



## AMNIOTIC MEMBRANE TRANSPLANTATION FOR OCULAR SURFACE DISORDERS

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**ABSTRACT** **Background:** Amniotic membrane transplantation (AMT) has gained attention as an effective method of reconstruction of the ocular surface.

The purpose of this study was to perform amniotic membrane (AM) grafting for various ocular surface disorders and assess the success of AMT.

**Methods:** 22 patients with ocular surface disorders who underwent AMT were included. Patients were followed up with clinical and photographic documentation.

**Results:** The study group comprised of 22 eyes. Symptomatic relief was obtained in cases of bullous keratopathy, band keratopathy and persistent epithelial defect (PED). A complete and stable epithelialization of the ocular surface was achieved in cases with chemical burns, ocular surface squamous neoplasia (OSSN), PED and corneal thinning. No recurrence was seen in pterygium and OSSN cases during follow up.

**Conclusion:** AM has improved our ability to treat ocular surface disorders. In our study AMT was successful in almost all cases.

**KEYWORDS:** Ocular Surface Disorders, Amniotic Membrane Transplantation, Amniotic Membrane

### INTRODUCTION

Managing patients with severe ocular surface disorders is challenging. Ocular surface reconstruction techniques have advanced from bare sclera technique to free conjunctival autografts, oral and nasal mucosal grafts and limbal transplantation.<sup>(1)</sup> AMT has been gaining attention as an effective method of ocular surface reconstruction.

The human AM is the innermost layer of the placenta. Amnion measures 0.02-0.05 mm in thickness and consists of three layers: epithelial monolayer, basement membrane and avascular stromal matrix.

AMT has been used for various ocular surface disorders which include partial limbal stem cell deficiency (LSCD), conjunctival defects following excision of pterygium and surface tumours, PEDs, and shield ulcer of vernal keratoconjunctivitis.<sup>(2)</sup>

The present study aimed to perform AM grafting for various indications of ocular surface disorders and assess the success of AMT.

### MATERIALS AND METHODS

**Inclusion criteria:** Patients with chemical burns, symblepharon, PEDs, bullous keratopathy, band keratopathy, corneal thinning, pterygium, LSCD, OSSN.

The study was conducted after obtaining approval from the institutional research and ethics committee. A written informed consent was taken. AMT was performed in 22 eyes of 22 patients with ocular surface disorders.

Surgeries were performed under peribulbar anaesthesia. A dry, preserved AM, Amnio-care<sup>®</sup> was used.

**Orientation of Amniocare<sup>®</sup>:** A cut on upper right side of membrane indicates the correct orientation of the membrane to be put on the cornea with stromal side facing the cornea.



**Figure 1: Orientation of Amniocare<sup>®</sup>**

**Procedure:** Diseased tissue was excised depending on indications such as pterygium excision and symblepharon or surface debrided in cases such as bullous keratopathy, band keratopathy. AMG was placed on the cornea. The technique appropriate to that particular case was performed to cover the defect and sutured with interrupted, 10-0 nylon monofilament suture onto the cornea and 8-0 polyglactin suture onto conjunctiva or sclera when required.

Post operatively patients were prescribed antibiotic drops, steroid drops and tear substitutes. Topical antibiotics were discontinued once epithelialization was noted. Bandage contact lens (BCL) was removed once epithelialization was complete. Steroids were tapered off over a period of 6 weeks.

Follow up was done on day, 1 at the end of 1 week, 2 weeks and then monthly for 6 months. Patients were followed up with clinical and photographic documentation. Reduction in pain, redness and photophobia were noted. Evidence of vascularization, recurrence of primary condition, microbial infection, graft retraction or dislodgement was recorded.

### Surgical success was defined as:

- Symptomatic relief and epithelialisation in bullous keratopathy and band keratopathy,
- Complete epithelialisation of the ocular surface at the operated site as demonstrated by slit lamp biomicroscopy and negative fluorescein staining without recurrence at the same area in PED
- Epithelialisation of the ocular surface and restoration of stem cell population as demonstrated by biomicroscopy in chemical burns
- Free of recurrence in pterygium
- Epithelialization, restoration of ocular surface and free of recurrence in OSSN.

Statistical analysis was done using percentage, frequency, Fishers exact t test and SPSS version 17 for windows. A p value of less than or equal to 0.05 was taken as significant.

### RESULTS

The mean age of patients was 50.16 years in males and 46 years in females.

### Etiological groups:

Etiology	Percentage
Band keratopathy	4.5
Bullous keratopathy	4.5
Chemical burns	9.1

Corneal thinning	4.5
OSSN	18.2
PED	4.5
Pterygium-primary	45.5
Recurrent pterygium	9.1
Total	100.0

Pain relief and re-epithelialization was achieved in the patient with pseudophakic bullous keratopathy 3 weeks post op. One patient had band keratopathy and post AMT, a significant decrease in pain, redness and photophobia was noted.

2 patients had unilateral grade 4 chemical burns and vascularized corneal opacity along with symblepharon. The corneal surface showed complete epithelialisation within a few weeks. 1 of the patients however, did have a corneal perforation 5 months later and BCL with tissue glue was applied.

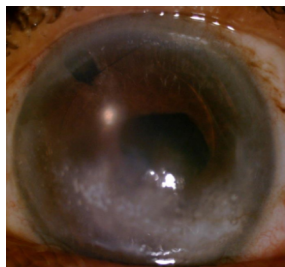
In 12 patients with pterygium, AMT was performed in conjunction with pterygium excision and conjunctival autograft (CLAG). All patients showed zero recurrence rate.

In 4 patients with OSSN, AMT was performed after adequate dissection. 2 patients had corneal involvement and a vascularised cornea and underwent autologous conjunctival limbal transplantation in addition. All patients showed complete re-epithelialization and restoration of ocular surface with no recurrence.

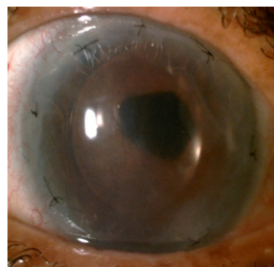
AMT was performed in 1 eye with PED. After single layer AMT, the epithelial defect healed in 8 weeks but recurred at 3 months 1 patient with corneal thinning and symblepharon resulting from ocular cicatricial pemphigoid underwent AMT. Post-operatively, a stable corneal epithelial surface was seen in 3 weeks and no symblepharon was noted.

Success was seen in almost all groups except for 1 patient with chemical burns and 1 patient with PED.

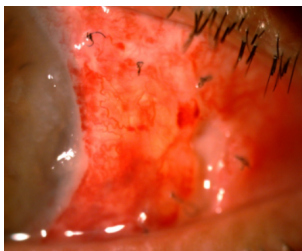
Among all the factors associated with success, only etiological groups showed a statistical significance associated with success of AMT.



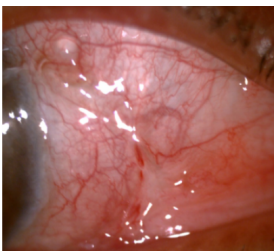
**Figure 2: Preoperative clinical picture of a patient with band keratopathy.**



**3: Post operative picture 1 week after AMT**



**Figure 4: post operative picture on day 1 following pterygium excision, AMT, CLAG**



**Figure 5: same patient post operative picture 3 months after the procedure**

## DISCUSSION

AM is used in ocular surface disorders due to its special properties. 12 patients with pterygium, of which 10 were primary and 2 were recurrent underwent AMT. None showed recurrence. Prabhawat et al<sup>(3)</sup> reported a recurrence rate of 10.9% for primary pterygium patients

following excision with AMT. AM can be used as an alternative to conjunctival autografts. Shimazaki et al<sup>(4)</sup> combined AMT with conjunctival autograft in recurrent pterygium cases and had a recurrence rate of 15%. Ghanvati et al<sup>(5)</sup> combined AMT with conjunctival autograft in treating 19 patients with pterygium. They reported a recurrence rate of 5.2%.

4 patients with OSSN underwent AMT. All showed complete epithelialization of the ocular surface with zero recurrence. Espana et al<sup>(6)</sup> evaluated the outcomes of 16 patients in whom AMT was performed after excision of large ocular surface neoplasias. Tumour recurrence occurred in 10% of conjunctival intraepithelial neoplasia cases. AMT avoids complications associated with conventional removal in cases where limbal stem cells are destroyed by surgical resection. Paridaens et al<sup>(7)</sup> studied results of AMT in the reconstruction of ocular surface defects following excision of primary acquired melanosis and conjunctival malignant melanoma in 4 patients with a satisfactory result in 3 patients. AMGs are superior to mucous membrane grafts or conjunctival grafts with advantages which include absence of donor site morbidity and the ability to clinically monitor tumour recurrence underneath the transparent AM.

2 patients had unilateral grade 4 chemical burns and vascularized corneal opacity along with symblepharon. 1 patient had 360 degrees LSCD and underwent autologous conjunctival limbal transplantation from the contralateral eye in addition to AMT. The corneal surface showed a complete and stable epithelialisation within a few weeks. Regression of neovascularisation was noted clinically. This is in accordance with Meller et al.<sup>(8)</sup> For a follow up of 8.8 months, 11 out of 13 eyes showed epithelialisation in 2 to 5 weeks. Eyes with grade II to III burns showed more visual improvement than those with grade IV. The transplanted AM promotes epithelialization of cornea and conjunctiva and also reduces vascularization, perilimbal inflammation and scarring. Advantages of AMT in reconstruction of the ocular surface enhance the success of subsequent limbal stem cell transplantation and/or penetrating keratoplasty.<sup>(9)</sup> Joseph et al<sup>(10)</sup> reported that AMT was not found to be useful in the restoration of the ocular surface in grade IV burns. 3 of the 4 eyes developed symblepharon and progressive corneal melt requiring urgent tectonic keratoplasty. In our study, 1 patient underwent successful optical penetrating keratoplasty 6 months later. 1 patient however, had corneal perforation 5 months later for which BCL and tissue glue was applied.

AMT was performed in 1 patient with pseudophakic bullous keratopathy. Symptomatic relief in the form of reduction in pain, photophobia and lacrimation was noted which was comparable to other studies.<sup>(11,12)</sup> Espana et al<sup>(12)</sup> performed AMT for 18 eyes with bullous keratopathy presenting with intractable pain or discomfort and poor visual potential. Pain relief was obtained in 15 patients. Corneal epithelial healing was complete in all except 1 eye. AM may also be used as a temporary measure in patients intolerant to BCL or those awaiting corneal transplantation.

1 patient with band keratopathy underwent AMT after superficial keratectomy and a decrease in pain and photophobia was noted post operatively. Corneal epithelialization was achieved in 3 weeks. Anderson et al<sup>(13)</sup> performed AMT in 16 eyes with band keratopathy after surgical removal of calcific deposits. 93.7% achieved epithelialization. Visual acuity improved in 44% of sighted eyes. Pain decreased in all cases.

AMT was performed in 1 eye with PED. AM was used as an overlay patch. After single layer AMT, the epithelial defect healed completely in 8 weeks but recurred. Letko et al<sup>(14)</sup> performed AMT in 30 eyes with PED. PED healed after first AMT in 70% and recurred in 29%. Among 22 eyes treated with an overlay graft, PED healed after AMT in 64% and recurred in 29%. Among 8 eyes treated with inlay AMT, PED healed in 88% and recurred in 2%. In PEDs that are refractory to conventional treatment such as lubrication and BCL, AMT may be considered as an alternative modality of treatment.

1 patient with corneal thinning and symblepharon resulting from ocular cicatricial pemphigoid underwent AMT. No recurrence was noted. The outcomes of AM for symblepharon associated with ocular cicatricial pemphigoid and Stevens Johnsons Syndrome are not as successful as those with stable non progressive cicatrization because of the chronic on going inflammation associated with these diseases.

Multilayer AM has been used to treat non traumatic microperforations and descemetocelles with upto 72.7% to 82.3% being reported.<sup>(15)</sup>

Small sample size was a limitation of this study. The use of fibrin glue instead of sutures to adhere AM to the ocular surface would have increased patient comfort and reduced surgical time.

## CONCLUSION

Due to easy availability, relative ease of surgery and avoidance of immunological rejection, AMT has become an attractive alternative for countries where there is shortage of donor corneal tissues. In our study AMT was successful in almost all cases. AMT is a safe and effective method of reconstruction of the ocular surface.

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