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Case Report

Management of chemical injury with total corneal scar and cicatrization treated with simple limbal epithelial transplantation and amniotic membrane transplantation: a case report

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ABSTRACT

Chemical injuries to the eye are medical emergencies that can result in severe visual impairment or blindness, especially when complicated by limbal stem cell deficiency (LSCD) and cicatrization. Simple limbal epithelial transplantation (SLET) combined with amniotic membrane transplantation (AMT) has shown promise in treating such conditions, offering a path to restore corneal clarity and function. A 46-year-old male presented with sudden vision loss, redness, and pain in the left eye following a chemical injury. Examination revealed a total corneal scar with cicatrization, and the patient was diagnosed with LSCD. He underwent SLET combined with AMT for corneal restoration. Postoperatively, gradual corneal clarity was observed, and vision improved to counting fingers at 2 meters, though further improvement was limited due to a cataract. This case underscores the potential effectiveness of SLET + AMT in managing severe chemical injuries complicated by LSCD. While partial recovery was achieved, further surgical intervention for cataract removal may be necessary to optimize visual acuity. The case highlights the importance of early diagnosis and timely surgical management in such patients.

Keywords: Chemical injury, Corneal scar, Limbal stem cell deficiency, SLET, AMT, Ocular trauma

INTRODUCTION

Chemical injuries to the eye are among the most serious forms of ocular trauma and often lead to long-term visual impairment.[1,2] These injuries are typically classified by the severity of damage to the corneal surface and the extent of limbal stem cell involvement.[3] The limbus plays a crucial role in maintaining corneal clarity and regeneration.[4] When limbal stem cells are damaged or lost, as seen in chemical burns, the result is limbal stem cell deficiency (LSCD), leading to conjunctivalization, neovascularization, and eventual corneal scarring.[3,5] In severe cases, this can progress to cicatrization, further complicating the prognosis.[5]

Recent advances in ocular surface reconstruction, such as Simple Limbal Epithelial Transplantation (SLET), have offered a promising solution for LSCD. In SLET, a small biopsy of healthy limbal tissue from the patient's unaffected eye is transplanted to the affected cornea.[6] When combined with Amniotic Membrane Transplantation (AMT), which provides a scaffold for cellular growth, SLET has demonstrated success in restoring corneal clarity and improving vision in patients with LSCD.[7] This case report aims to detail the management of a 46-year-old male with severe corneal damage following a chemical injury and the application of SLET + AMT to restore ocular surface integrity.

CASE REPORT

A 46-year-old male presented to the outpatient department (OPD) with complaints of sudden vision loss, redness, and pain in the left eye (LE). The patient reported a vague history of blunt trauma and possible chemical exposure. His medical history included cataract surgery in the right eye (RE) six months prior, with visual acuity (VA) recorded as 6/6 in the RE and 6/60 in the LE. Upon initial examination, VA in the LE was reduced to counting fingers close to the face (CFCF).

The slit-lamp examination revealed corneal abrasion, stromal edema, and minimal anterior chamber reaction. Initial treatment for chemical injury included steroids, lubricants, and dilating drops. Despite medical management, the patient's condition worsened, with progressive corneal decompensation leading to limbal stem cell loss and complete corneal opacity with cicatrization.

Investigation

Preoperative investigations were conducted, including, visual acuity tests. Slit-lamp examination. Assessment of corneal condition, systemic health evaluation for anesthesia safety. Given the progressive corneal decompensation and significant visual impairment, the patient was advised to undergo SLET combined with AMT to restore the corneal surface.

Management

Preoperative care

Topical steroids, lubricants, and dilating drops were administered to stabilize the eye before surgery. Informed consent was obtained from the patient, and preoperative preparations were completed.

Surgical procedure

Under local anesthesia, the following steps were performed.

Peritomy: A 360-degree peritomy around the limbus.

Pannus removal: Removal of abnormal tissue (pannus) from the cornea.

Amniotic membrane placement: A 5×5 cm block of amniotic membrane was placed on the cornea and secured with 10-0 nylon sutures.

Limbal stem cell harvesting: Limbal stem cells were harvested from the patient's healthy eye in four segments (2×8 mm each).

Stem cell placement: Harvested stem cells were placed in four quadrants on the peripheral cornea and secured with fibrin glue.

Bandage contact lens application: A bandage contact lens was applied, and the eye was patched.

Postoperative care

The patient was discharged with the medications, topical antibiotics, anti-inflammatory drops, lubricants.

Follow-up visits were scheduled for 2 days post-surgery, every 2 weeks for 2 months, monthly for an additional 2 months.

Outcome

At follow-up, the patient exhibited gradual improvement in corneal clarity, with vision improving to counting fingers at 2 meters. However, further visual recovery was limited by the development of a near-total cataract in the left eye.

Figure 1: Preoperative image.

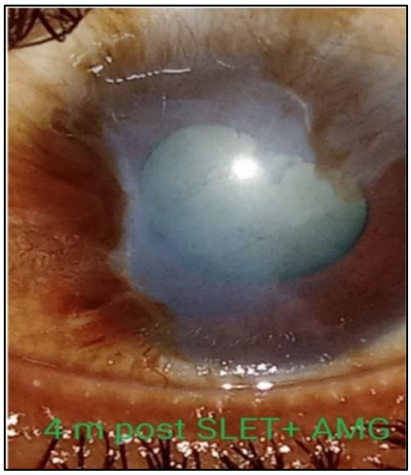

Figure 2: Preoperative Image of patient (SLET+AMT).

DISCUSSION

This case highlights the successful management of a 46-year-old male with chemical injury-induced LSCD and corneal cicatrization using SLET+AMT. In previously published case reports, outcomes of SLET have varied based on factors such as patient age, severity of the chemical injury, and the presence of concurrent ocular conditions.[8] For instance, a study by Sangwan et al. (2012) reported that the best corrected visual acuity in a total of six adult patients with unilateral and total LSCD eyes, which was worse than 20/200 prior to surgery, improved to 20/40 or better in four eyes (66.6%).[6] In our case, the patient's age may have contributed to the slower recovery and limited visual improvement. Additionally, gender has been noted to influence outcomes in corneal injuries. Male patients, particularly in industrial settings, are more prone to chemical injuries.[9,10] In this case, the patient was a middle-aged male, which is consistent with the demographic reported in similar studies, such as the work by Quesada et al. (2020), where male predominance (68.54%) was observed in ocular chemical injuries.[10]

The presenting symptoms of redness, pain, and sudden vision loss align with those commonly reported in chemical injury cases. Similar symptoms were documented in a review by Rauchman et al, which discussed the ocular surface damage that can occur due to exposure to a variety of categories of chemicals in the workplace, and in the course of everyday life.[11] Treatment protocols in chemical injuries typically focus on controlling inflammation, promoting corneal healing, and preventing limbal stem cell deficiency.[12] SLET, combined with AMT, offers a novel approach for ocular surface reconstruction. The use of AMT in this case provided an essential biological scaffold that facilitated epithelial cell growth, similar to findings published by Sangwan et al and Le et al, who highlighted the synergistic effect of AMT in enhancing corneal regeneration.[6,7]

Outcomes in our case were promising but limited by the presence of a developing cataract. Studies by Shanbhag et al, have suggested that while SLET can restore corneal clarity, additional procedures, such as cataract surgery, are often required to achieve optimal visual acuity.[8] Our case supports this observation, as the patient's final visual outcome remains dependent on further cataract extraction.

CONCLUSION

This case illustrates the effectiveness of SLET combined with AMT in managing severe chemical injury with LSCD. While corneal clarity was partially restored, visual outcomes were limited by a developing cataract, underscoring the need for further surgical intervention. The case highlights the importance of early diagnosis and timely surgical management in improving outcomes for patients with severe ocular trauma.

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