Dynamic Visual Acuity

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Dynamic visual acuity (DVA) measures the difference between the visual acuity when the head is stationary and when moving. This is an assessment of the ability to stabilize the image that is projected on the retina when the head moves. This is very physiological because in our daily activities, we regularly solicit our vision without having a strictly stationary head.

The image stabilization during head movement requires eye movement in the opposite direction but equal to that of the head speed. This stabilization of our gaze on a visual target fixed during head movements may involve several mechanisms: the vestibulo-ocular reflex, the attachment system-pursuit eye, eye saccades, the optokinetic system, cervical proprioception. It requires more healthy orbital mechanics.

Data from the literature show that a speed difference of the head and eyes than 4 ° per second degrades the image stabilization on the retina and decreased visual acuity.

The equipment used (DVA-FRAMIRAL) has a helmet equipped with a sensor measuring the precise movements of the head in three planes of space. Letters or drawings of various sizes (optotypes validated) are displayed on the computer screen, or continuously to allow a measure of visual acuity fixed head, only when the speed of movement of the head is included between two programmable limits. In addition, the visual target is displayed only if the head speed is reached in a preselected direction. It is thus possible to select specifically head movements in the horizontal plane to the left or right in the vertical plane up or down, during lateral tilting of the head or specifically in the plane of a semi-circular canals. The examiner can see the speed at which it rotates the head of the subject and be assured that this speed is sufficient time within predefined limits to allow the identification of the visual target. A procedure can also detect unreliable results in subjects who would simulate a drop in DVA..

In the absence of alteration of the orbital mechanics, measurement of the DVA reflects mainly the effectiveness of vestibular-ocular reflex when the measurements are performed during rapid head movements (> 100 ° / second) and not predictable by the subject. At these speeds, the attachment system-pursuit eye, cervical proprioception, and optokinetic system cannot provide a stable image on the retina. In addition, the methodology used, the extent of the DVA is indifferent to the presence or absence of catch-up saccades. Indeed, the determinant of image stabilization on the retina is the proximity speeds the eye and head velocities are very different in the presence of a deficit of vestibulo-ocular reflexes, but also for the jerks to catch up. If the end of the head movement, the deficit of vestibular-ocular reflex is overtaken by a saccade correction, a measure of the amplitude gain of the vestibulo-ocular reflex could be erroneously considered normal. The correct position of the end eye of head movement cannot influence the measurement of the RHF since visual target is projected during the head movement. The DVA test is a measure of the gain of the vestibulo-ocular reflex speed and not in amplitude.
The advantage of dynamic visual acuity is its direct relationship with the complaints of oscillopsia (Badaracco et al., 2010), the ability to make lateral or vertical measurements not only during rotational movements of the head but also lateral tilt, translation and in similar to that of daily life such as walking on a treadmill or on-site physical activity. The measurements made during movements in vertical planes are particularly representative capacity Stabilization look when walking.

The literature data confirm the good correlation between the measurements of the dynamic visual acuity and the gain of the vestibulo-ocular reflex in both horizontally and vertically or laterally. This correlation is also demonstrated in isolated with vertical channels as during surgical occlusion of an upper channel (Schubert et al., 2006). These data demonstrate the excellent discriminative ability of this measure among the control subjects, subjects with unilateral and bilateral labyrinthine deficit (Tian J, 2002).

Because of its direct relationship with the symptoms of oscillopsia, the DVA has its place in therapy. Vestibular rehabilitation exercises have shown their positive effect on the recovery of the DVA (SJ Herdman, 2007). If labyrinthine deficit unilateral partial peripheral and central mechanisms allow the gradual improvement of the gain of the vestibulo-ocular reflex ipsilateral and DVA.

We present the results obtained in 120 control subjects, in patients with a unilateral or bilateral labyrinthine deficit in neurological and eye damage. We also present the correlations between measures of dynamic visual acuity and video head impulse test in the same patients.

References