AMNIOTIC MEMBRANE TRANSPLANTATION IN OCULAR SURFACE DISORDERS – A CASE SERIES

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ABSTRACT

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The cornea, conjunctiva and the limbus comprise the tissues at the ocular surface. All of them are covered by stratified, squamous, non-keratinising epithelium and a stable tear film. The ocular surface health is ensured by intimate relationship between ocular surface epithelia and the preocular tear film. It is essential to establish accurate diagnosis for appropriate management of complex ocular surface disorders. Management has improved with introduction of the limbal stem cell concept and amniotic membrane transplantation.

KEYWORDS

Ocular surface, limbal stem cell, ocular surface disorders, ocular surface reconstruction, amniotic membrane grafting, limbal stem cell transplantation.

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INTRODUCTION: The anterior surface of cornea which is bathed by tear film is made up of highly organised non-keratinised stratified squamous epithelium with plentiful desmosomes and tight junctions, providing permeability barriers to non-ionic solutes. The conjunctival epithelium varies from stratified to columnar and has numerous mucin-secreting goblet cells. The limbus is a unique structure that acts as a junctional barrier separating the conjunctiva and cornea. Limbal stem cell deficiency may lead to the invasion of the cornea by conjunctival cells including goblet cells, a process termed conjunctivalisation of cornea.

There are two types of ocular surface failure. The first one is characterised by squamous metaplasia and loss of goblet cells and mucin expression. This is consistent with unstable tear film which is the hallmark of various dry-eye disorders. The second type of ocular surface failure is characterised by the replacement of the normal corneal epithelium with an invaded conjunctival epithelium in a process called limbal stem cell deficiency.

Ocular surface diseases such as Stevens-Johnson syndrome, chemical and thermal burns, ocular surface tumours, immunologic conditions, radiation injury, inherited syndromes (such as aniridia), and ocular pemphigoid can severely compromise the ocular surface and cause catastrophic visual loss in otherwise healthy eyes. Based on the pathogenic nature of limbal involvement, corneal surface diseases can be divided in two categories. Category I diseases destroy the epithelial stem cell population. The destruction can be caused by chemical/thermal injuries, Stevens-Johnson syndrome, and multiple surgeries or cryotherapies applied on the limbal regions, contact lens induced keratopathy, lens-wearing injuries or toxic effects from lens cleansing solutions (rare) can also cause limbal stem cell (SC) damage. Category II diseases include diverse causes such as aniridia, keratitis associated with multiple endocrinal deficiencies, neurotrophic keratopathy, and pterygium/ pseudopterygium which represents a milder form of corneal disease where limbal SC dysfunction is not due to the total loss of limbal SC, but rather is associated with a gradual loss of limbal SC population. Management includes "limbal cell transplantation".

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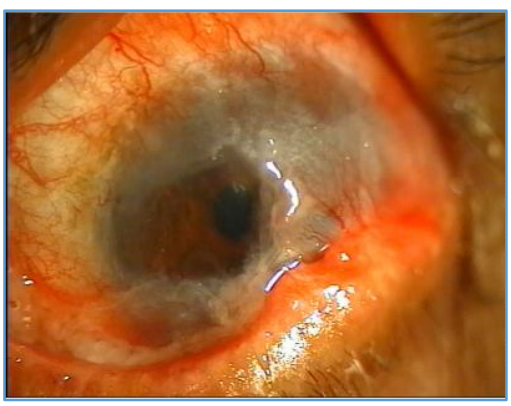
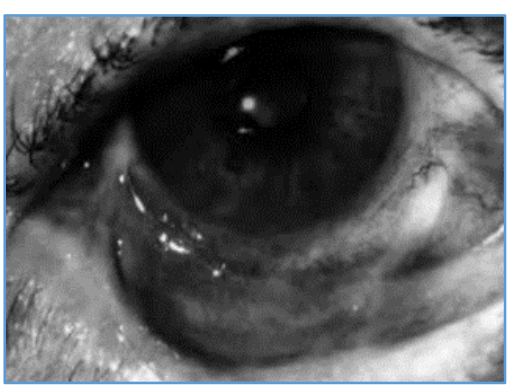
CASE REPORT

Case 1: A 26-year-old male, farmer by occupation with toxic epidermal necrolysis came with chief complaints of diminution of vision, watering, burning sensation, inability to open both the eyes since two and half years. There was a history of fever with chills followed by rash all over the body. He was prescribed some oral tablets and IM injections by a local doctor. Later, he developed ulcers in oral cavity. Associated with gradual painless diminution of vision in BE, watering, redness, photophobia and unable to open his eyes and pain on trying to open forcibly. On ocular examination:

Visual acuity for distance: Right eye-PL positive, PR accurate left eye-not able to perceive light. Tylosis, madarosis, hyperpigmentation of surrounding lid skin. Symblepharon formation in right eye. Ankyloblepharon formation in left eye. Treatment started with antibiotic eye drops q.i.d., tobramycin eye drops q.i.d., lubricating eye drops and eye ointment once a day, antibiotic eye ointment once daily. Right-sided symblepharon release with amniotic membrane graft followed by left-sided ankyloblepharon release with symblepharon ring was done after 2 weeks.

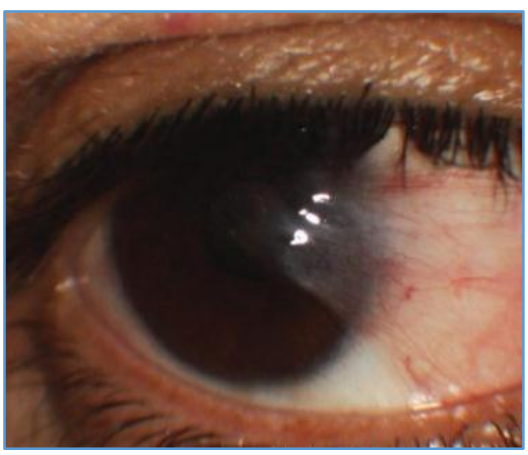




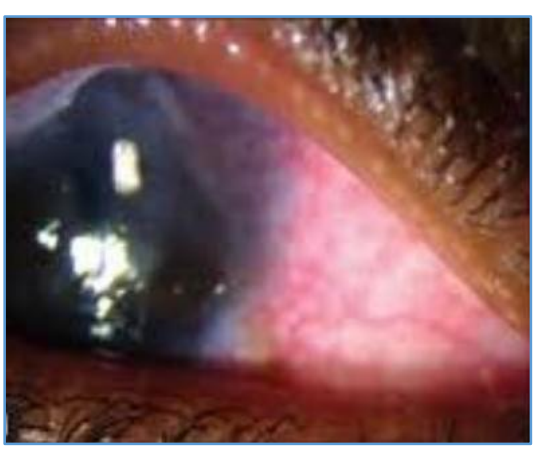
Case 2: A 13-year-old male presented with diminution of vision and inability to open his right eye since 3 months. He had a history of hydrated lime (chuna) falling accidently in his right eye 3 months back followed by redness and watering, burning type of severe pain in his right eye, which he rubbed vigorously and consulted a local ophthalmologist who washed his eye thoroughly with water for about 30 minutes and removed the residual lime from the eye and prescribed 4 types of eye drops. The patient then noticed DOV in right eye after 8 to 10 days, insidious in onset and gradually progressed over a period of 3 months to the present state where he can only perceive light and was unable to open his right eye even with his fingers since 3 months after the injury. On Ocular examination: Visual acuity for distance: Right eye- PL positive, PR inaccurate, Left eye- 6/6. There were thick fibrous adhesions between inner margin of upper and lower lid, sparing a small part of the lateral and medial lid margins, suggesting of total symblepharon in right eye. Right eye symblepharectomy with amniotic membrane graft with symblepharon ring was done followed by antibiotic-steroid eye drops 6 times a day.

Case 3: A 26-year-old male, factory worker, came with complaints of caustic soda falling accidentally in his left eye 3 days back followed by redness, watering, burning sensation, photophobia and sudden onset of diminution of vision. He washed his eyes thoroughly with cold water, but his symptoms did not improve. On ocular examination: Visual acuity for distance: Right eye- 6/6, Left eye < 6/60. Conjunctival congestion, mild chemosis, cornea appeared to be hazy iris and other details were not clearly visible. Patient was started on antibiotic-steroid eye drops 6 times a day, cycloplegic eye drops 3 times a day, lubricating eye drops 4 times a day. After 5 days of topical treatment, patient did not respond well and amniotic membrane transplant with symblepharon ring was done in left eye for better corneal healing.

Case 4: A 60-year- old female, farmer, with right eye grade 3 nasal pterygium with complaints of fleshy mass in left eye since 8 months, associated with mild foreign body sensation and watering with history of chronic exposure to sun. On ocular examination: Visual acuity remained unaffected. There was thick, fleshy, vascular and triangular fold of conjunctiva from nasal side encroaching on to the cornea of right eye, suggested grade 3 nasal pterygium. Pterygium excision with amniotic membrane transplant under LA was done. Postoperatively followed by artificial tear drops 3 times a day and antibiotic steroid drops 6 times a day.

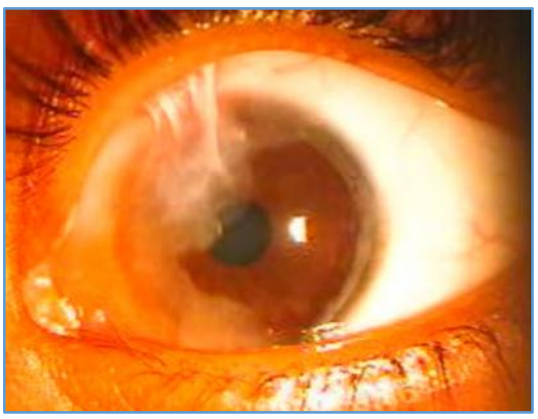


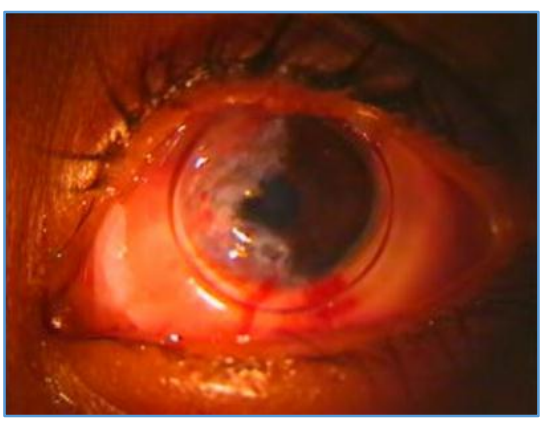
Preoperative



Postoperative

Case 5: A 17-year-old male, student, with chemical injury to left eye came with complaints of diminution of vision of left eye since 6 months. History of chemical injury (with lime) to left eye 15 months back and was asymptomatic for 8 months followed by formation of gradual and progressive adhesions between upper and lower lid of right eye during the course of 6 months, associated with gradual painless and progressive diminution of vision in left eye. On ocular examination: Visual acuity for distance: Right eye-6/6, Left eye-HMCF. There was symblepharon formation in left eye. Left eye symblepharectomy with amniotic membrane graft with symblepharon ring was done followed by postoperative treatment with antibiotic-steroid eye drops 6 times a day.





DISCUSSION: Amniotic membrane transplantation is currently being used for continuously widening spectrum of ophthalmic indications. It has gained widespread attention as an effective method of reconstruction of the ocular surface. Amniotic membrane has a unique combination of properties, including the facilitation of migration of epithelial cells, the reinforcement of basal cellular adhesion and the encouragement of epithelial differentiation. Its ability to modulate stromal scarring and its anti-inflammatory activity has led to its use in the treatment of ocular surface pathology as well as an adjunct to limbal stem cell grafts. Amniotic membrane transplantation has been used for reconstruction of the corneal surface in the setting of persistent epithelial defects (PED), partial limbal stem cell deficiency, bullous keratopathy and corneoscleral ulcers. As the AM, being continuously moistened by tears, provides adequate hydration to the regenerating epithelium and protects it from the abrasive effect of an abnormal palpebral conjunctiva. It has also been used in conjunction with limbal stem cell transplantation for total limbal stem cell deficiency.[1]

Amniotic membrane grafts have been effectively used as a conjunctival substitute for reconstruction of conjunctival defects following removal of pterygia, conjunctival lesions and symblepharon. In pterygium surgery, AM could serve as an useful alternative to conjunctival grafts when there exists a very large conjunctival defect to cover in primary double–headed pterygium in previous multiple failed surgeries or in the context of preserving superior bulbar conjunctiva for future glaucoma surgeries.[2] The advantages of AMT over conjunctival autografts and mucous membrane grafts, include superior postoperative cosmesis, absence of donor site morbidity complicating the harvest of mucosal and conjunctival autografts. In SJS, ocular cicatricial pemphigoid and toxic epidermal necrolysis, immune-mediated inflammation must be controlled prior to surgery and with AMT, creditable improvements in the ocular surface inflammation, deepening of fornices, decrease in the severity of vascularisation and absence of recurrent corneal erosions. Severe shield ulcers that do not respond to surgical debridement and phototherapeutic keratectomy PTK.[3]

Amniotic membrane transplantation combined with surgical debridement is an effective alternative modality in the management of these ulcers. The renewed basement membrane promotes epithelialisation, reinforces cellular adhesion and prevents epithelial apoptosis.[4]

CONCLUSION: Various disorders of the ocular surface still pose a clinical challenge in ophthalmic surgery. Since modern preservation methods were introduced, the AM, procured in sterile conditions following a caesarean section, has experienced a renaissance as a basement membrane. Today, it is hard to imagine reconstructive surgery of the ocular surface without it. It provides practicing ophthalmologists with a particularly multifaceted instrument to tackle the challenges posed by disorders of the surface of the eye successfully. AMT is used in acute ophthalmological care to treat chronic diseases of the surface of the eye, as the newest development, using tissue engineering, as a biomatrix to treat severe stem cell deficiency of the ocular surface. The success of AMT is dependent on the underlying condition and given the suboptimal results in some indications, stringent case selection is recommended.

The low rate of intraoperative and postoperative complications and the avoidance of immunosuppression are other advantageous features of this procedure. The utility of AM in healing ocular surface defects is unquestionable. However, there is still a lack of evidence based on randomised controlled studies to prove the benefits of AMT compared to other alternative modalities of treatment.

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