

Human mesenchymal stem cells expressing erythropoietin enhance survivability of retinal neurons against oxidative stress : an in-vitro study

ABSTRACT

Retinal degeneration is a prominent feature in ocular disorders. In exploring possible treatments, Mesenchymal Stem Cells (MSCs) have been recognized to yield therapeutic role for retinal degenerative diseases. Studies have also displayed that erythropoietin (EPO) administration into degenerative retina models confers significant neuroprotective actions in limiting pathological cell death. In this study, we aimed to use MSCs to deliver EPO and to evaluate the ability of EPO to rescue retinal neurons from dying upon reactive oxidative stress induction. We derived human MSCs from Wharton's jelly (hWJMSCs) of the umbilical cord and cells were transduced with lentivirus particles encoding EPO and a reporter gene of green fluorescent protein (GFP). The supernatants of both transduced and non-transduced cells were collected and used as a pre-conditioning medium for Y79 retinoblastoma cells (retinal neuron cell line) following exposure to glutamate induction. Retinal cells exposed to glutamate showed reduced mitochondrial depolarization and enhanced improvement in cell viability when incubated with pre-conditioned media of transduced cells. Our results established a proof-of-concept that MSCs could be used as a candidate for the delivery of EPO therapeutic gene in the treatment of retinal degenerations.

Keyword: Wharton's jelly; Erythropoietin; Mesenchymal stem cells; Ocular disorders; Oxidative stress; Retinal neurons