Assessing Visual Functions in Children with an Optic Pathway Glioma using Steady-State Visual Evoked Potentials

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Optic Pathway Gliomas (OPG) represent 4-6% of brain tumors in children. Magnetic resonance imaging (MRI) and visual acuity are usually used to evaluate clinical evolution and treatment response. Since the goal of treatment is to preserve vision, it is important to develop new rapid, reliable, and non-invasive techniques to objectively measure the integrity visual functions in patients with optic pathway gliomas. Treatment is prompted by neuroradiological evidence of tumor growth, usually associated with progressive visual loss. Despite therapy, approximately 40% will show visual deterioration. However, currently used visual-field assessment methods are unreliable for children with optic pathway gliomas who have limited collaboration. Thus, there is a need for new clinical tools to evaluate visual functions in these children. The goal of the study was to assess if steady-state visual evoked potentials can become a valuable tool to measure central and peripheral visual field processing in children with optic pathway gliomas. Ten patients with optic pathway gliomas and 33 healthy controls between the ages of 3 and 18 years were tested using steady-state visual evoked potentials. The stimulus was a circular checkerboard pattern consisting of one central circle alternating at 16 hertz and one peripheral hoop alternating at 14.4 hertz, separated by a hoop of gray space. The same stimulus was presented at two different contrast levels to maximize sensitivity (30% and 96% contrasts). Results indicated that the magnitude of central steady-state visual evoked potentials were significantly lower in children with optic pathway gliomas compared to healthy controls ($p = 0.001$). However, no significant group differences were detected in the peripheral visual field. Thus, steady-state visual evoked potentials could eventually be implemented in the clinical assessment and follow up of central visual field deficits in uncooperative or non-verbal children, but seem to have limited usefulness for evaluation of peripheral visual field deficits. Additional studies are needed to identify testing parameters for full visual-field assessment.