Five months following ex vivo stem cell transplantation, the eye undergoes a penetrating keratoplasty and resulted in a satisfactory restoration of the ocular surface and visual eye and then applied, acting as a bandage on the eye to conjunctival proliferation. After the graft had been completed, histological and DNA fingerprinting examinations were subsequently conducted to establish whether the cultured donor cells had survived.

The DNA fingerprinting showed that donor cells survived on the cornea over the first three to four months, but that the impressive epithelial recoveries over the longer term seemed to be due to the patient's own cells.

Retrospective study confirms efficacy

This outcome was confirmed by a retrospective study carried out by Dr Daya and his team on 10 eyes of 10 patients with profound limbal stem cell deficiency arising from conditions such as ectodermal dysplasia, Stevens-Johnson syndrome, chemical injury, thermal injury and rosacea blepharoconjunctivitis.

Allogeneic corneal limbal stem cells were again cultured on plastic and transplanted to the recipient eye after removal of conjunctival pannus and amniotic membrane was applied in a bandage capacity. The procedure was combined with other reconstructive surgery in two cases, said Dr Daya. Nine patients received systemic cyclosporine A immunosuppression, and the DNA genotype was investigated with surface impression cytology.

Over a mean follow-up period of 28 months (range 12-50 months), seven of 10 eyes had improved parameters of limbal stem cell deficiency at final follow-up and were considered successes. Four had improved visual acuity, including three patients who underwent further procedures for visual rehabilitation. Three patients failed to improve – one with a thermal burn and lid deformity, one with Stevens-Johnson syndrome and severe dry eye, and one with ectodermal dysplasia who developed an epithelial defect at 26 months. DNA analysis of the first seven cases showed no ex vivo donor stem cell DNA present beyond nine months.

The implication of these results is that long-term immunosuppression following surgery may not be necessary, said Dr Daya. This result has come as a surprise and the implications are the potential to regenerate other forms of tissue from the body's own stem cells using a similar technique.