APEX Diagnostics

(BLS Diagnostics, LLC)

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VIDEONYSTAGMOGRAPHY (VNG) REPORT

PI Sample VNG Report – mTBI / CONCUSSION **Test Date:** [redacted]

Patient:	[redacted]	**D.O.B.:**	[redacted]	**Prov. Phys:**	Marcia Ribeiro, MD
Gender:	Female	**Height:**	5' 6"	**Technician:**	J. Giordano, VNG.T.

REASON FOR ELECTRODIAGNOSTIC CONSULTATION AND EXAMINATION:
Patient was referred by [redacted] **following an auto accident described below for a thorough Videonystagmography (VNG), Sensory Integration & Balance (mCTSIB) and Concussion Cognitive Battery.** This examination is necessary to assess patient's concussion symptoms. **The goal of this independent examination is to rule in/out mTBI/concussion, vestibular, neurological and neuro-visual pathway involvement, and make appropriate recommendations for additional diagnostic testing and/or outside referrals for care as clinically indicated.**

CHIEF COMPLAINT:
Patient is a pleasant 37-year-old left hand dominant Female who presents with **16-day history of worsening concussion-like symptoms following an auto accident on** [redacted]**.**

ACCIDENT / INJURY INFORMATION:
Patient was a front seat passenger when her vehicle was **struck from the driver's side** as she recalls **her head striking the side window and then the headrest**. **Her right arm and right leg impacted the passenger door**. She recalls experiencing **disorientation**, feeling **dazed** and **nervous** after the accident. Patient was taken by ambulance to the ER where she was treated and released. Patient saw a chiropractor, where she received cervical x-rays. Patient has had headaches, dizziness and fatigue since the accident. Patient also complains of left arm and hand pain and numbness since the injury.

PAST / RELATED MEDICAL HISTORY:
No prior injuries or surgeries reported. Patient was able to sit for 8 hours without difficulty or discomfort, now can only sit for 20 minutes due to discomfort. Patient also shares that before the accident, she could work out for 2 hours without difficulty, but can't work out at all due to discomfort. Patient shares she cannot work because she cannot concentrate or look at a computer monitor because it causes severe headaches. Please see referring / providing physician's complete H&P for full history details.

VIDEONYSTAGMOGRAPHY (VNG) FINDINGS:

Spontaneous Nystagmus:	No significant spontaneous nystagmus.
Gaze *(Horiz/Vert)* Nystagmus:	No significant horizontal gaze nystagmus. No significant vertical gaze nystagmus.
Saccades *(Randomized)*:	Normal saccadic velocity with inconsistent accuracy some due to recording.
Smooth Pursuit *(0.2 Hz, 0.4 Hz)*:	Within normal limits for some cycles, recording lost for others.
Optokinetic Nystagmus *(OKN)*:	Symmetrical.
Positioning / Positional Testing:	
- Dix-Hallpike Maneuver:	No significant paroxysmal torsional nystagmus recorded in Dix-Hallpike

	left or Dix-Hallpike right positions.
- Static Positioning: *(Supine head center, right, left)* *(Supine body right and left)*	No significant static positional nystagmus.
Active Head Rotation *(Horiz, Vert)*:	Slightly increased gain.
Caloric Irrigation:	Within normal limits. 5% caloric weakness, 5% left directional preponderance. Caloric vestibular responses: RW5, RC4, LW6, LC4 deg/sec.

MODIFIED CLINICAL TEST OF SENSORY INTEGRATION AND BALANCE (mCTSIB):

Firm Surface- Eyes Open: *(Standard)*	Severe COG sway in the anterior right to the posterior left.
Firm Surface- Eyes Closed: *(Proprioception)*	Mild COG sway in the anterior to the posterior.
Foam Surface- Eyes Open: *(Vision)*	Mild COG sway in the anterior left to the posterior right.
Foam Surface- Eyes Closed: *(Vestibular)*	Severe COG sway in the anterior to the posterior.

** (COG: Center of Gravity)*

DIAGNOSTIC IMPRESSION:

- **mTBI/concussion**: Primary findings highly suggestive of mTBI/concussion. *(See Clinical Note)*
- **Vestibular dysfunction (traumatic)**: Secondary findings indicative of post-traumatic vestibular dysfunction. *(See Clinical Note)*
- Sensory Integration and Balance exam (mCTSIB) showed increased sway and/or falls, relative to age-matched normative data, for sensory conditions. Results are consistent with a pattern of **vestibular dysfunction** or inability to utilize vestibular cues alone for maintenance of static balance. Clinical correlation advised.

CLINICAL NOTE:

Concussion, also known as **mild traumatic brain injury (mTBI)**, is often the result of trauma to the cortex (brain), brainstem and/or the vestibular apparatus **following an impact injury or from "whiplash"**. Impact injuries occur when the head strikes, or is struck by, an object. **Lesser understood is the intracranial trauma associated with whiplash. With or without cranial "impact", the cervical spine is often involved and traumatized with a whiplash injury. Also common with whiplash, the cortex often has a "coup/contrecoup injury" (cortex experiences a violent collision with one side *(coup)* of the inner cranium followed by the contralateral *(contrecoup) side)*. [Example: a vehicle being struck from behind will likely cause its passengers to experience an initial posterior/occipital cortex trauma on the inner posterior cranium *(coup)*, followed by "whiplash" of the cervical spine leading to an anterior/frontal lobe impact on the inner anterior cranium *(contrecoup)*. The result is cortical trauma known as mTBI / concussion.** Concussion symptoms can often include headaches, dizziness, difficulty with focus, light and sound sensitivity, sleep difficulty, cognitive decline and numerous other symptoms.[1] **Studies show that whiplash injury can also lead to concussion-like symptoms[2], so it is recommended to have a thorough assessment of the cervical spine with conservative care as clinically indicated.** *(**1**. McCrory P, Meeuwisse WH, Aubry M, Cantu B, Dvořák J, Echemendia RJ, et al. Consensus statement on concussion in sport: the 4th International Conference on Concussion in Sport held in Zurich, November 2012. British Journal of Sports Medicine. 2013;47(5):250–8. **2**. Marshall CM, Vernon H, Leddy JJ, Baldwin BA. The role of the cervical spine in post-concussion syndrome. Phys Sportsmed. 2015;43(3):274–84.)*

Post-traumatic vestibular dysfunction is commonly **caused by trauma or whiplash** and often leads to a variety of symptoms including dizziness, vertigo (hallucination of rotation) and instability or loss of balance often leading to falls.[1] These symptoms may also be accompanied by nausea. The vestibular system (inner ear) is part of the system that provides our sense of balance and spatial orientation for the purpose of coordinating movement. Movement consists of both rotations and translations. The vestibular system has two components:

the semicircular canals which detect rotational accelerations; and the otoliths which detect linear accelerations and tilt. The vestibular system sends signals to the neural structures that control eye movements and to the postural muscles. **Head trauma (impact or whiplash) leading to vestibular dysfunction often results in injury to either the peripheral or central system that regulates and controls our ability to balance**.[2] The most common causes of vestibular dysfunction in humans are benign (paroxysmal) positional vertigo (BPPV), vestibular neuritis (swelling of the vestibulocochlear nerve- vestibular portions thus affects balance, labyrinthitis (swelling of both branches of the vestibulocochlear nerve- vestibular and cochlear portions thus affects balance and hearing), and Ménière's disease. **Treatment recommendations may include Epley/CRM maneuvers for BPPV, Lempert Maneuvers, Hanging maneuvers, Brandt-Daroff maneuvers, specialized vestibular therapy (adaptation, habituation & substitution), as well as, specific balance training and ADL (activities of daily living) improvement**. *(**1**. McCrory P, Meeuwisse WH, Aubry M, Cantu B, Dvořák J, Echemendia RJ, et al. Consensus statement on concussion in sport: the 4th International Conference on Concussion in Sport held in Zurich, November 2012. British Journal of Sports Medicine. 2013;47(5):250–8. **2**. Marcus, H., Paine, H., Sargeant, M., Wolstenholme, S., Collins, K., Narroney, N., Arshad, Q., Tsang, K., Jones, B., Smith, R., Wilson, M., Rust, H., Seemungal, B. Vestibular Dysfunction in Acute Traumatic Brain Injury. Journal of Neurology, 2019; 266(10): 2430-2433.)*

RECOMMENDATIONS:

- Follow up, continue care with [redacted].
- Neurologist consultation is recommended.
- Cervical spine assessment and manual therapy to address cervicogenic involvement, as indicated.
- Physical/Vestibular therapy for CRM (Lempert/BBQ Roll maneuver) on the left for horizontal canalithiasis BPPV.
- Progressive Physical Therapy balance training in the anterior right to posterior left (diagonal) plane to improve balance and reduce risk of falls. Gait assistive device to reduce risk of falls as clinically indicated.
- Re-Evaluate with VNG in 6 months if symptoms persist or worsen, or if otherwise clinically indicated.

Thank you for this referral and the opportunity to assist with this patient's care. The patient's **symptoms and condition are causally related to the injury**. These **statements are made within a reasonable degree of medical certainty**. **Recommendations are subject to the clinical data available at the time of this examination**. If you have any questions or concerns, please don't hesitate to contact our office.

Professionally,

Troy D. Hale, Au.D, CCC-A, FAAA
Fellow of the American Academy of Audiology

Marcia Ribeiro, MD
Providing Physician, Board Certified Neurologist

DISCLAIMER: This comprehensive Videonystagmography (VNG), Sensory Integration & Balance (mCTSIB), and Cognitive Report is not intended to be construed as a complete diagnosis or comprehensive plan for patient care. The AAA Fellow signing the report is only interpreting the test data as submitted by the providing physician or facility. Impressions and recommendations are solely based upon the results of this diagnostic test. It is ultimately the referring provider's responsibility to make decisions regarding diagnosis and treatment based upon the patient's full medical history and review the results with the patient.