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Traumatic wound dehiscence after penetrating keratoplasty: a retrospective analysis

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ABSTRACT

Traumatic wound dehiscence is one of the most serious postoperative complications that can be seen after penetrating keratoplasty (PK). Depending on the damage caused by the trauma to the anterior and posterior segments of the eye, the level of vision can be most severely affected. Data from 17 eyes of 17 patients treated for traumatic wound dehiscence after PK between 2013 and 2024 were retrospectively reviewed. Patient records were reviewed for type and time of injury, corrected distance visual acuity (CDVA), surgical method, and final results. The incidence of graft dehiscence was 2.46% (17 eyes) in 690 PK eyes. The interval between PK and trauma ranged from 2 months to 60 months, with a median of 10 months. The median age at trauma was 36.7 years (range, 12–78 years). Wound dehiscence occurred at the donor-recipient interface in all patients, and 75.2% of graft dehiscence occurred at 16 months postoperatively. In all patients, the wound was closed by primary repair under general anesthesia. The mean follow-up period was 16.4±12.3 months (4–66 months). Median CDVA was 4 mps (range, 2 mps– 0.2, Snellen chart) at final visit. Graft failure was the most common complication after wound repair (29.42%). This study aimed to demonstrate the postoperative outcomes due to traumatic wound dehiscence after PK.

Keywords: penetrating keratoplasty, ocular trauma, wound dehiscence

Abbreviation:
PK: penetrating keratoplasty

INTRODUCTION

Penetrating keratoplasty (PK) is a leading surgical approach for visually rehabilitating corneal pathologies. Graft survival is usually assessed by graft transparency and visual acuity.[1] Eye trauma is a significant cause of unilateral or bilateral blindness worldwide.[2] One of the most serious postoperative complications of PK is traumatic wound dehiscence.[3] Traumatic wound dehiscence is uncommon but has been reported in the literature to occur between 0.6% and 5.8%.[4-7] While Elder and colleagues reported this rate as 3%, Rehany, Kartal and Lam reported it as 2.5%, 2.6% and 3.8%, respectively. The surgical wound after PK makes the cornea more vulnerable

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to trauma than the intact cornea due to decreased bond strength at the graft-host interface.[8,9]

Compared to wound healing in other tissues, corneal scars, especially after PK, are susceptible to long-term wound dehiscence due to their tensile strength and are unlikely to recover to their original pre-injury levels. The avascularity of the cornea prevents effective wound healing and remodeling and creates a continuing weakness in the graft-host junction even when the wound appears clinically well healed.[10,11] Additionally, there are ideas that frequent use of steroids to prevent immune rejection after PK may delay the wound healing process and weaken the graft-host connection.[12]

This study aimed to retrospectively evaluate the clinical characteristics, risk factors and visual outcomes of patients with traumatic graft separation in PK patients registered in the Atatürk University Research Hospital Eye Bank database.

MATERIALS AND METHODS

Retrospective data analysis was performed on 17 patients who underwent PK between June 2013 and August 2024 and subsequently had wound dehiscence due to trauma. All patients were registered with the Atatürk University Research Hospital Eye Bank. The study was conducted by the principles of the Declaration of Helsinki and was approved by the Clinical Research Ethics Committee of Atatürk University Faculty of Medicine Health Practice and Research Hospital (B.30.2.ATA.0.01.00/66). Patient records were reviewed for age, gender, indication for PK, type and time of injury, presence of sutures, other accompanying intraocular pathologies, corrected distance visual acuity (CDVA) (Snellen chart), and surgical outcome.

STATISTICAL ANALYSIS

Statistical analyses were evaluated using SPSS for Mac version 26 software (IBM). Shapiro-Wilk test was performed to test the normality of the data. Statistical analyses were performed using frequency tables, nonparametric tests, and logistic regression analyses. A p-value of <0.05 was considered statistically significant.

RESULTS

Graft dehiscence was observed in 17 (2.46%) of 690 PK eyes. Eleven of the patients were male and 6 were female. The most common primary PK indication was keratoconus in 6 (35.30%) patients. Other PK indications are shown in Table. The interval between PK and trauma ranged from 2 months to 60 months, with a median of 10 months. The median age at trauma was 36.7 years (range, 12–78 years). All patients had wound dehiscence at the donor-recipient interface, and 75.2% of graft dehiscence occurred at 16 months postoperatively. The most common cause of trauma was blunt trauma caused by the hands of the patients' children (12 patients, 70.58%). Other causes of trauma were falls and blows. Before the trauma, 10 were phakic, 5 were pseudophakic, and two were aphakic. In 5 (29.41%) eyes, there was either crystalline lens/intraocular lens dislocation or expulsion due to trauma (Figure). Lens drop was observed in 2 (11.76%) eyes. Iris or vitreous prolapse was observed in 6 eyes (35.29%). Sutures were present in 11 (64.70%) eyes at the time of trauma.

Table Indications for PK

Indication	Number	%
Keratoconus	6	35.30
Corneal perforation sequelae	4	23.52
Pseudophakic bullous keratopathy	3	17.65
Herpetic keratitis scar	3	17.65
Corneal dystrophy	1	5.88
Total	17	100

PK: penetrating keratoplasty

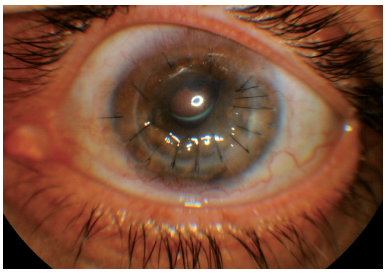

Fig. Appearance of the graft after wound repair in a patient with post-traumatic lens extrusion

Immediately after the trauma, CDVA was between at the level of hand movements and counting fingers from 2 meters away, respectively. Primary wound repair was performed on all eyes under general anesthesia using 10/0 nylon sutures. The mean follow-up period was 16.4±12.3 months (4–66 months). Posterior segment damage was recorded as retinal detachment in 3 patients. The final CDVA of the 3 retinal detachment patients was 1 mps, 3 mps and 1/10, respectively. Median CDVA was 4 mps (range, 2 mps– 0.2, Snellen chart) at final visit. No factors had a visual impact on the clinical condition ($p>0.05$). Graft failure was the most common complication after wound repair (29.42%). The graft was transparent in 70.58% of patients at the last visit.

DISCUSSION

After PK, especially in the first few months, sutures in the wound areas are important in maintaining the integrity of the wound area. Afterward, the healing period begins at the graft-host interface. For the wound area to heal completely, collagen needs to be restructured. After PK, a surgical wound area is formed at the 360° graft-host interface, creating permanent weakness in the eyeball for the patients' lives.[5,6] Two reports have shown that scar tissue at the graft-host interface never regains normal corneal strength.[13,14] Factors such as long-term steroid use, avascular cornea, suture materials used, and increased intraocular pressure may impair wound healing after PK. These reasons cause incomplete healing of the wound site at the graft-host interface. In the study, all wound dehiscences occurred at the graft-host interface, which is consistent with the literature.

In this study, the incidence of graft dehiscence was found to be 2.46% in 690 patients, and

this situation was found to be consistent with the literature. It has been reported that the first month after PK is the most at-risk period for traumatic wound dehiscence. This situation is significantly high in the first year. The risk gradually decreases in the next 18 months. In the literature, the average interval between PK and traumatic wound dehiscence varies from 18 weeks to 7.5 years.[4,6,11] While this interval was 44.1 months on average in Elder's study, it was found to be 36 and 14 months in Kartal and Barut's studies, respectively. In this study, the interval between PK and trauma ranged from 2 to 60 months, with a median of 10 months. The majority of wound dehiscence occurred within the first 2 years. Some studies[4,6] have reported that the majority of wound dehiscence cases occur within the first two years after PK. However, the literature has also reported dehiscence occurring after 2 years.[14]

The literature reports no correlation between the application of separate or continuous sutures and wound separation.[14] The current study transplanted grafts to all patients using a separating suture.

The most common indications in patients developing wound dehiscence were keratoconus (35.29%). This rate was consistent with the literature.[15,16] The following most common indications were perforation sequelae (23.52%) and pseudophakic bullous keratopathy (PBK) (17.64%).

Intraocular complications such as iris prolapse, vitreous loss, graft failure due to corneal endothelial damage, retinal detachment, and choroidal hemorrhage may also be seen after post-traumatic wound dehiscence. The incidence of lens extrusion has been reported as 25% to 100% in various studies.[5,11,17] While this rate was 34.4% in Rehany's study, it was 35.9% and 56.3% in Barut and Tseng's studies, respectively. In this series, similar to the literature, 29.41% of eyes had either crystalline lens/intraocular lens extrusion. Lens drop was observed in 11.76% of eyes. Iris or vitreous prolapse was detected in 35.29% of eyes. Retinal detachment developed in 3 patients.

The literature reports that the appearance of transparent grafts after traumatic wound dehiscence ranges from 20% to 100%.[17,18] In this study, post-traumatic graft transparency was found to be 70.58%, consistent with the literature.

Regarding visual outcomes, many studies report that traumatic wound dehiscence after keratoplasty significantly reduces visual acuity.[4,9,19] In the present series, 29.41% of cases (5 patients) had a best-corrected visual acuity of 0.1 or better.

In conclusion, traumatic wound dehiscence is a complication that may occur throughout life after PK, regardless of indication, age and time of transplantation. This is one of the most devastating and frightening complications of PK. Patients and their relatives should be informed at every examination that their eyes are vulnerable to injury after PK. The professions of young individuals, especially those who are active in social life, should be questioned, and if they are in a risk group, necessary advice should be given, including changing their profession. Individuals involved in risky professions and sports activities should wear protective glasses during their activities.

Limitations of the study

The primary limitation of the study is that, due to its retrospective design, the records were not originally structured to suit the study, and there is a lack of data regarding potential confounding factors.

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Author contributions

Study design: Mustafa Yıldırım. Data collection: Mustafa Yıldırım. Statistical analysis: Mustafa

Yıldırım. Data ınterpretation: Mustafa Yıldırım, Sadullah Keleş. Manuscript preparation: Mustafa Yıldırım, Sadullah Keleş. Literature search: Mustafa Yıldırım. Funds collection: None.

Conflicts of interest

The authors have no conflicts of interest or financial ties to disclose.

Finalcial disclosure

None.

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