

A SUCCESSFUL AMNIOTIC MEMBRANE TRANSPLANT FOR ACUTE CORNEAL THERMAL INJURY: A CASE REPORT

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ABSTRACT

Introduction: Burns to the eyelids, conjunctiva, cornea, or sclera, whether from thermal energy or a chemical cause, are a true ophthalmic emergency. Typical of the injury may vary but requires immediate evaluation and treatment. Ideal treatments aim to maximize corneal re-epithelialization and minimize both adnexal structural abnormalities as well as corneal vascularization or conjunctivalization.

Objective: The objective is to present interventional management in patients with acute corneal thermal injury.

Case Presentation: A 18 years-old girl was consulted from Plastic Surgery Department with diagnosed with grade I combustion at the face and right hand. Patient complained about ocular pain and blurred vision after got drenched with hot water on the right eye. The visual acuity measured 6/30 pin hole 6/15 on right eye. Normal intra ocular pressure on both eyes. The examination of the right eye revealed redness, swelling, combustion and excoriation on eyelid; ciliary injection on the conjunctiva, 360 degree chemosis limbal. The cornea was hazy with necrotic tissue and fluorescein test was positive with erosion whole surface, iris details were visible and lens was clear. The patient was planned for amniotic membrane transplant. The visual acuity one day after surgery was 2/60 and the examination was found ciliary injection, subconjunctival bleeding and sutured amniotic membrane with bandage contact lens on the cornea. One month after surgery, her visual acuity become 6/6 with very light scar on the periphery of the cornea.

Conclusion: Acute corneal thermal injury is a common injury and potentially blind if not treated properly. Good visual prognosis can still be obtained with early diagnosis and appropriate treatment, making correct and definitive diagnosis are very important in daily clinical practices for general ophthalmologist.

Keywords: Acute Corneal Thermal Injury, Amniotic Membrane Transplant.

INTRODUCTION

Ocular chemical or thermal injuries are true ophthalmic emergencies which represent 8-22.1% of traumatic ocular injuries. The majority of victims are young and male. Burns to the eyelids, conjunctiva, cornea, or sclera, whether from radiant energy or chemical causes, are true ophthalmic emergency. The extent of the injury may vary but requires immediate evaluation and treatment. Ocular burns are classified based on their etiologies with radiant energy injuries, either thermal or ultraviolet, tending to carry a better prognosis compared with chemical

exposures. In general, the severity of the injury is directly related to the duration of exposure and the properties of the causative agent. The cell death that occurs from a thermal injury is usually limited to the superficial epithelium, more extensive damage may sometimes occur. Careful inspection of the eyelids and ocular surface is essential to determine the proper approach to treatment. If the eyelids are injured as a result of the burn, it is important to determine whether or not the patient is able to adequately close the eye. If voluntary closure is not possible, then placement of a suture tarsorraphy may be helpful to protect the ocular surface. In

addition to inspection of the eyelids, a complete ocular examination should also be performed. One should assess the status of the conjunctiva as well as the corneal surface. Corneal epithelial defects should be quantified and the presence or absence of an anterior chamber reaction should also be noted.^{1,4,9}

Treatment in the immediate period following thermal injury should consist of frequent lubrication of the ocular surface with lubricant ointment or artificial tears if damage to the ocular surface is minimal and prevention of infection with the use of a topical antibiotic. Topical steroid regimen can be beneficial in treating corneal edema, whether careful observation should be needed to cases of epithelium healing. A combination of antibiotics and steroid ointment may also be beneficial in promoting healing and minimizing scar formation in extended burn injury. The patients should be work up very closely for signs of infection and referral to an oculoplastic specialist may also be indicated if cicatrical eyelid changes as the eye is healing. The amniotic membrane has a thick basement membrane and an avascular stromal matrix. The basement membrane facilitates migration of epithelial cells, reinforces adhesion of basal epithelial cells, and promotes epithelial differentiation. The basement membrane also plays a role in preventing epithelial apoptosis. Collectively, these are the possible actions by which the amniotic membrane permits rapid epithelialization. Amniotic membrane is also found to have anti-inflammatory and anti-scarring effects.^{4,5,9}

Amniotic membrane transplantation (AMT) in combination with limbal grafts has been found successful in ocular surface reconstruction in patients with chemical and thermal burns. AMT alone was found to be sufficient to restore corneal and conjunctival surfaces in mild to moderate burns. In severe burns, AMT restored the

conjunctival surface without symblepharon and reduced limbal stromal inflammation, but did not prevent limbal stem cell deficiency, which required further limbal stem cell transplantation.^{6,7,8}

CASE PRESENTATION

This was a single case study from patient who came to the Sanglah Hospital, Bali. Patient were followed up from May 2019 until June 2019 and diagnosed with RE palpebra combustion and corneal thermal injury.

A 18 year-old girl was consulted from Plastic Surgery Department diagnosed with grade I combustion injury at face and right hand after got drenched by hot water. Patient complained pain and blurry vision on the right eye. History of using spectacle was denied.

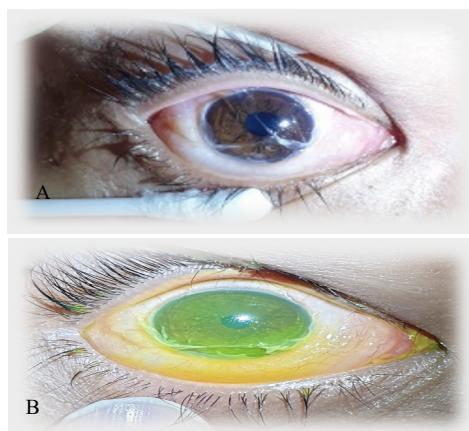


Fig 1. Clinical Photograph of the patient. (A) show ciliary injection and necrotic corneal tissue; (B) Fluorescein test was positive with wide corneal erosion

The visual acuity was 6/30 pin hole 6/15 on right eye with normal intra ocular pressure on both eyes. Examination revealed redness, swelling, combustion scar and excoriation on eyelid, with ciliary injection on the conjunctiva, and 360 degree chemosis limbal. Cornea was hazy with positive fluorescein test, wide corneal erosion and necrotic tissue was found.

The visual acuity one day after surgery was 2 meters counting finger and

conjunctival injection, subconjunctival bleeding and sutured amniotic membrane secured with bandage contact lens on the cornea was discovered

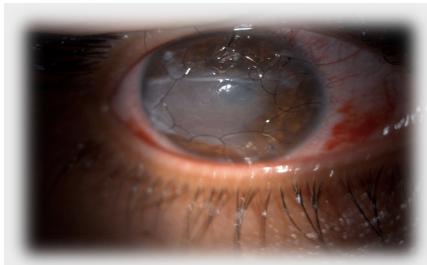


Fig 2. Follow up day 1 after surgery showed subconjunctival bleeding and sutured amniotic membrane

Two weeks after the surgery, the visual acuity improved to 6/18 and the amniotic membrane was fully absorbed then the suture was released. The medications were continued with topical steroid and topical antibiotic to combustion eyelid. In the last follow up the visual acuity was 6/6 and clearer cornea with very light peripheral scar was gathered.

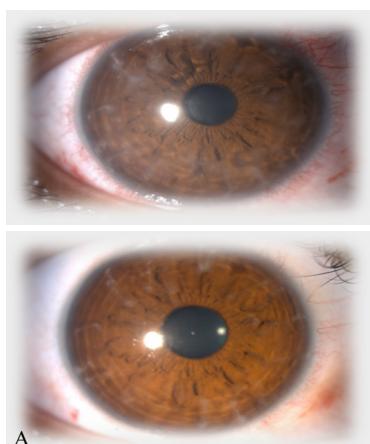


Fig 3. (A) Follow-up two weeks after the surgery. The amniotic membrane suture was released; (B) Last follow up, A Month after surgery, showed minimal peripheral scar of the cornea

DISCUSSION

Ocular chemical or thermal injuries are true ophthalmic emergencies which represent 8-22.1% of traumatic ocular injuries. The majority of cases are young

and male. The clinical course and ultimate prognosis correlate with the extent of limbal ischemic. The prognosis also depends on the extent of damage to conjunctival and episcleral tissue, severity of lid burns and damage to intraocular structures.^{1,4}

When a patient presents with a radiant energy injury, careful inspection of the eyelids and ocular surface is essential to determine the proper approach to treatment. If the eyelids are injured as a result of the burn, it is important to determine whether or not the patient is able to adequately close the eye. In addition to inspection of the eyelids, a complete ocular examination should also be performed. One should assess the status of the conjunctiva (both palpebral and bulbar) as well as the corneal surface. Corneal epithelial defects should be quantified and the presence or absence of an anterior chamber reaction should also be noted.

Mild burns injury (grade I and II) are associated with hyperemic, small conjunctival ecchymosis and chemosis as well as erosion of the corneal epithelium. In mild acid burns, the coagulated corneal epithelium often has a 'ground-glass' appearance. After removal of the epithelium, the clear corneal stroma is visible. Grade III, and especially grade IV, burns are accompanied by extensive and deep damage to the tissue. Typically, large areas of the conjunctival and subconjunctival tissue are involved. The visible blood vessels are thrombosed and appear dark. The corneal keratocytes are lost and hydration of the denatured proteins results in corneal opacification.⁴

In this present study, we report an ocular combustion with redness, swelling, combustion scar and excoriation on eyelid, with ciliary injection on the conjunctiva, and 360 degrees chemosis limbal. Ocular examination also revealed hazy cornea with positive fluorescein test, wide corneal erosion and necrotic tissue which categorized as grade II ocular burn injury.

Treatment in the immediate period following thermal injury should consist of frequent lubrication of the ocular surface with lubricating ointment or artificial tears if damage to the ocular surface is minimal and prevention of infection with the use of a topical antibiotic. Topical steroid regimen can be beneficial in treating corneal edema, whether careful observation should be needed to cases of epithelium healing. A combination of antibiotics and steroid ointment may also be beneficial in promoting healing and minimizing scar formation in extended burn injury on the eyelid.¹

The agents that promote epithelialization following acute ocular burns including artificial tears, fibronectin, epidermal growth factor, retinoic acid, and sodium hyaluronate. Artificial tears are the mainstay of treatment in cases of acute ocular chemical injuries and are routinely administered to promote epithelialization. Preservative-free tear substitutes may ameliorate persistent epitheliopathy, reduce the risk of recurrent erosion, and accelerate visual rehabilitation. Fibronectin helps preserve a stable, intact ocular surface by decreasing the peeling back of the healing epithelium and promoting re-epithelialization in experimental animal burns. Epidermal growth factor (EGF) stimulates the proliferation of keratocytes in the early stages of wound healing and promotes re-epithelialization. Vitamin A is necessary for normal epithelial growth and differentiation. High-molecular-weight hyaluronic sodium modulates biosynthetic pathways, cell migration, cell outgrowth, and protein degradation to stimulate wound healing and prevent cell death.⁹

Ideal treatments aim to maximize corneal re-epithelialization and minimize both adnexal structural abnormalities as well as corneal vascularization. Therapy should promote epithelial healing, reduce inflammation, and prevent tissue melting as well as scar formation. Conventional

medications include ascorbate (topical and systemic), citrates, oral tetracyclines, topical corticosteroids, lubricants, antibiotics, therapeutic contact lens, and tenonplasty.^{2,3,6}

The Amniotic membrane has been successfully used for ocular surface reconstruction in partial stem cell deficiency states that may occur secondary to chemical or thermal injuries, Stevens Johnson syndrome, and persistent epithelial defects of various etiologies. The amnion is the innermost layer of fetal membranes and consists of the epithelium, basement membrane, and stroma. The epithelium and stroma act as sources of growth factors and cytokines, which serve to maintain the microenvironment of the stem cells of the corneal epithelium. The amniotic membrane can function as a basement membrane substitute or as a temporary graft in the eye. It has anti-inflammatory and anti-scarring effects and contains growth factors that promote epithelial wound healing on the surface of the eye.^{6,9}

Amniotic membrane epithelium expresses neither HLA class I nor class II antigens. It also has antibacterial properties and hence reduced risk of infection. AMT gives a scope to try a simple method even in chronic severe thermal injury before planning desperate measures like limbal stem cell transplant.³ Emergency amniotic membrane transplant was performed in our case and the patient was prescribed with topical antibiotic, topical corticosteroid and artificial tears eye drop every 3 hours.

In those patients in whom it ultimately does not become possible to restore corneal clarity and a normal ocular surface, a keratoprosthetics remains a viable option. In the proper setting, however, keratoprosthetics placement can be a truly vision-saving procedure.¹ Best visual function and clear cornea was achieved only in 1 month after surgery that gives amniotic membrane transplant a promising

procedure in treating mild ocular burn injury for giving better quality of life for patients.

CONCLUSION

Patients experiencing an ocular burn will need a thorough and immediate evaluation and intensive treatment. Several mechanisms of action have been described for the amniotic membrane including its anti-inflammatory, anti-angiogenic, and epitheliotrophic properties. The goal of treatment is restoration of the normal ocular surface anatomy and lid position, and restoration of corneal clarity once this has been achieved.

REFERENCES

1. Fish R, Davidson RS. Management Of Ocular Thermal And Chemical Injuries, Including Amniotic Membrane Therapy. *Current Opinion in Ophthalmology*. 2010; 21:317-321
2. Eslani M, Raffi-Baradaran A, Cheung AY, Kurji KH, Hasani H, Djalilian AR, et al. Amniotic Membrane Transplantation in Acute Severe Ocular Chemical Injury: A Randomized Clinical Trial, *American Journal of Ophthalmology*. 2019;199:209-215
3. Joseph A, Dua HS, King AJ. Failure of Amniotic membrane transplantation in the treatment of acute ocular burns. *British Journal of Ophthalmology*. 2001;85:1065-1069
4. Kuckelkorn R, Schrage N, Keller Gabriela, Redbrake C. Emergency Treatment of Chemical and Thermal Eye Burn. *Acta Ophthalmologica Scandinavica*. 2002;80:4-10
5. Sridhar S, Bansal AK, Sangwan VS, Rao GN. Amniotic Membrane Transplantation in Acute Chemical and Thermal Injury. *American Journal of Ophthalmology*. 2000;130:134-137
6. Tejwani S, Kolari RS, Sangwan VS, Rao GN. Role of Amniotic Membrane Graft for Ocular Chemical and Thermal Injury. *Cornea*. 2007;26:21-26
7. Westekemper H, Figueiredo FC, Siah WF, Wagner N, Steuhal KP, Meller D. Clinical Outcomes of Amniotic Membrane Transplantation in the Management of Acute Ocular Chemical Injury
8. Georghe A, Pop M, Burcea M, Serban M. New Clinical Application of Amniotic Membrane Transplant for Ocular Surface Disease. *Journal of Medicine and Life*. 2016;9:177-179
9. Sharma N, Kaur M, Agarwal T, Sangwan VS, Vajpayee RB. Treatment of Acute Ocular Chemical Burn. *Survey of Ophthalmology*. 2018;63:214-235