Fibrin glue versus sutures for conjunctival autografting in pterygium surgery: a prospective comparative study

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ABSTRACT

Aim: To compare the use of fibrin glue versus sutures for fixating conjunctival autografts in patients undergoing pterygium excision.

Methods: Fifty patients (50 eyes) with primary pterygium were randomised to undergo pterygium surgery using either fibrin glue (25 eyes) or 8-0 Vicryl sutures (25 eyes) to attach the conjunctival autograft. The patients were followed up for 12 months. Outcome measures were postoperative patient comfort, duration of surgery and recurrence of pterygium.

Results: In the fibrin glue group, the mean operation time was 15.7 (SD 2.4) min (range 12–18 min) and in the suture group ($p<0.001$) it was 32.5 (6.7) min (range 25–40 min). The intensity of the postoperative pain, foreign-body sensation, irritation and epiphora were significantly lower in the fibrin glue group than in the suture group ($p<0.001$). The intensity of itchy sensation at the first two postoperative visits was lower among patients in the fibrin glue group (five patients, 20%) than in the suture group (12 patients, 48%) ($p<0.05$). Two patients in the fibrin glue group had partial graft dehiscence; these grafts were successfully reattached with fibrin glue. At the end of follow-up, pterygium recurrence was observed in one eye (4%) in the fibrin glue group and in three eyes (12%) in the suture group ($p<0.05$).

Conclusion: The use of fibrin glue in pterygium surgery with conjunctival autografting significantly reduces surgery time, improves postoperative patient comfort and results in a lower recurrence rate compared with suturing.

Conjunctival autografting after pterygium excision is associated with very low rates of recurrence and complications when compared with other techniques. The surgeon's skill and experience affect the recurrence rate, which varies between 2% and 39% with this technique.[1 2] Nevertheless, because of graft suturing, this method has the disadvantage of a relatively longer surgery time when compared with the bare sclera technique; also it carries the risk of complications such as granuloma formation and giant papillary conjunctivitis, as well as significant patient discomfort after surgery.[3]

Because of its biological and biodegradable properties, fibrin-based adhesives may be used under a superficial covering layer (conjunctiva, amniotic membrane, etc) without inducing inflammation.[4] Fibrin glues have been used in an array of ophthalmic procedures such as conjunctival closure in strabismus, vitreoretinal and glaucoma surgery.[5–7] Tissue adhesives of different types had been used in previous studies to attach conjunctival grafts and, compared with the use of sutures, were associated with a shorter operative time and reduced postoperative complaints.[8–12] However, the recurrence rates after the use of fibrin glue have been investigated in only a few studies, the results of which have been inconsistent.[13 14]

In the present study, we sought to determine the safety and efficacy of using fibrin glue (Tisseel VH, Baxter AG, Vienna) to attach conjunctival autografts and to the results of such with the use of Vicryl sutures in patients undergoing pterygium excision. To do this, we planned a prospective, randomised study to evaluate operation time, postoperative patient comfort and pterygium recurrence.

MATERIAL AND METHODS

Fifty consecutive patients (50 eyes) with primary nasal pterygium were enrolled in this prospective study. Patients with immune system, eyelid or ocular surface diseases (eg, blepharitis, Sjögren syndrome and dry eye), with a history of previous ocular surgery or trauma or known hypersensitivity to any component of fibrin glue were excluded from the study. All patients were informed about the design of the study and the procedure, and written informed consent was obtained from all patients. The study protocol was approved by the Ethics Committee at Başkent University Faculty of Medicine.

Patients were randomised to two groups. To reduce intraobserver bias and minimise the influence of the known surgical technique on the extent of removal and size of the graft, the randomisation was done after the surgeon (AK) had harvested the graft. To ensure subjective evaluation of symptoms and comfort, the patients also were masked. One eye of each patient was included in the study. If the patient had bilateral pterygium, one eye was selected randomly and included in the study.

The pterygia were graded according to the grading system developed by Tan and associates as grade 1 (atrophic) with episcleral vessels under the body of the pterygium not obscured and clearly distinguishable; grade 3 (fleshy), episcleral vessels totally obscured; or grade 2 (intermediate), all other pterygia not falling into grades 1 or 3.[15] In all cases, the pterygia extended at least 3 mm beyond the limbus.

Fibrin glue preparation

The fibrin glue (Tisseel VH, Baxter AG) was prepared according to the manufacturer's directions. In brief, freeze-dried protein concentrate and

thrombin were reconstituted in fibrinolysis inhibitor solution and calcium chloride solution, respectively, and were warmed for several minutes in a patented fibrinotherm device. Then, each solution was withdrawn into a separate disposable syringe. Both syringes were placed in a dual injection system, in which their contents were mixed in appropriate proportions.

Surgical technique

To ensure consistency, all operations were performed under an operating microscope by the same surgeon (AK). After administration of topical 0.5% proparacaine hydrochloride (HCL) (Alcaine, Alcon, Switzerland), lidocaine HCL 40 mg/2 ml+epinephrine 0.025 mg/ml (Jetokain, Adeka, Turkey) was injected under the conjunctiva at the superotemporal bulbar region and into the body of the pterygium. The head of the pterygium was excised completely from the cornea, and the body was dissected and excised with conjunctival scissors. Abnormal scar tissue on the corneal surface was polished. Minimal cauterisation was used to control bleeding. An oversized graft for 1 mm of length and width relative to the graft bed was harvested from the superotemporal limbus, with care to obtain a Tenon-free graft. The graft was subsequently moved to the nasal area and attached to the conjunctival edges and episclera with fibrin glue in 25 eyes (the fibrin glue group) or interrupted Vicryl 8-0 sutures (8-10 sutures) in 25 eyes (the suture group). The eye was covered with an eye pad after administration of topical antibiotic ointment (Tobrex, Alcon). The operating time was measured, starting from the placement of the lid retractor to its removal at the end of the surgery.

Postoperative follow-up

Postoperatively, patients used dexamethasone 0.1% (Maxidex, Alcon) and tobramycin 0.3% (Tobrex, Alcon) eye-drops four times a day for 7 days, and three times a day for the following 10 days. All eyes in both groups were covered with an eye shield for 10 days. Patients were examined on the first and 10th days, and also at the first, third, sixth and 12th months after surgery. In the suture group, sutures were removed 10 days after the surgery.

Recurrence was defined as any fibrovascular growth that passed the corneal limbus by more than 1 mm. Reoperation was done if further growth of the recurrent pterygium was observed on any follow-up examination.

Patients were asked to fill out a questionnaire on postoperative day 1 and during every follow-up examination until the first month, grading their symptoms (pain, foreign body sensation, irritation and epiphora) using a five-point scale adapted from Lim-Bon-Siong and associates,[16] in which 0 means none, or no symptoms; 1 means very mild, or presence of the symptom but that it is easily tolerated; 2 means mild, or that the symptom causes some discomfort; 3 means moderate, or that the symptom partially interferes with usual activities or sleep; and 4 means severe, or that the symptom interferes completely with usual activities or sleep.

Statistical analyses

Statistical analyses were done with SPSS software (SPSS, version 9.0, SPSS, Chicago). The Mann–Whitney *U* and chi-square tests were used for statistical analyses. A p value less than 0.05 was considered statistically significant.

RESULTS

All patients completed the 12-month follow-up. None was excluded from the study. The preoperative characteristics of the patients are summarised in table 1. No significant difference was found between the two groups with regard to sex or age ($p>0.05$). The mean duration of surgery was 15.7 (SD 2.4) min (range 12–18 min) in the fibrin glue group, and 32.5 (6.7) min (range 25–40 min) in the suture group. The operation time was significantly shorter in the fibrin glue group than it was in the suture group ($p<0.001$).

The intensity of the postoperative complaints including pain, foreign-body sensation, irritation and epiphora was significantly lower in patients treated with fibrin glue than in those treated with sutures at both postoperative days 1 and 10 ($p<0.001$). Also, the intensity of itchy sensation at the first two postoperative visits was lower among patients in the fibrin glue group (five patients, 20%) than in the suture group (12 patients, 48%) ($p<0.05$). After suture removal in the suture group at postoperative day 10, all symptoms disappeared quickly. None of the patients had any complaints of epiphora or pain at day 30. Only a few patients in both groups still had mild irritation and foreign-body sensation in their eyes at day 30; however, there was no statistically significant difference between the two groups ($p>0.05$) (fig 1).

Figure 2 shows the preoperative appearance as well as postoperative appearances on days 1 and 10 of the patients in both groups. Corneal re-epithelialisation was completed within 10 days after surgery in all patients. At postoperative day 10, partial conjunctival graft dehiscence was noted in two patients (8%) in the fibrin glue group (fig 3). Grafts were reattached with fibrin glue under topical anaesthesia, and neither of the patients developed any complication including recurrence throughout the follow-up.

Pterygium recurrence was observed in one patient (4%) in the fibrin glue group and in three patients (12%) in the suture group ($p<0.05$) during the 12-month follow-up. The recurrences occurred in the third month in the fibrin glue group and in the third, fourth and fifth months in the suture group. The preoperative grades of the recurred pterygia were grade 2 (one patient in the suture group) and grade 3 (one patient in the fibrin glue group and two patients in the suture group). The recurrent cases were closely followed-up for continuing growth of fibrovascular tissue onto the cornea. No reoperation was necessary during the follow-up.

None of the patients developed complications such as granuloma formation, graft necrosis or failure, pannus formation, symblepharon or pseudopterygium at the donor site during the 1-year follow-up. No adverse effects from the fibrin glue application were observed.

Table 1 Patient characteristics in the fibrin glue group and the Vicryl sutures group

	Fibrin glue group n = 25	Vicryl sutures group n = 25	p Value
Mean (SD) age, years*	53.4 (11.8)	58.8 (12.3)	0.58
Sex			
Male (%)	11 (44%)	12 (48%)	0.72
Female (%)	14 (56%)	13 (52%)	0.68
Pterygium grade			
Grade 1 (%)	6 (24%)	7 (28%)	0.48
Grade 2 (%)	12 (48%)	13 (52%)	0.52
Grade 3 (%)	7 (28%)	5 (20%)	0.33

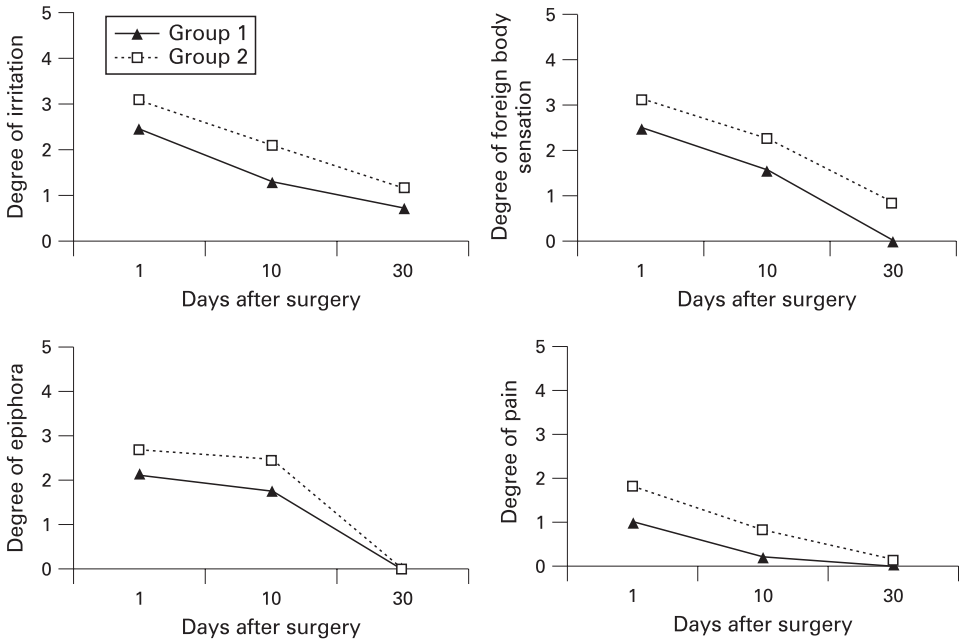

Figure 1 Five-point scale used to assess postoperative irritation (upper left), foreign-body sensation (upper right), epiphora (lower left) and pain (lower right) at 1, 10 and 30 days after pterygium surgery.

DISCUSSION

Compared with bare sclera excision, primary closure and the use of amniotic membrane grafts, conjunctival autografting after pterygium excision is associated with lower recurrence rates and fewer complications.[15 17 18] Although it is safe and effective, more surgical expertise, technical ability and surgical time are needed to secure the grafts with sutures. [19] Sutures do not actively participate in wound healing and may cause additional trauma to the injury site and adjacent tissue. Also, infectious agents might enter along the suture tract, or the sutures might act as the nidus of the inflammation itself. Loose or broken sutures require removal and, hence, additional working time.[20]

Cohen and McDonald[8] have used a combination of Tisseel glue and sutures in a case series in which they secured the four corners of the graft to the host conjunctival tissue with four absorbable 7-0 sutures. However, this study had a relatively small number of patients (six patients) and a short follow-up (30 days). Koranyi and associates[9] were the first to report the use of fibrin glue for conjunctival transplanting in pterygium surgery in a prospective randomised study. They used Tisseel in 20 eyes of 20 patients and 7-0 Vicryl sutures in 23 eyes of 23 patients to secure the grafts. The authors evaluated the postoperative pain using a visual analogue scale and demonstrated that the use of fibrin glue, when securing conjunctival autografts, was associated with significantly less postoperative pain than that from sutures. The authors also reported that the mean length of surgery was significantly shorter in the fibrin glue group compared with the suture group (9.7 min vs 18.5 min, respectively). In another study by Marticorena and associates,[10] 20 patients (20 eyes) underwent pterygium surgery, and Tisseel glue was used for conjunctival autograft fixation. The authors found the glue to effectively reduce surgery time and improve patient comfort; however, the study had the limitations that it lacked a pain-scoring system and a control group. In the current study, we found that symptom scores were significantly lower on at the first and 10th postoperative day in the fibrin glue group than they were in the suture group. The duration of surgery was also significantly shorter, and these findings are consistent with previous studies.[8–10]

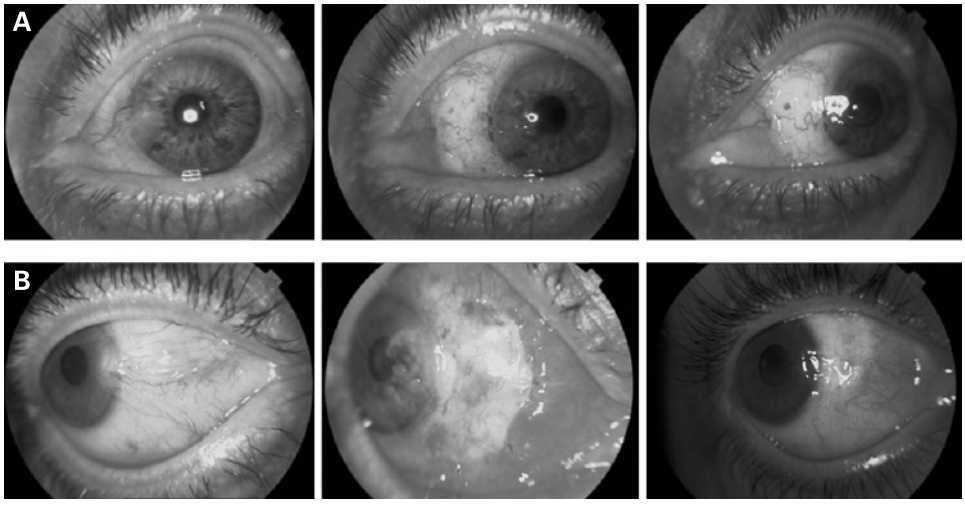

Figure 2 Pictures of the patients in both groups, before and after surgery. (A) Pictures of preoperative (left) and postoperative days 1 (middle) and 10 (right) of a patient in the fibrin group. (B) Pictures of preoperative (left) and postoperative days 1 (middle) and 10 (right) of a patient in the suture group.

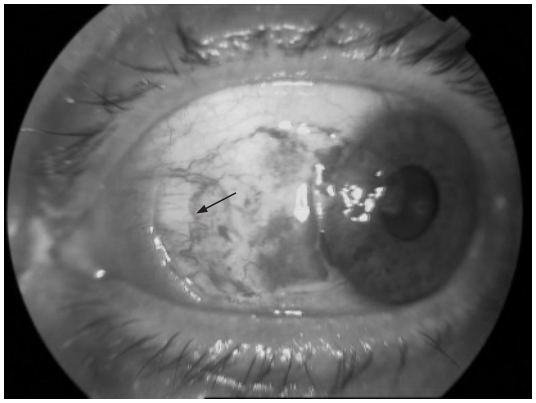

Figure 3 Graft dehiscence (arrow) in a patient at postoperative day 10.

Fibrin adhesives such as Beriplast P (Aventis Behring, King of Prussia, PA) and Quixil (Omrix Biopharmaceuticals, Rehovot, Israel) also have been used in pterygium surgery. In a study by Uy and associates,[11] Beriplast P was used for attaching conjunctival autografts and resulted in shorter operating times and less patient discomfort than did nylon sutures. Bahar and associates, however, compared the results of Quixil with Vicryl sutures for conjunctival autografting in two consecutive studies.[12 14] The results of their studies confirmed the benefits of using fibrin glue over sutures with regard to surgical time and postoperative discomfort.

More severe inflammation may cause higher recurrence rates, and silk and nylon sutures placed in the conjunctiva can cause inflammation and migration of the Langerhans cells to the cornea.[21] In our study, we found a 4% recurrence rate in the fibrin glue group and a 12% recurrence rate in the suture group at 12 months' follow-up. Although 10-0 nylon suture is a finer material and may produce less discomfort, fewer symptoms were still reported with the use of fibrin glue.[11] Also, a recent study demonstrated that the postoperative discomfort using nylon sutures was comparable with the use of Vicryl sutures for attaching conjunctival autografts.[22] In a study of 461 eyes of 381 patients, Koranyi and associates[13] reported that the recurrence rate was 5.3% in a fibrin glue group and 13.5% in a suture group over a mean follow-up of 23 months. They suggest that the use of fibrin glue instead of sutures for graft attachment in pterygium surgery provides better contact with underlying tissues. However, in another prospective study, the recurrence rates were 11.9% and 7.7% in a fibrin glue and a suture group, respectively.[14] Conjunctival autografts were shown to vascularise during the first postoperative week from the underlying episcleral vascular bed.[23 24] The immediate adhesion of the graft with the use of fibrin glue may result in early graft vascularisation and prevent recurrence. However, the sample size of our study is relatively small to demonstrate conclusively the lower recurrence rate with fibrin glue.

All patients were instructed not to remove the patch for 24 h and not to rub the eye for the first 2 days. The patients in the fibrin glue group have reported less itchy sensations than the suture group. However, both patients in whom dehiscence occurred admitted that they have removed the pad and had rubbed the operated eye intensively the first day after surgery. In both of these patients, the grafts were reattached with fibrin glue under topical anaesthesia and appeared to be well healed with no recurrence of the pterygium at 12 months' follow-up. Although this complication can be treated without much effort, a protective eye-shield should be used in the early postoperative period to avoid eye rubbing. Also, detailed instructions must be given to patients about postoperative eye care and proper instillation of eye-drops.

Transmission of parvovirus B19, hepatitis or human immunodeficiency virus from fibrin glue use during surgery continues to be a theoretic risk despite viral inactivation techniques.[4] The manufacturer of Tisseel glue uses a double-barrelled approach to safety by careful donor selection and two-step vapour heating treatment. No documented cases of viral transmission have occurred from the use of Tisseel, which agrees with our observations during follow-up.

The relatively small number of patients and the lack of a postoperative grading based on the final cosmetic appearance might be the limitations of the current study. Also, as shown in previous studies, conjunctival autografting yields better cosmetic outcomes; hence, such final appearance grading might be valuable to compare the effectiveness of fibrin glue with suture fixation.[25] On the other hand, being a prospective, randomised clinical trial with a long-term follow-up strengthens the credibility of our results. In addition, besides blinding the surgeon to the patient randomisation, the patients also were unaware of which group they had been enrolled in. Even if patients might have been able to tell each other after surgery by inspection, we believe that this effort to mask the patients to their treatment groups makes the results of this study more valuable.

In conclusion, the use of fibrin glue for the attachment of conjunctival autografts in pterygium surgery is safe and effective in reducing early postoperative complications and patient discomfort. Furthermore, using fibrin glue in pterygium surgery significantly shortens the duration of surgery and therefore allows more rapid and efficient surgery, which may reduce the risk of infection and save the surgeon and the facility valuable operating-room time. From the patient's standpoint, greater comfort allows a more rapid return to their normal lifestyle and productivity.

Competing interests: None.

Ethics approval: The study protocol was approved by the Ethics Committee at Başkent University Faculty of Medicine.

Patient consent: Obtained.

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