Miracles of Amniotic Membrane Graft in a Case of Severe Alkali Burn of the Eye

Dr. Raghav Malik¹, Dr. Sanjiv Kumar², Dr. V. K. Malik³

¹, ², ³Department of Ophthalmology, Subharti Medical College, India

Abstract: Chemical injury to the eye is a medical emergency and needs immediate attention. Else visual impairment invariable ensues. Alkali burns are much more harmful than acids. A 21 year old man presented with injury to his left eye with caustic soda (Strong alkali) and vision 1/60. Amniotic membrane graft was put over the cornea in conjunction with topical medication. At 9-month follow up, he had a BCVA of 6/9. We present such a medical miracle.

Keywords: Alkali, Amniotic membrane, Chemical, Graft

1. Introduction

Chemical injuries to the eye represent between 11.5%-22.1% of ocular traumas (1). About two thirds of these injuries occur in young men. The vast majority occur in the workplace as a result of industrial accidents. A minority of injuries occur in the home or secondary to assault. Alkali materials are found more commonly in building materials and cleaning agents and occur more frequently than acid injuries (2).

The purpose of Amniotic membrane graft (AMG) is to rapidly restore the conjunctival surface and to reduce limbal and stromal inflammation. We also wanted to observe the effect of the AMG on limbal ischaemia.

2. Case Report

A 21-year old Male patient came to the emergency of our hospital after accidental injury with caustic soda (An Alkali) over his left half of the body, including left half of face and the left eye, while working in a sugar factory. Following which, he complained of sudden, painless, diminution of vision. On examination, total Burn Surface Area (BSA) was 26%. On examination, Vision in R/E was 6/6. Vision in the L/E was 1/60.

Lids were normal in position, movements. Edema and Blisters were present on the skin. Conjunctiva showed marked Chemosis and congestion; Mucoid discharge was present. Cornea was normal in size and shape; Widespread sloughing of epithelium and diffuse opalescence was present. Limbus showed Ischaemia, present in Superior, Inferior and Nasal quadrants. Based on these findings, the injury was classified as a Grade III – IV chemical injury (Roper Hall). {Figure 1}

Immediate rinsing of the eye was done with ringer lactate for 30 minutes, followed by topical medication, which included E/D Moxifloxacin with Dexamethasone LE qid, E/D Atropine LE tds, E/D Carboxy Methycellulose LE qid, E/D Timolol + Brimonidine LE bd, E/O Chloramphenicol LE hs, Tab. Vitamin C TDS.

At the end of the 1st week, Amniotic membrane graft was placed on the cornea. Topical Dexamethasone (Strong steroid) was replaced with Loteprednol (A weaker steroid). Topical ointment was discontinued. Rest treatment continued as before.

AMG was left in-situ for 2 weeks, after which spontaneous expulsion of the AMG was seen, which was probably attributed to the patient rubbing his eye vigorously.

At the end of week 3, Epithelium started regrowing, outside inwards, except nasally. Resolution of limbal ischaemia followed the epithelium. Topical steroids were tapered. [Figure 2]
At the end of week 4, Only a small central area of denuded epithelium left. Nasal limbal ischaemia persisted [Figure 3]. Topical lotepredol was replaced with a locally acting steroid (Fluoromethalone).

At the end of 5 weeks, epithelium fully recovered, except a triangular area immediately adjacent to the area of nasal limbus. Area of limbal ischemia covered by a cystic swelling of conjunctiva. BCVA improved to 6/60 [Figure 4].

At the First follow-up (WEEK 8), Limbal ischaemia almost gone. Cystic swelling persisted. BCVA LE improved to – 6/60. [Figure 5]

At the 2^{ND} FOLLOW UP (WEEK 12), Conjunctival vessels seen encroaching the cornea. Conjunctival Cystic swelling reduced in size and the stain +ve area reduced further. BCVA 6/24P. (Figure 6)

On the 3^{rd} FOLLOW UP (WEEK 16), Epithelium healed completely. Conjunctivalisation of nasal cornea persisted. Conjunctival swelling gone. BCVA 6/12. (Figure 7)
At the 4th FOLLOW UP (WEEK 20), Central Cornea was clear. Conjunctivalisation of nasal cornea started to regress. BCVA ultimately improved to 6/9p. [Figure 8]

3. Discussion

Alkali agents are lipophilic and therefore penetrate tissues more rapidly than acids. They saponify the fatty acids of cell cell membranes, penetrate the corneal stroma and destroy proteoglycan ground substance and collagen bundles. The damaged tissues then secrete proteolytic enzymes, which lead to further damage (3,4).

Once the epithelium is compromised, alkaline solutions penetrate more rapidly into the underlying tissues, destroying proteoglycan ground substance and the collagen matrix. If the agent reaches the collagen fibrils of the trabecular meshwork, it can cause scarring inhibiting aqueous outflow, leading to secondary glaucoma. Strong alkaline agents penetrate into the anterior chamber and cause widespread inflammation of iris, lens, and ciliary body (5,6).

Subsequent progression of the injury and the healing process may fall anywhere between a highly active inflammatory process to a hyporeactive nonviable process due to complete tissue necrosis (7,8).

Identifying the stage of a chemical eye burn is particularly helpful in prediction of the outcome. Most importantly, the relative proportion of surviving limbal tissue has been shown to be a major prognostic factor. Several classifications have been proposed: the Roper-Hall classification system was initially developed in the mid 1960s, first by Ballen (9), and then modified by Roper-Hall (10). [Table 1]

Table 1: Roper-Hall classification for the severity of ocular surface burns

<table>
<thead>
<tr>
<th>Grade</th>
<th>Clinical Findings</th>
<th>Prognosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Corneal epithelial damage</td>
<td>No limbal ischemia</td>
</tr>
<tr>
<td>II</td>
<td>Corneal haze, iris details visible</td>
<td>&lt;1/3 limbal ischemia</td>
</tr>
<tr>
<td>III</td>
<td>Total epithelial loss, stomach haze, and iris details obscured</td>
<td>1/3-1/2 limbal ischemia</td>
</tr>
<tr>
<td>IV</td>
<td>Cornea opaque, iris and pupil obscured</td>
<td>&gt;1/2 limbal ischemia</td>
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</tbody>
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Amniotic membrane transplantation (AMG) can be used both as a graft which can provide a basement membrane for epithelialization and/or as a patch where it acts as a biological bandage contact lens (11,12,13). In addition, it is often used as an adjunct to medical therapy to decrease ocular surface inflammation and reduce scarring. Besides, multilayered AMG is an appropriate surrogate in severe corneal thinning (14,15). Further, amniotic membrane may also be applied to the cornea using a contact lens type.

4. Conclusion

Amniotic membrane grafting is a very effective method of managing chemical corneal burns with an alkali, given that it is placed as early as possible. However, Amniotic membrane must be placed in conjuction to other topical medication.

References


