CASE REPORT

First report of traumatic scleral rupture after penetrating keratoplasty

Ceyhun Arıcı, M.D.,[1] Samira Hagverdiyeva, M.D.,[1] Burak Mergen, M.D.,[1]
Mehmet Serhat Mangan, M.D.,[2] Osman Şevki Arslan, M.D.[1]

[1]Department of Ophthalmology, İstanbul University-Cerrahpaşa, Cerrahpaşa Faculty of Medicine, İstanbul-*Turkey*

[2]Department of Ophthalmology, Okmeydanı Training and Research Hospital, İstanbul-*Turkey*

ABSTRACT

Globe rupture is a major postoperative complication after penetrating keratoplasty (PK). Because the corneal wound is never comparable with that of healthy corneal tissue, globe rupture following blunt trauma occurs at the corneal graft-host junction. In this study, we report a case of scleral rupture that arose from blunt trauma occurring after PK. A 60-year-old female presented with loss of vision, redness and pain in the left eye, which was the consequence of blunt trauma, was our case in this study. Slit-lamp examination revealed ecchymosis on the eyelids, diffuse subconjunctival hemorrhage and total hyphema. The donor cornea was intact. The right eye showed PK, the cornea was transparent, and the sclera was blue. A 2 mm rupture behind the limbus extending from 3 o'clock to 9 o'clock in the upper half of the sclera was observed during exploratory surgery. She did not report any coexisting medical conditions except for systemic hypertension. The differential diagnosis of the bluish discoloration of her sclera was investigated. In detailed anamnesis, the patient reported that she had been treated for severe allergic eye disease during childhood. Vernal keratoconjunctivitis complication was diagnosed. It should be kept in mind that closed scleral perforation may occur in the patient with PK and blue sclera due to blunt trauma.

Keywords: Blue sclera; keratoplasty; ocular trauma; vernal keratoconjunctivitis.

INTRODUCTION

The incidence of traumatic globe dehiscence after penetrating keratoplasty (PK) has been reported to be 0.6–5.8%.[1–4] Any globe is susceptible to rupture and will do so at its weakest point if subject to sufficient force. Postoperatively, corneal scars are unlikely to regain the original preinjury strength and remain vulnerable to spontaneous and traumatic dehiscence. This complication generally occurs within the first two years after PK.[1–5] To date, all graft dehiscences have been reported to occur at the graft-host interface.[1–5]

The present study aimed to present a case of occult scleral rupture with an intact graft-host interface due to blunt trauma in a patient who had had a PK surgery 17 years earlier.

CASE REPORT

A 50-year-old woman was admitted to our emergency ophthalmology clinic with complaints of pain, loss of vision and redness of the left eye, which arose from a left-sided blunt trauma. She reported having had a head-to-head trauma with her grandson. The patient also reported to have used protective eyewear for the last five years regularly; unfortunately, she did not have it during the trauma. Her visual acuities were light perception without projection in the left eye and 20/40 in the right eye. The eye movements of the right eye were free in all directions, and there was only a minimal upward restriction in the left eye. Ecchymosis on the eyelids, diffuse subconjunctival hemorrhage, and total hyphema were observed in the left eye, and the donor cornea was intact.

Cite this article as: Arıcı C, Hagverdiyeva S, Mergen B, Mangan MS, Arslan OŞ. First report of traumatic scleral rupture after penetrating keratoplasty. Ulus Travma Acil Cerrahi Derg 2019;25:631-634.

Address for correspondence: Ceyhun Arıcı, M.D.
İstanbul Üniversitesi-Cerrahpaşa, Cerrahpaşa Tıp Fakültesi, Göz Hastalıkları Anabilim Dalı, İstanbul, Turkey
Tel: +90 532 - 340 93 51 E-mail: ceyhundr@gmail.com

Ulus Travma Acil Cerrahi Derg 2019;25(6):631-634 DOI: 10.5505/tjtes.2018.55014 Submitted: 22.05.2018 Accepted: 12.11.2018 Online: 30.10.2019

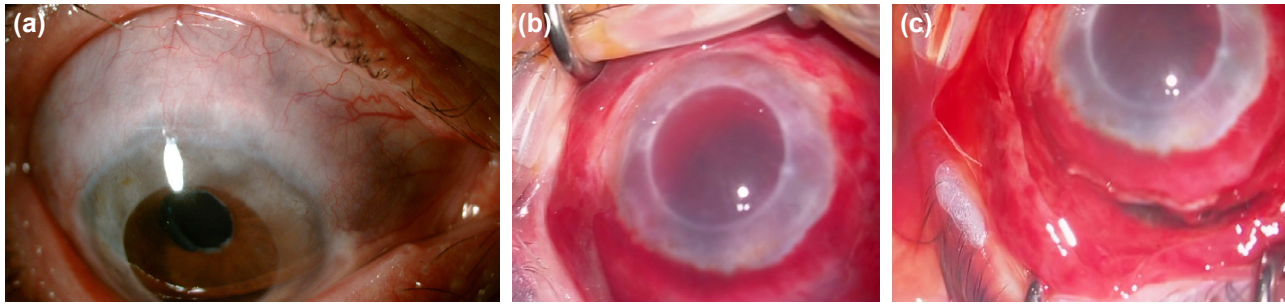

Figure 1. (a) Penetrating keratoplasty and blue sclera in the right eye. **(b)** Diffuse subconjunctival hemorrhage and total hyphema in the left eye. **(c)** 180° sclera rupture in the lower half during emergency surgical exploration.

The right eye showed PK; the cornea was transparent, and the sclera was blue (Fig. 1a). Using the Icare Pro Tonometer (Helsinki, Finland), the intraocular pressure (IOP) was determined to be 20 mmHg in the right and hypotonic in the left. An orbital computed tomography (CT) scan was performed under emergency conditions. The axial length was 24.0 mm on the right and 23.0 mm on the left eye. No retroorbital hemorrhage or orbital wall fracture was observed in the orbital CT, and globe integrity was reported to be intact.

Emergency exploratory surgery was planned to exclude globe rupture (Fig. 1b). A 360-degree peritomy under general anesthesia was performed in her left eye. A 2 mm scleral rupture behind the limbus extending from 3 o'clock to 9 o'clock in the upper half of the sclera was observed with some vitreous protruding into the scleral rupture area (Fig. 1c). Scleral perforation was sutured with 7.0 polyglactin, the conjunctiva was closed with 8.0 polyglactin, and the anterior chamber hyphema was cleaned with irrigation and aspiration. Iris dialysis in the upper half was detected.

Visual acuity on the 1st day postoperatively was limited to light perception. Anterior segment examination revealed donor corneal edema, diffuse conjunctival injection with recurrent hyphema. IOP was 19 mmHg. In B-scan USG, hyperechogenicity in the vitreous was observed without any retinal detachment consistent with vitreous hemorrhage. The patient was followed up by medical treatment consisting of topical moxifloxacin 0.5%, prednisolone 1%, cyclopentolate 1%, preservative-free artificial tears and hypertonic solution 5%.

Within the first week of the operation, the hyphema healed and the visual acuity improved from the light perception to hand motion (HM). B-scan USG showed diffuse vitreous opacities similar to what was seen day 1 postoperatively. At the four-week follow-up visit, visual acuity was still limited to HM. Slit-lamp examination revealed decreased corneal edema. The fundus could not be visualized because of vitreous hemorrhage. In B-scan USG, diffuse vitreous opacities were still present. The patient underwent pars plana vitrectomy (PPV) surgery. The visual acuity improved to counting fingers at 4 meters on day 1 postoperatively (Fig. 2). Mild corneal edema and conjunctival injection were present at the first-month follow-up exam following PPV surgery. IOP was measured at 17 mmHg. The retina was intact, and the vitreous was clear. Visual acuity was five meters of finger counting.

The patient had undergone bilateral PK 17 years earlier, and due to graft rejection on the left eye, PK was performed again on that eye one year later. She also had had bilateral cataract surgery 15 years ago. She did not report any coexisting medical conditions except for systemic hypertension.

The differential diagnosis of the bluish discoloration of her sclera was investigated. Firstly, localized conditions, such as primary acquired melanosis, oculodermal melanocytosis, conjunctival nevus, and conjunctival melanoma, were ruled out. Secondly, toxicity from systemic medications, topical medications and argyrosis were also excluded. Thirdly, internal medicine and cardiology consultations were performed to rule out the possible causes of blue sclera, such as collagen synthesis diseases (e.g., Ehlers-Danlos syndrome, osteogenesis imperfecta and Marfan's Syndrome), alkaptonuria and primary adrenal insufficiency (Addison's disease). In detailed anamnesis, the patient reported that she had been treated due to severe allergic eye disease during childhood. A diagnosis of vernal keratoconjunctivitis (VKC) complication was reached.

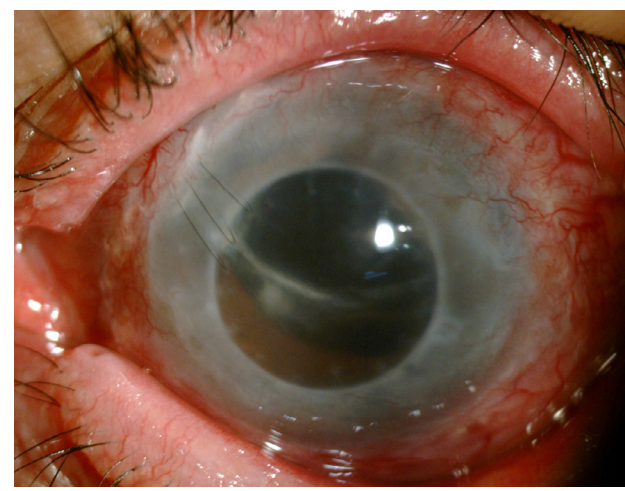

Figure 2. One day following pars plana vitrectomy, mild donor corneal edema, conjunctival injection.

DISCUSSION

Any trauma to the globe with proper mechanism and sufficient force would cause rupture of the globe in the weakest region. In healthy eyes, these regions are insertions of extraocular muscles or the limbal area, whereas in unhealthy eyes with previous surgery or penetrating trauma, the rupture site will be the previous corneal scar. The most prevalent cause of trauma has been reported to be accidental blunt trauma.[1,3,6]

The occurrence of traumatic graft rupture has been reported from three days to 33 years after PK.[4,5] Thirty-three years is the longest reported time interval after PK, which suggests a lifetime risk of traumatic dehiscence.[6] This risk remains throughout life; laboratory experiments, histopathological studies and clinical reports showed that a corneal wound never regains the tensile strength of a normal cornea regardless of whether the wound involves the full thickness or partial thickness or has 10/0 nylon sutures in place.[6] To our knowledge, this is the first case of a scleral rupture in a patient with PK after blunt trauma.

In this study, the slit-lamp examination of the patient showed blue sclera on his right eye. After localized, systemic investigation and detailed anamnesis of the patient, the reason for the blue sclera, VKC complication was diagnosed. We hereby suggest that the scleral tissue decomposition arose from trauma might be the cause of the blue sclera.

VKC is a chronic, bilateral, conjunctival inflammatory condition. VKC typically starts before age 10 and lasts two to ten years and usually resolving during puberty. The diagnosis is relatively easily reached, based on the history and presentation of the findings. The hyperplastic epithelium of VKC patients contains eosinophils, mast cells, neutrophils, and mononuclear cells. Compared to healthy individuals, the substantia propria contains elevated numbers of mast cells. [7] Approximately half of the mast cells in the substantia propria contain basic fibroblast growth factor, which may serve as a stimulus for fibroblast growth and production of collagen.[8] Eventually, chronic immunologic inflammation and alterations in collagen types and proteoglycans result in the abnormal connective tissue metabolism seen in VKC.[7] These biochemical and immunologic reactions may cause blue sclera, which in turn may make the sclera susceptible to blunt trauma because of its thinness and transparency. In our case, although the severity of trauma was enough to bring about hyphema and vitreous hemorrhage, the graft remained intact. We linked the biochemical and immunologic reactions that occurred in the sclera as the possible causes of scleral rupture without affecting the graft-host interface.

CT scans of the eye may provide valuable information for further assessment of occult open globe injuries. Reported sensitivity and specificity of orbital CT in determining occult open globe injury varies between 56 to 68% and 79 to 100%, respectively.[9] However, in our case, orbital CT was unable to detect the globe perforation.

In conclusion, we are reporting the first case of scleral perforation after blunt trauma in a patient with PK. Although it was shown that the graft-host junction was almost always the site of dehiscence after trauma, ophthalmologists should be careful about the scleral perforations, especially in patients with the blue sclera. The risk of traumatic corneal graft or scleral rupture after PK is significant, even years after surgery, and may cause a poor visual outcome, depending upon the severity of wound dehiscence. This should be clearly emphasized during preoperative counselling. To minimize the risk of wound dehiscence after PK, thorough education of transplant candidates encouraging the use of protective eyewear and a low-risk lifestyle is warranted.

Acknowledgments: None.

Funding/Support None: Financial disclosures the authors have no financial or proprietary interest to disclose.

Conflict of interest: The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of the research reported in this study. The manuscript has been read and approved by all the authors.

REFERENCES

1. Elder MJ, Stack RR. Globe rupture following penetrating keratoplasty: how often, why, and what can we do to prevent it? Cornea 2004;23:776–80.[CrossRef]
2. Rohrbach JM, Weidle EG, Steuhl KP, Meilinger S, Pleyer U. Traumatic wound dehiscence after penetrating keratoplasty. Acta Ophthalmol Scand 1996;74:501–5. [CrossRef]
3. Selver ÖB, Palamar M, Eğrilmez S, Yağcı A. Traumatic wound dehiscence after penetrating keratoplasty. Ulus Travma ve Acil Cerrahi Derg 2016;22:437–40. [CrossRef]
4. Lam FC, Rahman MQ, Ramaesh K. Traumatic wound dehiscence after penetrating keratoplasty-a cause for concern. Eye (Lond). 2007;21:1146–50. [CrossRef]
5. Tran TH, Ellies P, Azan F, Assaraf E, Renard G. Traumatic globe rupture following penetrating keratoplasty. Graefes Arch Clin Exp Ophthalmol 2005;243:525–30. [CrossRef]
6. Das S, Whiting M, Taylor HR. Corneal wound dehiscence after penetrating keratoplasty. Cornea 2007;26:526–9. [CrossRef]
7. A Leonardi, G Abatangelo, R Cortivo, A G Secchi. Collagen types I and III in giant papillae of vernal keratoconjunctivitis. Br J Ophthalmol 1995;79:482–5. [CrossRef]
8. Leonardi A, Borghesan F, Faggian D, Depaoli M, Secchi AG, Plebani M. Tear and serum soluble leukocyte activation markers in conjunctival allergic diseases. Am J Ophthalmol 2000;129:151–8. [CrossRef]
9. Arey ML, Mootha VV, Whittemore AR, Chason DP, Blomquist PH. Computed Tomography in the Diagnosis of Occult Open-Globe Injuries. Ophthalmology 2007;114:1448–52. [CrossRef]

OLGU SUNUMU - *ÖZET*

Penetran keratoplasti varlığında travmatik skleral rüptür gelişen ilk olgu

Dr. Ceyhun Arıcı,[1] Dr. Samira Hagverdiyeva,[1] Dr. Burak Mergen,[1]
Dr. Mehmet Serhat Mangan,[2] Dr. Osman Şevki Arslan[1]

[1]İstanbul Üniversitesi-Cerrahpaşa, Cerrahpaşa Tip Fakültesi, Göz Hastalıkları Anabilim Dalı, İstanbul
[2]Okmeydanı Eğitim ve Arştırma Hastanesi, Göz Hastalıkları Kliniği, İstanbul

Penetran keratoplasti (PK) sonrası glop rüptürü önemli bir ameliyat sonrası komplikasyonudur. PK sonrası kornea yarası normal kornea dokusunun sağlamlığına hiçbir zaman erişemediğinden, künt travma sonrasında glop rüptürü kornea da alıcı-donör yatağında gerçekleşir. Biz PK'li hastada künt travmaya bağlı skleral rüptürü gelişen bir hastayı sunduk. Altmış yaşında kadın hasta sol gözünde künt travmaya bağlı görme kaybı, kızarıklık ve ağrı ile başvurdu. Ön segment muayenesinde total hifema, yaygın subkonjonktival hemoraji ve kapaklarda ekimoz mevcuttu. Donör kornea sağlamdı. Sağ göz de PK'li, kornea saydam, sklera mavi renkte idi. Limbusa 2 mm mesafede üst kadranda saat 3'ten 9'a kadar uzanan skleral rüptür cerrahi sırasında saptandı. Hastanın öyküsünde sistemik hipertansiyon dışında başka bir hastalığı yoktu. Mavi skleraya neden olan hastalıkların ayırıcı tanısı yapıldı. Ayrıntılı öyküde hasta çocukluk döneminde ciddi alerjik göz hastalığı yaşadığını belirtti. Vernal keratokonjonktivite bağlı gelişen komplikasyon tanısı kondu. PK'li ve mavi skleralı hasta da künt travmaya bağlı kapalı sklera perforasyonu gelişebileceği akılda bulundurulmalıdır.

Anahtar sözcükler: Keratoplasti; mavi sklera; oküler travma; vernal keratokonjonktivit.

Ulus Travma Acil Cerrahi Derg 2019;25(6):631-634 doi: 10.5505/tjtes.2018.55014