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Visuoocular Reflexes in Presbyvertigo

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Abstract: Using electronystagmography, we tested 100 patients (ages 65–80 years) manifesting the clinical signs of presbyvertigo, for the purpose of demonstrating their visuoocular reflexes. We administered not only simple optokinetic and eye-tracking stimuli but caloric modification of each one as well (with contrary directed optokinetic trace movement). The results were compared with those obtained in a group of 40 healthy subjects between the ages of 20 and 25 years. In the older group, we observed a statistically significant increased frequency of asymmetry of optokinetic nystagmus and pathological patterns revealed by the eye-tracking test and caloric modification of both the optokinetic and eye-tracking tests. We discuss the hypothetical predominant localization of age-dependent changes, with emphasis on the disturbances of visual-vestibular integration, on the basis of data obtained from anamnesis and other electronystagmographic findings.

Key Words: elderly; presbyvertigo; visuooculomotor reflexes

It is difficult to determine definitively which age range may be classified as elderly. On the basis of previous examinations, it may be assumed that 4–12% of individuals reaching the age of 65 years suffer from primary or secondary dementia. Vertigo and balance disturbances are frequently noted in that group. These symptoms coexist with both disabilities of optic and vestibular organs and arthrosis or vascular deficit. Oosterveld [1] demonstrated a vertigo syndrome called *presbyvertigo* (*presbyastasia*) in 41–61% of the elderly population.

Taking this finding into consideration, we undertook to evaluate vestibular function on the basis of selected tests in young normal subjects and in elderly patients, whom we defined as aged 65 years or older. The aim of our study was to compare the visuooculomotor reactions in these two groups of patients and to try to establish the origin of vertigo syndromes in the elderly.

MATERIALS AND METHODS

The investigations were performed in 100 patients (48 male, 52 female) aged 65 to 80 years (group 1) and in 40 normal volunteers (19 male, 21 female) aged 20 to 25 years (group 2). Those in the first group (the elders) were tested to exclude diabetes mellitus and chronic rheumatic arthritis. This group was formed in such a way as to contain only those in reasonably good health without previous brain diseases that required a sudden intervention.

Each person (in both groups) underwent subjective and objective examinations including electronystagmographic analysis, which estimated spontaneous, positional, gaze, optokinetic, and cervical nystagmus, according to the test from J. B. Causse et al. [2], and eye-tracking proof. Optokinetic and eye-tracking stimulations were given separately and during postcaloric nystagmus. The last examination was called *caloric modification of visuooculomotor reflexes.* The trace velocity was always the same and reached 20 degrees/sec. In the statistical analysis, the χ^2 test was used.

RESULTS

First, the anamnesis of vertigo syndromes was examined. Table 1 lists the complaints collected from both groups 1 and 2. The results of examinations of balance and coordination are collated in Table 2. A comparison of the electronystagmographic data in the first and the second tested groups is shown in Figure 1. In Figure 2 is depicted the differences in statistical significance between the young and elder groups.

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Table 1. Vertigo Syndromes in the Tested Groups

Symptoms	Percentage of Cases
Group 1 (elderly subjects)	
Nonsystemic vertigo	70
Turning sensation	22
Accompanying vegetative symptoms	35
Vestibular symptoms sufficiently intense to disturb daily activity	23
Duration of syndrome	
<1 yr	31
>1 yr	69
Duration of attacks	
Seconds or minutes	0
Hours	53
Days	46
Weeks or months	81
Accompanying hearing disturbances	37
Accompanying memory deficit	14
Other symptoms of central nervous system dysfunction	0
Group 2 (young subjects)	
Train sickness	0
Height vertigo	2.5
Vegetative symptoms	1

Table 2. Pathological Findings in Balance and Coordination Tests

Results of Tests Performed	Percentage of Cases	
	Group 1	Group 2
Positive standard Romberg test	37	0
Positive sharpened Romberg test	52	2.5
Impaired tandem walking with eyes open	20	0
Past-pointing	29	0
Asynergy and dysmetria on pointing tests	37	0
Adiadochokinesia or dysdiadochokinesia	31	0

DISCUSSION

We found no significant difference between the two groups in the frequency of positional and gaze nystagmus, which confirmed the findings in a previous study by Brunner et al. [3]. Our data proved that only the optokinetic and eye-tracking stimulations together with cervical maneuver were able to distinguish the reaction produced by both young and elderly subjects. Optokinetic asymmetry and increased latency time of caloric modification of the optokinetic test were noted statistically more frequently in the first group. Bodo [4] did not observe similar disabilities in the elder patients, a finding contrary to that reached by Wilke et al. [5].

However, the pathology demonstrated on the eye-tracking tests in our first group was similar to that demonstrated previously by Kornhuber [6] and Bodo [4]. These authors were of the opinion that such a result in the elderly depended on the degeneration of the cerebellar nuclei. Wilke et al. [5] reported disturbances of visual-vestibular integration on reaching an advanced age. In people older than 65 years, cervical nystagmus was suspected to appear, according to the experiments performed by Oosterveld [1].

All our data obtained in the group of elderly subjects revealed that presbyvertigo was a consequence not only of disabilities of vestibular and visual organs but also of dysfunction of the frontal and occipital brain lobes and cerebellum. Some of our findings—such as characteristic Romberg test, tremor, asynergy, dysmetria, dysdiadochokinesia, and gaze nystagmus—highlighted the effect of Purkinje cell diminution on balance system disorders.

CONCLUSIONS

The disturbances of visual-vestibular integration in the elderly are believed to play a leading role in the presence of presbyvertigo. The pathological data obtained from anamnesis, compound visuooculomotor tests, and cervical proof pointed out the compound character of presbyvertigo as a result of visual, vestibular, vascular, and motion system dysfunctions.

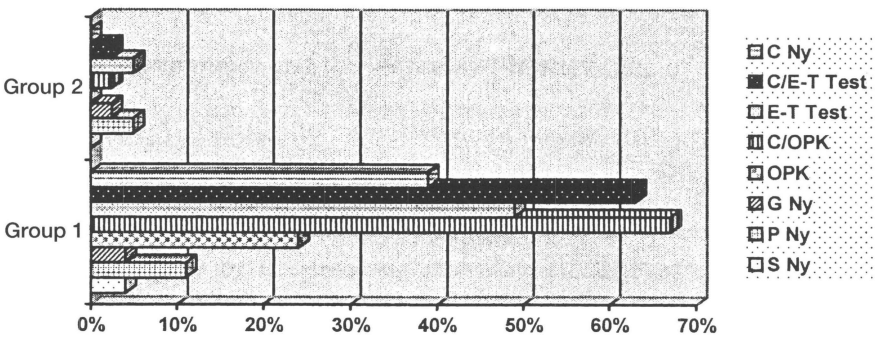

Figure 1. Frequency of pathological electronystagmographic findings. (*C/E-T Test* = caloric modification of eye-tracking test; *C Ny* = cervical nystagmus; *C/OPK* = caloric modification of optokinetic nystagmus; *E-T Test* = eye-tracking test; *G Ny* = gaze nystagmus; *OPK* = optokinetic nystagmus; *P Ny* = positional nystagmus; *S Ny* = spontaneous nystagmus.)

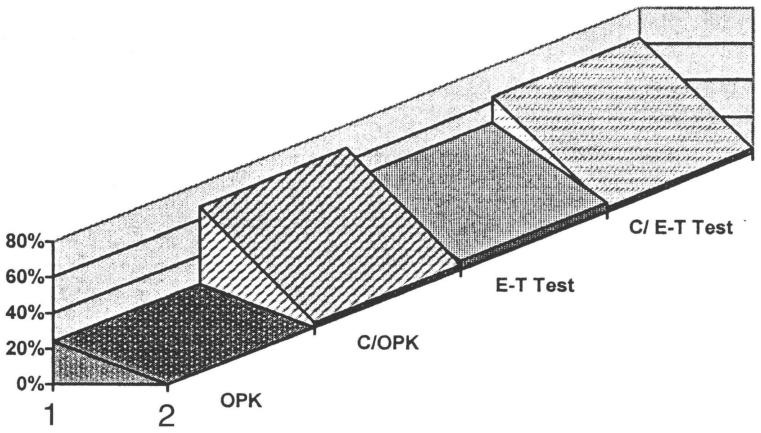

Figure 2. Statistically significant differences between groups 1 and 2. (*C/E-T Test* = caloric modification of eye-tracking test; *C/OPK* = caloric modification of optokinetic nystagmus; *E-T Test* = eye-tracking test; *OPK* = optokinetic nystagmus.)

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