Retinal cell transplantation using iPS cells

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The first in man application of iPS-derived cells started in September 2014, targeted age-related macular degeneration (AMD). AMD is caused by the senescence of retinal pigment epithelium (RPE), so that we aimed to replace damaged RPE with normal, young RPE made from iPS cells. We judged the outcome 1 year after the surgery. Primary endpoint was the safety, mainly the tumor formation and immune rejection. The grafted RPE cell sheet was not rejected nor made tumor after two years. The patient’s visual acuity stabilized after the surgery whereas it deteriorated before surgery in spite of 13 times injection of anti-VEGF in the eye.

Although autologous RPE sheet transplantation is scientifically best approach, it is time consuming and expensive and it is necessary to prepare allogeneic transplantation to establish a standard treatment. RPE cells are suitable for allogeneic transplantation because they suppress the activation of the T-cell. From in vitro and in vivo study, it is possible that the rejection is considerably suppressed by using the iPS cell with matched HLA. Our new protocol has accepted by ministry in Feb 2017. We are planning transplantation using allogeneic iPS-RPE cell suspension & sheet, and also autologous iPS-RPE. For the cell suspension transplantation we will not combine CNV removal and apply to milder cases than sheet transplantation.

In Japan, pharmaceutical law has been changed and a new chapter for regenerative medicine was created for clinical trial. Also the separate law for safety of regenerative medicine for clinical research (study) was enforced in 2015. These laws made the suitable condition for the brand new field of regenerative medicine. We are making regenerative medicine in co-operation with ministry & academia.