Preliminary Findings of FMRI in Congenital Nystagmus

Abstract

Purpose: To identify the anatomical correlates associated with congenital nystagmus, by capitalizing on the null/semi–null zone compared to the gaze angle where the nystagmus was enhanced.

Methods: Subjects included 5 with congenital nystagmus (CN) (age 13–45, mean VA 0.50 LogMAR) and 5 normal controls (age 11–33, mean VA –0.10 LogMAR). High–resolution and echo planar images were acquired of the whole brain on a 1.5 Tesla imager (GE Medical Systems NVi, OS 8.6). The eye movements of the CN subjects were characterized by external infrared eye movement recordings to determine the waveforms and null/semi–null zone of gaze. A functional block paradigm (8 blocks, 24s each) was used to isolate the nystagmus–associated
activation by capitalizing on the null zone as the low activation condition. Each block involved fixation on a single, 1–degree visual angle diameter white dot on a dark background using a back–projection system. The dot changed position between blocks from the center (normals) or null/semi–null zone (CN) and either left or right 10 degrees. All subjects were instructed to fixate on the dot throughout each exam. Data were processed using FSL 3.1 (Image Analysis Group, FMRIB, Oxford, UK) and regions of activation were analyzed using cluster–based thresholding statistics using $Z > 3.0, p=0.01$.

Results: Regions of activation corresponding to alternating fixation between center (or null/semi–null zone for the nystagmus subjects) and ± 10 degrees were compared for each CN and normal control subject. Regions of activation within the visual cortex and midbrain structures varied between left and right fixation in the congenital nystagmus subjects.

Conclusions: The proposed novel paradigm of capitalizing on the null/semi–null zone, often present in congenital nystagmus, may yield important insight into the anatomical correlates of congenital nystagmus. These structures may involve yet–to–be identified midbrain anatomical correlates. The novel paradigm may be used to explore additional types of nystagmus including latent nystagmus.
Keywords: nystagmus • ocular motor control • imaging methods (CT, FA, ICG, MRI, OCT, RTA, SLO, ultrasound)