



Minimally invasive primary excision and primary closure versus primary closure using mitomycin C to prevent pterygium recurrence

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Abstract

Aim: This study aimed to present a surgical technique in which we applied minimal excision and primary closure and evaluate the recurrence rate in this technique.

Materials and Methods: Data from primary pterygium excision performed from 2013 to 2019, were retrospectively analyzed from the patient's electronic database. After the pterygium detached from the cornea with the help of blunt dissection, only the cap of the pterygium was resected with a Westcott scissor by vertical incision on the vascular and avascular region border. The primary closure involved a complete closure of the defect in the limbal surface by suturing the pterygium's head. Patients who underwent only primary closure constituted Group 1, patients who underwent primary closure using mitomycin C as adjuvant therapy constituted Group 2.

Results: The study comprised a total of 31 patients, including 12 participants in Group 2 and 19 in Group 1. The average age of all subjects was 58.7 ± 9.4 years. The average postoperative follow-up time of groups was 29.2 ± 20.1 months and 30.0 ± 21.9 months, respectively ($p = 0.88$). Recurrence was observed in 4 (12.9%) of all patients during follow-up. While recurrence occurred in 10.5% of patients in Group 1, recurrence was observed in 16.7% of patients in Group 2. When the groups were compared in terms of recurrence, no statistically significant difference was observed ($p=0.62$).

Conclusion: This minimal excisional and maximum physiological pterygium surgery is simple, fast, and safe in primary pterygium. It also has a relatively acceptable recurrence rate.



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Introduction

Pterygium is the wing-like fibrovascular growth of conjunctival tissue into the cornea and is defined by Susruta [1]. Throughout the centuries, numerous medical and surgical treatments used for pterygium. Surgical excision of the pterygium can be planned, especially in cases where the pterygium extends to the visual axis or causes vision loss by causing astigmatism and in cases of recurrent inflammation and discomfort [2]. However, in pterygium surgery, postoperative recurrence complication is a concern for surgeons, as fibrovascular growth may also occur with a more significant extension than its initial presentation [3]. Hirst's review summarizes the surgical techniques in the management of pterygium, including the bare sclera approach, which is the basic procedure for pterygium surgery [4]. In certain populations, recurrence rates

of up to 88% after surgical excision and the use of various surgical options and adjuvant combinations are aimed at removing pterygium and preventing recurrence [5].

The duration of surgery differs extensively depending on the surgeon's skill, the complexity of the chosen surgical technique, the patient's compliance, and the type of anesthesia [6]. The use of intraoperative antimetabolites prolongs the surgical procedure for 5 to 10 minutes, and for suturing a conjunctival or limbal graft or amniotic membrane transplant, about 20 minutes [6]. The investigations reported that techniques using conjunctival or limbal grafts need around 90 minutes [7].

In this study, we aimed to present a minimal excisional and more physiological surgical technique that may reduce the recurrence rate compared to primary closure procedures.

Materials and Methods

The data of primary pterygium excision patients performed between 2013 to 2019 were retrospectively col-

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lected from the patient's electronic file. The median age at surgery, median follow-up time, adjuvant usage, and recurrence rate were calculated. All patients had primer pterygium and underwent primary closure after minimal pterygium excision. Pterygium surgery was performed on all subjects by the same surgeon. Patients who underwent only primary closure constituted Group 1, patients who underwent primary closure using mitomycin C as adjuvant therapy constituted Group 2. In patients who had surgery on both eyes, the eye that was followed for a longer period was included in the study.

The indications of surgery were cosmetic reasons and the disruption of visual acuity due to pterygium. The grading of pterygium was based on the size of the horizontal pterygium measured from the limbus defined by Verma et al. [8]. Exclusion criteria were described as having a recurrent pterygium or pseudopterygium, concomitant severe ocular surface diseases, follow-up time less than 12 months. All steps of this study were done adhering to the principles of the Declaration of Helsinki. Both written and oral informed consent was obtained from the subjects before the surgery. This retrospective study was started following the permission of the Scientific Research and Publication Ethics Committee of Inonu University (Reference number: 2020/867).

Surgical procedure

All surgeries were initiated after subconjunctival anesthesia. The spatula was first entered under the pterygium from the limbus region, where the pterygium loosely attaches. The pterygium was separated using a spatula from the cornea by blunt dissection. Two radial relaxant incisions were performed at the limbal lower and upper pterygium boundaries towards the nasal conjunctiva. Only the cap of the pterygium was excised with a Westcott scissor by vertical incision on the vascular and avascular region border. Then the corneal bed and limbal area were cleaned and polished utilizing a 45 angle crescent blade. The subconjunctival degenerative component of the pterygium and the tenon capsule were preserved without excision. Cautery was gently performed on any bleeding vessels. The primary closure procedure involved a complete closure of the defect in the limbal surface by suturing the head of the pterygium Figure 1. The conjunctiva was then sutured using 8-0 vicryl suture. At the upper and lower borders, the closest suture to the limbus was passed into 1/3 of the sclera. During surgery, mitomycin C 0.02 % was used as an adjunctive treatment in young patients (particularly under 50 years). Mitomycin C 0.02 % was applied in the bare sclera (between about 3 mm posterior of the limbus and limbus) for 3 minutes. The schematic demonstration of surgery was illustrated in Figure 2.

Postoperative care

After all surgical procedures, the operated eye was covered with an eye pad for three days to protect the cornea from the trauma that may occur by opening and closing the eyelid and to relieve the pain. After the surgery, patients used artificial tears, topical corticosteroids, and antibiotic eye drops four times a day for one month. Topical steroids were tapered for two months depending on the extent of

Table 1. General characteristics of groups.

Characteristic	Group 1 (n:19)	Group 2 (n:12)	P value
Age (year), median (min-max)	65 (53-77)	53.5 (28-63)	0.001
Gender n (%)			0.91
Female	6 (31.5)	4 (33.3)	
Male	13 (68.5)	8 (66.7)	
Eye n (%)			0.37
Right	11 (57.8)	5 (41.7)	
Left	8 (42.2)	7 (58.3)	
Grade of pterygium n (%)			0.37
Grade 2 (2-4 mm)	14 (73.6)	7 (58.3)	
Grade 3 (> 4 mm)	5 (26.4)	5 (41.7)	
Follow up time (month), median (min-max)	18 (12-78)	20.5 (12-87)	0.88

the inflammation and the postoperative course. In the postoperative period, all patients were examined in postoperative 3rd day, postoperative 1st and 2nd months, and later every six months. All postoperative complications and recurrence were noted. Postoperative recurrence of pterygia was described as developing a fibrovascular conjunctival growth that crossed the limbus and invaded the cornea.

Statistical analysis

IBM SPSS Statistics for Windows, Version 22.0 (IBM Corp., Armonk, NY, USA) was used to analyze our research data. Descriptive statistical data for categorical variables were given as numbers, and statistical data for continuous variables were reported as mean, standard deviation, median, minimum and maximum values. The Shapiro Wilk test examined the suitability of continuous variables to normal distribution. In order to investigate the differences between the two groups, the Mann-Whitney U test was used. A Chi-square test was used for qualitative data. The confidence level was reported as 95% in the analyses, and the p-value of less than or equal to 0.05 was recognized as statistically significant.

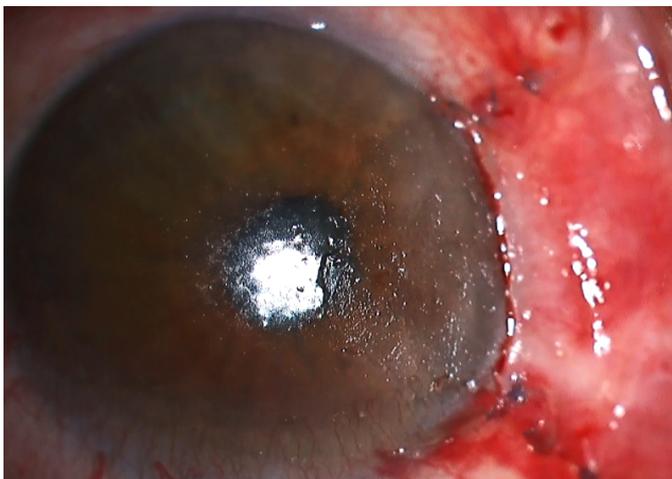
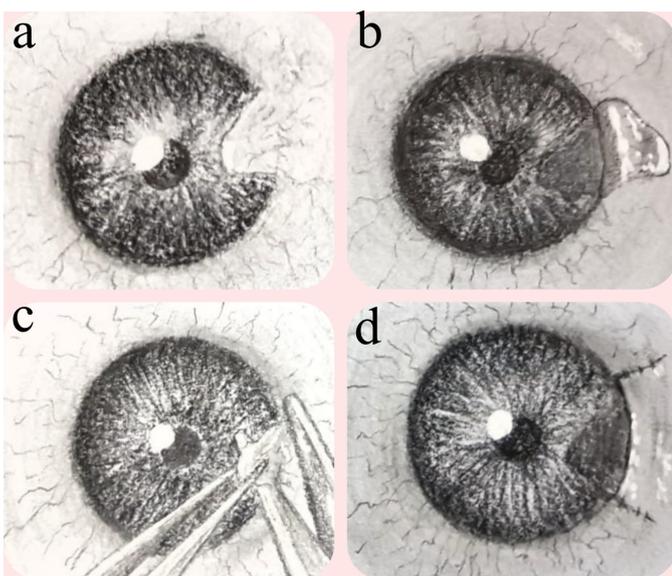
Results

Thirty-one patients were included in the study, with nineteen in Group 1 and twelve in Group 2. The average age of all subjects was 58.7 ± 9.4 years. There was no statistically significant difference between the groups in gender distribution ($p = 0.91$), whereas there was a statistically significant difference between the mean age ($p = 0.001$). Also, there was no statistically significant difference in terms of the eye ($p = 0.37$), the grade of pterygium ($p=0,37$) and follow up time ($p = 0.88$) values between the groups (Table 1).

Recurrence was observed in 4 (12.9%) of all patients during follow-up (Table 2). While recurrence occurred in 10.5% of

Table 2. Frequency of recurrence in groups after surgery.

	Recurrence		Total
	Negative	Positive	
Group 1			
Count	17	2	19
%	89.5%	10.5%	100.0%
Group 2			
Count	10	2	12
%	83.3%	16.7%	100.0%
Total			
Count	27	4	31
%	87.1%	12.9%	100.0%

**Figure 1.** Completely closed limbus defect by the pterygium head, and sutured relaxant incisions.**Figure 2.** Schematic demonstration of minimally invasive primary pterygium excision with primary closure; a: preoperative appearance, b: pterygium which separated from the cornea and limbus, c: excision of the cap with a Westcott scissor, d: postoperative appearance.

patients in Group 1, recurrence was observed in 16.7% of patients in Group 2, and there was no statistically significant difference between the groups in terms of recurrence ($p=0.62$). The recurrences in Group 1 occurred in postoperative 12th months, while those in Group 2 occurred in postoperative 18th month.

Discussion

This study described a novel surgical approach to diminish the recurrence percentage in primary pterygium subjects after surgery. For that end, minimal excision (only cap of pterygium) was performed, and the remaining pterygium tissue was shifted nasally with relaxation incisions. The limbal defect was completely closed by suturing the head of the pterygium. We believed that only excision of the avascular part of the pterygium and complete closure of the limbal defect would help keep conjunctival barrier capacity and then defeat postoperative pterygium recurrence. In our study, the rate of recurrence in all patients during follow-up was 12.9% (10.5% in group 1, 16.7% in Group 2).

While making the surgical management decision, the patient should be informed about postoperative recurrence, which is one of the most severe complications of pterygium surgery [9]. Recurrence of pterygium is usually manifested by faster growth, including redness. The surgical technique is one of the critical determinants of recurrence rates [10-12]. Previous studies have reported that excision of the pterygium to the bare sclera leads to a higher rate of recurrence than other surgical techniques [6, 13]. For this reason, the bare sclera technique is rarely used in pterygium treatment nowadays [4]. Primary closure, conjunctival autograft, and amniotic membrane transplantation are currently used as the primary surgical approach [9]. Our study used a modified primary closure technique to minimize recurrence, with minimal excision and complete closure of the limbal defect. Other predisposing factors that increase the risk of recurrence are younger age and ocular surface inflammation [14]. Therefore, we used mitomycin C as an adjuvant in addition to our surgical approach to reduce recurrence, especially in patients who are young and have prominent ocular surface inflammation.

Although not well documented, the published recurrence percentages of primary closure are unfavorable, varying from 14.4% to 70% [4, 9, 15]. Prabhasawat et al. reported the rate of recurrence as 45% in patients with primary closure due to primary pterygium [16]. In the current study, the rate of recurrence in group 1 was found to be 10.5%. The lower rate of recurrence in our study may be due to the reasons mentioned above. Rock et al. showed that conjunctival autograft was related to a significantly lesser recurrence rate than the primary closure group (6.4% versus 14.4%) [9]. Moreover, many studies have reported recurrence in autograft pterygium surgery to be below 10% [17, 18]. For this reason, autograft pterygium surgery is generally accepted as the most effective method in the treatment of pterygium. However, conjunctival autografting's main challenge is the needed technical expertise of the ophthalmic doctor and the longer surgery time. Although our technique has a relatively higher recurrence than the conjunctival autograft, it can be used in

patients with poor cooperation due to its simplicity and short surgical time.

Previous researches described the usage of mitomycin C to reduce the pterygium recurrence rate. Therefore, it has been applied preoperatively, intraoperatively, or postoperatively. Diaz et al. showed that the percentage of recurrence was 12% in patients who underwent primary closure and intraoperative mitomycin C usage due to primary pterygium [19]. When mitomycin C was applied with bare sclera techniques, it was observed that the higher the concentration, the lower the recurrence rate [6, 20]. A higher recurrence rate (16.7%) was observed in Group 2 than in Diaz's study in our study. This higher recurrence rate may result from the use of mitomycin C in younger patients (53.5 versus 57.5 years) and at a lower concentration (0.02 versus 0.04). Lam et al. reported that the recurrence rate was 75% in the bare sclera group and 42% in the group that applied 0.02% mitomycin C for 3 minutes [20]. The recurrence rates in Lam's study were much higher than the groups in our study. Unlike the groups in our study, primary closure was not performed in Lam's study, and bare sclera was left. Complete closure of the limbal defect resulting from pterygium excision with avascular tissue may have contributed to the limbal barrier functions, resulting in a low recurrence rate in our study.

The recurrence of pterygium tends to occur relatively quickly after excision. Yang et al. demonstrated that in 97% of recurrences rate of pterygium, recurrence would initiate within the postoperative first year [21]. Hirst et al. also found a similar recurrence rate within the first year, suggesting a 1-year follow-up as adequate [22]. Therefore, we excluded patients with a follow-up time of fewer than 12 months in our study. In two patients with recurrence in Group 1, recurrences were observed at 12 months, whereas in two patients with recurrence in Group 2, recurrences were seen more later (at 18 months). Also, no substantial complications such as scleral or corneal dellen and conjunctival cyst were observed in any patient during postoperative follow-up.

Our surgical approach is simple and time-saving. Our surgical method does not require a conjunctiva-limbal autograft, conjunctival flap, and amniotic membrane transplantation. Furthermore, adjuvant therapy (mitomycin C) was used only for younger patients. Since the conjunctiva and tenon tissues are not excised, hemostasis is usually not needed. The most important precaution is to close the limbus defect completely. The key to this technique's success is to excise only the cap part of the pterygium and create a barrier with the avascular pterygium part by completely closing the limbal defect to prevent the invasion of vascularized pterygium tissue on the cornea.

The current study has some shortcomings. First, the sample size was small, and the postoperative follow-up time might have been longer. Because the pterygium is a benign disorder, some subjects may not come to postoperative follow-ups after a successful operation. Second, the study did not have control groups to perform comparisons. Furthermore, because of the study's retrospective characteristic, the duration of surgery cannot be evaluated sufficiently. Further prospective controlled studies with a large study population size and a more extended follow-up pe-

riod will be required to validate our results.

In conclusion, this surgical approach is simple, fast, and safe in patients with primary pterygium. In particular, it may provide an advantage in patients who are not suitable for general anesthesia and have poor cooperation. Also, the recurrence rate of this surgical approach is relatively acceptable.

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Ethics approval

Inonu University Scientific Research and Publication Ethics Committee (Reference number: 2020/867).

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