	6(11.3%)	7(14.6%)	2(4.2%)
Conjunctival transplant group	36	5(12.2%)	5(13.9%)	1(2.8%)
Conjunctival transposition group	52	8(13.1%)	4(7.7%)	2(3.8%)
Total	137	19(12.3%)	16(11.7%)	5(3.6%)

(χ^2 : 0.008, 1.211, 0.890; P : 0.593, 0.218, 0.276).

Discussion

Previous studies suggested that the incidence of pterygium is probably associated with UV radiation. The mortality rate from pterygium gradually increases from high to low latitude regions. Ranging from latitude 30° to the equator zone, solar radiation presents a large angle (>80°), and the mortality rate from pterygium becomes higher than 10%. It has been proved that people engaged in outdoor tasks are more susceptible to pterygium⁵. Kaiping is located in south central Guangdong province, southwest of the Zhu Jiang delta, at northern latitude covering 21°56'–22°39', and abounds in intensive solar radiation. Pterygium is one of the most frequently observed eye diseases in Kaiping city. It is also known that pterygium is likely to recur following surgical resection alone. In this paper, the patients received 1.92 times of resection surgeries previously on average. Farmers and outdoor-task workers account for 87% of all 155 participants in this study, which is similar to the peer study conducted in Hainan province.

Nowadays, although several risk factors have been identified as related to the incidence of pterygium, the underlying pathogenesis is still elusive. Surgical resection serves as the unique treatment for pterygium diseases¹. Previous investigations indicated that the recurrence rate of pterygium is strikingly high following pterygium resection alone². Hence, many studies focusing on pterygium resection have been performed. Some scientists adopted allogeneic or autologous corneal limbus stem cell conjunctival transplantation and amniotic membrane transplantation combined with alternative operations. In the meantime, intraoperative or postoperative administration of a low dosage of mitomycin C has gained a certain efficacy in preventing the recurrence of pterygium^{3-5,7}. It has also been suggested that patients receiving anti-metabolism drug therapy experienced evident eye pain and poor healing of the conjunctiva, and that some patients even had necrotizing scleritis. Hence, some ophthalmologists oppose the administration of anti-metabolism drugs in the treatment of pterygium^{4,7,8}. It has been corroborated that amnion or conjunctival transplant or conjunctival transposition can effective-

ly prevent the recurrence of pterygium^{4,5,8}.

A total of 155 patients with pterygium, 53 cases received amniotic membrane transplantation, 41 underwent corneal limbus stem cell conjunctival transplantation, and 61 were subjected to pedicle conjunctival flap transposition, were retrospectively analyzed in this paper. All patients from the three groups presented no significant difference in terms of ages, times of operations prior to enrollment, length of the pterygium invading the cornea, suggesting that the participants were comparable due to similar preoperative physical conditions. The recurrence rate among the three groups were 14.5% , 13.9% , and 7.7% after a 6-month follow-up, respectively, indicating that the patients in conjunctival transposition had the lowest recurrence rate, whereas no statistical significance was noted when comparing the remaining two groups. The recurrence of pterygium was higher compared with those in other studies⁸, possibly because most of the patients in our study have undergone two or more pterygium resection surgeries (1.92 times on average). Repeated pterygium resections are likely to cause a higher recurrence rate postoperatively. We regarded pedicle conjunctival flap transposition as the optimal treatment against pterygium among the three surgical approaches due to the following reasons: 1. Traditionally, some detections of infectious pathogens will take place prior to amnion transplantation, whereas these detections fail to completely eliminate the incidence of infectious diseases; 2. Corneal limbus stem cells conjunctival transplantation tends to cause certain injuries to the cornea, leaving various degrees of nebula in the sampling area. If the sampling is collected on the lower side, vision acuity may be affected. If the sampling is conducted on the upper side, even though the shielding of the eyelid may offset such influence, the scars on the upper conjunctiva possibly negatively affect patients requiring glaucoma surgery. 3. Conjunctival transposition operations collect a lower conjunctival sampling, properly avoiding the disadvantages above and the risk of infectious diseases. In this paper, 5 cases (3.6%) suffered from complications; 3 cases of hematocele beneath the implant, 1 case of a dissolved amniotic membrane, and 1 case of a conjunctival cyst. Hence, we

suggested that complete hemostasis and a small-range of sclerotic tissue damages serves as a key factor guaranteeing surgical success. Partial hemostasis possibly leads to hematocele beneath the implant postoperatively, which interferes with the growth of the implant. Excessive cauterization-induced injuries may increase the incidence of recurrent pterygium. Moreover, much attention should be paid to full flattening of the implant, removal of hydrops beneath the implant and prevention against conjunctival reflexion, which can effectively inhibit the incidence of a conjunctival cyst and amniotic membrane dissolution, and enhance the survival rate of grafts.

To conclude, although all three operations can effectively cure pterygium and properly prevent the risk of recurrent pterygium, conjunctival transposition surgery should be preferentially considered in the treatment of pterygium due to its lower cost and greater success rate compared with the other two options.

References

- 1 Liu ZG, Xie YH, Zhang M, Stephen C. Pflugfelder. The abnormal expression of epidermal growth factor receptor family in pterygium. *Chinese Journal of Ophthalmology*, 2000, 36: 372-374.
- 2 Hirst LW. Treatment of pterygium. *Austral New Zeal J Ophthalmol*, 1998, 26: 269-270.
- 3 Chen JQ. Reviewed and prospect the investigate of keratopathy in China. *Chinese Journal of Ophthalmology*, 2000, 36: 182-186.
- 4 Katircioglu YA, Altiparmak UE, Duman S. Comparison of three methods for the treatment of pterygium; amniotic membrane graft, conjunctival autograft and conjunctival autograft plus mitomycin C. *Orbit*, 2007, 26(1): 5-13.
- 5 Mao YX, Wu ZY. Application of amniotic membrane transplantation for recurrent pterygium. *Chinese Journal of Practical Ophthalmology*, 2001; 19: 876-877.
- 6 Liu HS, Yang J, Zhong LH, et al. Prevalence survey on pterygium in two counties of Hainan Province. *Chinese Journal of Ophthalmology*, 2001; 37: 21-23.
- 7 Mikaniki E, Rasolinejad SA. Simple excision alone versus simple excision plus mitomycin C in the treatment of pterygium. *Ann Saudi Med*, 2007; 27(3): 158-160.
- 8 Wang YS, Sha Q, Lu DG. Comparative study on two types conjunctival autograft transplantation for primary pterygium. *International Journal of Ophthalmology*, 2009; 9: 1362-1364.