Acta Scientific Ophthalmology (ISSN: 2582-3191)

Volume 7 Issue 3 March 2024

Case Report

Failed Corneal Graft Due to Severe Corneal Vascularization - A Novel Quadruple Strategy

Preethi Naveen*, Chandini Selvarajan and Jayapratha R Selvaraj

Department of Cornea and Refractive Services, Dr. Agarwals Eye Hospital and Eye Research Centre, Chennai, Tamilnadu, India

***Corresponding Author:** Preethi Naveen, Department of Cornea and Refractive Services, Dr. Agarwals Eye Hospital and Eye Research Centre, Chennai, Tamilnadu, India.

DOI: 10.31080/ASOP.2024.07.0738

Received: January 19, 2024

Published: February 06, 2024

Abstract

Despite being a successful form of human organ transplantation, corneal grafts still carry the risk of primary and secondary graft failures. Factors such as ocular surface disease, immunological rejection, corneal vascularization, and late endothelial failure contribute to this risk. Each instance of graft failure necessitating a repeat graft increases the demand for corneal tissue and raises the likelihood of subsequent graft failures. Addressing issues, such as dry eyes and corneal vascularization during repeat corneal grafts, can enhance the chances of graft survival. In this context, we present the case of a 51-year-old female who was diagnosed with a failed therapeutic penetrating keratoplasty graft in the right eye due to grade 4 corneal vascularization, resulting in visual acuity limited to counting fingers close to the face. To address this, a novel quadruple approach involving optical penetrating keratoplasty, 360-degree peritomy, amniotic membrane graft with adjuvant selective fine needle diathermy, and lateral temporary tarsorrhaphy was performed on the right eye. At the tenth-week postoperative visit, her visual acuity improved to Snellen 6/24 with grade 4 graft clarity, showing no epithelial defects and vascularization. By incorporating cost-effective and simple adjuvant measures like peritomy, temporary tarsorrhaphy, and amniotic membrane grafting during repeat corneal grafts, there is a potential for increased graft survival and early rehabilitation.

Keywords: Failed Corneal Grafts; Optical Penetrating Keratoplasty; 360-Degree Peritomy; Fine Needle Diathermy; Amniotic Membrane Graft; Temporary Tarsorrhaphy

Introduction

Avascular corneal epithelium heralds integrity and transparency of the cornea with its complex structure containing hemidesmosomes and gap junctions. Contact lens wear, previous surgery, chemical injury, immunological and degenerative conditions result in corneal vascularization [1]. Vascularization and lymphangiogenesis of the cornea are due to the sprouting from pre-existing limbal blood and lymphatic vascular arcade [2,3]. Overexpression of pro-inflammatory cytokines and chemokines in corneal inflammation mediate angiogenesis [4-14]. Corneal vascularization can be classified as active young, active old, mature, partially regressed and regressed considering factors such as location, depth, length, branching pattern, color, lipid leakage, nature of blood flow and hemorrhages [15]. Medial treatment of corneal vascularization includes anti-inflammatory agents and anti-vascular endothelial agents. Surgical treatments are aimed at vessel occlusion, ocular surface reconstruction and stem cell-based therapy.

We describe a case of management of a failed corneal graft due to severe vascularization with a combined approach using optical penetrating keratoplasty, temporary tarsorrhaphy, 360-degree peritomy and amniotic membrane grafting.

Case Report

A 51-year-old female presented to our clinic with complaints of redness and diminished vision in her right eye. She underwent therapeutic penetrating keratoplasty (TPK) in her right eye six months before for infective keratitis in our institution. She de-

veloped graft failure due to severe corneal vascularization four months after TPK, for which an attempt of fine needle diathermy was performed. Her condition did not improve after the fine needle diathermy and she was managed with topical anti-inflammatory agents and lubricants.

During the sixth month post operative visit, her visual acuity was counting fingers close to the face in the right eye with an intraocular pressure of 16 mm Hg. She had circum-ciliary congestion with an opaque corneal graft with Grade 4 superficial and deep corneal vascularization. Other details of the anterior segment were unclear due to hazy media. Ultrasound B scan of her right eye was normal. The decision of combined approach including optical penetrating keratoplasty, temporary tarsorrhaphy, 360-degree conjunctival peritomy and amniotic membrane graft in the right eye was made.

After the physician's concurrence and consent of the patient, peribulbar local anaesthesia was administered in the right eye of the patient with 2 % Lignocaine and 0.5 % Bupivacaine. Aseptic preparation of donor cornea (35-year-old) with 7.5 mm trephine was performed. 360-degree conjunctival peritomy with adjunctive selective diathermy of limbal vessels was performed. After paracentesis, the anterior chamber was filled with viscoelastics. The host cornea was trephined 7.5*8 mm and the donor cornea was placed with the endothelial side facing downwards. Using 16 interrupted sutures, the donor cornea was secured with the host cornea. After the removal of the viscoelastics, the anterior chamber was formed with balanced salt solution.

Dry amniotic membrane graft was placed epithelial side-up over the cornea and secured with fibrin glue and purse string sutures. Using a 4'0 non-absorbable silk suture, lateral temporary tarsorrhaphy with plastic bolsters was performed. After assuring complete hemostasis, the eye was patched with antibiotic eye ointment. The patient was started on a course of oral antibiotics, analgesics, Vitamin C and oral steroids on the same day.

On the first post-operative day, the patient had a graft clarity of grade 3 with amniotic membrane graft in situ (Figure 2). The tarsorrhaphy sutures with bolsters were in place. She was started on a course of topical antibiotics, a tapering course of topical steroids and copious lubricants.

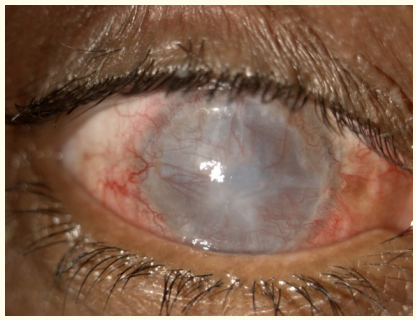

Figure 1: Colour photograph showing pre-operative status of right eye.

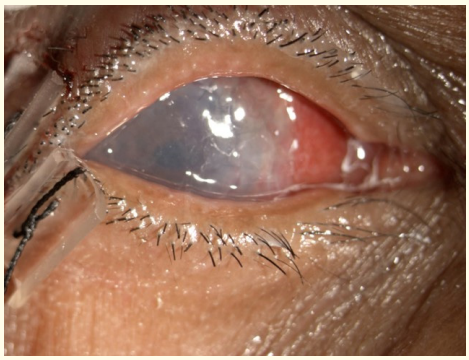

Figure 2: Colour photograph of right eye on first post operative day.

On her third week post-operative visit, the purse string suture supporting AMG and tarsorrhaphy sutures were removed. Graft clarity was grade 4 in the right eye with no epithelial defect (Figure 3). Her best corrected visual acuity improved to Snellens 6/24 and the patient was symptomatically better. She was started on topical cyclosporine eye drops (0.05%) twice daily. On the 10th week post-operative visit, her best corrected visual acuity using Snellens 6/24 with graft clarity 4 (Figure 4). Tapering of topical steroid medications was advised and she was advised to review after a month.

Discussion

Fine needle diathermy

Fine needle diathermy (FND) disrupts the vascular endothelial cells leading to degeneration. Though it is associated with complications like intra-corneal hemorrhage and corneal thinning, it's

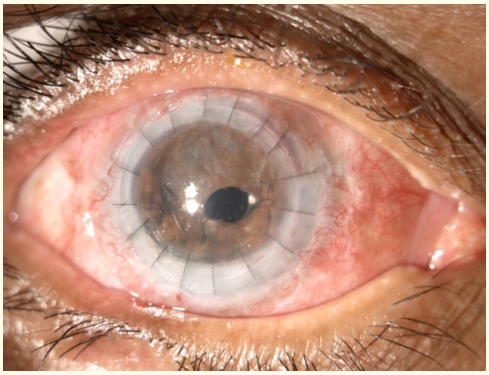

Figure 3: Colour photograph of right eye on third week post operative visit.

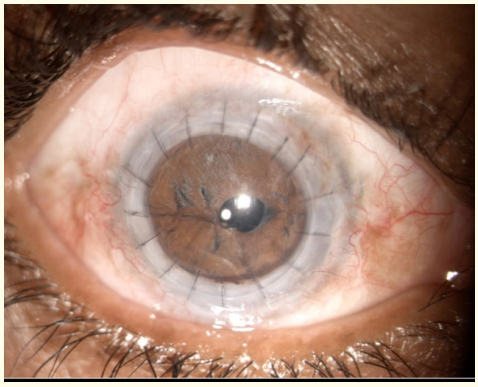

Figure 4: Colour photograph of right eye on tenth week post operative visit.

a low-cost and easy method to address corneal vascularization. Around 80% of corneal grafts survived for more than one year in eyes pre-treated with FND [16]. The lasting effectiveness and enhancement of visual acuity with FND in the management of CNV associated with HSK were observed for an average duration of 18.9 months following the initial treatment [17]. FND combined with topical anti-VEGF reduces recurrence rates [18].

360-degree peritomy

Lambiase et al described a case of bilateral Mooren's ulcer unresponsive to medical therapy in a 36-year-old male where a 360-degree peritomy was performed combined with an amniotic membrane transplant [19]. Control of inflammation was achieved for one year with stability of vision and no additional medical therapy was required in the patient.

Amniotic membrane transplantation (AMT)

Amniotic membrane transplantation (AMT) has demonstrated efficacy in averting inflammation and angiogenesis after ocular injuries [20]. The temporary or permanent transplantation of human amniotic membrane (HAM) in cases of acute chemical injury facilitates reepithelialization and diminishes both inflammation and vascularization. Chondrocyte-derived extracellular matrix (CDECM) has been proposed as a substitute for amniotic membrane in the reconstruction of the ocular surface due to its robust anti-fibrotic and antiangiogenic properties [21]. The implantation of CDECM during the early stage of alkali injury to the cornea led to a notable decrease in corneal neovascularization (CNV) and opacity in a rabbit model [21].

Lateral tarsorrhaphy

Tarsorrhaphy is an inexpensive reversible method that helps protect the graft and host in the eyes post-penetrating keratoplasty [22]. While there is a potential for scarring of the lid margins, the subsequent survival of the corneal graft outweighs the minimal scarring on the eyelids.

Conclusion

Newer therapeutics like small interfering RNA (siRNA) and adeno-associated viral vectors (AAV) are being developed to tackle corneal vascularization [23]. The introduction of advanced and more effective anti-angiogenic agents, including multi-kinase inhibitors, ROCK inhibitors, and MMP inhibitors show promise in treating severe persisting corneal vascularization. The importance of thorough pre-operative assessment will endure in the future, as it facilitates the recognition of elevated risks associated with graft failure. This, consequently, empowers us to incorporate straightforward measures like a 360-degree peritomy, significantly contributing to the preservation of valuable human donor tissue. Our innovative quadruple approach, integrating Optical Penetrating Keratoplasty (OPK) with Amniotic Membrane Transplantation (AMT), 360-de-

gree peritomy, and lateral tarsorrhaphy, represents a simple and cost-effective method that promotes faster healing and early rehabilitation. Nevertheless, further extensive research is imperative for a comprehensive understanding of its effectiveness.