Excision of Pterygium and Conjunctival Autograft

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Abstract

Background: Pterygium is a common disease in Israel. Different surgical techniques are used to manage it with varying degrees of success.

Objectives: To evaluate the efficacy and safety of a conjunctival autograft after excision of pterygium.

Methods: Excision followed by conjunctival autograft was used to treat 40 eyes of 40 patients with pterygium. The surgical results were evaluated retrospectively. Follow-up continued for a median of 296 days (range 6–1,056); 26 cases were followed for more than 100 days (average 418 days) and comprised the study cohort. All reported procedures were performed consequentially and by one surgeon in the Tel Aviv Sourasky Medical Center, Israel between 1 June 1997 and 31 March 2000.

Results: There were two recurrences of pterygium (2/26, 7.7%) 2 months postoperatively. There were no major complications. Superficial corneal vessels (without concurrent fibrosis) appeared in 10 of 17 cases sutured with nylon, but none occurred in any of the seven grafts sutured with vicryl ($P = 0.068$). The average LogMAR-corrected visual acuity of the study group improved slightly, from 6/16.5 to 6/11 ($P = 0.003$).

Conclusions: Excision of pterygium with a conjunctival autograft is a safe and effective operation, with no procedure-specific added surgical risks. The relatively long surgical time and microsurgical methods required to perform the procedure properly have hindered its acceptance as the mainstream approach to pterygium management. Long-term follow-up is needed for better discernment of the surgical results in Israel.

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Pterygium, an external eye disease, is common worldwide but is particularly prevalent in tropical and subtropical areas. The prevalence rates range from 0.7 to 31% among different populations [1–6] and are also influenced by age, race, and exposure to solar radiation.

The excision of a pterygium with no added therapy ("bare sclera excision") was widely practiced because it was believed to be safe and simple. However, with time it became apparent that the recurrence rate was unacceptably high in many places: 48% in Papua, New Guinea [7], 88% in Southern California, USA [8], 32% in India [9], 61% in Singapore [10], and 70–82% in England [11].

Several methods were implemented with the aim of improving the success rate, among them transplantation of the head of the pterygium, conjunctival flaps, conjunctival autografts, lamellar keratoplasty and penetrating keratoplasty, mucous membrane grafts, skin grafts, chemotherapy by thiotepa or by mitomycin-C, radiation therapy by radon bulbs, radium plaques, X-rays, or Strontium 90 beta irradiation. Several of them succeeded in lowering recurrence rates but did so at the price of sight-threatening complications from the tissue damage associated with the treatment.

Kenyon et al. [12] first described a conjunctival autograft in 1985. They reported a recurrence rate of 5.3%, and infrequent and relatively minor complications. The primary disadvantage of the technique is the prolonged operative time required when compared to the bare sclera technique. In addition, an operating microscope is required for optimum results. These disadvantages are outweighed, however, by the lack of sight-threatening complications and the relatively low recurrence rate. The procedure gained popularity in many centers, and today most surgeons are inclined to choose one of three techniques: bare sclera excision of pterygium, excision of pterygium with intraoperative or postoperative application of mitomycin-C, or excision of the pterygium with a conjunctival autograft.

The reported recurrence rates in the combined excision and autograft technique vary between studies, reflecting the geography-dependent variability of pterygium behavior. A 5.4% recurrence rate was reported in Taiwan [13], 3.8–5.0% in India [14,15], 7.7% in The Netherlands [16], 25.9% in Saudi Arabia [17], and 2.6–9.1% in Miami, Florida [18]. The fact that results differ in different locations and even among different surgeons means that the findings of other surveys cannot be extrapolated for application in other areas. There are no published data on the results of the Israeli experience with excision of the pterygium with a conjunctival autograft. Indeed, being geographically located in the subtropical belt and exposed to solar radiation, less than optimal results might be expected. We performed the current study in order to evaluate our results with this technique in Israel.

Patients and Methods

A total of 40 consecutive pterygia were excised from the eyes of 40 patients at the Tel Aviv Sourasky Medical Center, Israel between 1 June 1997 and 31 March 2000. The 40 patients were followed for a

Table 1. Preoperative characteristics

	Included	Excluded
No. of eyes	26	12
Age		
Mean ± SD (yr)	53.73 ± 14.82	49.17 ± 13.77
Range	33–79	31–72
Eye		
Right	10	9
Left	16	3
Gender		
Male	16	8
Female	10	4
Previous excisions		
No. of eyes	3	2
No. of procedures	6	2
Pterygium size (mean ± SD)(mm)		
Width (limbal)	6.59 ± 0.91	7.02 ± 1.49
Range	5.3–9.0	4.4–8.5
Length (radial)	4.22 ± 1.34	4.12 ± 1.94
Range	2.4–8.0	0.5–6.6

median of 296 days (range 6–1,056), and 26 of them were followed for more than 100 days (mean 418 days) and comprise the study cohort. The excluded 14 patients included 2 who failed to report for postoperative follow-up and 12 who had been seen for 6–69 days after surgery with no signs of recurrence.

The preoperative characteristics of the patients are shown in Table 1. We chose not to exclude patients with a younger age or eyes with recurrent or large pterygium, although the recurrence rate was expected to be higher in those groups. All procedures were performed in our ophthalmology department and by the same ophthalmologist (D.V.).

The operative procedure is similar to that originally reported by Kenyon et al. [12]. The surface of the eye is anesthetized by topical instillation of 2% I.V. lignocaine solution, which is repeated during surgery according to the patient's request. A stay suture is placed at the upper limbus. The pterygium body is separated from the upper and lower conjunctiva. A muscle hook is passed through the upper conjunctival wound, under the body of the pterygium near the limbus, and out through the lower conjunctival wound. The hook is then pulled anteriorly and away from the limbus to protect the rectus muscle, and the body of the pterygium is excised at the muscle hook. Minimal if any cautery is performed, and bleeding typically stops spontaneously. The head of the pterygium is then addressed: it is dissected carefully from the apex towards the limbus, taking care to remove all scar tissue but not any of the opaque stroma sometimes underlying the scar. The size of the conjunctival wound is measured with Castroviejo calipers. The globe is rotated downward using the stay suture to expose the superior bulbar conjunctiva. The dimensions of the intended conjunctival graft adjacent to the limbus are marked with a gentian violet marking pen. The upper angle of the conjunctiva is grasped by fine forceps, and blunt Wescott conjunctival scissors are used to separate the conjunctiva from the underlying Tenon's capsule. The final graft is kept as thin as possible, and is deliberately somewhat larger than the marks in order to reduce shrinkage and pulling after surgery. The free graft is placed on the scleral bed, ensuring that the epithelial side faces up and that the limbal edge is adjacent to the recipient limbus. Multiple sutures are used to attach the graft to its location, and they are either 10-0 nylon, or 8-0 to 10-0 vicryl, and placed in an interrupted and running manner. The goal is to firmly attach the graft to the bed and to the surrounding conjunctiva. Nylon sutures are removed 1 month postoperatively (vicryl is absorbed at about that time). The harvest site wound remains as it is, and epithelial healing covers it within a few days. Antibiotic drops are used as long as an epithelial defect persists, and steroid drops are administered 4 times a day and tapered during the following 3–4 months.

Follow-up visits were scheduled for postoperative days 1, 7, 14, 21, 30, 60, 90, and 120, at 6, 9, 12, 18 months postsurgery; and then yearly visits. Visual acuity, intraocular pressure as well as the existence of a recurrence were monitored and recorded. Recurrence was defined as postoperative fibrovascular regrowth crossing the corneoscleral limbus by 1.0 mm, and this constituted treatment failure.

The data were analyzed by the paired and unpaired Student *t*-tests and by Fisher's exact test when applicable.

Results

The average graft width was 6.98 mm (SD 1.03 mm, range 5–9 mm) and its average length (radial from limbus) was 6.85 mm (SD 1.57 mm, range 4–10 mm). Nylon sutures were used in 71% of the procedures and vicryl in 29%. Running sutures were used in 17%, running and interrupted sutures in 42%, and only interrupted sutures in 42%.

There were two recurrences (2/26, 7.7%), both in men aged 38 and 50 years, and both pterygia were primary. The size of the original pterygium was 6.2 mm wide by 3.2 mm long in one patient and 6.2 mm wide by 3.4 mm long in the other. Two running 10/0 nylon sutures were used in the first procedure and a single 10-0 vicryl suture in the second. The two procedures were performed 15 months apart. The recurrence was noted at 60 and 55 days postoperatively. The final recorded pterygium measurements in these two patients were 3.7 mm wide by 1.8 mm long and 2.1 mm wide by 1.3 mm long. Thus, the recurrence rate in our study cohort was 2/26, 7.7%. When considering only the patients followed for more than one year, the recurrence rate would be 2/15, 13.3%.

There were no major complications such as perforation, scleral melt or endophthalmitis. All the patients reported varying levels of discomfort, foreign body sensation, tearing and redness.

Visual acuity (logMAR corrected) was compared between preoperative measurements and the final result [Figure 1]. The preoperative logMAR best spectacle-corrected visual acuity was 6/16.5 (20/55), range 6/6–hand motion, while final vision improved to 6/11.1 (20/37), range 6/6–1/36 ($P = 0.003$, paired *t*-test). Specifically, the visual acuity decreased by two lines in 1 eye, by one line in 1 eye, remained unchanged in 6 eyes, improved by one line in 8 eyes and improved by two or more lines in 9 eyes.

Superficial vessels without fibrous tissue grew in 12 more cases (46%). Their average width was 2.5 mm (range 1.4–4.0 mm) and their average length was 0.8 mm (range 0.5–1.2 mm). Vessels were

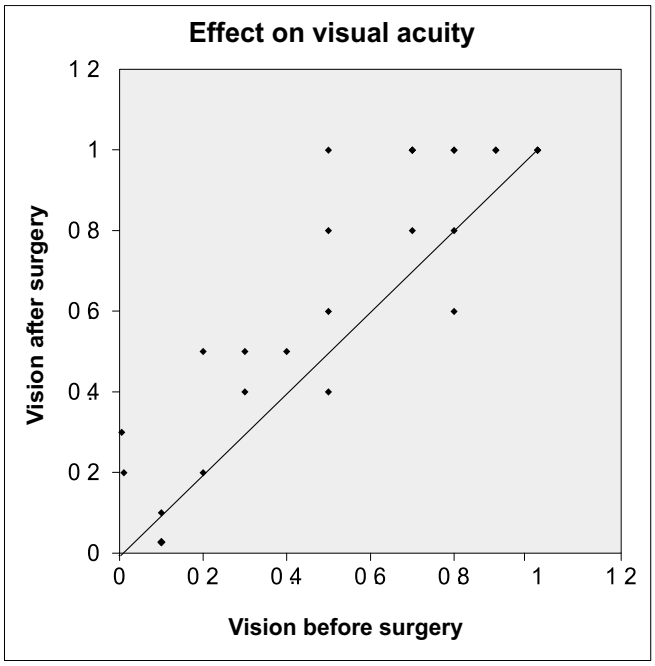

Figure 1. The effect of surgery on visual acuity. Vision improved in 17 eyes, did not change in 6, and deteriorated in 3.

noted in 4 of 14 eyes that had been followed for 104–374 days (28.6%), but they were apparent in 8 of 12 eyes that had been followed for 426–1,056 days (66.7%). The earliest observation of superficial vessels was 181 days after surgery. Interestingly, while superficial vessels were not seen in the eyes sutured with vicryl, they were detected in 58.8% of the eyes sutured with nylon (P = 0.068).

Discussion

After pterygium excision, a "bare sclera" technique was advocated by many researchers in the past, in which the resultant scleral and corneal defects would be left to epithelialize postoperatively. It was theorized that recurrence would be prevented if the corneal epithelium could heal before the conjunctival epithelium reached the limbus [19]. Many authors claimed impressive success rates with this bare sclera technique [19–21]. Unfortunately, controlled studies were not performed to validate these reports. During the last few decades, many studies reported recurrence rates ranging from 32 to 88% [7–11].

Of the many procedures used over the years to improve the surgical success rate, two are currently enjoying widespread popularity, with high rates of success repeatedly reported in multiple independent studies: one is excision of the pterygium with a conjunctival autograft and the other is excision of a pterygium with intraoperative application of mitomycin-C. Mitomycin-C, an antibiotic that was first isolated from *Streptomyces caespitosus* in 1956, has been used as a systemic drug for solid tumors since the late 1960s. Topical use to prevent recurrence of pterygium was first described by Kunitomo and Mori in the early 1960s in Japan [22]. Following reductive activation, mitomycin-C interacts with DNA to form monofunctional adducts as well as covalent cross-links between the two complementary strands of DNA. With such permanent structural alterations, molecular synthesis cannot progress normally. The greatest antiproliferative effect of mitomycin-C is on cells showing the highest rate of mitosis. Recurrence rates of pterygium after intraoperative instillation of mitomycin-C are relatively low and comparable to the rate after a conjunctival autograft. However, two-digit recurrence rates have recently appeared in the literature [14,23]. Moreover, complications related to both the short and long-term damage of mitomycin-C were frequently reported [13,14,24].

Kenyon et al. [12] first described the conjunctival autograft in 1985 as a method to reduce recurrence of pterygium. The recurrence rates are less than 10% in most series using this approach [13–16,18] but not in all [17]. Complications from a conjunctival autograft are infrequent and generally not sight-threatening [25]. Minor problems include conjunctival graft edema, corneoscleral dellen and epithelial inclusion cysts, all of which occur infrequently. Even less common problems include corneal astigmatism, hematomas, Tenon's granulomas, retraction and necrosis of the graft, and extraocular muscle disinsertion.

In our series we utilized the somewhat lengthy procedure of conjunctival autograft, which yielded a recurrence rate of 7.7%. It should be emphasized that this result was achieved in a country in a subtropical region.

Due to the small number of recurrences, there was no way to analyze the results to identify risk factors. It is noteworthy that both patients with recurrences, who had undergone the procedure more than a year apart and with different suturing materials, had running sutures only. This raises some doubt about using running sutures without adding at least four cardinal interrupted sutures and anchoring the autograft deep into the episclera or sclera at the graft edges.

The occurrence of superficial vessels should not be confused with the persistence of stromal vessels. The stromal vessels that are sometimes seen during surgery are not part of the fibrovascular pterygium and are left untouched. They may sometimes persist. In contrast, the superficial vessels we observed were not present at surgery or immediately afterwards but rather 6 months or more later and in a non-inflamed eye. We cannot say whether they would evolve to recurrent pterygium, but they differ from the natural history of recurrence that usually presents early and is easy to diagnose. We contend that there might be a connection to the suturing material: all the eyes with superficial vessels appeared in eyes sutured with nylon and none in those sutured with vicryl.

The improvement of the visual acuity in 17 of the 26 studied eyes can be attributed to removal of a large pterygium head in most of the patients. The pterygium head was small, growing into the cornea for less than 3 mm, in only three patients while it was in proximity to or completely occluded the visual axis in the others. We believe that visual acuity would be less affected if surgery is performed early in the development of a pterygium. Indeed, of the three small pterygia operated, one eye lost a single line of acuity, one maintained its previous visual acuity, and one improved by a single line.

Conclusion

Excision of a pterygium with a conjunctival autograft resulted in acceptably low recurrence rates in Israel. The procedure was safe and effective and free from long-term sight-threatening complications. Refinement of suturing technique and suturing materials may even further improve results and lessen surgical time.

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Capsule

Automated external defibrillators for public use

Ventricular fibrillation is the major cause of sudden out-of-hospital cardiac arrests, but a defibrillator can reverse the arrhythmia if applied within minutes. Studies have shown that the rate of prompt defibrillation and survival increased when non-medical personnel with minimal training used the automated external defibrillator.

To improve the chance of rapid defibrillation, the city of Chicago placed 53 visible and accessible automated external defibrillators for public use at three airports, beginning in June 1999. Summarizing the 2 year experience, Caffrey and colleagues report that of the 18 patients with ventricular fibrillation who used the defibrillators, 11 were successfully resuscitated and 10 were alive and neurologically intact one year later. With two exceptions, all of the defibrillator operators were not obliged to act ("good Samaritans"), and all except three had no training or experience with the defibrillators. The authors claim that lack of training does not preclude use of such defibrillators in emergencies. They recommend public education campaigns to promote public use and that these devices be distributed in appropriate locations.

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