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PREVALENCE OF VERTIGO AND DIZZINESS IN MIGRAINE PATIENTS AND NON-HEADACHE SUBJECTS

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Summary

The aim of this study was to assess the prevalence of vertigo and dizziness in patients with migraine as compared to the control group without a headache. A total of 327 patients with migraine and the control group of 324 subjects were evaluated for vertiginous signs and dizziness, time of onset of the symptoms, frequency of the symptoms and temporal association of the symptoms with the migraine attack. More than half of the migraine patients had in their lifetime experienced a sense of vertigo or dizziness: 169 patients (51.7%), and 102 subjects (31.5%) in the control group. Vertigo symptoms were associated with a migraine attack always in 38 (22.5%), sometimes in 38 (22.5%) and were not associated in 93 (55.0%) patients. Patients having migraine with aura significantly more often have migraine attacks associated with symptoms of vertigo or dizziness. Our study, together with other similar studies, suggests that migraine should be considered in the differential diagnosis of vertigo.

Key words: Vertigo, headache, migraine, migraine with aura, migraine without aura

INTRODUCTION

Headache is one of the most frequent complaints in the general practice, and migraine is the second most frequent primary headache [1]. Many patients with migraine

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complain because of dizziness, sense of disequilibrium and head motion intolerance or a more specific vertigo. Recently, migrainous vertigo was recognized as a frequent cause of recurrent vertigo in patients presenting to specialized dizziness and headache clinics [2,3]. Migraine headaches and vestibular vertigo concur in the general population about three times more often than expected by chance [4]. An epidemiologic study carried out in the general population of adults showed that the lifetime prevalence of migrainous vertigo is 0.98% and 1 year prevalence 0.89% [4]. Since migrainous vertigo is a relatively frequent disorder it also has a considerable impact both on personal and social level [4].

The aim of this study was to assess the prevalence of vertigo and dizziness in the patients with migraine as compared with the control group.

Methods

A total of 327 consecutive patients with migraine with or without aura presenting to the Headache clinic were clinically assessed between March 2005 and December 2006.

The control group consisted of 324 subjects who were not diagnosed with migraine or frequent headaches; they were chosen randomly outside the hospital between March and December 2006. A medical doctor (I.G.) working as a research fellow at the Neurology Department was trained to perform a face-to-face interview to select subjects for the control group.

Both groups were evaluated for vertiginous signs and dizziness, the time of the onset of symptoms, frequency of the symptoms and temporal association of the symptoms with the migraine attack. Migraine with or without aura was diagnosed according to the revised IHS criteria [5] during a clinical interview by a neurologist, (headache specialist V. V.); and a clinical neurological examination was included. When investigating for the presence of dizziness, the study group and the control group were specifically asked to describe their symptoms; dizziness symptoms implying non-vestibular dizziness such as orthostatic hypotension were not included. Vertigo was not counted as an aura symptom for the diagnosis of migraine with aura. None of these patients fulfilled the IHS criteria for basilar migraine. The prevalence of vertigo and dizziness was assessed as lifetime prevalence. The group of patients with migraine who had experienced vertiginous symptoms in their lifetime are referred to as the MVL group (Migraine Vertigo Lifetime), and subjects in the control group who experienced vertiginous symptoms in their lifetime as the CVL group (Control Vertigo Lifetime). The migraine patients who met the diagnostic criteria for migrainous vertigo are referred to as the MV group (definite migrainous vertigo). Although the diagnostic category of probable migrainous vertigo was proposed for the patients who did not entirely fulfill the criteria for migrainous vertigo [2], in this study only the patients that met the proposed diagnostic criteria for definite migrainous vertigo are referred to as the MV group.

The diagnosis of definite migrainous vertigo was based on the following criteria [2]:

1. Episodic vestibular symptoms of at least moderate severity (rotational vertigo, other illusory self or object motion, positional vertigo, head motion intolerance - sensation of imbalance or illusory self or object motion that is provoked by head motion).
2. Migraine according to the IHS criteria.
3. At least one of the following migrainous symptoms during at least two vertiginous attacks: migrainous headache, photophobia, phonophobia, visual or other auras
4. Other causes ruled out by appropriate investigations.

Further diagnostic works such as extracranial color Doppler, transcranial Doppler, brainstem auditory-evoked potentials, MRI, vestibular tests (calorimetrics) and laboratory tests were performed individually when considered appropriate.

Statistical analysis was performed using the χ^2 test and Fisher's exact test to compare proportions. Mean and SD were used to describe continuous variables, and Student's t-test to compare them between different groups and subgroups. STATISTICA release 6.0 (StatSoft Inc., Tulsa, OK, USA) was used for all analyses. $P < 0.05$ was considered significant.

Results

The patients in the migraine group and the control group did not differ significantly in age or gender. There was a preponderance of female patients in the sample of the migraine group, 289 (88.4%) women, 38 (11.6%) men, as was in the control group, 263 (81.2%) women and 61 (18.8%) men; $P = 0.065$.

Mean age of the patients with migraine was 39.9 ± 12.2 (39.9 ± 12.3 for women, 40.5 ± 11.5 for men); mean age of the control group was 39.8 ± 12.1 (39.5 ± 11.5 for women and 43.0 ± 11.5 for men); $P = 0.86$.

The mean number of migraine headaches per month was 3.4 ± 3.3 ; 3.3 ± 3.3 in women and 3.7 ± 3.0 in men; $P = 0.48$.

Slightly over a half of the migraine patients had in their lifetime experienced a sense of vertigo or dizziness (MVL) - 169 (51.7%), as compared with 102 (31.5%) in the control group (CVL); $P < 0.0001$.

In the MVL group the onset of vertiginous symptoms was earlier than in the CVL group: vertigo or dizziness began 14.6 ± 19.2 years prior to our testing in the MVL group, and 9.9 ± 17.0 years ago in the CVL group; $P = 0.0011$. Furthermore, the patients were asked to define the time of onset of vertiginous symptoms and they stated as follows (MVL vs. CVL): a) from childhood in 8 (2.45%) vs. 6 (1.85%) patients; b) symptoms began later in life in 67 (20.49%) vs. 54 (16.67%) patients; c) symptoms began just recently in 94 (28.75%) vs. 42 (12.96%) patients; d) 158 (48.32%) vs. 222 (68.5%) patients never had such symptoms, $P < 0.0001$.

There was no significant difference in the proportion of the patients in the MVL group and CVL group who had symptoms of dizziness or vertigo; in the MVL group 113 (34.56%) patients stated that they had dizziness (head motion intolerance – sensation of imbalance or illusory self or object motion that is provoked by head motion) vs. 66 (20.37%) patients in the CVL group, while 56 (17.13%) MVL patients stated that they had a sense of vertigo (rotational vertigo, other illusory self or object motion, positional vertigo) vs. 36 (11.1%) patients in the CVL group, $P=0.716$.

There was no statistical difference between the MVL and CVL groups regarding the appearance of symptoms: vertigo or dizziness appeared only in relation with the movement of the head in the migraine group in 61 (18.65%) patients vs. 39 (12.04%) in the control group, and during movement of the head and in a steady state in the MVL group in 100 (30.58%) patients vs. 58 (17.9%) in the CVL group; $P=0.395$.

There was no statistical difference between the MVL and CVL groups regarding the frequency of attacks: every or every other day in 14 (4.28%) vs. 10 (3.09%) patients, couple of times per month in 85 (25.99%) vs. 41 (12.66%) patients and one to three attacks of vertigo during the lifetime in 64 (19.57%) vs. 50 (15.43%) patients; $P=0.185$. Results regarding the differences between the MVL and CVL groups are shown in Table 1.

Table 1. Differences between the MVL and CVL groups of patients

	MVL (%)	CVL (%)	P-values	
Number of individuals	169 (51.7)	102 (31.5)	<0.0001	
Individuals with vertigo	56 (17.13)	36 (11.1)	<0.716	
Individuals with dizziness	113 (34.56)	66 (20.37)		
Appearance of symptoms in relation to head movement	61 (18.65)	39 (12.04)	<0.395	
Appearance of symptoms during head movement and in a motionless state	100 (30.58)	58 (17.9)		
Frequency of attacks	Every or every other day	14 (4.28)	10 (3.09)	
	A couple of times a month	85 (25.99)	41 (12.66)	<0.185
	1-3 attacks in the lifetime	64 (19.57)	50 (15.43)	

MVL: migraine patients who have experienced a sense of vertigo or dizziness in their lifetime

CVL: individuals in the control group who have experienced a sense of vertigo or dizziness in their lifetime

Vertigo symptoms were associated with a migraine attack: always in 38 (22.5%), sometimes in 38 (22.5%) and were not associated in 93 (55.0%) patients. According to the proposed criteria 76 (23.2%) migraine patients from our study met the criteria for definite migrainous vertigo.

Migraine without aura (MO) was diagnosed in 199 (60.9%) patients, while 128 (39.1%) had migraine with aura (MA); patients having MA were regarded as such if they had at least one aura sign. Signs of visual aura were present in 111 (86.7%) MA patients: scintillating scotomata in 73 (57.0%), partial loss of vision in 17 (13.3%), and "vague" vision in 21 (16.4%) patients. Paresthesiae in the arm or face unilaterally were present in 5 (3.9%) patients and speech problems in 11 (8.6%).

The patients with MA had significantly more often migraine attacks in association with symptoms of vertigo or dizziness: a) MA always in 19 (14.84%) vs. MO in 19 (9.55%) patients or b) sometimes MA in 28 (21.88%) vs. MO in 10 (5.03%) patients; $P < 0.0001$. The results regarding migraine patients with or without aura are shown in Table 2.

Table 2. Differences between migraine patients with or without aura.

	Migraine with aura (%)	Migraine without aura (%)	P-value
Number of individuals	128 (39.1)	199 (60.9)	
Always migraine with vertigo/dizziness	19 (14.84)	19 (9.55)	<0.0001
Sometimes migraine with vertigo/dizziness	28 (21.88)	10 (5.03)	

Discussion

Studies investigating migraine and vertigo have shown data that support the observation that there is an association between migraine and vertigo, which is not a pure coincidence. However, the epidemiologic evidence for this association from control studies is not as sufficient as one might expect since migraine has long been associated with vertigo [6,7].

The prevalence of migraine worldwide ranges from 6 to 18% in women and 3-6% in men [8-11]. Population studies show that the prevalence of dizziness in the general population is over 20% [12] and the lifetime prevalence of vertigo is 7% [13]. A neurology survey revealed that 3.2% of the general population had both vestibular vertigo and migraine; in that study 1% of the population was diagnosed with migrainous vertigo [4]. 1% of the population could be expected to have a concurrence of vertigo and migraine by chance, if the lifetime prevalence of 7% for vertigo and 16% for migraine were taken into account [11,13]; so authors [4] suggested that the remaining 1% out of the original 3.2% might have probable migrainous vertigo or other vestibular disorders, including BPPV or Meniere's disease, since both were associated with migraine [14-16]. In one study a high proportion of patients (81%) diagnosed with the «vestibular Meniere's

disease» had migraine, however, a certain number of these patients might in fact had had migrainous vertigo [17].

Vertigo was found to be three times more common in the migraine patients than in the control group: vertigo occurred in 24-27% of the migraine patients, as compared with 8-10% in the control group [6,18]. However, these studies did not use the IHS criteria for migraine. Our study included only the patients with migraine diagnosed according to the revised IHS criteria. The results of our study showed that a significant proportion of the migraine patients experienced a sense of vertigo or dizziness in their lifetime: 51.7%, as compared with 31.5% in the control group ($P=0.001$).

A high prevalence of migraine of 30 to 61% was found in the patients with vertigo [19-21]. The lifetime prevalence of definite migrainous vertigo was 7% in the dizziness clinic group and 9% in the migraine clinic group; probable migrainous vertigo was found in a further 4% of the patients in the dizziness clinic [2]. In a retrospective study, 6% of the patients presenting to the dizziness clinic had «vestibular migraine» [22].

In our study vertiginous symptoms began earlier in life in the MVL patients than in the control group with vertigo (14.6 ± 19.2 years ago vs. 9.9 ± 17.0 ; $P=0.0011$); this may reflect the common pathophysiological pathways in migraine and vertigo.

In our study the proportion of women in the MVL and CVL groups did not differ significantly; from a different point of view, the proportion of women did not differ among migraineurs with or without dizziness, suggesting that the female preponderance among the patients with migrainous vertigo reflects the female preponderance among migraineurs in general [4].

There was no significant difference between the proportion of the patients in the MVL group and the CVL group who had symptoms of dizziness or vertigo; dizziness was reported more frequently (34.56%) than vertigo (17.13%) in the MVL group, as was in the CVL group (20.27% reported dizziness and 11.1% reported vertigo). Since either vertigo or dizziness provoked by head motion are required for the diagnosis of migrainous vertigo, having either of these symptoms does not make any difference. These data reflect only the preponderance of dizziness in the general population as observed in studies [12,13].

There was no statistical difference between the MVL group and the CVL group regarding the appearance of symptoms: 30.58% of the MVL patients had symptoms in a motionless state or during head movement, as compared with 17.9% in the control group, and symptoms were present only during head movement in 18.65% of the patients in the MVL group, as compared with 12.04% in the control group; $P=0.395$. These data show that more migraine patients have dizziness or vertigo even in a motionless state along with head movement as compared with the control group, which might indicate that in the migraine patients additional pathophysiological pathways may

play a role in provoking (and maintaining) such symptoms. The vertical vestibulo-ocular reflex plays an important role in the visual stabilization during daily activities such as normal ambulation; in the patients with a migraine aura and dizziness an abnormal vertical vestibulo-ocular reflex at higher head movement frequencies has been found [3].

The majority of the MVL and CVL patients have vertiginous symptoms a couple of times per month, although there was no statistical difference between the two groups regarding the frequency of attacks: every or every other day in 14 (4.28%) vs. 10 (3.09%) patients, a couple of times per month in 85 (25.99%) vs. 41 (12.66%) patients and one to three attacks of vertigo in the lifetime in 64 (19.57%) vs. 50 (15.43%) patients respectively; $P=0.185$.

Vertiginous symptoms may last from seconds, minutes, hours, to even more than a day, and in some patients occur on a daily basis [2, 24]. One study revealed that the majority of patients have short lasting dizziness attacks (less than 5 minutes) and a minority over a day lasting dizziness (3%), which is probably why only one third of the participants consulted a doctor because of their vertigo [4]; this may reflect the causes of underdiagnosis of migrainous vertigo in the migraine population.

Among the patients with migrainous vertigo, vertigo was regularly associated with migrainous headache in 24% to 45% of patients; in 48% of patients vertigo occurred with or without a headache and in two patients a headache and vertigo never occurred together [2,4]. Similar findings were shown in other studies [6,26], as well as in our study: vertigo symptoms were associated with a migraine attack always in 38 (22.5%), sometimes in 38 (22.5%) and were not associated in 93 (55.0%) patients. This means that the lifetime prevalence of migrainous vertigo is 23.2% in the population of our migraineurs according to the proposed criteria.

A relatively high proportion (33%) of patients with migrainous vertigo report visual auras, which is not significantly higher than in the group of the dizziness free migraineurs (26%) [4]. These results regarding a visual aura in the patients with migrainous vertigo are very similar to ours. Significantly more often the MA patients have migraine in association with symptoms of vertigo or dizziness: always 19 MA (14.84%) vs. 19 MO (9.55%) patients, or sometimes 28 MA (21.88%) vs. 10 MO (5.03%) patients; $P<0.0001$.

Migrainous vertigo is not sufficiently recognized among clinicians. The diagnosis of migrainous vertigo is not easy, since there may be an overlap of symptoms of different disorders. Migrainous vertigo may present as episodic positional vertigo, Factors that help to distinguish migrainous positional vertigo from BPPV include short-duration symptomatic episodes and frequent recurrences, manifestation early in life, migrainous symptoms during episodes with positional vertigo and atypical positional nystagmus



[26]. Another study revealed spontaneous rotational vertigo in 67% and positional vertigo in 24% of patients with migrainous vertigo [4].

A study among the patients presenting to a neurology dizziness clinic showed that 31% had a benign paroxysmal positional vertigo (BPPV), 20% psychogenic vertigo, 7% definite and 4% probable migrainous vertigo, 7% vestibulopathy of unknown origin, 7% neurological gait disorder, 5% Meniere's disease, 5% orthostatic hypotension, 4% central vestibular syndromes, 3% vestibular neuritis [2]. In this study the patients with non-traumatic BPPV of the posterior semicircular canal had a significantly higher prevalence of migraine than the control patients.

In the IHS classification the criteria for migrainous vertigo are still lacking. In children benign paroxysmal vertigo of childhood is recognized and accepted as a separate entity within the IHS classification; it affects 2.6% of school children according to a population based study [27]. Basilar migraine is recognized as a category of migraine with aura, requiring at least two symptoms originating in the posterior circulation territory which should last between 5 and 60 minutes to fulfill the aura criteria; whereas patients with migrainous vertigo have only vestibular symptoms, which puts them in a distinct category. So far, most patients with vertiginous symptoms in epidemiological studies have shown symptoms that were not strictly in the temporal relation required for an aura, but occurred in various time lengths.

The diagnosis of migrainous vertigo should probably be a distinct entity, since the majority of patients with definite migrainous vertigo do not meet all the IHS criteria for migraine with aura or basilar migraine. Usually the temporal distribution and length of symptoms do not fulfill the IHS criteria for migraine with aura. Studies have shown that the diagnosis of migrainous vertigo should be given only in cases where all other possible causes of vertigo have been excluded [2].

A reason for the underdiagnosis of migrainous vertigo may be in part due to the fact that some patients, when their migraine is accompanied by vertigo, have an attenuated headache as compared with their usual migraine attacks [22]. The diagnosis of migrainous vertigo in such cases should rely on the presence of accompanying migraine symptoms, such as photophobia or phonophobia, which are related to the vertiginous attacks of migraine. Detailed history should be taken in patients with migraine and vertiginous symptoms in order to establish a connection, if one exists. Making a correct diagnosis in such cases might save the doctor and the patient time, as well as health insurance money, because the unnecessary diagnostic tests can be avoided. In most cases a comprehensive diary could help to establish whether migraine and vertigo are related or are separate entities in an individual. Migraine diaries have been proved to help establish a correct diagnosis [28,29], however, similar diaries for the diagnosis of vertiginous disorders are not a standard recommendation in clinical work. Migraine should be easy to diagnose

since strict diagnostic IHS criteria are proposed [5], and, if diagnostic uncertainties exist, the diagnosis should be easier to establish after reviewing a diary. However, diagnosing a vertiginous disorder is not always as easy, and, unlike for migraine where no specific diagnostic work-up is warranted, especially in typical cases, in most patients with vertigo certain diagnostic tests should be done in order to exclude more serious causes. In the remaining patients who meet the proposed criteria for definite migrainous vertigo, a diagnosis can be set. Even if in some patients not all criteria can be fulfilled, a diagnosis of «probable migrainous vertigo» can be set in order to help guide the therapeutic course [2]. Therefore, physicians dealing with patients with migraine and vertigo should keep in mind not only the IHS criteria [5] and the guidelines for the treatment of migraine headaches [30], but should also be aware of a relatively high percentage of patients that might in fact have „migrainous vertigo“, rather than two separate disorders, i.e. migraine and vertigo.

There are studies in favor of the fact that migraine and vertiginous symptoms are in association which have shown that preventive antimigraine therapy is often useful in such patients [24,25,31].

The mechanisms of migraine pathophysiology are still not understood; perhaps patients with migrainous vertigo share common pathophysiological pathways which may help to elucidate the nature of migraine attacks, at least in the subgroup of patients with migrainous vertigo. Hypoplasia of a vertebral artery is frequently found in migraine patients, especially in migraine with aura, which might at least in part play a role in migraine pathophysiology [32]. It is well accepted that migraine is a heterogeneous disorder. Specific forms of migraine, such as familial hemiplegic migraine, are linked with mutations on the gene for the $\alpha 1$ subunit component of a voltage-gated calcium channel [33]. In some patients with a cerebellar dysfunction a neuronal calcium channelopathy can be detected [34] and because the cerebellum and the vestibular system are connected, these patients often have symptoms originating from the vestibular system. A genetic study performed on 14 genetically unrelated patients with migrainous vertigo did not gain evidence that genes causing familial hemiplegic migraine and episodic ataxia type 2 represent major susceptibility loci for MV [35]. Extensive genetic work-up is needed, especially in patients with migrainous vertigo, in order to try to establish the existence of a genetic background if such exists. First of all, other causes of vertigo should be excluded, and even then in a relatively small proportion of patients (12.5 to 16.7%) with migraine and vertigo an abnormal vestibular function can be found [21,24]. The search for a genetic pattern will not be easy since patients with vertiginous symptoms are probably as heterogeneous as are migraine patients. Still, research is worth a try in a subgroup of such patients.

In some studies a significant association between migrainous vertigo and coronary heart diseases, and marginally with diabetes, was found [4], while in others a higher



cardiovascular profile was found among adult migraineurs, especially with migraine with aura [36], however the causal relationship remained unknown.

The results of this study show that migrainous vertigo affects a significant proportion of patients with migraine, and are in favor of the association between dizziness/vertigo and migraine. Although there is no «gold standard» for the diagnosis of migrainous vertigo and further research is needed, we hope that the results of this study will help to establish the criteria for migrainous vertigo that will be helpful to clinicians in their everyday work with patients with migraine and vertigo.

In conclusion, a significant number of migraine patients have dizziness or vertiginous symptoms; however, vertigo can only be attributed to migraine after other causes have been excluded. Our study, together with other similar studies, suggests that migraine should be considered in the differential diagnosis of isolated vertigo of unknown cause.

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Sažetak

Prevalencija vertiga u bolesnika s migrenom i u osoba bez glavobolje

Cilj ovog istraživanja bio je procijeniti prevalenciju vertiga u bolesnika s migrenom i u kontrolnoj skupini osoba bez glavobolje. Ukupno je 327 bolesnika s migrenom i 324 osobe u kontrolnoj skupini ispitano da li imaju simptome vrtoglavice, o vremenu nastanka simptoma, učestalosti simptoma i vremenskoj povezanosti simptoma s napadom migrene. Više od polovine bolesnika s migrenom je imalo osjećaj vrtoglavice: 169 bolesnika (51.7%), a u kontrolnoj skupini 102 osobe (31.5%). Simptomi vrtoglavice bili su povezani s napadom migrene uvijek u 38 bolesnika (22.5%), ponekad u 38 bolesnika (22.5%), a nisu bili povezani u 93 bolesnika (55.0%). Bolesnici koji imaju migrenu s aurom značajno češće imaju napade migrene povezane sa simptomima vrtoglavice. Ovo istraživanje, kao i ostala slična istraživanja, pokazuje da treba uzeti u obzir migrenu u diferencijalnoj dijagnozi vertiga.

Ključne riječi: Vertigo, glavobolja, migrena, migrena s aurom, migrena bez aure