

Ultrastructural analysis of streptozotocin induced sequential changes in the rat retina

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This study was conducted to evaluate morphological changes in the neural retina caused by diabetic retinopathy. Rats were injected with streptozotocin in dose of 60mg/kg body weight via femoral vein. The animals showing high glucose level (over 200 mg/dl) were cared for 1, 4, 12, and 24 weeks. The retinas were dissected out and processed for electron microscopy. The first sign of streptozotocin effects in the retina were defined as myelinated and multivesicular features of mitochondria at 1 week. Degenerating mitochondria showing these features appeared in a few photoreceptors and their post-synaptic processes in the outer plexiform layer and in some axon terminals in the inner plexiform layer (IPL) near the capillaries at this time. Nerve terminals containing degenerated mitochondria were mainly observed near the stout radial processes of Mueller cells in the IPL by 4 weeks. A few ganglion cells were also found to be in necrotic changes at this time point. At 12 weeks, photoreceptor cells showing apoptotic figure appeared. The most outstanding findings of this study was that the outer nuclear layer was reduced to 2 or 3 cell layers at 24 weeks. In lamina 5 of the IPL near the degrading ganglion cells, the nerve terminals scrolled with fine processes of Mueller cells, and ganglion cells, terminals with degenerating mitochondria were also remarkable. Time course of these neuronal changes suggests that different types of retinal neurons require different energy metabolism. Morphological changes caused by streptozotocin were characterized by mitochondria defect in some neurons, photoreceptor cell loss and ganglion cell death time sequentially.