

Video Head Impulse Test (vHIT): Main Concepts

Short Communication

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Abbreviations: SCC: Semi Circular Canals; VOR: Vestibulo Ocular Reflex; ms: milliseconds; vHIT: video Head Impulse Test; RALP: Right Anterior-Left Posterior; LARP: Left Anterior-Right Posterior

Introduction

Balance is maintained by a complex set of systems that include sensory input from proprioception, visual and vestibular system. The vestibular system has two parts: the otoliths (linear acceleration) and the semicircular canals (SCC) (head angular acceleration). This group of organs activates many reflexes, such as the Vestibulo Ocular Reflex (VOR). This reflex is responsible for stabilizing images on the retina during head movement by producing an eye movement in the opposite direction to head movement, thus preserving the image on the center of the visual field. It involves a 3-neuron arc that consists of the vestibular ganglion, vestibular nuclei, and oculomotor nuclei. With a latency period of only 8 to 12 milliseconds (ms), the VOR is considered the fastest reflex in humans.

Supported on this mechanism the VOR can be evaluated using an equipment for recording the movement of the eyes and find quantitatively responses about this reflex, based on the gain between eye velocity/head velocity. The normal value is equal to one for healthy subjects.

Concept

Nowadays, it is observed a growing of test for vestibular system evaluation. One of them evaluates all semicircular canals and it is called video Head Impulse Test (vHIT) [1]. The vHIT allows the verification of the SCC dynamic function. It consists of monitoring eye movements as the patient fixates on a stationary target while the head is moved. The methodology is applying a passive high speed head rotation and immediately brief which permits a quantitative record by a digital video camera [2].

After the test, besides the gain, it is possible to verify presence of normal or abnormal eye movements. As abnormal responses, catch up saccades, are classified as overt and covert saccades. Catch-up saccades reposition the eyes on the target. Overt saccades occur after head impulse and covert saccades typically occur toward the end of head impulses because of the saccadic latency. It is important to regard that covert saccades are very fast and they occur during the head rotation. Without the vHIT it is almost impossible to detect by the naked eye. As advantages of the test, could be mentioned that it has a lower cost, shorter test time, greater portability, and increased patient comfort, comparing to the others. But it is classified as a complementary test for the vestibular pathology diagnosis.

Horizontal vHIT

The responsible for the evaluation needs to hold the head from

the patient with both hands, and incline it 30 degrees to maintain the horizontal canal parallel to the ground, permitting the best stimulation of them. Passive high speed head rotation around 5 to 10 degrees, alternating left and right at random mode. The patient would be able to keep the eyes fixed on target. It is important that the direction be unpredictable and timing [3].

Verticals vHIT

The vertical canals paired are: right superior with left posterior and left superior with right posterior. This is explained because they lie in planes approximately 45 degrees to the sagittal plane of the head. Vertical head impulses were delivered by the clinician in the following manner: The patient was seated so that their body faced the target on the wall but with their head turned to be positioned about 35 degrees to the left for testing in the right anterior-left posterior (RALP) plane or 35 degrees to the right for testing the left anterior-right posterior (LARP) plane [4].

Conclusion

The complexity of the human balance system creates challenges in diagnosis. The possibility of examining each of the six semicircular canals separately introduces a revolutionary change in clinical neurotology and may in time contribute to newer diagnostic possibilities, particularly when associated with the electrical responses of the saccule and utricle (cervical and ocular VEMP) [5-8]. But, it is important to salient that, vHIT is a complementary test, which adds information for the vestibular evaluation.

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