HEALTH PLANS
UNIVERSITY OF UTAH

Medical Policy

Vestibular Evoked Myogenic Potential (VEMP) Testing

Policy MP-029

Origination Date: 09/26/2018

Reviewed/Revised Date: 05/03/2024

Next Review Date: 05/03/2025

Current Effective Date: 07/03/2024

Disclaimer:

1. Policies are subject to change in accordance with State and Federal notice requirements.
2. Policies outline coverage determinations for U of U Health Plans Commercial, CHIP and Healthy U (Medicaid) plans. Refer to the "Policy" section for more information.
3. Services requiring prior-authorization may not be covered, if prior-authorization is not obtained.
4. This Medical Policy does not guarantee coverage or payment of the service. The service must be a benefit in the member's plan and the member must be eligible for coverage at the time of service. Additional payment guidelines may be applied that are not included in this policy.

Description:

Vertigo is the primary symptom of vestibular dysfunction. It can be experienced as illusory movement such as spinning, swaying, or tilting. Vertigo may be associated with a feeling of being pushed or pulled to the ground, blurred vision, nausea and vomiting, or postural and gait instability. Vertigo may arise from damage or dysfunction of the vestibular labyrinth, vestibular nerve, or central vestibular structures in the brainstem.

Vertigo may be caused by loose particles (otoconia) from the otolith organs that pass into one of the semicircular canals, most frequently the posterior canal. Specific head movements cause the particle to stimulate the canal, causing brief benign paroxysmal positional vertigo.

Vestibular evoked myogenic potential (VEMP) tests use newer techniques that allow loud sound (e.g., click, tone burst) or bone vibration (e.g., tendon hammer tap to the forehead or mastoid) to assess otolith function. Both the saccule and utricle are sensitive to sound as well as vibration and movement.

Cervical VEMPs (cVEMPs) use surface electrodes on the ipsilateral sternocleidomastoid muscle in the neck to be measured and are thought to originate primarily in the saccule of the inner ear. Although, abnormality in any part of the auditory cVEMP pathway (saccule, inferior vestibular nerve, vestibular nucleus, medial vestibulospinal tract, the accessory nucleus, the eleventh nerve, and sternocleidomastoid) can affect the response.

Ocular VEMPs (oVEMPs) use surface electrodes under the contralateral eye during an upward gaze, to detect subtle activity of an extraocular muscle and are thought to be due primarily to

stimulation of the utricle. The vestibulo-ocular reflex stimulated by sound or vibration is very small, but synchronous bursts of activity of the extraocular muscles can be detected by electromyography. Lesions that affect the oVEMP may occur in the utricle, superior vestibular nerve, vestibular nucleus, and the crossed vestibulocochlear reflex pathways.

As it relates to superior canal dehiscence syndrome (SCDS), this is a rare condition caused by a deficiency of bone overlying one of the bony canals in the inner ear. SCDS results in vertigo and oscillopsia caused by loud sounds or changes in the pressure of the external auditory canal middle ear. The abnormal opening (dehiscence) in the temporal bone forms the roof of the superior semicircular canal. The etiology is unknown, however, in the majority of cases the cause of SCDS is thought to be a developmental anomaly of the temporal bone. Diagnosis can be made by history of symptoms consistent with SCDS, lab and physiologic testing, and detection of the bone defect on neuroimaging such as high-resolution computed tomography (CT) scan. Clinical exam may show eye movements induced by Valsalva maneuvers either by pressure in the external auditory canal or by sounds. Examples of physiologic testing suggestive of SCDS can include supranormal hearing thresholds on audiometry, abnormal Valsalva testing, reduced threshold or increased magnitude of response on VEMP testing, or vibration induced torsional nystagmus.

Policy Statement and Criteria

1. Commercial Plans/CHIP

U of U Health Plans covers vestibular evoked myogenic potential (VEMP) testing for the evaluation of individuals with suspected superior canal dehiscence syndrome (SCDS) when neuroimaging is inconclusive for that diagnosis.

U of U Health Plans does NOT cover vestibular evoked myogenic potential (VEMP) testing for any other indication as this testing is considered investigational.

2. Medicaid Plans

Coverage is determined by the State of Utah Medicaid program; if Utah State Medicaid has no published coverage position and InterQual criteria are not available, the U of U Health Plans Commercial criteria will apply. For the most up-to-date Medicaid policies and coverage, please visit their website at: http://health.utah.gov/medicaid/manuals/directory.php or the Utah Medicaid code Look-Up tool

CPT/HCPCS codes covered by Utah State Medicaid may still require further evaluation to determine medical necessity for coverage.

Clinical Rationale

In 2015, Weber et al reported on Vestibular evoked myogenic potential (VEMP) tests and how they use sound or vibration to stimulate the otolith organs. Cervical VEMP (cVEMP) measures evoked electrical

potentials in the ipsilateral sternocleidomastoid muscle following stimulation of the saccule, while ocular VEMP (oVEMP) measures electrical potentials in the extraocular muscles contralateral to the utricle. There is large and rapid growing literature on VEMPs for the assessment of otolith function, although most studies assess how cVEMP and oVEMP change with various disease states. VEMPs have been evaluated in superior canal dehiscence, vestibular neuritis, benign paradoxical positional vertigo (BPPV), vestibular schwannoma, Meniere disease, vestibular migraine, and central vestibular disorders.

A number of concerns arise about using VEMPs to assess the otolith organs. One issue is that sound and bone conduction stimuli are likely to influence senses other than the saccule and utricle, and stimulation of structures other than the utricle can affect the VEMP. In addition, VEMP responses have been shown to decrease with age, with a high rate of absent responses in normal older adults. Another is that latency and amplitude measures are very sensitive to variables that can be introduced by the examiner, as observed in a 2016 study by Welgampola et al that included 1038 patients whose ailments included vestibular migraine or neuritis, BPPV, somatoform, phobic postural vertigo, unilateral or bilateral vestibulopathy, Meniere disease, downbeat nystagmus syndrome, and other diagnoses. The authors observed significant differences between examiners for measures of oVEMP and cVEMP latencies, concluding that the field should "work on a better standard for VEMP recordings.

Per Maheu et al (2017): "It is, however, important to remain cautious when associating endolymphatic hydrops (EH) with Ménière's disease (MD), since EH could also be present in individuals who do not have an MD diagnosis. Therefore, VEMP findings in the diagnosis of MD should be analyzed in the light of the symptoms described by the patients, but also using the results of other evaluations. In terms of diagnostic efficiency, modifications in cVEMP amplitude following glycerol or furosemide administration, BCV stimulation, and frequency sensitivity shift appear to be better supported than IAR and, thus, should be considered first when MD is suspected." The authors found that, further studies are needed to evaluate the usefulness of VEMP, using either BCV or ACS, for the early identification and the development of a proper classification of MD, which is of clinical importance when it comes to early intervention.

In a 2019 meta-analysis, Oya et al aimed to validate the clinical significance of cervical (c) and ocular (o) VEMP in BPPV. The authors found that p13 latency in cVEMP and n1 latency in oVEMP were slightly but significantly prolonged in BPPV patients compared to control patients. AR in oVEMP of BPPV patients also showed higher value than that of control patients. However, the n23 latency and AR in cVEMP and p1 latency in oVEMP showed no significant difference between BPPV and control patients. Furthermore, latencies in VEMPs also showed no significant difference between an affected and a non-affected ear in BPPV patients. In conclusion, although the results indicated that otolith dysfunction of BPPVs was detected by latencies in VEMPs and AR in oVEMP more sensitively reflects the difference between affected and non-affected ears in BPPV patients. The otolith dysfunction of BPPV might be induced by the systemic condition. Therefore, because the differences of latencies between BPPV patients and control patients were too small to use VEMPs as a prognostic predictor, further studies are needed.

A Meta-analysis of 9 studies and 721 patients (Kim, 2022) found that there was a high degree of heterogeneity ($I2 \geq 70\%$) due to the different VEMP threshold values used among the studies. In conclusion, cVEMP is a reliable adjunctive tool for the clinical diagnosis of SCD. Taking the balance between sensitivity and specificity into consideration, a cVEMP threshold value of 75 showed good diagnostic accuracy.

The International Federation of Clinical Neurophysiology reported in a 2014 expert consensus document, on cervical vestibular evoked myogenic potential methods that the clinical use of VEMP's "is evolving and questions still exist about its underlying physiology and measurement."

The American Academy of Neurology's (AAN) practice guidelines from 2017 (reaffirmed 2021) assessed the diagnostic value of vestibular evoked myogenic potential testing in individuals with vestibular symptoms. The conditions of interest included superior canal dehiscence syndrome, vestibular neuritis or migraine, Meniere disease, and benign paroxysmal positional vertigo (BPPV). The evidence for testing in BPPV was drawn from 2 class III studies, neither of which presented sufficient diagnostic value of VEMP testing for the treatment to be recommended.

A 2018 UpToDate article on Meniere disease states that in addition to diagnosis, VEMP testing might be useful for monitoring the disease progression and possibly identifying the active ear in patients with bilateral disease, however it is "an emerging technology that has not yet been standardized or fully validated clinically".

A 2017 cohort study by Hunter et al compared cVEMP and oVEMP testing in 39 individuals who had known superior semicircular canal dehiscence, with a control cohort of 84 age-matched symptom-free individuals. Primary end points included peak-to-peak amplitudes of the 2 treatments and sensitivity and specificity. The authors observed that between cVEMP and oVEMP, cVEMP peak amplitudes (>214.3 µV) were less effective overall for diagnosis of semicircular canal dehiscence (area under the curve [AUC], 0.731). At the 2 treatment centers from which patients were drawn, oVEMP amplitudes and cVEMP thresholds proved to be the superior tests (overall AUC scores, 0.856 and 0.912, respectively). For patients between 50 and 60 years of age, testing cVEMP threshold (<75 decibels) provided sensitivity of 100%, as well as good specificity (92.9%). Overall, findings suggested superiority of cVEMP thresholds or oVEMP amplitudes over measurement of cVEMP amplitudes.

A 2017 Practice Guideline on cervical and ocular vestibular evoked myogenic potential testing published by the American Academy of Neurology (Fife, 2017) issued a level C recommendation for cervical VEMP used to distinguish SCDS and notes a sensitivity of 86%–91% and a specificity of 90%–96% for this condition. This guideline also includes the following statements:

- cVEMP and oVEMP have unknown efficacy in accurately identifying vestibular function specifically related to the saccule/utricle (Level U).
- cVEMP may be used as an ancillary test in Ménière disease for vestibular dysfunction (Level C). There is insufficient evidence that either cVEMP or oVEMP may be used to diagnose Ménière's disease (Level U).
- cVEMP was not demonstrated to aid in establishing a BPPV diagnosis. cVEMP may not be used to make a BPPV diagnosis (Level C).
- In no study was VEMP useful in establishing a vestibular migraine diagnosis. Recommendation. Although an absent VEMP response in one or both ears appears to occur more often in patients with VM than in normal controls, VEMP may not be used to assist in VM diagnosis or management (Level C).

The guideline panel found insufficient data to determine the usefulness of VEMP in diagnosing other vestibular disorders.

On behalf of the American Academy of Neurology (AAN), Fife and colleagues (2017) reviewed the evidence and made recommendations regarding the diagnostic utility of cervical and ocular vestibular evoked myogenic potentials (cVEMP and oVEMP, respectively). Four questions were asked:

1. Does cVEMP accurately identify superior canal dehiscence syndrome (SCDS)?
2. Does oVEMP accurately identify SCDS?
3. For suspected vestibular symptoms, does cVEMP/oVEMP accurately identify vestibular dysfunction related to the saccule/utricle?

4. For vestibular symptoms, does cVEMP/oVEMP accurately and substantively aid diagnosis of any specific vestibular disorder besides SCDS?

The guideline panel identified and classified relevant published studies (January 1980 to December 2016) according to the 2004 AAN process. The following recommendations were provided:

Level C positive: Clinicians may use cVEMP stimulus threshold values to distinguish SCDS from controls (2 Class III studies) (sensitivity 86% to 91%, specificity 90% to 96%). Corrected cVEMP amplitude may be used to distinguish SCDS from controls (2 Class III studies) (sensitivity 100%, specificity 93%). Clinicians may use oVEMP amplitude to distinguish SCDS from normal controls (3 Class III studies) (sensitivity 77% to 100%, specificity 98% to 100%). oVEMP threshold may be used to aid in distinguishing SCDS from controls (3 Class III studies) (sensitivity 70% to 100%, specificity 77% to 100%).

Level U: Evidence is insufficient to determine whether cVEMP and oVEMP can accurately identify vestibular function specifically related to the saccule/utricle, or whether cVEMP or oVEMP is useful in diagnosing vestibular neuritis or Meniere disease.

Level C negative: It has not been demonstrated that cVEMP substantively aids in diagnosing benign paroxysmal positional vertigo, or that cVEMP or oVEMP aids in diagnosing/managing vestibular migraine.

Applicable Coding

CPT Codes

92517	Vestibular evoked myogenic potential (VEMP) testing, with interpretation and report; cervical (cVEMP)
92518	Vestibular evoked myogenic potential (VEMP) testing, with interpretation and report; ocular (oVEMP)
92519	Vestibular evoked myogenic potential (VEMP) testing, with interpretation and report; cervical (cVEMP) and ocular (oVEMP)
92700	Unlisted otorhinolaryngological service or procedure

HCPCS Codes

No applicable codes

References:

1. Chen G, Dai X, Ren X, Lin N, Zhang M, Du Z, Zhang E. Ocular vs. Cervical Vestibular Evoked Myogenic Potentials in Benign Paroxysmal Positional Vertigo: A Systematic Review and Meta-Analysis. Front Neurol. 2020 Oct 26;11:596454. doi: 10.3389/fneur.2020.596454. PMID: 33193065; PMCID: PMC7649758
2. Ertl M, Boegle R, Kirsch V, et al. On the impact of examiners on latencies and amplitudes in cervical and ocular vestibular-evoked myogenic potentials evaluated over a large sample (N = 1,038). Eur Arch Otorhinolaryngol. Feb 2016;273(2):317-323. PMID 25628238
3. Fife TD, Colebatch JG, Kerber KA, et al. Practice guideline: Cervical and ocular vestibular evoked myogenic potential testing: Report of the Guideline Development, Dissemination, and Implementation Subcommittee of the American Academy of Neurology. Neurology. Nov 28 2017 (reaffirmed 2021);89(22):2288-2296. PMID 29093067
4. Fife TD, Tusa RJ, Furman JM, et al. Assessment: Vestibular testing techniques in adults and children: Report of the Therapeutics and Technology Assessment Subcommittee of the American Academy of Neurology. Neurology. 2000;55(10):1431-1441.
5. Hunter JB, Patel NS, O'Connell BP, et al. Cervical and ocular VEMP testing in diagnosing superior semicircular canal dehiscence. Otolaryngol Head Neck Surg. May 2017;156(5):917-923. PMID 28168887

6. Kim DH, Kim SW, Kim SH, Jung JH, Hwang SH. Usefulness of Cervical Vestibular-Evoked Myogenic Potentials for Diagnosing Patients With Superior Canal Dehiscence Syndrome: A Meta-Analysis. Otol Neurotol. 2022 Feb 1;43(2):146-152. doi: 10.1097/MAO.0000000000003430. PMID: 34855686.
7. Maheu, Maxime, et al. "The clinical utility of vestibular-evoked myogenic potentials in the diagnosis of Ménière's disease." Frontiers in neurology 8 (2017): 415.
8. Moskowitz, HS MD, PhD, Dinces, EA, MD. Meniere Disease. UpToDate, Inc. Last updated April 25, 2018. Topic 6859, Version 36.0.
9. National Organization for Rare Disorders (NORD). Superior Semicircular Canal Dehiscence. Available at: https://rarediseases.org/rare-diseases/superior-semicircular-canal-dehiscence/. Accessed on April 25, 2024.
10. Oya, R., et al. (2019). "Clinical significance of cervical and ocular vestibular evoked myogenic potentials in benign paroxysmal positional vertigo: a meta-analysis." Eur Arch Otorhinolaryngol 276(12): 3257-3265.
11. Papathanasiou ES, Murofushi T, Akin FW, et al. International guidelines for the clinical application of cervical vestibular evoked myogenic potentials: an expert consensus report. Clin Neurophysiol. Apr 2014;125(4):658-666. PMID 24513390
12. Scarpa A, Gioacchini FM, Cassandro E, Tulli M, Ralli M, Re M, Cassandro C. Clinical application of cVEMPs and oVEMPs in patients affected by Meniere's disease, vestibular neuritis and benign paroxysmal positional vertigo: a systematic review. Acta Otorhinolaryngologica Italica. 2019 Oct;39(5):298. Accessed: November 5, 2021.
13. Starkov D, Strupp M, Pleshkov M, Kingma H, van de Berg R. Diagnosing vestibular hypofunction: an update. Journal of Neurology. 2021 Jan;268(1):377-85. Accessed: November 5, 2021.
14. Weber KP, Rosengren SM. Clinical utility of ocular vestibular-evoked myogenic potentials (oVEMPs). Curr Neurol Neurosci Rep. May 2015;15(5):22. PMID 25773001
15. Welgampola MS, Colebatch JG. Vestibulocollic reflexes: normal values and the effect of age. Clin Neurophysiol. Nov 2001;112(11):1971-1979. PMID 11682335