

Subretinal Schwann Cell Injections Preserve Plexiform Synapses and Retinal Function in RCS Rats

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PURPOSE

To examine the preventive potential of subretinal injections of neurotrophin producing cells (Schwann cells) on retinal circuitry in the RCS (Royal College of Surgeons) rat model of progressive retinal degeneration.

METHODS

Schwann cells isolated from human peripheral nerve roots were injected as a suspension into the subretinal space of 21 day old RCS rats. Eyes were fixed at 70, 90 days and 120 days of age and prepared for immunocytochemistry. ERG was recorded at the different time points.

RESULTS

Cell injections preserved photoreceptors: up to 6 cells thick layer compared with no more than one layer in areas remote from the subretinal injection site. Normal retinal cell morphology was preserved in the area of injection. Furthermore, pre- and post-synaptic markers (bassoon, synaptophysin and mGluR6) showed normal paired contacts between both preserved rods and cones and their respective bipolar cells and with horizontal cells. Inner plexiform connectivity patterns involving rod bipolar axon terminals and amacrine cell dendrites also had normal configurations. The ERG b-wave, which requires photoreceptor synapses onto mGluR6 bearing bipolar cells, was also preserved up to 120 days of age.

CONCLUSION

Schwann cell, injected subretinally, prevent the deterioration of synaptic connectivity in both plexiform layers and the loss of ERG b-wave that normally occurs in RCS rats. Whether this is due to indirect effects associated with photoreceptor preservation or to a direct effect on inner retina cells remains to be elucidated.