Ocular Surface Burn – Can it be Cured?

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A 9 year old girl presented with decreased vision and whiteness on the cornea 9 months after a chemical injury induced after burst chuna packet. Total unilateral limbal stem cell deficiency was managed by performing single stage simple limbal stem cell transplantation (SLET) combined with large graft penetrating keratoplasty, cataract surgery and posterior chamber intra-ocular lens implantation. She regained 20/80 vision at 3 months. The ocular surface was stable and the cornea was clear. Further visual gain was limited due to anterior capsular opacification and amblyopia. Treatment of unilateral corneal blindness following ocular surface burns, once considered incurable, gives rewarding results. Early visual rehabilitation is essential to prevent amblyopia.

Keywords: ocular surface, cured, posterior chamber, intra-ocular lens

Case History

A 9 year old girl presented 9 months after chemical injury with lime powder from a burst ‘chuna’ packet, with complaints of painless decrease in vision for past 6 months. Her clinical records revealed that she had undergone a surgical procedure earlier which had a corneal perforation and cyanacrylate glue application.

At presentation, she had perception of light with inaccurate projection of rays. Clinical examination revealed 360 degree conjunctivalisation with total limbal stem cell deficiency (LSCD) (Figure 1). Anterior segment was not visible. Ultrasound biomicroscopy (UBM) was done to assess the anterior segment which showed open angles all around. It also revealed iris adhesions with the cornea centrally, evidence of the perforation that had happened earlier when cyanoacrylate glue had been applied (Figure 2). Ultrasonography revealed a normal posterior segment. The other eye was normal.

A diagnosis of unilateral total limbal stem cell deficiency was made. We performed a single stage surgery which included resection of the conjunctival pannus, penetrating keratoplasty, extracapsular cataract surgery with intra-ocular lens implantation and in-vivo expansion of autologous simple limbal epithelial transplantation (SLET). A 360 degree peritomy was done and the sclera was freed from all pannus. Once a plain of dissection was obtained, it was continued towards the cornea from all directions and the pannus was freed from the cornea. A 10 mm host...
trephination was made. Extracapsular cataract surgery was done and a 6.5 mm PMMA lens was implanted in the capsular bag. A 10.5 mm graft was secured with 24 interrupted monofilament nylon sutures. For SLET, a 2x2 mm limbal biopsy was harvested from the superior limbus of the contralateral eye. This tissue was cut into 16 small pieces and transplanted on the recipient eye on a human amniotic membrane graft. These tiny ‘explants’ were secured with fibrin glue (Tisseel Kit; Baxter AG, Vienna, Austria).

On post-operative day 1, a large pool of blood was found under the amniotic membrane. However both the amniotic membrane over the ocular surface and the tiny explants on the amniotic membrane were nicely stuck (Figure 3). Over the next 4 weeks, the blood dissolved and the corneal surface epithelialised. At 6 months, her best corrected visual acuity was 20/80. A completely epithelised, avascular and clinically stable corneal surface was seen with normal anterior and posterior segment and no evidence of recurrence of LSCD in either donor or recipient eye. (Figure 4) The patient had an opacified anterior capsule which prevented further visual clarity. The optic nerve was now visible and was normal.

Discussion
This case represents a typical scenario of limbal stem cell deficiency (LSCD) in India occurring due to exploding lime pouches resulting from the popular practice of domestic consumption of lime as an adjunct to tobacco and betel nut chewing. Most of these innocent victims are children. These injuries lead to varying degree of LSCD, unilateral or bilateral.1,2

Graft survival of penetrating keratoplasty in lime burns is dismal- 33-46% at 1 year and 0% at 3 years.3 Treatment of limbal stem cell deficiency necessitates limbal stem cell transplantation. Sangwan et al4 have proposed a novel simplified technique of limbal transplantation, in-vivo cultivation of autologous limbal epithelial cells (Simple Limbal epithelial Transplantation-SLET), which combines the advantages of conjunctival limbal autografting (CLAU)5 and cultivated limbal epithelial transplantation (CLET)6 by being a single-stage, easily affordable procedure which utilizes a minimal donor tissue and does not need a stem cell laboratory for cultivation of limbal epithelial cells. Besides, it offers a better success rates than autologous CLET in both adults (76% vs 71%) and children (74% vs 37%).7

A two-stage approach of performing autologous CLET followed by penetrating keratoplasty (PK) has been found to be better in successfully restoring the ocular surface stability and vision in eyes with unilateral LSCD due to ocular burns.8 However, our patient had a perforated cornea with cyanoacrylate glue application done elsewhere prior to presentation. Hence a decision to perform a penetrating graft was done with SLET.

The final best contact lens corrected visual acuity in our patient was 20/80. Reasons for the limited visual acuity were anterior capsular opacification and possible amblyopia induced due to the history of visual deprivation for the last 1 year. Early visual rehabilitation in children is paramount even if we consider the long-term prospects not being great. This prevents the children from visual deprivation amblyopia that might set in very soon.9 The major long term challenge in these cases is the survival of the ocular surface. Even trivial trauma to the ocular surface is best avoided since the regenerative potential of ocular surface is limited. Further, problems of the large graft like glaucoma, graft rejection are known and need to be looked for at follow-up visits.

To conclude, treatment of unilateral corneal blindness following ocular surface burns, once considered incurable, gives rewarding results. Early visual rehabilitation is, however, essential to prevent amblyopia.

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