Ocular Surface Reconstruction with Amniotic Membrane Matrix in a Contact Lens Delivery System

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Background and Methods

Amniotic membrane (AM) is anti-inflammatory, anti-angiogenic and reduces scarring. These properties make it well suited for repair of persistent epithelial defects (PED) of the cornea [1]. Less invasive application of AM may allow more rapid and effective management of a variety of ocular surface pathologies. This is a retrospective non-comparative case series. Initial experience with AM matrix (AMM) Omnigen® and OmniLenz® for patients with non-healing PED at 2 UK centres are presented.

Case 1

A 51-year-old man with severe atopic eye disease on topical immunosuppression (cyclosporin 0.1%) and associated limbal stem cell deficiency (LSCD) requiring 2 previous right penetrating keratoplasties (PK) developed a right PED (See A). Initial right BCVA was 0.7 logMAR. Following seven applications of AMM BCVA improved to 0.5. AMM was able to main the ocular surface pending further intervention (LSC transplant).

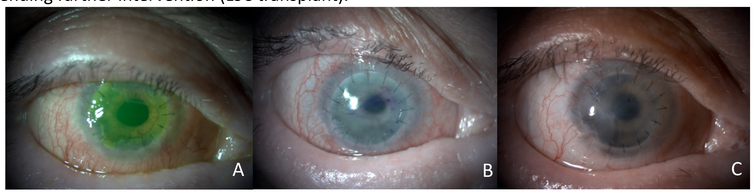


***Figure 1** – Slit Lamp Photographs of the Right Eye - A. Temporal Corneal ED B. AMM in situ C. Healed corneal ulcer*

Case 2

A 51-year-old lady with previous right PK for Lattice Dystrophy develops a PED. AMM was applied once to good effect stabilising the epithelial surface. Vision also improved from initial BCVA of 0.7 to 0.62 LogMAR. Six months after treatment with AMM the patient had photorefractive keratectomy for recurrent corneal erosions.

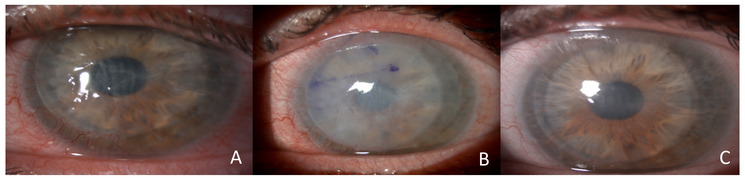


***Figure 2** – Slit Lamp Photographs of the Left Eye – A. Paracentral Corneal ED B. AMM in situ C. Healed ED*

Case 3

A 48-year-old man with ocular Graft Versus Host Disease (GVHD) presents with bilateral ED, worse in the left eye and vision of 1.2 right and 1.4 left. Despite optimal conservative management vision in the left eye deteriorated to hand movements. A 10mm AMM graft (Omnigen, NuVision, United Kingdom) was placed in a bespoke 16mm hydrophilic contact lens (OmniLenz, NuVision Biotherapies Ltd, United Kingdom) with sterile non-toothed forceps with the epithelium facing up. The AMM was rehydrated and placed on the left ocular surface (See B). Following application an area of epithelial remodelling was noted. After three months the epithelial defect had healed, and the AMM absorbed with a final visual acuity of 0.5 (See C).

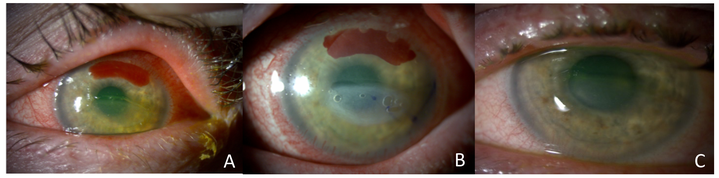


***Figure 3** - Slit lamp photographs of the left eye A. At first presentation Conjunctival injection, ED and superior subepithelial haemorrhage, hazy cornea B. AMM in situ C. Healed corneal ulcer*

Case 4

A 53-year-old man with psychosis developed bilateral ED secondary to self-inflicted chemical injury. Vision was CF and HM. AMM was applied after acute management and pH was normalised. Due to lockdown and sectioning of the patient, patient review was managed with telephone and virtual consultations during a 6-week period.

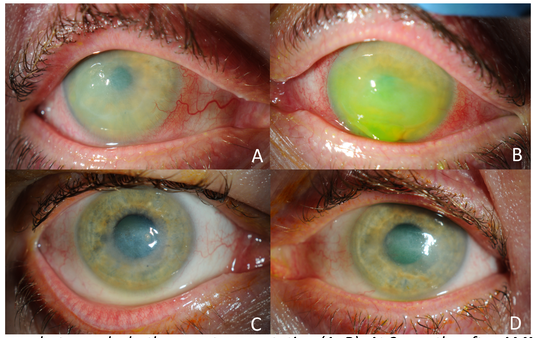


***Figure 4** - Slit lamp photographs both eyes at presentation (A, B). At 3 months after AMM application with full ED healing and focal stromal scars (C, D); vision improved to right 0.8 and left 1.0*

Results

Besides the four patients presented a further seven patients with PED were treated with AMM. The underlying pathologies of persistent ED were varied including chemical injury, high risk corneal transplantation, and ocular GVHD (see table 1).

Cause of ED	Number of Patients
Chemical injury	3
Herpes Simplex Keratitis	2
Atopic Corneal disease	2
Infective Keratitis	1
Ocular GVHD	1
Lattice Dystrophy	1

Baseline Treatments	Number (%)
Topical Lubricants	10 (100)
Topical Antibiotic	8 (80)
Serum Eye drops	2 (20)
Topical Steroids	9 (90)
VitaPos	5 (50)
Topical Antihistamine	1 (10)
Topical Immunotherapy	2 (20)
Systemic Immunotherapy	2 (20)
Oral Aciclovir	2 (20)
Oral Antibiotic	2 (20)
BT Ptosis	2 (20)
Tarsorrhaphy	3 (30)
Punctal Plugs	1 (10)

***Table 1 (above)** – Aetiologies of Persistent ED in patients treated with AMM*

***Table 2 (right)** – Management before AMM application.*

The mean number of AMM used was 3 per patient (range 1-9). All patients had satisfactory corneal healing after AMM application. The ED recurred in two patients due to compromised limbal stem cell function and there were no episodes of intolerance or keratitis.

Discussion

In select patients we have found AMM to be very helpful in promoting healing of persistent ED with improvement of symptoms and no reported complications. AMM was also useful as a temporising measure in patients who were otherwise not suitable for surgical intervention and/or were awaiting stem cell transplantation. Compromised limbal stem cell function limited long-term outcomes in some patients and led to recurrence of ED once the AMM was removed. We found that application via a contact lens delivery system was safe, effective and well tolerated and could be performed at the bedside if required.

Conclusions

AMM has shown great promise in our patients with PED as a consequence of severe ocular surface disease. The contact lens delivery systems provides a suture-less, minimally invasive option which can prove advantageous for select patients.

References

1. Gomes, J. A. P., Romano, A., Santos, M. S., Dua, H. S. Amniotic membrane use in ophthalmology. Current Opinion in Ophthalmology. 2005; 16(4): 233-240
2. Jirsova, K., Jones, G. L. A. Amniotic Membrane in Ophthalmology: Properties, Preparation, Storage and Indications for Grafting – A Review. Cell Tissue Bank. 2017; 18: 193-204