WSR VATplus

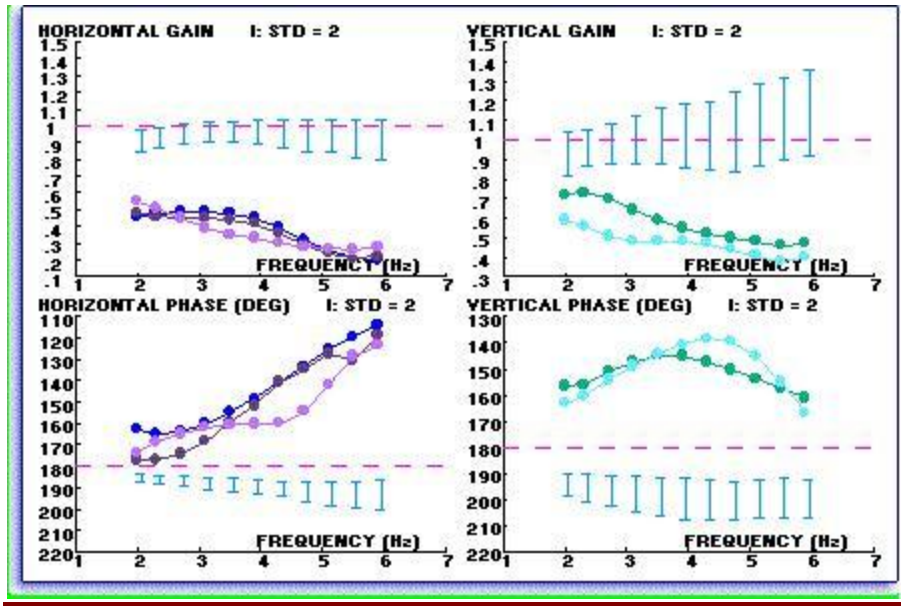
Diagnostic Information

For most of the population, balance control occurs at an unconscious level. Signals from the inner ear continuously drive the eye muscles to coordinate eye movement with head movement. This coordination is necessary to have clear vision and balance. The communication between the ear and the eye is called the vestibulo-ocular reflex (VOR). When the VOR is functioning properly, eye speed and timing are equal and opposite to those of the head. But, if the speed or timing is off, even slightly, vision is distorted because of apparent motion of the visual field.

The VAT® is an 18 second test of the high frequency horizontal and vertical VOR's for diagnosis, treatment planning and monitoring of vestibular disease. The frequency tested (2 - 6 Hz) closely approximates normal head movements. For example, many patients complain of dizziness or loss of balance when they are walking, bending over or turning their head quickly. The VAT® quickly and comfortably monitors a patient's head and eye motions to record what is happening in the vestibular portion of the inner ear.

Testing with the VAT® often identifies problems not found with other vestibular tests, because the VAT® tests natural, faster motions and unlike other conventional vestibular tests, evaluates both the horizontal and vertical canals. Because the VAT® is sensitive to changes of the VOR and is easy to perform, it is often the first screening test a patient receives who complain of dizziness or balance problems. Patients do not object to repeated testing which makes the VAT® the ideal test to monitor ototoxic medication and vestibular rehabilitation.

The data shown below illustrates the VAT® test results from a gentamicin ototoxicity patient. The normative data is shown as the blue error bars (± 2 std.) Individual patient VAT® data are shown in various colors. Notice that both the horizontal and vertical gains (top two graphs) are well below the normal data. The horizontal and vertical phases (bottom two graphs) are above the normal data. This data pattern is typically seen in gentamicin ototoxicity.



Explanation of Gain And Phase For The VAT®

GAIN: Eye velocity amplitude divided by head velocity amplitude. If you look straight ahead at a spot or target, and move your head to the right, your eyes will move to the left at the same angle and at the same speed.

PHASE: (Latency) A measure of time(in degrees)of the eye velocity relative to the head velocity. As you move your head back and forth your head and eye movements should reach the center at the same time.

Only the last 12 seconds of the test(movements above 2 Hz) are used to compute the gain and phase. This is because above 2 Hz the patient does not use vision to help with balance, therefore relying totally on the vestibular system of the inner ear to maintain balance. This is why VAT testing is done in the light(head movements above 2 Hz) and rotating chair testing is usually done below 2 Hz in the dark(turning off the visual system).

During the first six seconds, the patient moves his head at 1/2 Hz or very slowly. Vision is the dominant system(smooth pursuit system)to maintain balance at these slow motions. This system is controlled by the brain. If a patient cannot fixate on the target while moving his head back and forth, this suggests a central problem rather than one of the inner ear. This is shown by an irregular tracing of eye velocity that does not match head velocity.

Hz: how fast the patient is moving his head back and forth in a one second period.
1Hz = 1 complete back and forth motion in one second.

2Hz = 2 complete back and forth motions in one second
3Hz = 3 complete back and forth motions in one second etc.

GAIN
Patients > 65 years have gains toward the lower end of the normal range, particularly if they are not active.

Younger, active children and adults typically have gain closer to the normal range.

PHASE
Patients > 65 years may have phases toward the lower end of the normal range, particularly if they are not active.

Phases will often be lower on the normal range in patients > 65 years, particularly if they are not active.