Vestibular Evoked Myogenic Potentials (VEMPs)

The purpose of this test is to determine if the saccule, one portion of the otoliths, as well the inferior vestibular nerve and central connections, are intact and working normally. The saccule, which is the lower of the two otolithic organs, has a slight sound sensitivity and this can be measured. This sensitivity is thought to be a remnant from the saccule's use as an organ of hearing in lower animals.

VEMP - Pathway

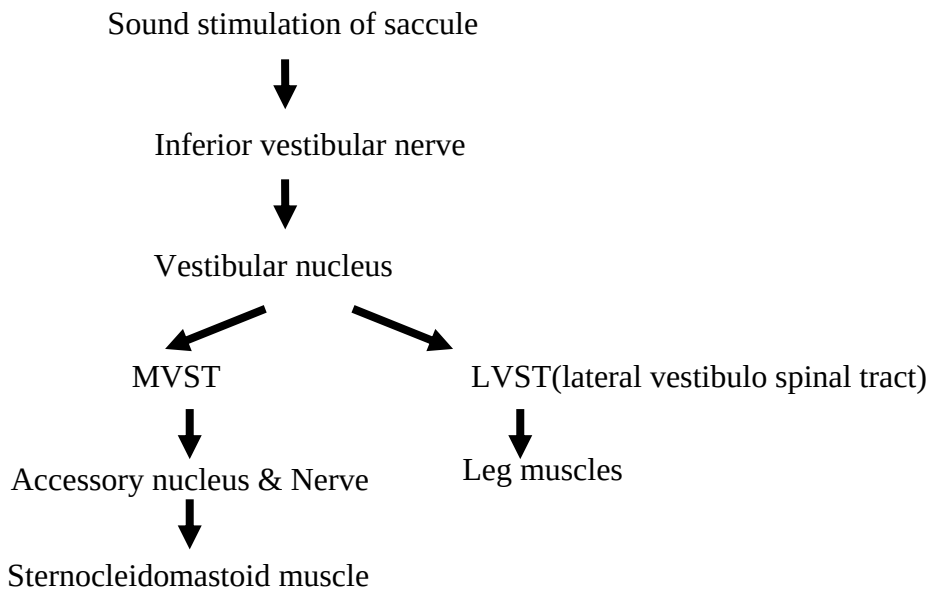
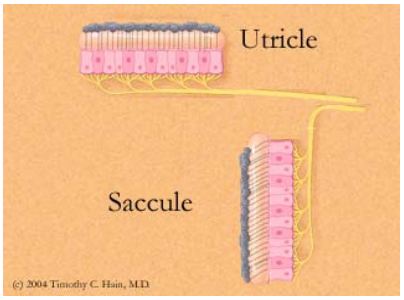
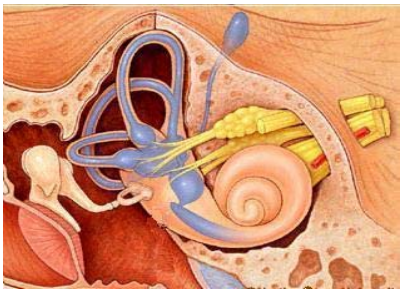


Figure 13: Flow chart of vestibulo-spinal pathway

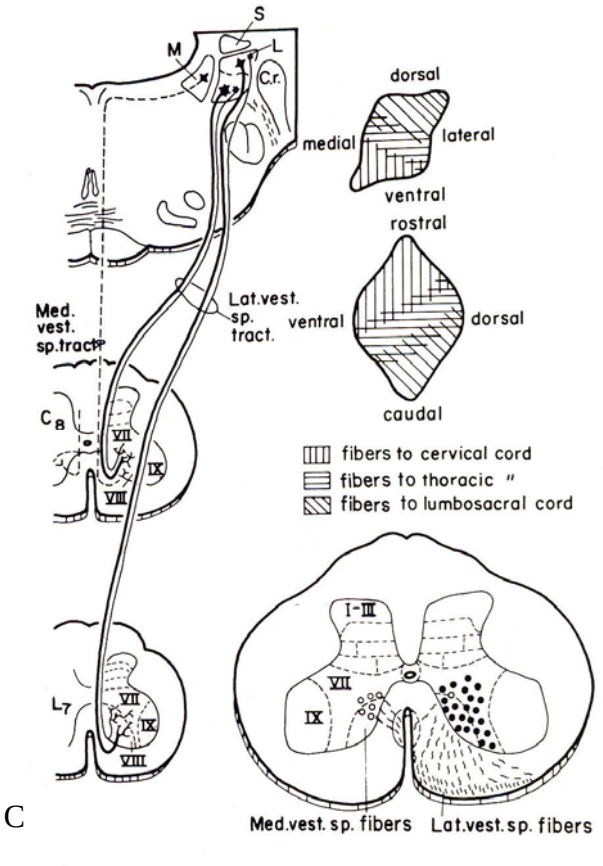
VEMP – Pathway

A





B



C

Figure 14: A. Orientation of macula of saccule and utricle. B. Orientation of inferior vestibular nerve with saccule. C. Connections of vestibulo-spinal pathway in the brain stem.

The pathway that accounts for the VEMP response is shown in figure 14. Sound stimulates the saccule, traverses the vestibular nerve and ganglion to reach the vestibular nucleus in the brainstem. From there, impulses are sent to the neck muscles via the medial vestibulospinal tract (MVST). Sound evoked VEMPs recorded from the neck are claimed to be almost completely unilateral. (Colebach et al, 1994; Uchino et al, 1997;

Kushiro et al, 2000; Murofushi et al, 1996; Wilson et al, 1995), but in clinical practice this can't be counted upon.

VEMPs are recorded using an evoked response computer, a sound generator, and surface electrodes to pick up neck muscle activation or other muscles if this is of interest. The figure below illustrates the basic rather minimal equipment needed. The patient is either in sitting or in lying down position with the sternocleidomastoids in contraction. The responses are better obtained with patient in lying down position.

Figure 15: VEMP in progress.

The VEMP response consists of an initial positivity (p1 or p13) followed by a negativity (n1 or n23), see figure 16. It is an evoked potential. Although P1 is positive, it is shown negative on many VEMPs, because of electrode placement (basically putting them on backwards).

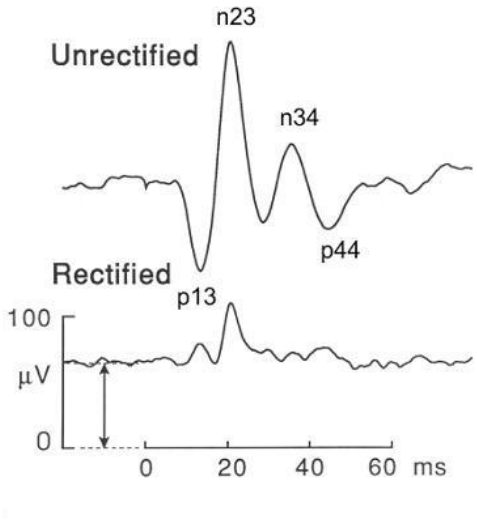


Figure 16: graphic representation of a normal VEMP recording

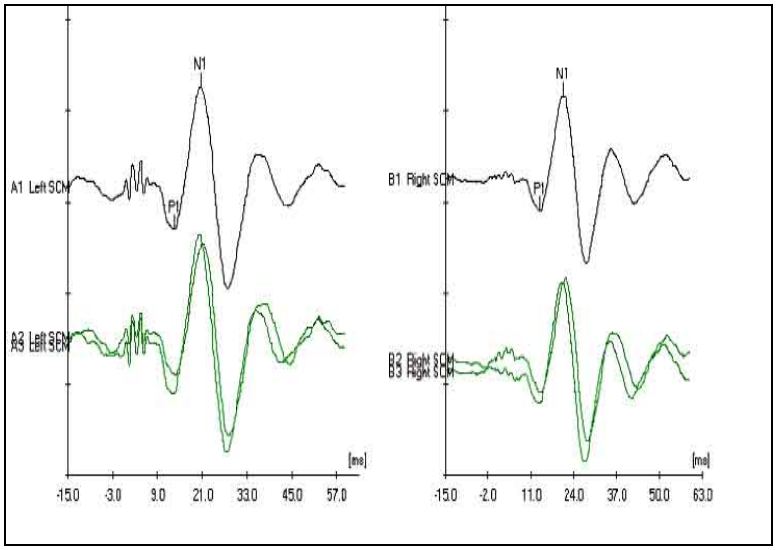


Figure 17: Normal VEMP response.

The general rule of thumb with hearing and VEMPs is that conductive hearing loss obliterates VEMPs, and sensorineural hearing loss does little or nothing to VEMPs.

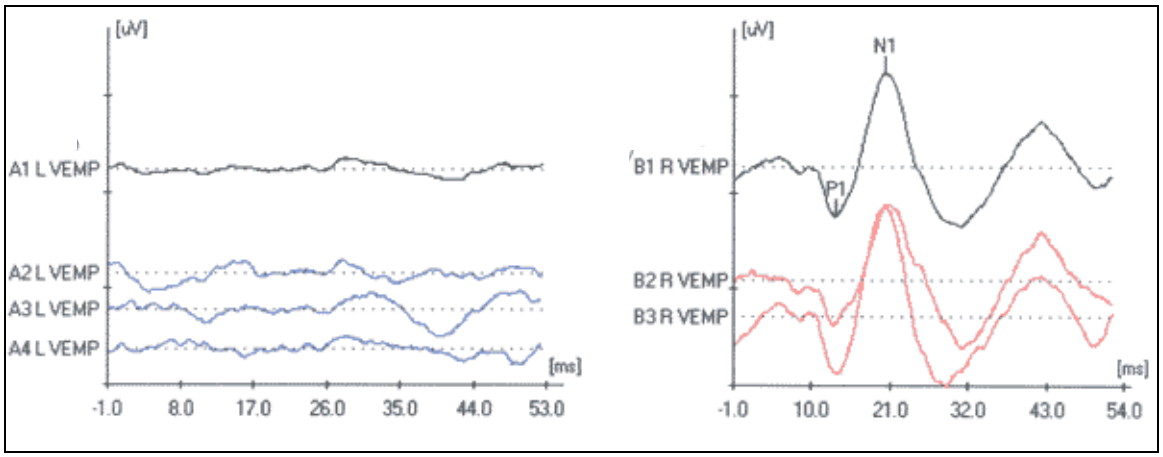


Figure 18: VEMP obtained in an individual with a modest left sided conductive hearing loss. The VEMP on the right was normal, and the VEMP on the left, entirely absent.

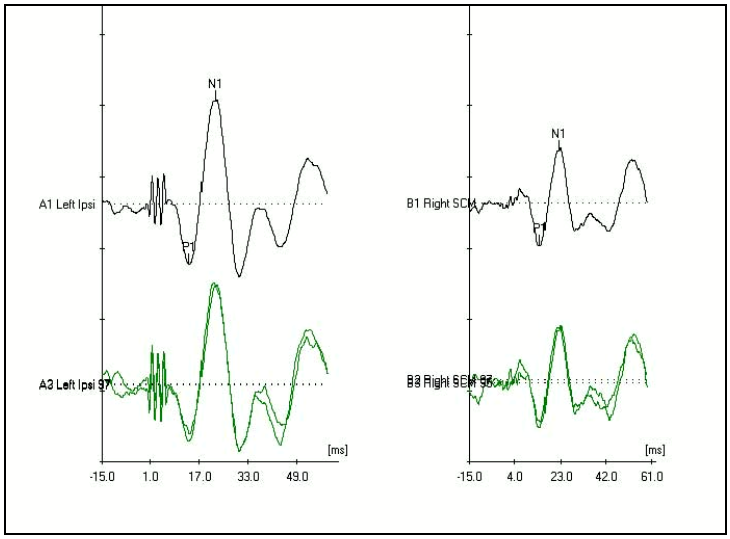


Figure 19: VEMP obtained in an individual with a profound right sensorineural hearing loss. This shows that (sensorineural) hearing is not necessary to obtain a VEMP.

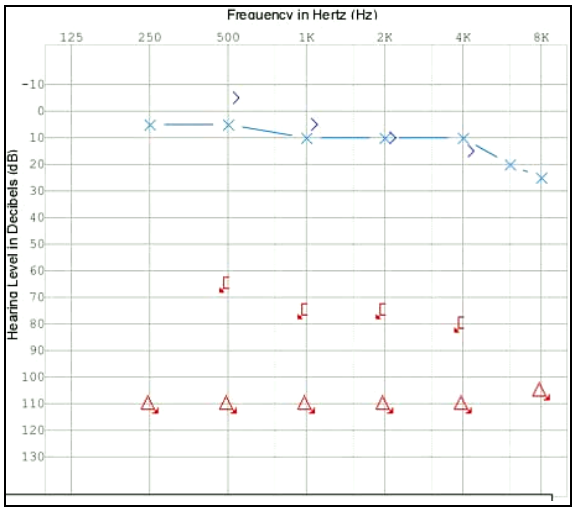


Figure 20: Audiogram of the person with the VEMP shown to the above. There is a profound sensor neural hearing loss.