ORIGINAL ARTICLE

Outcomes of Fibrin Glue for Graft Fixation in Primary Pterygium Surgery with Conjunctival Autograft

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Objective: To evaluate the recurrence rate and postoperative complications of fibrin glue fixation of conjunctival autografts following primary nasal pterygium excision.

Materials and Methods: The present study was a retrospective study of all eyes with primary nasal pterygium that underwent pterygium excision with conjunctival autograft transplantation using fibrin glue for graft fixation at Mettapracharak (Wat Rai Khing) Hospital between July 2017 and December 2018. The author analyzed pterygium recurrence rates and postoperative complications such as graft loss, graft displacement or dehiscence, pyogenic granuloma, or any other complications.

Results: Fifty-seven eyes of 57 patients were evaluated, of which 43 (75.4%) were female. The mean age was 57.09±1.38 years (range of 34 to 80 years). No serious complications occurred. One eye (1.8%) sustained recurrence in the six months follow-up. All grafts were intact. Graft displacement requiring suturing occurred in three cases (5%). Graft dehiscence was observed in 29.8%, and in all cases epithelialized without intervention. Other postoperative complications included pyogenic granuloma in 3.5%, graft edema, subgraft hemorrhage in 21.1%, and elevation of intraocular pressure over 21 mmHg in 5.3%.

Conclusion: Fibrin glue for fixation for conjunctival autografts after primary nasal pterygium excision is safe and effective. The most common complication in the present study was graft dehiscence, which did not require surgical intervention.

Keywords: Conjunctival autograft; Fibrin glue; Pterygium recurrence rate; Graft dehiscence

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Pterygium is a common condition characterized by abnormal fibrovascular tissue of the bulbar conjunctiva extending on to the clear cornea usually in a triangular shape. The prevalence of pterygium has been reported to vary widely from 0.3% to 29% and is high in tropical areas[1,2]. A meta-analysis of 68 articles from 24 countries in 2018 reported an overall prevalence of 12%[3]. Significant demographic risk factors include older age, male gender, outdoor occupations, and rural location[3]. The etiology of pterygium is uncertain. Sunlight exposure is the most common environmental risk factor and is known to cause oxidative stress with associated increase of cytokines and growth factors, matrix metalloproteinase activation, and cellular proliferation. Chronic exposure to ultraviolet -B radiation induces damage to the limbal stem cells and results in conjunctivalization of the corneal epithelium. Other risk factors include environmental irritants such as wind, dust, heat, and smoke. Genetic factors such mutations in the p53 tumor-suppressor gene and other genes may be associated in the pathogenesis of pterygium. Human papillomavirus infection has been suggested as a risk factor[4,5].

Pterygium usually induces symptoms of eye irritation, redness, and refractive error and may result in visual impairment from encroachment of the visual axis or irregular astigmatism. Surgical resection is the definitive treatment, but recurrence is the most common complication. Many techniques have thus been used to reduce the rate of recurrence, with incomplete success. In 1985, Kenyon et al. reported the recurrence rate was 5.3% after pterygium removal with conjunctival autografting in primary cases[6]. A 2016 Cochrane meta-analysis reported that conjunctival autograft technique was safe and associated with lower recurence rate at six months

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compared with amniotic membrane transplantation[7]. Although conjunctival autografting is effective in reducing recurrence, it requires technical expertise and longer surgical time. In addition, fixation of the graft with sutures is occasionally complicated by infection and inflammation. Recently, fibrin glue fixation of the graft has gained popularity, as it enables a shorter operative time, reduced postoperative discomfort, less postoperative inflammation, and low recurrence rate[8,9]. The purpose of the present study was to assess the outcome of fibrin glue fixation of conjunctival autografts as part of primary nasal pterygium resection surgery.

Materials and Methods

The present study was approved by the Research and Ethics Committee of Mettapracharak (Wat Rai Khing) (COA No. 007/2564) Hospital, Department of Medical Services, Ministry of Public Health, Thailand. The medical records were reviewed for all patients with primary nasal pterygium that underwent pterygium excision with conjunctival autograft using fibrin glue for graft fixation between July 2017 and December 2018 by a single surgeon (NP) at Mettapracharak (Wat Rai Khing) hospital. Those with less than six months follow-up time were not included.

Records of the patients with previous ocular surgery or trauma, pseudopterygium, double-headed pterygium, or significant ocular surface disorders were excluded from the study, as were those taking anticoagulants or antiplatelet agents at the time of surgery, and those with known bleeding or coagulation disorders or immune system diseases.

The primary outcome measure was the presence of pterygium recurrence. Postoperative complications such as graft loss, graft displacement (defined as separation of the graft from the underlying sclera while still adherent to the eye), graft dehiscence (defined as a gap between the graft edge and the adjacent conjunctiva, the graft still in place), graft edema, subgraft hemorrhage, pyogenic granuloma, and elevation of intraocular pressure were recorded. Pterygium recurrence was defined as the presence of any fibrovascular tissue regrowth extending beyond the limbus onto clear cornea in the area of the previous pterygium.

Fibrin glue preparation

Fibrin glue is a tissue adhesive composed of two components that combine to mimic fibrin formation. One component contains fibrinogen mixed with factor XIII and aprotinin and the other component contains thrombin and calcium chloride[8]. Once the two components are mixed, fibrinogen is converted into fibrin by the action of thrombin. Fibrin is then cross-linked by coagulation factor XIII to create a firm fibrin network. A commercially available fibrin glue (Tisseel Baxter AG, Vienna, Austria) was obtained at least half an hour before the operation. Two components of fibrin glue were prepared in a sterile manner. Each component was drawn out into two separate 1-mL syringes. The author divided each component on average into five to six syringes for use in five or six patients.

Surgical procedures

All of the surgeries were performed by the same surgeon (NP) using an operating microscope. The surgery was performed under local anesthesia. The involved eye underwent standard ophthalmologic sterile preparation and draping. Then after insertion of a wire speculum, lidocaine 1% with adrenaline (1:100,000) (Xylocaine 1%, AstraZeneca, Cambridge) was injected into the pterygium body. The head of the pterygium was excised gently using the avulsion technique and the body was dissected from the underlying tenon, sclera and the surrounding conjunctiva and was cut off using scissors. Minimal cauterization was used to control bleeding. The residual fibrovascular tissue on the cornea was removed using a No. 15 Beaver blade and, in some cases, a rotating diamond burr. After excision of the pterygium, a thin, tenon-free conjunctival autograft was harvested from the superior bulbar conjunctiva of the same eye using Westcott scissors. The autograft was measured to match the size of the resection bed and was harvested no closer than 2 mm from the limbus. After the bare sclera was dried, a few drops of the thrombin were applied, followed immediately by an equal amount of fibrinogen, and the components were mixed together. The conjunctival graft was placed over the glue, with care taken to maintain the original orientations of both the epithelial face and the limbal edge, joining the graft and surrounding conjunctival edges together with 0.12 forceps and McPherson forceps while pressing the graft gently to the scleral bed. Excess glue was removed. No sutures were used. After surgery, combination dexamethasone 0.1% and tobramycin eye ointment was placed, and a pressure patch was applied overnight. Postoperatively, combination dexamethasone 0.1% and tobramycin eye drops were applied every two hours for the first week and then decreased to four times daily for

three weeks. The same ointment was used at night for four weeks. Preservative-free artificial tear eye drops were used every two hours during the first month postoperatively. After one month, patients remained on fluorometholone 0.1% eye drops and preservative-free artificial tear eye drops four times daily for another month.

Clinical follow-up

All patients underwent follow-up evaluation on days 1 and 7 and months 1, 3, and 6 postoperatively. At each visit, visual acuity, and intraocular pressure were recorded, and slit lamp biomicroscopy evaluation was performed to assess for pterygium recurrence, graft integrity, ocular surface integrity, and any postoperative complications such as graft loss, graft displacement or dehiscence, graft edema or hemorrhage, and pyogenic granuloma.

Statistical analysis

Complications were tabulated and the results are presented as mean ± standard deviation (SD) or frequency (%). The time frame for evaluating for postoperative recurrence was six months. The IBM SPSS Statistics, version 28.0 (IBM Corp., Armonk, NY, USA) was used for the analyses of the data.

Results

Fifty-nine eyes of 59 patients met the study criteria. Two patients were excluded due to follow up less than six months, leaving 57 eyes of 57 patients for analysis. There were 14 male (24.6%) and 43 female patients (75.4%). The mean age of the patients was 57.09±1.38 years (range of 34 to 80 years).

Pterygium recurrence

Pterygium recurrence was observed in one patient (1.8%). It was a 41-year-old male, three months postoperatively.

Postoperative complications

No patient had conjunctival graft loss. Three patients (5.3%) were found to have partial graft displacement by the first day postoperatively, requiring immediate repositioning and suturing. No recurrence occurred in these cases. Seventeen patients (29.8%) had mild graft dehiscence as a gap between the graft and host conjunctiva, on the first postoperative day, and were observed. All achieved complete epithelialization in one month. Twelve eyes (21.1%) developed graft edema, presenting as a yellowish swelling, or subgraft hemorrhage in the first week postoperatively, and these findings resolved between one week and one month. There was small pyogenic granuloma in two eyes (3.50%) at one month after surgery, resolving by three months with conservative management. Intraocular pressure exceeded 21 mmHg was detected in three eyes (5.3%) during the first month and decreased to normal levels after discontinuation of the tobradex eye drops. None of the patients had infection, dellen, scleral thinning, symblepharon, or fibrosis at the donor site. No adverse effects of fibrin glue were observed. Postoperative complications are summarized in Table 1.

Table 1. Postoperative complications associated with using fibrin glue for fixation of the conjunctival autograft (n=57)

Complications	n (%)
Pterygium recurrence	1 (1.8)
Conjunctival graft loss	0 (0.0)
Partial conjunctival graft displacement	3 (5.3)
Conjunctival graft dehiscence	17 (29.8)
Graft edema or subgraft hemorrhage	12 (21.1)
Pyogenic granuloma	2 (3.5)
Elevation of intraocular pressure (over 21 mmHg)	3 (5.3)

Discussion

Pterygium is one of the most common ocular diseases in Thailand, and surgery is one of the most common performed in Mettapracharak Hospital. Medical management with topical lubricants and anti-inflammatory drugs may be used for symptom relief and signs of ocular irritation. The definitive treatment is surgery, which is indicated when the lesion causes visual deterioration due to proximity to the visual axis or induction of significant astigmatism. Other indications include symptoms of irritation, severe inflammation, eye movement restriction, inability to wear contact lenses, and cosmetic concerns[10]. The aim of surgery is to excise the fibrovascular growth completely and prevent recurrence, which is the most common complication.

Various surgical techniques for pterygium resection have been described, along with recurrence rates. The simple excision technique, in which one leaves the resection site as bare sclera, has the highest reported recurrence rates of between 38% and 88%[11,12]. Adjunctive intraoperative therapies including mitomycin C (MMC), and β-irradiation have been used to reduce the recurrence rate but are associated with problematic complications[12,13]. MMC in particular is well recognized to cause punctuate

keratopathy, corneal edema, corneoscleral melt, late-onset scleral necrosis and scleral calcification, iritis, leading to secondary glaucoma and cataract. Most resection techniques involve covering the resection bed with a conjunctival autograft, conjunctival/limbal autograft, and conjunctival flap or amniotic membrane.

Conjunctival autograft transplantation has been widely used and is considered to be safe and efficacious in lowering recurrence rates with very few complications[14]. Many studies have shown conjunctival autografting to be superior to amniotic membrane transplantation (AMT) in reducing the recurrence rates in resection of uncomplicated pterygia, including the previous studies from Thailand[15,16]. AMT is thus generally reserved as an adjunct for severe or advanced pterygia in which the conjunctival defects are large, double- headed pterygia, recurrent pterygia, or is occasionally used alone in patients who may need glaucoma surgery in the future. Although conjunctival autografting effectively reduces recurrence rates, these rates still vary between 3.3% and 16%[7]. Most recurrences occur within six months postoperatively[17]. Moreover, this technique necessitates technical skills requiring extensive surgical experience, and longer operative times due to the need to harvest and secure the conjunctival graft. Conjunctival autografts are typically sutured, a time-consuming process that is performed in a range of techniques so varied that it may explain the equally wide variation in reported recurrence[17]. Suturing has clear downsides, including patient discomfort (foreign body sensation, pain, discomfort, and tearing), chronic inflammation, pyogenic granuloma, giant papillary conjunctivitis, suture abscesses, and frequently the need for suture removal[18,19]. Suzuki et al. reported that conjunctival sutures induced inflammation and migration of Langerhans cells to the cornea[20]. Postoperative inflammation is widely suspected to increase the risk of pterygium recurrence.

Fibrin glue is an alternative method to conjunctival autograft fixation. Its use in ophthalmic surgery is not new, and is reported in conjunctival wound closure, corneal surgery, oculoplastic and orbital surgery, glaucoma surgery, strabismus surgery, lens surgery, and vitreoretinal surgery[18]. It has clear advantages, including reduced surgery time, ease of application, and a short learning curve since it is much easier to learn to spread glue than to learn to suture under a microscope. Kheirkhah et al. reported that conjunctival inflammation around the surgical site was significantly more common in eyes with sutures than those with fibrin glue[21]. The technique spares patients the discomfort associated with sutures, and the reported recurrence rates are lower than those following conjunctival suturing[18,22].

Fibrin glue graft fixation has downsides, most notably graft instability. A meta- analysis of 14 randomized controlled trials comparing graft fixation with fibrin glue versus suturing found that gluing resulted in lower recurrence rates (RR 0.47, 95% CI 0.27 to 0.82) but increased rates of other complications (RR 1.92, 95% CI 1.22 to 3.02), including the most common complications were graft dehiscence, graft retraction, and granuloma[9]. The use of fibrin glue in pterygium surgery at Mettapracharak Hospital began in 2017.

In the present study, the pterygium recurrence rate with using fibrin glue for conjunctival autograft fixation was 1.8% or one eye at the end of six months follow-up, which is comparable to the previously reported rates of between 0% and 12%[23]. As with most other studies, the current report is limited to six months follow-up since many study-participants' follow-up was much less consistent at later time points. No previous studies of this procedure in Thailand have been published to enable direct comparison, although two Thai studies involving conjunctival autograft suturing showed recurrence rates of 4.76% and 13.1%[15,16]. In the present study, there are no sight-threatening complications.

The generalizability of the author's findings is limited by the lack of systematic grading of pterygia preoperatively, and by very precise measurements of the sizes of conjunctival autograft. Such qualification in future studies will enable more meaningful comparison with other studies.

Conclusion

The present study of 57 patients suggests that fibrin glue fixation of conjunctival autografts is a viable option in pterygium surgery, being easy to perform and with rates of safety and complications that compare favorably to other published techniques.

What is already known on this topic?

Conjunctival autograft transplantation after pterygium removal has been reported in studies from other countries, beside Thailand, to be both safe and efficacious in lowering recurrence rates and reducing sight threatening complications.

What this study adds?

This study presents similar findings in Thai patients and a Thai hospital.

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Conflicts of interest

The authors declare no conflict of interest.

References

1. Ang LP, Chua JL, Tan DT. Current concepts and techniques in pterygium treatment. Curr Opin Ophthalmol 2007;18:308-13.
2. Moran DJ, Hollows FC. Pterygium and ultraviolet radiation: a positive correlation. Br J Ophthalmol 1984;68:343-6.
3. Rezvan F, Khabazkhoob M, Hooshmand E, Yekta A, Saatchi M, Hashemi H. Prevalence and risk factors of pterygium: a systematic review and meta-analysis. Surv Ophthalmol 2018;63:719-35.
4. Bradley JC, Yang W, Bradley RH, Reid TW, Schwab IR. The science of pterygia. Br J Ophthalmol 2010;94:815-20.
5. Liu T, Liu Y, Xie L, He X, Bai J. Progress in the pathogenesis of pterygium. Curr Eye Res 2013;38:1191-7.
6. Kenyon KR, Wagoner MD, Hettinger ME. Conjunctival autograft transplantation for advanced and recurrent pterygium. Ophthalmology 1985;92:1461-70.
7. Clearfield E, Muthappan V, Wang X, Kuo IC. Conjunctival autograft for pterygium. Cochrane Database Syst Rev 2016;2:CD011349.
8. Koranyi G, Seregard S, Kopp ED. Cut and paste: a no suture, small incision approach to pterygium surgery. Br J Ophthalmol 2004;88:911-4.
9. Romano V, Cruciani M, Conti L, Fontana L. Fibrin glue versus sutures for conjunctival autografting in primary pterygium surgery. Cochrane Database Syst Rev 2016;12:CD011308.
10. Kaufman SC, Jacobs DS, Lee WB, Deng SX, Rosenblatt MI, Shtein RM. Options and adjuvants in surgery for pterygium: a report by the American Academy of Ophthalmology. Ophthalmology 2013;120:201-8.
11. Janson BJ, Sikder S. Surgical management of pterygium. Ocul Surf 2014;12:112-9.
12. Moriarty AP, Crawford GJ, McAllister IL, Constable IJ. Severe corneoscleral infection. A complication of beta irradiation scleral necrosis following pterygium excision. Arch Ophthalmol 1993;111:947-51.
13. Safianik B, Ben-Zion I, Garzozi HJ. Serious corneoscleral complications after pterygium excision with mitomycin C. Br J Ophthalmol 2002;86:357-8.
14. Fonseca EC, Rocha EM, Arruda GV. Comparison among adjuvant treatments for primary pterygium: a network meta-analysis. Br J Ophthalmol 2018;102:748-56.
15. Tananuvat N, Martin T. The results of amniotic membrane transplantation for primary pterygium compared with conjunctival autograft. Cornea 2004;23:458-63.
16. Luanratanakorn P, Ratanapakorn T, Suwan-Apichon O, Chuck RS. Randomised controlled study of conjunctival autograft versus amniotic membrane graft in pterygium excision. Br J Ophthalmol 2006;90:1476-80.
17. Ti SE, Chee SP, Dear KB, Tan DT. Analysis of variation in success rates in conjunctival autografting for primary and recurrent pterygium. Br J Ophthalmol 2000;84:385-9.
18. Hovanesian JA, Starr CE, Vroman DT, Mah FS, Gomes JAP, Farid M, et al. Surgical techniques and adjuvants for the management of primary and recurrent pterygia. J Cataract Refract Surg 2017;43:405-19.
19. Starck T, Kenyon KR, Serrano F. Conjunctival autograft for primary and recurrent pterygia: surgical technique and problem management. Cornea 1991;10:196-202.
20. Suzuki T, Sano Y, Kinoshita S. Conjunctival inflammation induces Langerhans cell migration into the cornea. Curr Eye Res 2000;21:550-3.
21. Kheirkhah A, Casas V, Sheha H, Raju VK, Tseng SC. Role of conjunctival inflammation in surgical outcome after amniotic membrane transplantation with or without fibrin glue for pterygium. Cornea 2008;27:56-63.
22. Panda A, Kumar S, Kumar A, Bansal R, Bhartiya S. Fibrin glue in ophthalmology. Indian J Ophthalmol 2009;57:371-9.
23. Cagatay HH, Gokce G, Ekinci M, Koban Y, Daraman O, Ceylan E. Long-term comparison of fibrin tissue glue and vicryl suture in conjunctival autografting for pterygium surgery. Postgrad Med 2014;126:97-103.