

(VEMP)

*

(EMG) (VEMP) :

(SCM) VEMP :

() VEMP :

VEMP :

VEMP :

VEMP dBnHL :

Hz VEMP :

VEMP Hz :

VEMP :

()

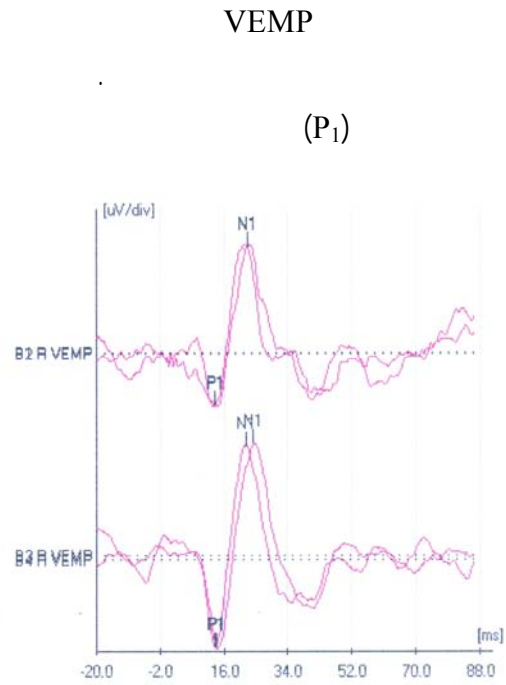
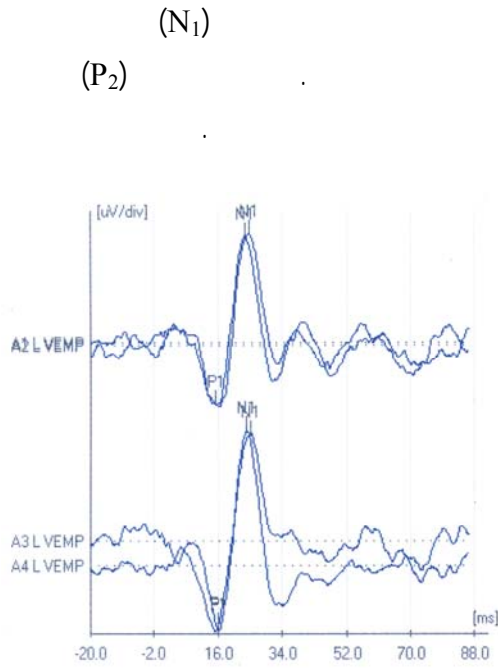
() ()

VEMP

()

(N₁) ()
(P₂)
() N₁ P₁
() (EMG)
() VEMP (SCM)
() SCM ()
(Non0inverting) VEMP SCM
SCM (.)
SCM
VEMP EMG
() EMG
SCM VEMP VEMP
EMG P₁-N₁ (:
EMG (. ء
EMG VEMP
SCM
(.
EMG
VEMP SCM (.)
VEMP)
(
VEMP
VEMP
EMG
() (P₁) VEMP

VEMP ()
ENG/)
VEMP .()
mmHg
mmHg
VEMP (mmHg)
mmHg
VEMP
EMG
VEMP
VEMP
VEMP
()
(/ ± /)
VEMP
Bio-Logic AEP VEMP
AEP System 580-NAVPRO
/ Hz () .()
() VEMP
()
/ dB nHL () .()
Hz
P₁ P₁-N₁
N₁)



dB nHL

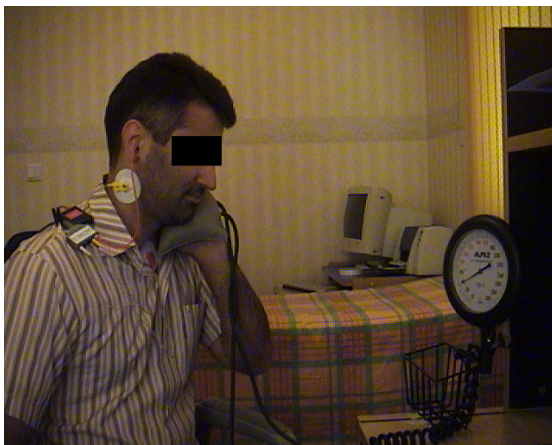
VEMP

) SCM

) SCM

(

.(



SCM

()

SCM

SCM

SCM

.() ()

) VEMP

SCM

(SCM) SCM

(

)

(

SPSS 12

P₁-N₁

(/ ± /) ()

(/ ± /) (/ ± /) P < /

(

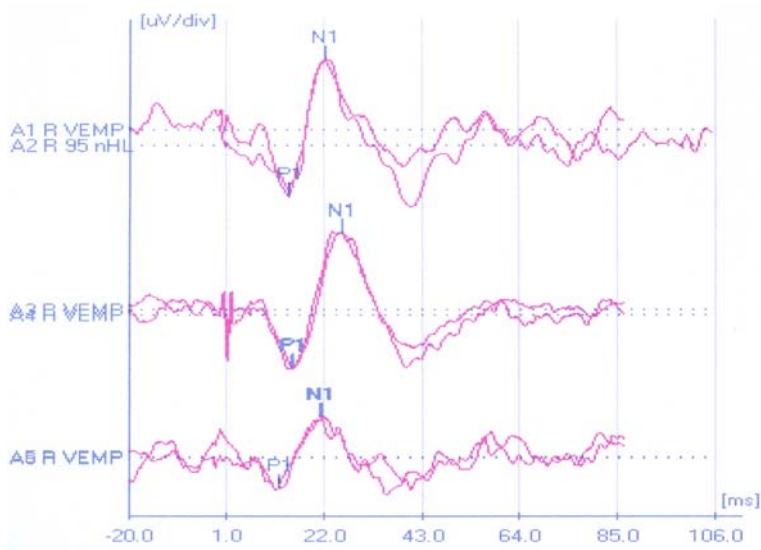
P₁-N₁

(P= /) VEMP

(P= /))

(P= /) dBnHL (

()



dB nHL

VEMP

SCM

/ ± / / ± / P₁

/ ± / / ± / P₁-N₁ N₁

N₁ P₁ VEMP

()

(: P₁ N₁ P₁

(/ ± / / ± /

VEMP

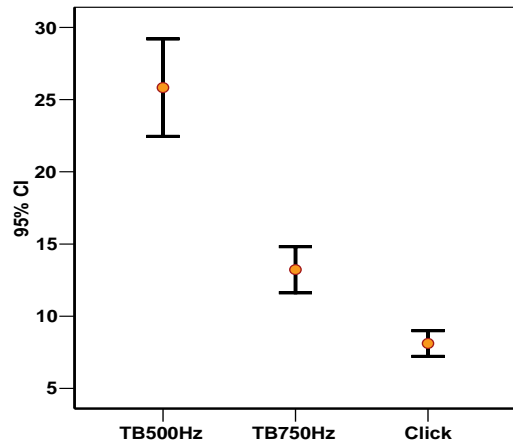
(: N₁

VEMP

VEMP ()

VEMP

()



VEMP

VEMP

()

dBnHL

N₁ P₁

VEMP

(N₁ P₁) VEMP

()

()

()

()

()

()

SCM

)

VEMP

VEMP

(

VEMP

()

VEMP

() ()
 (ENG) VEMP
)
 VEMP (VEMP
 () SCM
 SCM VEMP
 VEMP
 EMG
 VEMP EMG VEMP
 VEMP ()
 SCM
 VEMP SCM

REFERENCES

1. Popper A, Plan C, Soidal W. Acoustic functions in the fish ear. *Trends Neurosci* 1882; 5: 276-80.
2. Moffat A, Capranica R. Auditory sensitivity of the saccule in the American toad (*Bufo Americanus*). *J Compo Physiol* 1976; 105: 1.
3. Young E, Fernandez C, Goldberg J. Responses of squirrel monkey vestibular neurons to audio-frequency sound and head vibration. *Acta Oto-Laryngologica* 1977; 84: 352-60.
4. Murofushi T, Curthoys IS, Topple AN, Colebatch JG, Halmagyi GM. Response of guinea pig primary vestibular neurons to clicks. *Experiment Brain Res* 1995; 103: 174-8.

5. McCue Mp, Guinan JJ. Spontaneous activity and frequency selectivity of acoustically responsive vestibular afferents in the cat. *J Neurophysiol* 1995; 74(4): 1563-72.
6. Bickford RG, Jacobson JL, Cody TR. Nature of average evoked potentials to sound and other stimuli in man. *Ann N Y Acad Sci* 1964; 112: 204-23.
7. Colebatch JC. Vestibular evoked potentials. *Curr Opin Neurol* 2001; 14: 21-6.
8. Akin FW, Murnane OD, Proffitt TM. The effects of click and tone-burst stimulus parameters on the vestibular evoked myogenic potential (VEMP). *J Am Acad Audiol* 2003; 14 (9): 500-9.
9. Halmagyi GM, Curthoys I. Otolith function tests. In: SJ Herdman S, editor. *Vestibular Rehabilitation*. Philadelphia: FA. Davis. 2000; PP: 196-214.
10. Zhou G, Cox L. Vestibular evoked myogenic potentials: histoty and overview. *Am J Audiol* 2004; 13: 135-43.
11. Colebatch JC, Halmagyi GM. Vestibular evoked potentials in human neck muscles before and after unilateral vestibular deafferentation. *Neurology* 1992; 42: 1635-6.
12. Colebatch J, Halmagyi GM, Skuse NF. Myogenic potentials generated by a click-evoked vestibulocollic reflex. *J Neurol Neurosurg Psychiat* 1994; 57: 190-7.
13. Wu C, Young Y. Vestibular evoked myogenic potentials are intact after sudden, deafness. *Ear Hear* 2002; 23: 235-8.
14. Vanspauwen R, Wuyts FL, Van de Heyning PH. Improving vestibular evoked myogenic potential reliability by using a blood pressure manometer. *Laryngoscope* 2006; 116: 131-5.
15. Vanspauwen R, Wuyts FL, Van de Heyning PH. Validity of a new feedback method for the VEMP test. *Acta Oto-Laryngologica* 2006; 126: 796-800.
16. Roberrson DD, Ireland DJ. Vestibular evoked myogenic potentials. *J Otolaryngol* 1995; 24: 3-8.
17. Lim CL, Clousron P, Sheean G, Yiannikas C. The influence of voluntary EMG activity and click intensity on the vestibular click evoked myogenic potential. *Muscle Nerve* 1995; 18: 1210-3.
18. Bath AP, Harris N, Yardley MP. The vestibulo-collic reflex. *Clin Otolaryngol* 1998; 23. 462-6.
19. Li MW, Houlden O, Tomlinson RD. Click evoked EMG responses in sternocleidomastoid muscles: characteristics in normal subjects. *J Vestibular Res* 1999; 9: 327-34.
20. De Waele C. Tran Ba Huy P, Diard J-P, Freyss G, Vidal PP. Saccular dysfunction in Meniere's disease. A vestibular-evoked myogenic potential study. *Ann N Y Acad Sci* 1999; 871: 392-7.
21. Murofushi T, Matsuzaki M, Chih-Hsiu W. Short tone burst evoked myogenic potentials on the sternocleidomastoid muscle: Are these potentials also of vestibular origin? *Arc Otolaryngol Head Neck Surg* 1999; 125: 660-4.
22. Todd NPM, Cody FWJ, Banks JR. A saccular origin of frequency tuning in myogenic vestibular evoked potentials: implications for human responses to loud sounds. *Hear Res* 2000; 141: 180-8.
23. Ochi K, Ohashi T, Nishililo H. Variance of vestibular-evoked myogenic potentials. *Laryngoscope* 2001; 111: 522-7.

-
24. Welgampola MS, Colebatch JG. Characteristics of tone burst-evoked myogenic potentials in the sternocleidomastoid muscles. *Otol Neurotol* 2001; 22: 796-802.
 25. Akin FW, Murnane OD, Panus PC, Caruthers SK, Wilkinson AE, Medley TM. The influence of voluntary tonic EMG level on the vestibular evoked myogenic potential. *J Rehabil Res Dev* 2004; 41(3B):473-80.
 26. McCue MP, Guinan JJ. Acoustically responsive fibers in the vestibular nerve of the cat. *J Neurosci* 1994; 14(10): 6058-70.
 27. Zhou G, Cox L. Vestibular evoked myogenic potentials: history and overview. *Am J Audiol* 2004; 13: 135-43.
 28. Rauch S. Vestibular evoked myogenic potentials. *Otolaryngol Head Neck Surg* 2006; 14: 299-304.