Evaluation of masseteric vestibular evoked potentials in patients with migraine

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Introduction

In 2003, Deriu et al. found that unilateral or bilateral electrical vestibular stimulation (EVS) evoked a short-latency, short-duration, bilateral EMG response in active masseter muscles of healthy subjects, and that these responses reflected the connection between the vestibular complex and trigeminal nerve nuclei [1]. In 2005, they concluded that mVEMP consists of 2 components, P11/N15 and P16/N21 and P11/N15 wave was of vestibular origin (VMR) and the P16/N21 wave was of cochlear origin (AMR) [2]. Studies in the literature show that mVEMP is used in studies examining central nervous system diseases such as multiple sclerosis (MS), REM sleep behavior disorder, idiopathic Parkinson's disease, and amyotrophic lateral sclerosis, in addition to normalization studies.

Object

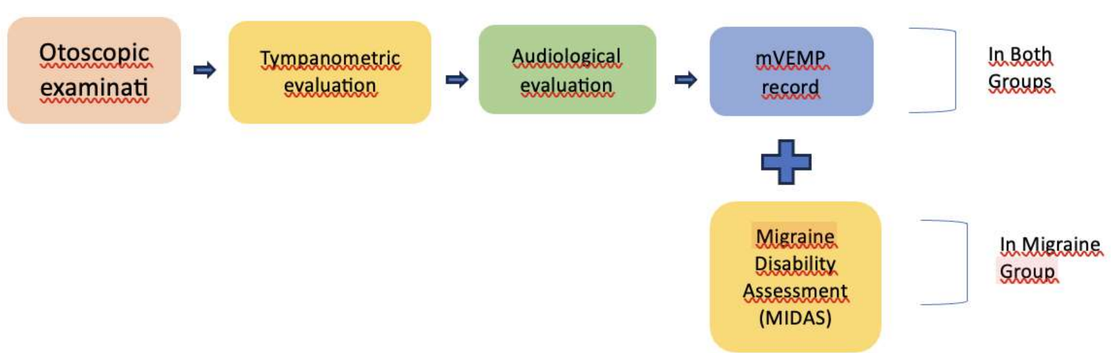
Considering the hypothesis that migraine occurs due to increased activation in the trigeminal nerve, it is thought that mVEMP responses, which evaluate the connection between the vestibular complex and trigeminal nerve nuclei, may be affected in migraine patients. Therefore, our study aimed to compare VEMP responses recorded with click and 500 Hz tone burst stimuli in migraine patients.

Method

The prospective study, conducted within the scope of Istanbul Aydın University Graduate Education Institute Audiology Program Master's thesis, was conducted at Bezmialem Vakıf University Audiology Clinic. Permission was received from Bezmialem Non-Interventional Ethics Committee on 05.07.2022 to conduct the study (Ethics Committee Number: 2022/192).

The study included 20 individuals diagnosed with migraine and 20 healthy individuals aged between 18 and 50 years, who had normal ear examination findings, bilateral Type-A tympanograms, and an air-bone gap below 10 dB at 500-4000 Hz. The participants had no vestibular complaints, no history of noise exposure, head trauma, ototoxic drug use, or otological, metabolic, or neurological disorders. The procedure diagram is shown in Figure-1.

Figure-1 Procedure diagram



Result

mVEMP evaluation was performed with ipsilateral 500 Hz tone burst and click stimuli in migraine and control groups. P1, N1, N1-P1 latency, N1-P1 and interaural amplitude values, and the number of pathological ears were compared between the groups.

In the evaluation made with 500 Hz tone burst stimulus, N1-P1 amplitude value was found to be significantly lower in the migraine group compared to the control group.

500 Hz Tone Burst Stimulus	Groups		
	Migraine (36 Ears) Mean-SD	Control (40 Ears) Mean-SD	p Value
P1 Latency	16,34±2,30	15,60±1,37	0,091
N1 Latency	25,46±2,46	25,04±1,90	0,413
N1-P1 Latency	9,43±1,90	9,11±2,57	0,533
N1-P1 Amplitude	35,43±14,28	45,17±15,35	0,006*

In the evaluation made with the click stimulus, N1 latency value in the migraine group was found to be significantly prolonged compared to control group.

Click Stimulus	Groups		
	Migraine (30 Ears) Mean-SD	Control (37 Ears) Mean-SD	p Value
P1 Latency	13,33±1,85	12,63±1,59	0,156
N1 Latency	19,24±2,71	17,91±1,53	0,014*
N1-P1 Latency	5,92±1,86	5,27±1,21	0,091
N1-P1 Amplitude	27,24±11,64	31,22±10,39	0,145

In both mVEMP evaluations performed with 500 Hz tone burst and click stimuli, the number of pathological ears in the migraine group was significantly higher than the control group.

The number of pathological ears within the group was compared according to the stimulus types in the migraine and control groups, and no significant difference was found in the number of pathological ears in the 500 Hz tone burst and click stimuli.

No correlation was found between VEMP responses and MIDAS scores of participants in the migraine group.

Discussion

Studies in the literature evaluating mVEMP responses in central nervous system diseases such as MS, REM sleep behavior disorder, idiopathic Parkinson's disease, and amyotrophic lateral sclerosis have shown that pathological responses such as latency prolongation, amplitude decrease, or lack of response are common in these patients [3]. Murofushi et al. (2001) investigated the clinical significance of VEMP latency prolongations and examined the responses of 134 patients with Meniere's disease, acoustic neuroma, vestibular neuritis, and multiple sclerosis, and found that prolonged VEMP responses were associated with retrolabyrinthine lesions [4]. In our study, consistent with the literature, pathological responses in the migraine group were higher than in the control group, and the most common pathology was found to be latency prolongation.

In our study, no superiority was observed in click and tone burst stimuli in terms of lesion location detection. Consistent with normalization studies in the literature, high amplitudes and long latencies were obtained in recordings made with tone burst stimuli [5].

In our study, no correlation was observed between MIDAS scores and the number of pathological ears in the migraine group. It is thought that this situation may be related to the presence of asymptomatic pathologies, the symptoms being felt to different degrees due to the difference in emotional and physical perception in individuals, and the inclusion of young patients with migraine for a short time in the study.

References

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