VESTIBULAR EVOKED MYOGENIC POTENTIAL (VEMP)

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VEMP TEST PARAMETERS

Stimulus type	**500 Hz tone burst**
Level	**95-100 dB nHL**
Repetitions	**100-150 sweep x 2 and average**

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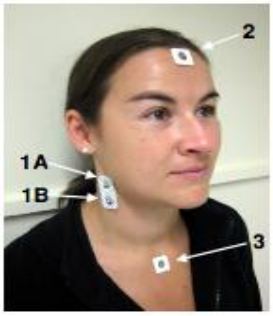
ELECTRODE PLACEMENT



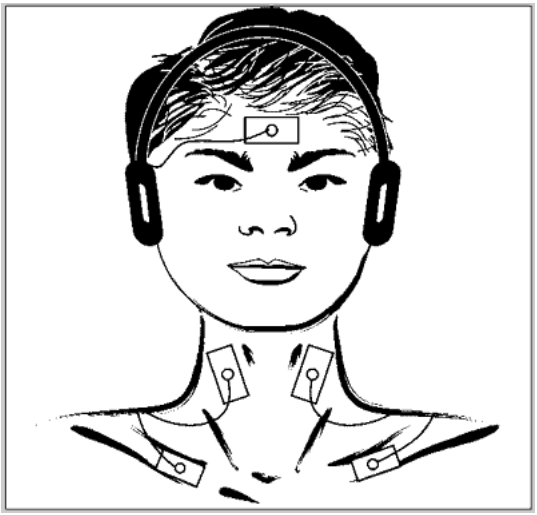
1A: Non-inverting (+ve) electrode upper 1/3rd of the SCM (approximately 10 cm below the mastoid).

2: Common electrode on forehead

3: Inverting (-ve) electrode on the sternoclavicular junction

1B: Additional non-inverting electrode for recording ongoing EMG activity to ensure consistent muscle contraction (not used all the time)

ELECTRODE PLACEMENT



TRANSDUCERS

- For air-conducted VEMPs, either insert earphones (e.g. ER-3A) or supra-aural earphones (e.g. TDH-39) may be employed. Careful positioning of the transducer must be ensured in order to avoid stimulus attenuation.

RECORDING VEMPS

- The patient should be warned that the stimulus may be loud and must be advised to let the clinician know if discomfort occurs.
- For each side, two recording runs of 100-150 sweeps should be completed to assess the repeatability of any response and the extent of residual noise.
- The two runs may be combined (using a weighted add function if available) to create a grand average from which measurements of amplitude and latency can be made.
- Simultaneous binaural recording is not recommended (evidence suggested a cross response).

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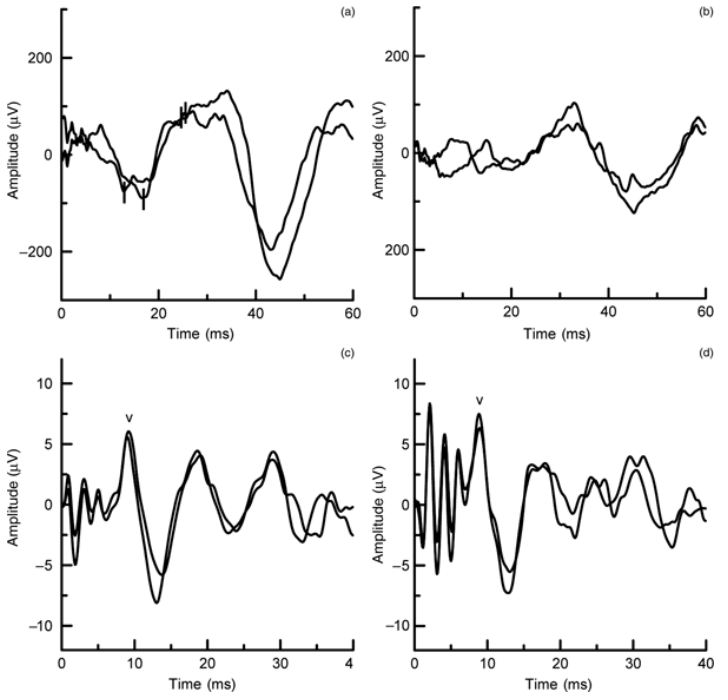

THE EFFECTS OF ELECTROMYOGRAPHIC (EMG) LEVEL

- The amplitude of the VEMP is directly proportional to the strength of the SCM contraction.
- It is therefore important that muscle contraction is sufficient to record a good response.
- It is also important to ensure that equal EMG activity is maintained between left and right side to ensure accurate side-to-side comparisons
- Prolonged measurements can result in muscle fatigue and therefore a reduction in response

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METHODS FOR MONITORING AND MAINTAINING CONSISTENT MUSCLE CONTRACTION

- Visual feedback via a computer display, hand-held EMG meter

COMMON PITFALLS

- Incorrect electrode placement because of difficulties in identifying the SCM
- Insufficient SCM contraction
- Use of sub-threshold stimulus levels
- Insufficient sound reaching the saccule due to occluding wax or other causes of a conductive hearing loss.
- Insufficient stimulus levels due to incorrectly fitted insert earphones and headphones

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PRESENCE/ABSENCE OF THE RESPONSE

- VEMPs have been shown to be present in otologically normal subjects up to the age of 40, and in 95% of those aged from 41-50, with the amplitude generally decreasing with age.
- No normative data for the presence/ absence of responses.
- Care should be taken in interpreting the absence of a VEMP, and the overall clinical picture must be taken into consideration when reporting absent or reduced activity of the saccule/inferior portion of the vestibular cochlear nerve.

VEMP INTERPRETATION

- 2-3 repetitions required due to variability
- Presence/absence
- Asymmetry- remember the consistency of muscle contraction is important
- Threshold

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VEMP AMPLITUDE AND MEASUREMENT OF 'SACCULAR PARESIS'

- Comparison of VEMP responses from each side has led to the proposal of calculating a 'saccular paresis', analogous to the canal paresis determined from caloric testing and which would be equal to the percentage difference in VEMP amplitudes between the right and left sides.
- However, such analysis currently requires a highly cautious approach, since the literature reports varying values for what might constitute a significant paresis.
- One study has reported differences of up to 35% between the two sides in normal subjects below the age of 60.
- Others consider VEMPs to be asymmetrical when one is two times or more as large as the other, low in amplitude, or absent.

CLINICAL VALUE OF VEMPS

- Some dizzy patients show normal caloric responses but may have pathology in other part(s) of labyrinth
- Provides possibility to objectively test sacculae (and therefore inferior vestibular nerve) independently
- Certain results can confirm/suggest specific etiologies

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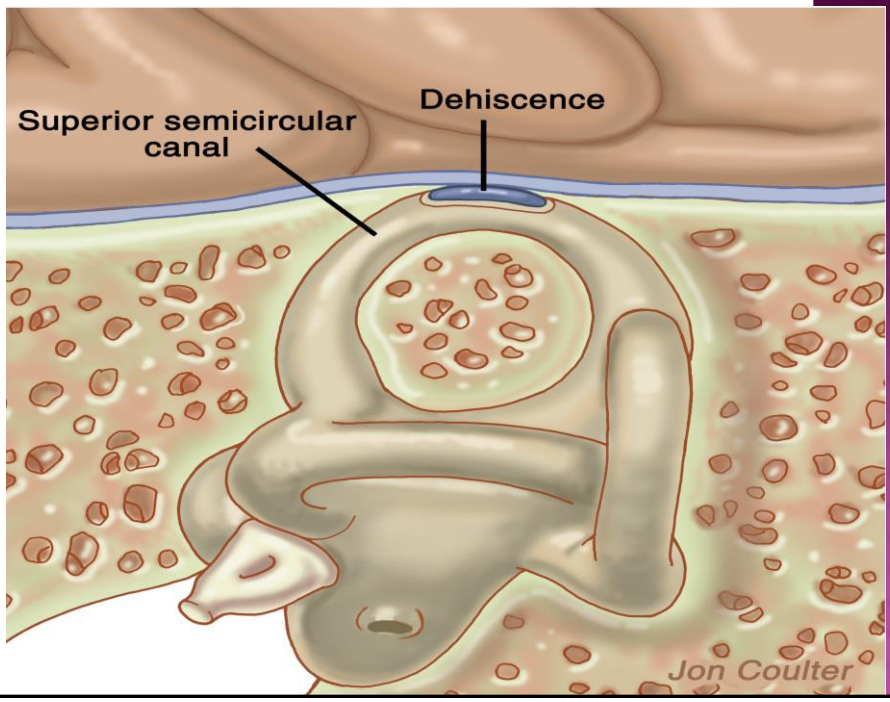
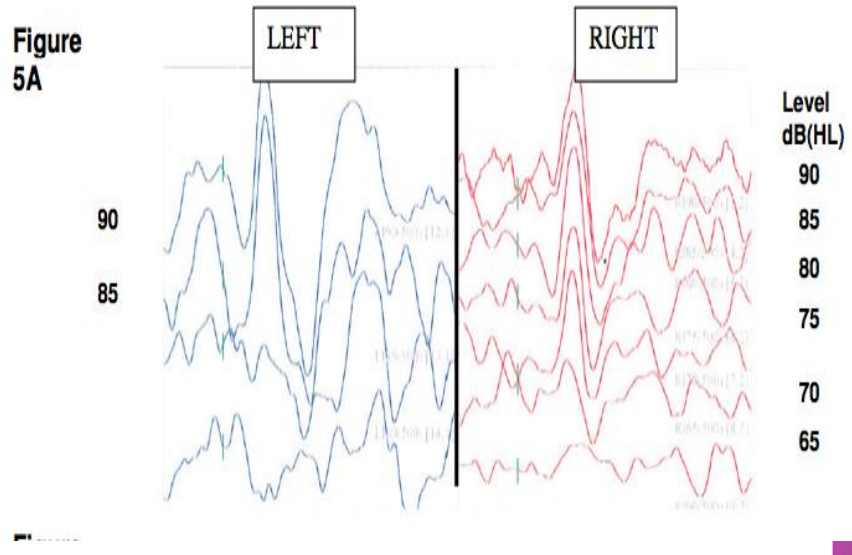
FISTULA AND SUPERIOR CANAL DEHISCENCE (SCD)

- Fistula is abnormal connection between middle and inner ear
- Usually at oval or round window, producing occasional fluid leakage
- Dehiscence is due to missing bone over the superior SSC and is generally less severe than fistula
- Both produce hypersensitivity to sounds and pressure "Tullio effect" (dizziness in response to loud sounds).



- A major utility of the VEMP threshold is to aid in the diagnosis of superior semicircular canal dehiscence (SSCD).
- In this condition, which is usually detected via high resolution CT scanning, abnormally low VEMP thresholds have been typically found.
- Thresholds are >=10 dB below normal levels for a given stimulus



MENIERE'S DISEASE

- VEMP was sometimes used in the diagnosis of Meniere's disease because the saccule, next to the cochlea, is the second most frequent site of hydrops formation.

EFFECT OF AGE AND GENDER ON VEMP AMPLITUDE

- Amplitude
  - Decreases in patients > 60.
  - Due to degeneration in the vestibular system.
  - Results should be interrupted with caution in case the patient is unable to maintain contraction of the SCM.
  - Amplitude is not affected by gender.

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EFFECT OF AGE AND GENDER ON VEMP LATENCY

- Latency measurements are not as clinically useful as amplitude measurements.
- Increases in VEMP latency have been found in some cases of multiple sclerosis, brainstem lesions and other central pathologies.
- Studies in adults have indicated no age-related effects on VEMP latency.

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