Theme 3: Emerging Technologies

AB009. Regenerative medicine—stem cell delivery for retinal disease

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Abstract: Vision loss in retinal disease is often secondary to neural cell loss. Neural loss of any type including that of the retina has always been considered irreversible as these cells rarely retain the ability to regenerate. The recent identification of stable stem cell sources and the advances in stem cell technology have transformed this area of research science into an important area of strong therapeutic possibility. These sources include human embryonic stem cells (hESC), induced pleuripotent stem cell sources (iPS) as well as adult sources. The main advantage of using a stem cell source is that there is an infinite capacity to reproduce and therefore an infinite capacity to produce cells, including neural cells for transplantation. The challenge more recently has been to transform these stem cells into differentiated cells that are useful for transplantation in disease. In terms of the retina, hESC have been successfully developed into retinal pigment epithelial cells. These cells have been characterised as identical to native human RPE cells structurally, functionally and biochemically. Previous studies of macular translocation and RPE/choroidal transplantation have shown that vision loss from AMD can be reversed. Early animal studies show that the transplanted HESC RPE survive and can prevent vision loss in animal models of disease. Initial hESC based RPE transplantation trials using suspension cultures were successful in demonstrating safety of the cells in the context of disease and sub-retinal delivery. More recently, we have carried out the first 2 transplantations of sheets of hESC based RPE on a coated artificial Bruch's membrane, in the London Project's RPE transplantation trial, with promising results. As well as RPE— Bruch's transplantation I will also briefly discuss the recent advances in neuro-retinal and vascular reconstructions using stem cells.

Keywords: Retina, pleuripotent stem cell, differentiation, RPE, transplantation

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