SUMMARY

Stem cells are cells capable of unlimited division during the life of the organism-giving rise to progeny that enter a differentiation pathway with subsequent terminal differentiations.

Limbal basal cells are considered primitive because they contain few products of differentiation. They have a slow cell cycle under homeostatic conditions but have the capacity to increase their mitotic rate in response to injury.

During mitosis, one daughter cell replenishes the stem cell pool and the other daughter cell enters the definition pathway to become a TAC. Limbal basal cells can thus the considered to fulfill the general characteristics normally associated with stem cells.

Insufficient corneal epithelial stem cells in the limbal regions can arise for a number of reasons. For example, congenital abnormalities, such as aniridia, are accompanied by stem cell deficiencies. Limbal cells can also be absent because of chronic conditions like radiation keratitis, durg toxicity and ocular cicatrical pemphegoid. An injury, too, can deprive and eye of its limbal epithelial cells, and most often this tends to be of a chemical nature.

Previously the patients with severe ocular surface disorders (OSD) had a very poor prognosis. The available techniques for ocular surface reconstruction at that time consisted of lamellar and penetrating keratoplasty, tarsorrhaphy and artificial tears. The outcome of keratoplasty was uniformly poor due to recurrence of ocular surface failure. The current approach to severe OSD is based on a scientific

understanding of the role played by limbal stem cells in corneal surface maintenance. Several clinical trials provided evidence to provegrafting viable limbal tissue, either from fellow healthy eye or a donor eye, with the resident stem cell population may replenish limbal stem cells (LCS) and may restore the corneal surface to normality. Transplanting the limbal tissue can be achieved through a variety of procedures that include cadaveric keratolimbal allorgraft (KLAL), live or living related conjunctival limbal allorgraft (Ir-CLAL) and limbal auto graft. Also, Amniotic membrane transplantation (AMT) offers a simple and effective approach to restore ocular surface abnormalities resulting from partial stem cell deficiency, as it is not effective in treating total stem cell deficiency, even when it is combined with limbal transplantation.

Advances in tissue engineering techniques have offered a viable alternative to overcome the limitation of limbal tissue available for transplantation. Much interest has been generated by the prospect of re-implanting ex vivo expanded limbal stem cells as a techniqued to replenish the corneal surface. Various centers have reported the successful use of cultured limbal epithelial stem cells for reconstructing the damaged ocular surfaces. However, the technical difficulties of handling and transferring the fragile epithelial sheets led to a search for a carrier to transfer cultured epithelium.

Investigators have cultured the limbal stem cells as explants cultures using either the human amniotic membrane (HAM) with its epithelium or denuded, which proved to be of better results, or other substrates such as fibrin, extra cellular matrix protein (fibronectin, laminim, collagen IV) coated pertridishes, corneal stroma and temperature responsive gels to culture the limbal epithelial cells and for their probable application in ocular surface reconstruction.

Retinal stem cells are multipotent central nervous system precursors tat give rise to the retina during the course of development. Retinal stem cells are present in embryonic eye cup of all vertebrate species.

The approaches to treat degenerative changes of the retina due to diseases or injury are categorized into an ex vivo and I vivo these approaches may be applicable, for treating degenerative changes in the retina associated with diseases such as retinitis pigmentosa, age related macular degeneration and Glaucoma.

However, there is a barrier to use of embryonic retinal stem cell/ progenitors that may make their clinical use rather impractical. For these reasons there are attempts in various labs to identify alternate sources (ocular- extra ocular) for generating retinal cells and study the putative mechanism tat regulate the efficiency and fidelity of retinal differentiation from heterologous cells.