VERTIGO, NAUSEA, TINNITUS AND HYPOACUSIA DUE TO CENTRAL DISEQUILIBRIUM

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COMPARATIVE STUDY OF ACOUSTICALLY EVOKED BRAINSTEM POTENTIALS AND VESTIBULAR FINDINGS IN MULTIPLE SCLEROSIS

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Introduction

Multiple sclerosis is presumed to be a virus-induced autoimmune-type inflammatory illness affecting various structures of the central nervous system, either simultaneously, or in a random sequence during the course of the disease. Pathologically, it is characterized by demyelinization, predominantly involving the white substance of the brain (7). Demyelinated plaques are often located around the IIIrd and IVth cerebral ventricles near the vestibulocerebellar tract and the medial longitudinal fascicle. As the alterations invade only the roots of the cerebral nerves, the cochlear and the vestibular sensory epithelia remain intact. The great variability of the cochleovestibular symptoms affords a peculiar clinical picture to the disease (1, 5).

Patients

The present study reports the results of otoneurologic and objective audiometric examinations of 39 multiple sclerosis patients. The diagnosis was based on neurologic, cerebrospinal fluid, EEG, ophthalmologic, visually evoked potential, otoneurologic, audiologic and radiologic examinations and on a long-term follow-up of the process. In harmony with the general literature data, we observed a higher incidence rate among women (28 women versus 11 men) (6). At the time of the first otoneurologic investigation, the average age for women was 39.8 (18-52) years, while for men was 32.2 (20-43) years. The mean interval between the observation of the initial symptoms and the first otoneurologic examination was 4.8 (0.5-18) years (Table I).

Interval (years) between first symptom and examination

Sex	<1	1-3	4-6	7-9	10-12	>12
Women	2	12	6	4	2	2
Men	1	4	1	4	1	0

Table I

Results

Among the early complaints (numbness of the lower extremities, temporary diplopia, visual weakness, etc.), dizziness was reported with the highest frequency. Of 39 patients, 2 complained of vertigo and 26 of imbalance. Gaze-evoked horizontal nystagmus was found in 5 of 21 cases with electronystagmographically registered spontaneous nystagmus. Latent vertical nystagmus was detected in 2 and direction fixed latent horizontal nystagmus in 14 patients. In all the multiple sclerotic subjects, the vestibulospinal and vestibulocerebellar investigations revealed atactic gait (with falling in 9, gait deviation in 8, pastpointing in 4, and dysdiadochokinesis in 10). On 20°/s foveal optokinetic stimulation, pathologic responses were given by 31 of 39 patients: the slow phase of the optokinetic nystagmus of 28 patients showed a serrated shape (Fig. 1); nystagmus with a fast phase only to the right was found in 1 patient, a side difference in the horizontal plane in a further 1, and a reduced amplitude of vertical nystagmus also in 1 case.

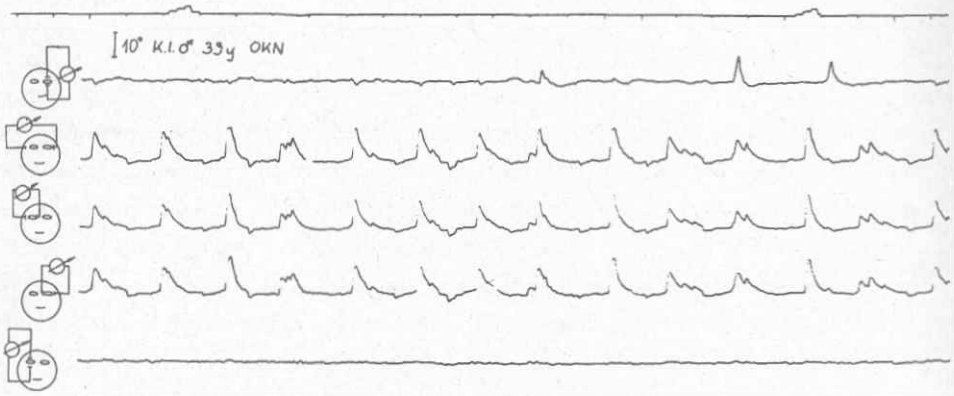

Fig. 1. Broken-up optokinetic nystagmus of a 33-year-old male patient

The caloric vestibular examinations were carried out by the Cawthorne-Fitzgerald-Hallpike method with electronystagmographic recording. Normal reactions were given only by 4 patients. As signs suggestive of lesions of the central vestibular tracts, dysmetric or, dysrhythmic nystagmus were detected in 16 (Fig.2) a directional preponderance in 18, a vestibular tonus difference in 7 and vestibular hyperaesthesia in 7 cases.

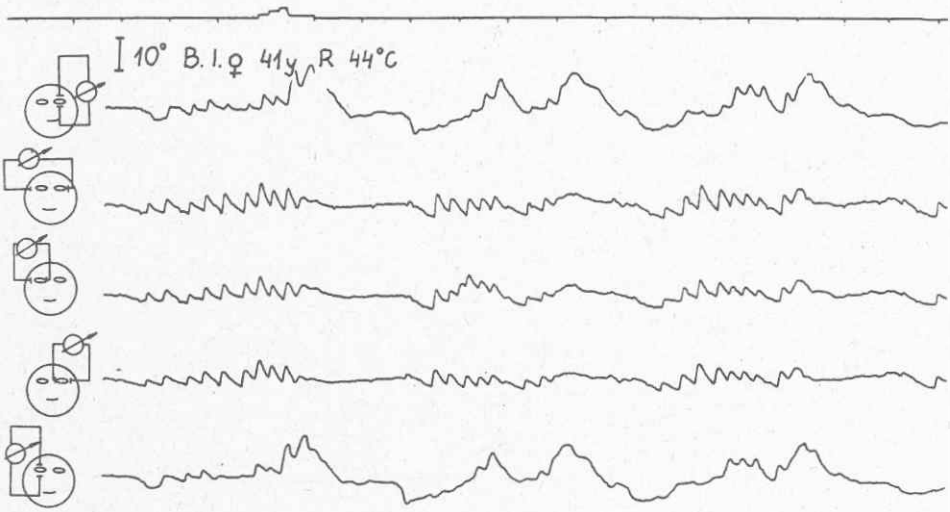

Fig.2. Dysrhythmic caloric nystagmus of a 41 year-old female patient.

The canal paresis in 5 patients involved a contralateral directional preponderance in 4 and an ipsilateral preponderance in 1 case. Weakness of abduction was demonstrated in 1 and absence of the inhibitory action of ocular fixation in 3 patients.

Five patients complained of unilateral, and 5 more of bilateral tinnitus. Pure tone threshold audiometry and BERA investigations revealed a retrocochlear-type lesion in 7 of 8 subjects with an increased hearing threshold. Besides 20% speech comprehension, a marked increase of the threshold was observed, predominantly at low frequencies only in 1, and at high frequencies also in 1 case. Studies of the acoustically evoked brainstem potentials of 31 patients with normal pure tone and speech audiometric findings demonstrated pathologic responses in 24 cases. The absence of wave V, indicative of a lesion of the inferior colliculus, was observed in 9 patients. A delayed latency of wave V, and particularly of waves III-V, is a frequent phenomenon in this disease. In accordance with the data of others (4), we found an increased ratio of waves I/V in 29 cases (Table II).

Pathologic BERA findings

Waves	Variables	Right	Left	Side difference
V.	delayed latency	14	10	8
	absence	5	4	
I-III.	delayed latency	10	7	6
III-V.	delayed latency	20	12	13
I-V.	delayed latency	18	14	10
I/V.	increased amplitude ratio	14	15	13

Table II

Figure 3 depicts 4 pathologic patterns of acoustically evoked brainstem potentials measured in our laboratory. In group I, a delayed nerve conduction is indicated by the prolongation of the absolute latency of the waves and by the increased IPL. In group II, the distortion of waves IV/V may be indicative of a higher brainstem lesion. In group III, waves IV/V can not be registred at all. In group IV, with the exception of wave I, none of the waves can be visualized.

Discussion and Conclusions

In multiple sclerosis, a large number and variety of otoneurologic and audiologic alterations can be recorded. In 35 of the present 39 patients, the applied diagnostic procedures disclosed impaired functions. While electronystagmography is a suitable technique for the demonstration of central vestibular lesions, dysfunction of the central acoustic tract can be verified only via acoustically evoked brainstem reactions (2,3,4) Although some authors attribute more significance to electronystagmography in the diagnostic of multiple sclerosis, our otoneurologic results correlate adequately with the findings of objective audiometry. In our examinations, the absence in BERA of waves IV/V was associated with a contralateral directional preponderance of the caloric nystagmus in 8 cases, but with an ipsilateral preponderance in only 1. This findings may be explained with the anatomical difference between the central cochlear versus vestibular pathways. Though the otoneurologic and audiologic results are not specific for multiple sclerosis, these techniques are able to reveal abnormalities suggestive of lesions in various parts of the central nervous system, and are thus

helping the neurologist in his diagnostic practice.

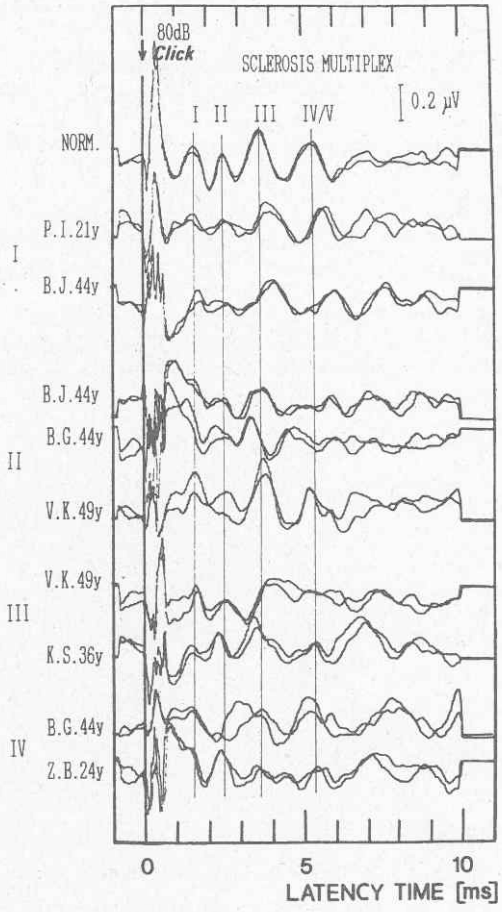

Fig.3. Various patterns of acoustically evoked brainstem potentials in multiple sclerosis patients.

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