Retinal degeneration rat model: a study on the structural and functional changes in the retina following injection of sodium iodate

ABSTRACT

Retinal disorders account for a large proportion of ocular disorders that can lead to visual impairment or blindness, and yet our limited knowledge in the pathogenesis and choice of appropriate animal models for new treatment modalities may contribute to ineffective therapies. Although genetic in vivo models are favored, the variable expressivity and penetrance of these heterogeneous disorders can cause difficulties in assessing potential treatments against retinal degeneration. Hence, an attractive alternative is to develop a chemically-induced model that is both cost-friendly and standardizable. Sodium iodate is an oxidative chemical that is used to simulate late stage retinitis pigmentosa and age-related macular degeneration. In this study, retinal degeneration was induced through systemic administration of sodium iodate (NaIO3) at varying doses up to 80 mg/kg in Sprague-Dawley rats. An analysis on the visual response of the rats by electroretinography (ERG) showed a decrease in photoreceptor function with NaIO3 administration at a dose of 40 mg/kg or greater. The results correlated with the TUNEL assay, which revealed signs of DNA damage throughout the retina. Histomorphological analysis also revealed extensive structural lesions throughout the outer retina and parts of the inner retina. Our results provided a detailed view of NaIO3-induced retinal degeneration, and showed that the administration of 40 mg/kg NaIO3 was sufficient to generate disturbances in retinal function. The pathological findings in this model reveal a degenerating retina, and can be further utilized to develop effective therapies for RPE, photoreceptor, and bipolar cell regeneration.