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Opinion

The Visual - Postural Integration Test - The New Method

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Introduction

Abnormal perception of moving surroundings has a destabilizing influence of postural reflexes. The cause is the mismatch of information from the visual, vestibular and somatosensory receptors. [1] For correct form of the postural reflexes consensus of afferent information from otholites, canals and proprioception are essential. Postural body sway in saccadic, smooth pursuit and optokinetic tests is a result of increasing vestibular and somatosensoric detection level during induced eye movements. [2] The modeling centers for afferent and efferent neuromuscular control are located mainly in mesencephalic and ventricular formation of pontis structures of central nervous system. Afferent information are transmitted to the parietal and occipital lobes. Efferent informations are going down to mesencephalic centers and reticular formation of the medulla oblongata. This multineuronal mechanism is integrated with cerebellum. [3] Horizontal or vertical rotation of the surroundings, for example horizontal optokinetic visual induction, causes body deviation in direction to the slow phase of optokinetic induction. In the cases of otolith - canal disturbances visual - postural integration test is useful for searching subclinical balance disorders.

We propose the test which consists of examination: a. without visual stimulation b. with eyes closed c. with visual stimuli - eyes in a head position d. eyes turned to the left and right extreme position. [5-4] The essence of posturographic measurement is the determination of the trajectory of the foot pressure center (COP). Patient head must be in vertical position to preserve producing pseudo - Purkinye effect during optokinetic stimuli. In the test amplitude and speed of body sway are analyzed. [6-5] Current research concerns the effect of visual optokinetic stimulation on the human body sways during long-term (several minutes) measurement on the force plate. We propose short-term (up to 2 minutes) test where vertical and horizontal stripes, pendulum and saccades are used as visual stimuli. The angular velocity of the moving virtual images ranges from 10 to 40 degrees per second. The software in Pascal (Delhi) and the OpenGL library is used for rendering the images. For increasing fluidity, monitors with increased refresh rate (240 hz) are used. The image frame rendering frequency is synchronized with the display cycle of the monitor using the V-sync technique. This made it possible a smooth image to be viewed without tearing, jerks or inconsistencies between the bottom and top of the screen.

The evaluation of the COP trajectory is performed in 32 or 16 second intervals. In each section, the average sway radius, developed area and trajectory length were determined. One must remember that in visual - postural integration test using static posturography and saccadic, smooth pursuit or optokinetic stimuli visual acuity, suitable distance between patient and moving targets, form and seize of target are essential. In situations of weak visual acuity or non appropriate targets, results of the test may be false. For geometric reasons the relative retinal shift of viewed scene is suitable for critical distance 1 meter. Changing in the size of target, larger distance or chaining in disparity have a disturbing influence on the results of examination. [4-6] One must keep in mind that sagittal body sway is higher than lateral. This is a result of body anatomical configuration and feet position. At a frequency 0,5 Hz of moving target stabilization of posture is preserved among healthy population. On the other hand disturbances during this short-term test will show subclinical balance disorders which source is situated in central nervous system structures.

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