A CASE STUDY

NeuroCom® International, Inc.

Return to Work Determination

Acuity & Steadiness During Active Movement

A 47 year-old construction worker complains of a six month history of intermittent dizziness and mild unsteadiness accompanied by visual blurring. He is a self-referral, concerned about his ability to perform his job safely, particularly in elevated locations. The office examination findings were as follows:

- **Past medical history:** Non-contributory; No precipitating event
- **Previous work-up:** Negative (Primary Care, Neurology, Psychology), including MRI
- **Clinical examination:** Inconclusive
- **Test results:** ENG identified a 55% right unilateral vestibular weakness; Other test results consistent with stable vestibular lesion

Impression: While the patient's right unilateral weakness seen on the ENG is clinically significant, this finding in isolation is insufficient to determine whether the patient is safe to continue working in his high-demand occupation. Medical findings alone do not explain why the patient has apparently failed to functionally compensate, nor does it identify a treatment plan likely to improve the patient's balance.

OUTCOMES

Objective data provided a solid basis for treatment planning and thus a documented decision for safe return to work. The patient had a full resolution of symptoms.

In order to answer questions raised in the initial workup and to design a treatment program likely to allow the patient to safely return to work, the following additional information is needed:

- **Failure to compensate:**
  1. Are there other factors contributing to the patients gaze and balance symptoms?
  2. Has the patient failed to compensate?
- **Functional status:**
  1. Are the patients gaze and balance impairments severe enough to compromise job safety?
  2. Are there identifiable components of the patient's gaze and balance impairments likely to improve with training exercises?

Inside You'll Find ...

- An evidence-based clinical management approach which facilitates and documents appropriate treatment planning and outcome.
- A look beyond the medical diagnosis to a functional outcome.

Measuring Impairments

To answer questions related to the patient's failure to compensate and his functional status, the following tests were conducted to isolate and quantify impairments in gaze and balance control:

Gaze Control: The Dynamic Visual Acuity (DVA) and Gaze Stabilization Test (GST) isolate impairments related to a patient's ability to view objects accurately during head movement. As indirect measures of the functional compensation of the Vestibular Ocular Reflex (VOR), they provide information about the direction and velocity of head movements which may result in decreased visual acuity. Both of these parameters are critical factors in this patient's job performance.

A significant decline in visual acuity with head movements ≥120 deg/sec.

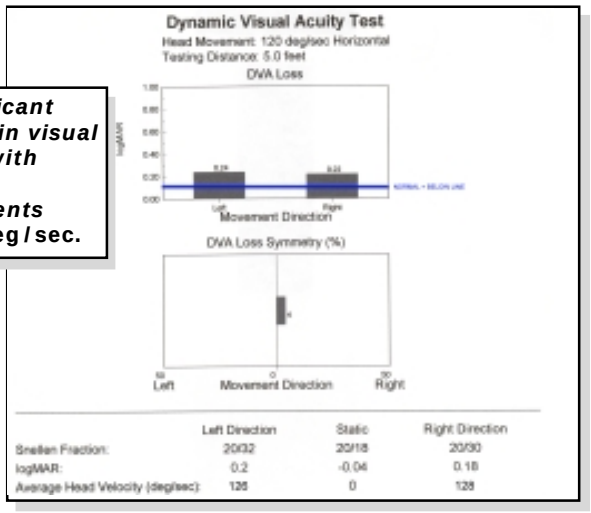
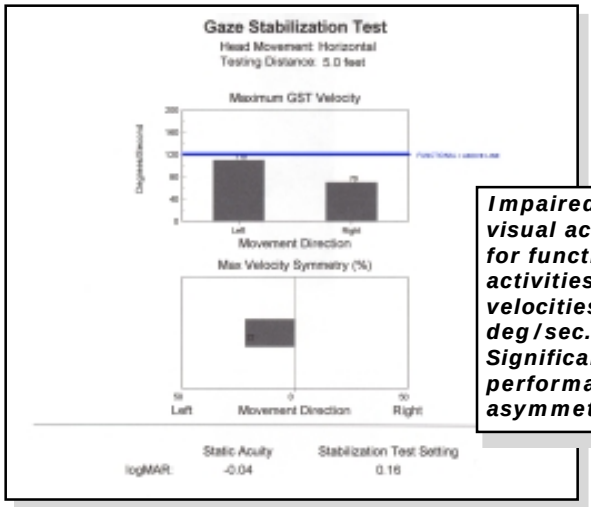


FIGURE 1: Pre-treatment DVA performance.



Impaired visual acuity for functional activities at velocities >70 deg/sec. Significant performance asymmetry.

FIGURE 2: Pre-treatment GST performance.

The patient's DVA test results showed a 0.22-0.24 LogMAR decrease in visual acuity with horizontal head movements to either side (*Figure 1*). This finding is consistent with an uncompensated UVL. In comparison, visual acuity during head movement will decrease only one LogMAR level (0.051 ± 0.052) from static visual acuity in individuals with a normal functioning VOR.[1]

According to the GST results, the patient was able to maintain adequate visual acuity (20/20 acuity; 0.00 LogMAR) with head movements no faster than 70 degrees per second to the right and 110 degrees per second to the left (*Figure 2*). This suggests intact VOR function sufficient for basic ADLs[2], but insufficient for high demand movement tasks including those required for his job.

Balance Control: Dynamic balance control was assessed using Computerized Dynamic Posturography (CDP) to isolate impairments related to the effective use of sensory inputs and coordination of motor responses. Overall performance on both the Sensory Organization (SOT) and Motor Control (MCT) subtests of CDP were within normal limits (*Figures 3-4*). However, the patient demonstrated erratic and marginally normal performance on conditions 5 and 6 of the SOT (high demand for vestibular sensory input) and was symptomatic during those test conditions. These findings would be considered unusual in a healthy, high-performance individual.

1 Herdman S, Tusa R, Blatt P, Suzuki A, Venuto P, Roberts D. Computerized dynamic visual acuity test in the assessment of vestibular deficits. *American Journal of Otology.* Nov 1998;19(6):790-796.

2 Grossman G, Leigh R, Abel L, Lanska D, Thurston S. Frequency and velocity of rotational head perturbations during locomotion. *Exp Brain Res.* 1988;70:470 - 476.

Grossman G, Leigh R. Instability of gaze during locomotion in patients with deficient vestibular function. *Ann Neurol.* 1990;27:528-532.

3 Herdman S. Vestibular rehabilitation. Contemporary perspectives in rehabilitation. 2d ed. Philadelphia, PA: F A Davis Co., 1999, pg. 396.

Computerized Dynamic Posturography

Sensory Organization Test (SOT)

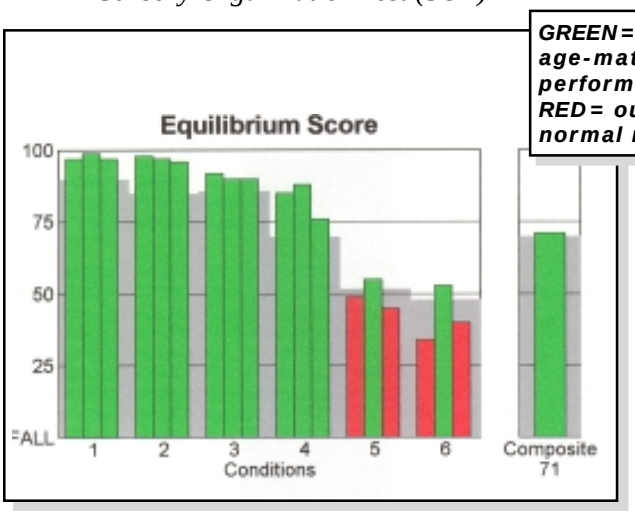


FIGURE 3 (pre-treatment): Inconsistent performance on vestibular conditions (5,6) of the sensory subtest.

Motor Control Test (MCT)

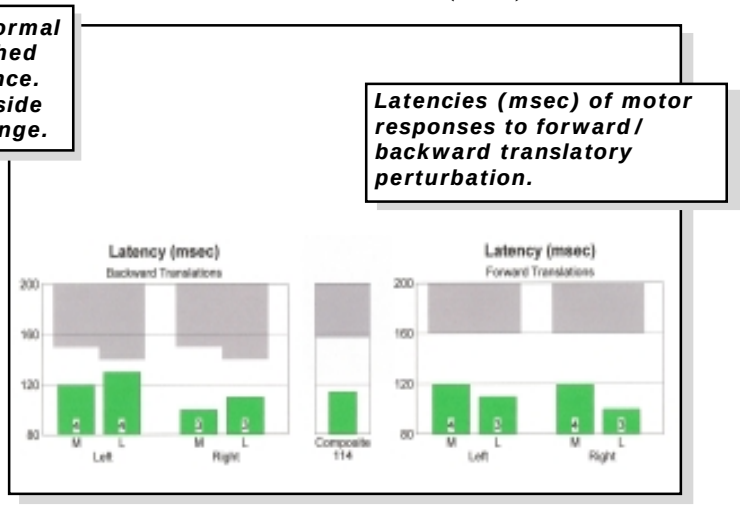


FIGURE 4 (pre-treatment): Normal automatic motor function on the motor subtest.

The erratic results seen in SOT conditions 5 and 6 (*Figure 3*) were suggestive of a subtle sensory balance problem. On that basis, the decision to perform a Head Shake SOT (HS-SOT) was made to increase balance demand by requiring the patient to coordinate active head and balance movements. Specifically, the HS-SOT requires the patient to maintain balance under complex sensory conditions while performing head movements in horizontal and vertical planes similar to those required in his occupation.

Head Shake SOT

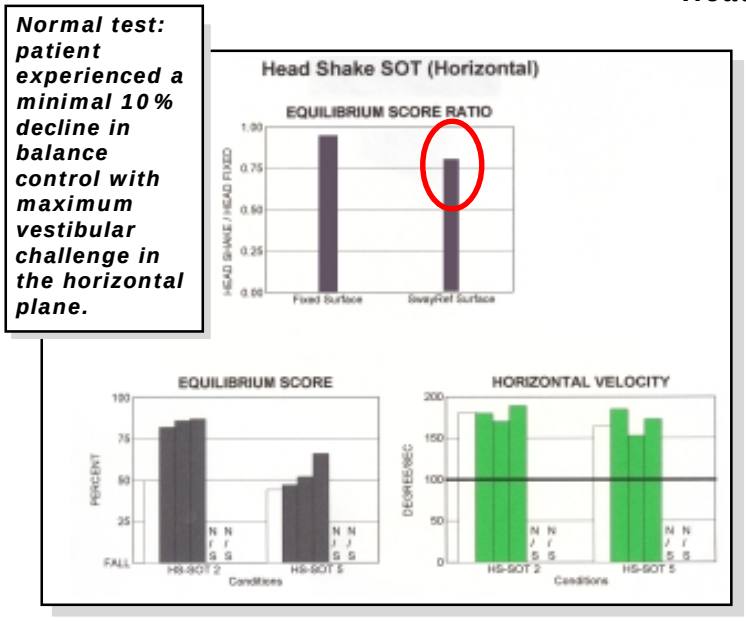


FIGURE 5: Normal function in the horizontal movement plane of the head shake subtest.

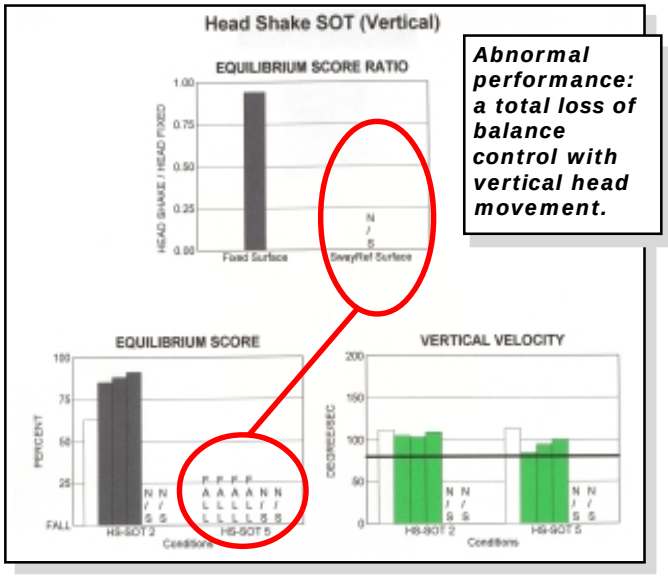


FIGURE 6: Impaired function (falls) with head movement in the vertical movement plane of the head shake subtest.

The patient maintained normal balance while performing head movements in the horizontal plane (*Figure 5*). In contrast, the patient repeatedly fell when head movements in the vertical plane were required (*Figure 6*), thereby identifying an impairment specific to that plane of head movement.

Impression & Recommendation

Due to the high demands of the patient's occupation and lifestyle, the identified gaze and balance control impairments were considered functionally significant. These impairments placed him at risk for loss of balance during occupational tasks with altered head positions, or in rapidly changing visual environments. Performance was, however, adequate for basic function and ADLs.

How did the examination help to determine if the vestibular function was adequate for return to basic function? For return to his employment demands?

In review, pre-treatment office examination findings were as follows:

- **Past medical history:** Non-contributory; No precipitating event
- **Previous work-up:** Negative (Primary Care, Neurology, Psychology), including MRI
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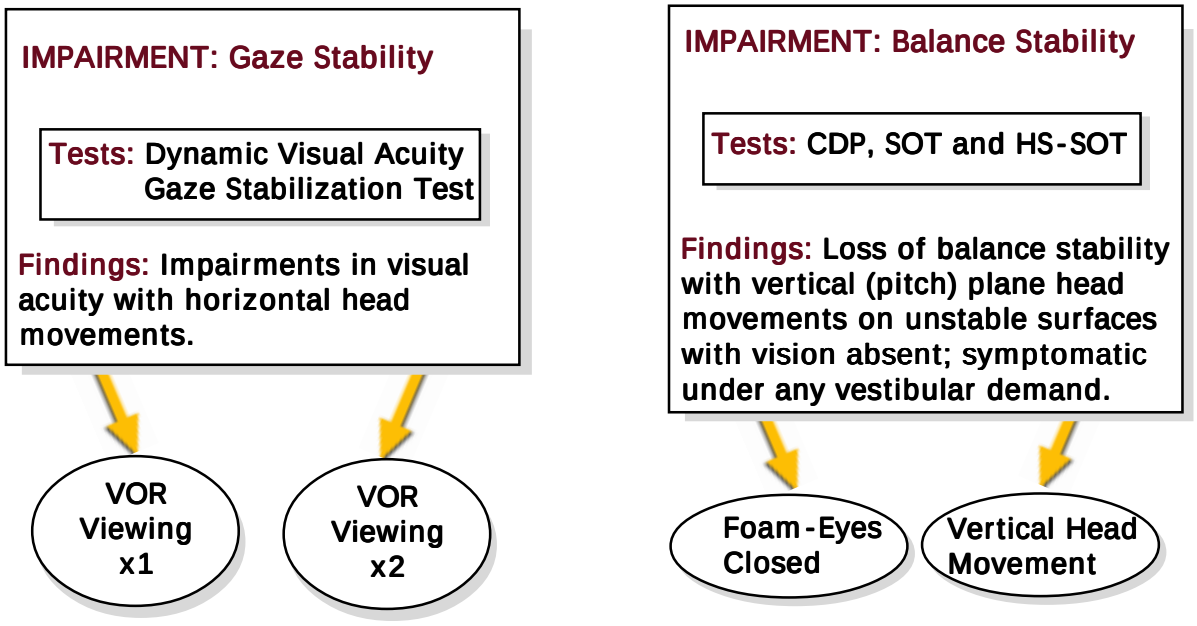
- **Test results:** ENG identified a 55% right unilateral vestibular weakness; Other test results consistent with stable vestibular lesion

Additional information from the DVA and GST protocols, as well as CDP identified the key impairments:

- Confirmed incomplete vestibular compensation
- Identified specific impairments in gaze stability and balance control
- Provided information supporting that the prognosis was good for complete compensation and safe return to work within a limited treatment period with targeted rehabilitation

Treatment Plan

The clinical management team was able to identify a treatment plan directly based on the objective data. The plan included patient education and rehabilitation with a home exercise program. The treatment was targeted to the specific impairments identified through testing.



The rehabilitation program included visual exercises (horizontal VOR x 1 and VOR x 2)[3] for gaze stability impairment. Balance exercises limited to head movements in specific planes (vertical) with absent or altered visual conditions with a variety of unstable surfaces were designed based upon the HS-SOT findings.

Turn to page 6 for the outcome...

Overview

Physical Exam/History

Non-contributory; No precipitating event
- Unsteadiness
- "Dizzy"

Diagnostic Hypotheses

1. Vestibular; 2. Cardiovascular; 3. Brain Tumor
4. Neurologic disease, e.g. MS; 5. Psychogenic

Medical Work-Up

Diagnostic Testing
MRI (-); ENG (+)

Blood Pressure
OK

Medical Workup
Negative

Observational Tests
- Romberg
- Gait

WNL

Diagnosis

Pathology: Unilateral Vestibular Lesion
Function: Compensated or uncompensated?
Involving balance? Gaze? Both?
Adequate for occupational demands?

1. Rehabilitation ?
2. Return to Work ?
3. Watch & Wait?

Impairment Work-Up

Tests of Postural and Gaze Control to isolate impairments

Dynamic Visual Acuity &
Gaze Stabilization Test (Figure 1-2)

Computerized Dynamic Posturography
Sensory Organization Test (SOT), Motor Control Test (MCT)
Head Shake SOT (Figure 3-6)

Impairment Diagnosis

- Uncompensated vestibular lesion
- Customized rehabilitation required to achieve successful return to work

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Functional Outcome

- Re-evaluation confirmed normal performance on all tests.
- Data provided documented clinical conclusion for decision to return to work.

Influence of CDP/computerized tests on medical decision making?

1. *CDP showed that the patient lacked adequate vestibular compensation to return to his high-demand occupation and confirmed no other contributing problems.*
2. *CDP directed the management approach in general and the vestibular rehabilitation approach specifically.*
3. *CDP provided an objective benchmark for the return to work decision.*

Functional Outcome: Return To Work

Patient progress was re-evaluated against baseline performance after thirty (30) days of home exercise intervention. He was asymptomatic and performance on all tests (HS-SOT, DVA-GST) was within normal limits, indicating complete functional compensation. Objective data provided a documented clinical conclusion for safe return to work. More importantly, the patient was asymptomatic during daily activities and felt he could return to work.

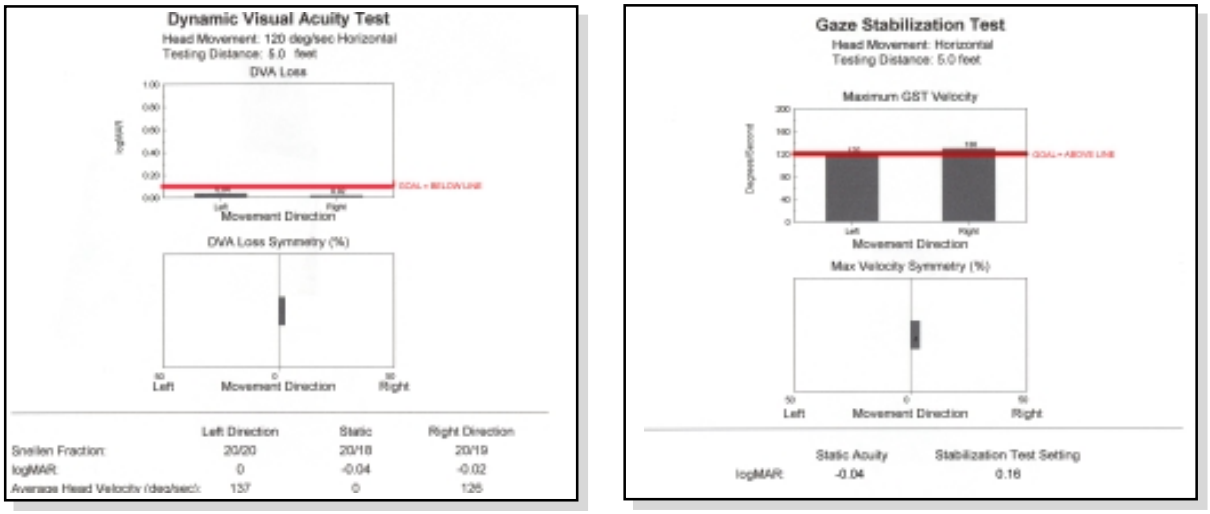

Figure 7-8 (post treatment): Maximized visual acuity to within normal limits for job performance at head speeds up to ≥120 degrees/second.

Normal use of vestibular cues.

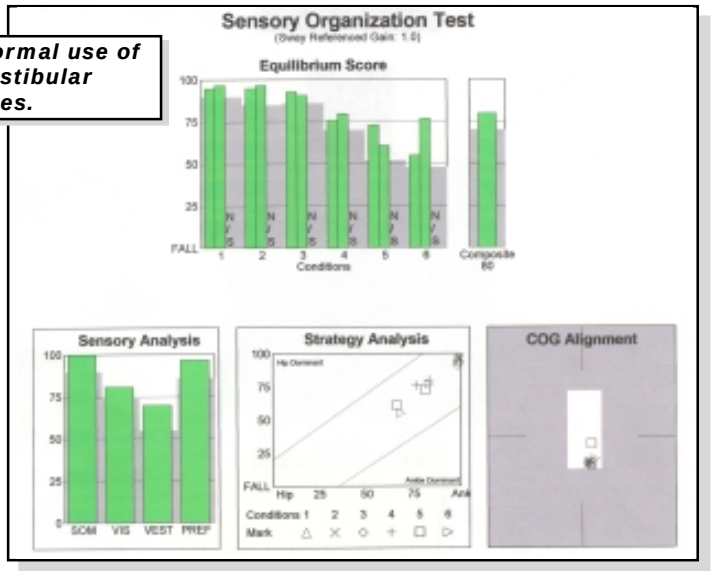

FIGURE 9 (post treatment): Normal sensory balance test.

Normal balance control with vertical head movement.

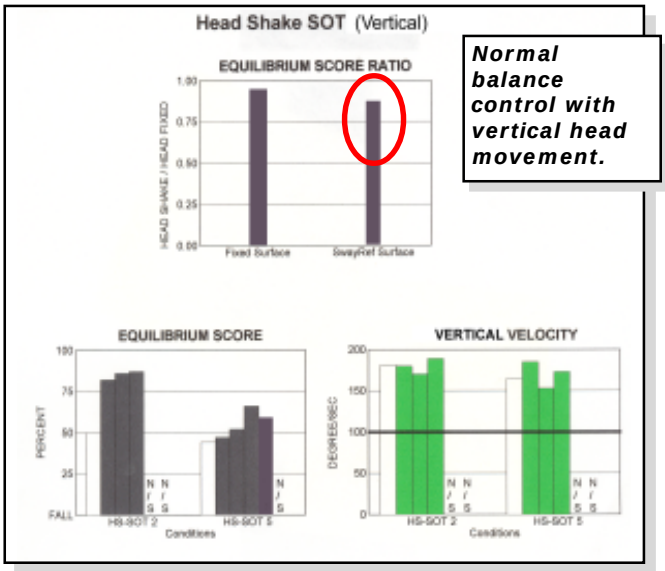

FIGURE 10 (post treatment): Normal balance control with head movements in the vertical plane as required for this patient's safe function.

Computerized gaze and balance control testing, including CDP, provided:

- *Objective evidence supporting patient's complaints and symptoms*
- *Objective evidence supporting that patient's balance function was inadequate for safe return to work*
- *Systematic, documented pathway for treatment approach*
- *Post-treatment objective evidence which documented that patient was ready to return to work*

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