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Envisaging an allogenic Corneal endothelial precursor/Stem Cell Bank (CESBANK)

Parikumar P^{*1}, Nelson J², John S², Baskar S³, Senthil KR³, Murugan P³, Senthil Nagarajan R³,
Srinivasan V³, Abraham S^{3,4}, Amano S⁵

¹The Light Eye Hospital, Dharmapuri, India.

²Joseph Eye Hospital, Trichy, India.

³Nichi-In Centre for Regenerative Medicine, Chennai, India.

⁴Yamanashi University - Faculty of Medicine, Chuo, Japan.

⁵Tokyo University-School of Medicine, Tokyo, Japan.

* Dr. P. Parikumar, The Light Eye Hospital, 39D, By-pass Road, Dharmapuri Lodge Compound, Dharmapuri,
Dharmapuri Dist, India. Email: pparikumar@yahoo.com

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Background:

Bullous Keratopathy (BK) affects thousands of people in India every year. Though in early stages it is manageable medically, advanced disease warrants either total corneal transplantation or partial thickness transplantation for which a donor-cadaver cornea is necessary. Amano et al have reported the successful treatment of BK in animal models using in-vitro expanded human corneal endothelial precursors; though the rabbits had to be kept facing eye down to allow gravity assisted settling of the cells to the summit of the cornea where the damage had been created. For successful treatment using the above method, a human being has to lie prone with eyes immobilized for 24-36 Hrs. This is extremely discomfoting and hence not practical. Corneal endothelium removed from the button and transported at varying temperature conditions for 48Hrs was successfully cultured in NCRM and this was

reported earlier. We are working on a suitable scaffold to retain the cells in situ until their attachment to the damaged portion of the corneal endothelium enabling it to heal without the patient having to lie prone. With such capability, we envisage to make a corneal endothelial precursor/stem cell (CES) bank named as CESBANK to make in-vitro expanded CES available for patients with corneal diseases, most commonly Bullous Keratopathy (BK).

Materials & Methods for the project:

The CESBANK will have a (i) Total ophthalmology diagnosis clinic, (ii) Operation theater and an out-patient clinic equipped for handling corneal procedures, (iii) An in-patient ward for post-CES transplantation patients, (iv) A cGMP cell screening, serology, immunology & molecular characterization lab, (v) Cell processing, expansion and

cryopreservation lab, (vi) An eye bank, (vii) Documentation & networking facility (viii) Teaching accessories with lecture rooms, web & telecon capability (ix) A world class faculty for clinical & research projects. Earlier proven methodologies of corneal endothelial harvesting will be undertaken in CESBANK along with the collaborating hospitals. Studies comparing presently available scaffolds with novel nanomaterials for the application of CES into the affected portion of the eye will be undertaken. Long term cryopreservation and transportation to and fro from longer distances will be standardized to enlarge the network.

Expected Outcome:

Ninety thousand patients are in the backlog every year, waiting for corneal transplantation in India, of which 30,000 may benefit from CESBANK. The CESBANK, as per the present plan, would be able to provide expanded CES for at least 14000 eyes to be treated every year when fully functional, provided it gets adequate number of donor eyes.

Conclusion:

The present project when implemented could make one donor eye be usable to more than 5 to 14 recipient eyes. By increasing the awareness for eye donation, more patients with corneal endothelial diseases awaiting donor cornea could be treated.