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Panic and Somatoform Disorders After Vestibular Neuritis: How Relevant is Postural Compensation?

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Abstract

We used posturography to clarify whether long-term impairment of vestibular function following acute vestibular neuritis is a relevant factor in the development of panic or somatoform disorders. A total of 75 psychiatrically healthy patients with vestibular neuritis were studied prospectively using dynamic posturography one year after they experienced unilateral loss of vestibular function. Two years after the acute episode, we conducted a standardized diagnostic interview (DIPS) to determine whether any panic or somatoform disorders had developed.
Seven patients developed a new panic disorder (with or without agoraphobia), and five developed a somatoform disorder. Only two patients exhibited persistent pathological vestibular function one year after the acute vestibular episode. One of them went on to develop a panic disorder. All other patients had normal posturography scores. We found no relationship between subclinical vestibular dysfunction and the development of panic or somatoform disorders.
Several studies have shown an increased prevalence of subclinical vestibular abnormalities in patients with panic disorder, which led to the hypothesis that vestibular dysfunction might be regarded as an organic risk factor for psychiatric disorders. Our findings, however, do not support the notion that panic or somatoform disorders are promoted by subclinical vestibular dysfunction (German J Psychiatry 2006;9:36-40).

Keyword: panic disorder, vestibular dysfunction, posturography

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Introduction

A large number of studies have found a close association between psychiatric illnesses, such as panic and somatoform disorders, and vertigo (Yardley et al., 2001). Indeed, panic and somatoform disorders are the leading diagnoses among patients who present with vertigo at neurological or otolaryngological clinics in Western industrialized countries (Kroenke el al., 1992). Furman & Jacob (2001) suggest that there is a strong overlap between vestibular disorders and the experience of anxiety. This so-called Mismatch Theory is based on the idea that incorrect or inaccurate information about spatial relationships and movements can trigger anxiety in patients with vestibular disorders. In this regard, Yardley et al. (1999) assume that even minor impairments of vestibular function can lead to anxious reactions in predisposed individuals.

The aim of our study was to assess whether long-term impairment of vestibular function is, in fact, associated with the development of psychiatric diseases such as panic or somatoform disorders. To gain a better understanding of the interplay between vestibular function and the development of anxiety disorders, we prospectively examined patients with vestibular neuritis over a period of two years.

Vestibular neuritis is characterized by an acute unilateral loss of vestibular function, leading to a sensation of spinning vertigo, spontaneous nystagmus beating to the healthy ear,

and postural instability with ipsilesional falls. During vestibular testing, the caloric response is reduced when the ear canal on the affected side is irrigated (Allum and Shepard, 1999). Usually, vestibular neuritis is benign and self-limiting (Baloh, 2003); in the majority of patients, vestibular function is either recovered, or central compensation of the unilateral deficit develops, within several weeks. Recently, it has been shown that a variety of cognitive factors determine the course of anxiety in the first several weeks after the failure of vestibular function (Godemann et al., 2004), and an important subgroup of patients goes on to develop an anxiety or somatoform disorder during the following two years (Godemann et al., 2006).

In the present study, we investigated the course of vestibular neuritis using posturography, a procedure that provides objective information on a patient's ability to adjust his or her balance appropriately in reaction to vestibular, visual, and proprioceptive stimuli (EquiTest System, 2001). Subsequently, we related these findings to psychiatric diagnoses obtained using a standardized psychiatric interview.

Methods

Between 1999 and 2001, a total of 103 patients with acute vestibular neuritis from seven hospitals were included in the study after providing written informed consent. In addition to rotatory vertigo, nausea, and vomiting, patients had to present with direction-fixed horizontal-torsional spontaneous nystagmus beating towards the healthy ear and postural sway towards the affected side during Romberg testing to be diagnosed with the disease. The diagnosis had to be confirmed within 48 hours by a caloric test showing a response asymmetry of at least 40%.

Patients were excluded from the study if they had already complained of vertigo for more than 24 hours prior to hospital admission, if they had previously experienced trauma to, or had surgery on, the inner ear, or if they had another illness affecting the vestibular organ (e.g. benign paroxysmal positional vertigo, Meniére's disease, other episodic vertigo) (Godemann et al., 2006).

The EquiTest system, version 5.02 from NeuroCom International (Oregon, US) (EquiTest, 2001) was used to examine patients one year after the acute vestibular episode. The EquiTest system is a computerized posturography device that allows balance control to be examined under dynamic test conditions. The test includes three standardized assessment protocols for diagnosing functional impairments of the somatosensory, visual, and vestibular systems. The primary test for assessing vestibular function is the Sensory Organization Test (SOT). We used this test because, in contrast to caloric testing, posturography provides information about the vestibular system that is functionally relevant to the patient; it is for this reason that posturography has become a standard tool for outcome assessment in vestibular neuritis (Strupp et al., 1998).

Allum and Shepard (1999) developed the technical basis for the SOT, which involves a combination of slow movements on a moving platform and a series of standardized tests (Romberg Test). The test consists of six subtests, during which patients stand on a platform that is sometimes stationary and sometimes in motion. At irregular intervals, patients are asked to open or close their eyes. Each measurement is carried out three times for 20 seconds in order to obtain an individual's balance capacity score. The evaluation shows the extent to which the patient's body sways during the tests. The anterioposterior sway scores are then compared with a theoretical stability level of 12.5 degrees. A patient who sways 12.5 degrees is given a very low score, whereas the highest score of 100 indicates that the patient has not swayed at all (Allum and Shepard, 1999). The test was designed so that an increase in difficulty generally leads to a decrease in a patient's performance. SOT scores are interpreted based on currently available normative population data provided by NeuroCom International, which are stratified according to different age groups. The results of the SOT are presented in increasing levels of difficulty (1 = eyes open, stationary platform, 2 = eyes closed, stationary platform, 3 = eyes open, moving visual surround, stationary platform, 4 = eyes open, moving platform, 5 = eyes closed, moving platform, 6 = eyes open, moving visual surround, moving platform).

Of the 103 patients participating in our study, 28 did not attend the posturography test, which took place one year after the acute vestibular episode. One patient could not be examined because one of his legs had been amputated. Eighteen others indicated that the distance was too far to travel (i.e. up to 1.5 hours). The others did not give a specific reason for not wanting to participate. When we compared drop-outs with patients who participated in the posturography test, we were unable to find any significant age differences (t = -0.53, P = 0.6). However, fewer women than men attended the posturography test (P = 0.045, df = 1).

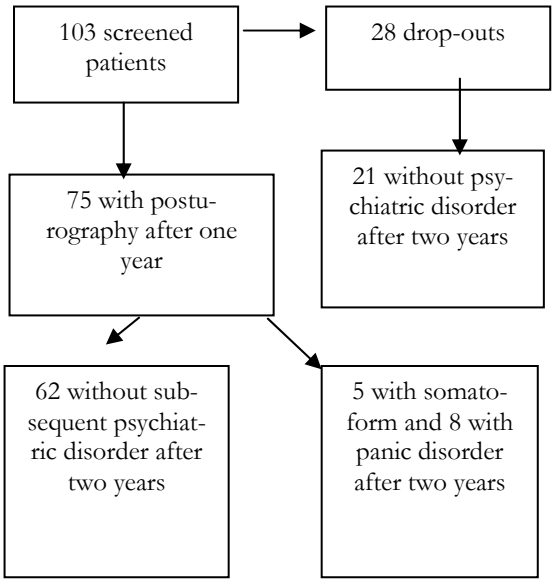
Twenty of these 28 patients participated in the follow-up psychiatric examination conducted two years after the acute vestibular episode. Of these patients, one had developed a panic disorder, and none had developed a somatoform disorder. Thus, we can rule out the possibility that non-participation was due to avoidance behavior. In addition, we were unable to detect any relationship between drop-out patients and the hospitals in which they had been recruited.

All of the 75 patients (37 men and 38 women) who participated in the follow-up psychiatric examination were interviewed by a trained psychiatrist. The mean age of the patients was 50.7 ± 12.2 years; the age range was between 19 and 77 at the time of recruitment. At the same time, the mean age of patients with a panic or somatoform disorder was 49.7 ± 12.1

We determined the DSM-III-R psychiatric diagnoses in our patients twice during the course of the study using the Diagnostic Interview of Psychiatric Diseases (Margraf et al., 1999). The first psychiatric examination was conducted one week after the acute vestibular episode; the second (i.e. follow-up) examination took place two years after the acute illness. The posturography test and the standardized psychiatric interview had to be conducted on different dates, as they were performed at two different institutions located 30

km apart and the availability of the posturography equipment was limited. Arranging individual appointments for all study participants would not have been feasible in this context.

Figure 1. Recruitment, drop-outs, and diagnosis in patients with vestibular neuritis



Statistical analysis was performed with SPSS for Windows, version 13.01. Differences in continuous variables between subgroups of patients were assessed by *t* tests and by chi square for nominally scaled variables. Data are presented as mean values and standard deviation. A *P* value less than 0.05 was considered significant.

Table 1. Pathological results on the Sensory Organization Test in 75 patients one year after vestibular neuritis

Scale	Inconspicuous	1 x conspicuous	2 x conspicuous	3 x conspicuous
SOT 1 (n=75)	72	2	1	0
SOT 2 (n=75)	70	3	2	0
SOT 3 (n=75)	63	11	1	0
SOT 4 (n=75)	61	11	1	2
SOT 5 (n=75)	61	10	3	1
SOT 6 (n=75)	48	15	9	3
SOT Total (n=75)	73	2		

Results

Of the 75 patients who completed all parts of the study, seven developed a new panic disorder (with or without agoraphobia) and five developed a somatoform disorder after the acute vestibular episode. Only two of the 75 patients had pathological total scores when tested with dynamic posturography. One of these two patients went on to develop a panic disorder, whereas the other did not.

Six weeks after the unilateral loss of vestibular function, patients who went on to develop a panic or somatoform disorder had equivalent caloric testing results to those who did not (measurement of the relative sensitivity of the peripheral vestibular organs: side with vestibular dysfunction / healthy side; $t = -0.67$, $P = 0.5$).

At the most difficult level (SOT 6) of the dynamic posturography examination, 27 patients had at least one pathological score within a series of three tests: three patients were abnormal on all three tests, nine patients on two, and 15 patients on one (Table 1).

In the next step, we analyzed whether postural stability, when calculated as the median of all six subtests of the SOT, was associated with the development of a panic or somatoform disorder. In Table 2 we show the results of the test levels SOT 1 (most simple test condition) through SOT 6 (most difficult test condition). SOT 2 and 5 are the most informative tests with regard to vestibular function. However, there were no statistically significant differences at these two test levels between patients who went on to develop anxiety or somatoform disorders and those who did not. Only SOT 4 showed a slightly significant difference between the two groups. However, after Bonferroni adjustment for multiple tests, this difference was no longer significant (Table 2).

Finally, we tested the hypothesis that subclinical changes in vestibular function might be responsible for causing anxiety-inducing repetitive irritation in patients. In order to do so, we compared the frequency of pathological scores on at least

Table 2. The relationship between posturographic findings and the incidence of panic or somatoform disorders in 75 patients after vestibular neuritis

	Vestibular neuritis and no subsequent psychiatric disorder n = 63	Vestibular neuritis with subsequent panic or somatoform disorder n = 12	*t*	*P*
SOT 1	94.9 ± 1.6	93.8 ± 2.9	1.83	0.072
SOT 2	91.7 ± 4.1	90.9 ± 5.3	0.72	0.472
SOT 3	91.8 ± 4.7	92.3 ± 3.9	-0.31	0.755
SOT 4	84.6 ± 6.2	80.0 ± 9.0	2.05	0.044*
SOT 5	67.6 ± 8.5	62.7 ± 15.9	1.49	0.141
SOT 6	62.6 ± 12.6	55.4 ± 19.9	0.99	0.322
SOT mean	79.2 ± 4.8	75.0 ± 10.0	1.56	0.125

* $P>0.05$

one of the subtests in patients who went on to develop a psychiatric disorder and those who did not. However, in the chi square analysis, there were no statistically significant differences between these two groups ($P = 0.86$, $df = 1$).

Discussion

The main finding of our study is that subclinical posturographic disturbances are not more frequent in patients who go on to develop psychiatric diseases, such as panic and somatoform disorders, after an episode of vestibular neuritis.

These findings are in contrast to those of Jacob et al. (1997), who have suggested that vestibular disorders occur more frequently in patients with panic disorders. Thus, our study does not lend support to Furman and Jacob's Mismatch Theory (2001), which states that vestibular disorders can lead to the faulty processing of space and motion information, and that faulty processing occurs in situations in which increased demands are made on the integration of this information (cramped spaces, fast movements, etc.). According to the Mismatch Theory, the continually misleading information provided by the vestibular system can – together with unfavorable coping behaviors – lead to symptoms of open anxiety or to the avoidance of such situations.

The present study is limited by the fact that we only used posturography to assess vestibular function. Nevertheless, our decision to refrain from using other vestibular tests was based on several reasons. Firstly, responses measured by tools such as electrooculography do not relate directly to imbalance, which defines the patient's level of impairment. As a result, posturography provides a clearer picture of the patient's functional limitations (Yardley et al., 1992). Secondly, a number of authors have demonstrated that posturography is more sensitive than other methods (Hamid et al., 1991; Voorhees, 1989); when sensory input is limited to vestibular information, poor performance is a sign of vestibular dysfunction (Fetter et al., 1991). Thirdly, it has been shown that patients with panic disorders and agoraphobia have a latent imbalance. Indeed, in one study, 12 of 17 patients with panic disorder and agoraphobia exhibited an increased dependence on proprioceptive and visual information versus one of 17 controls (Yardley et al., 1994). Fourthly, the results obtained using other methods have been contradictory. Whereas several authors have found a clear predominance of vestibular dysfunction in patients with panic disorders by means of videooculography (Jacob, 1988), others were unable to establish such a correlation (Swinson et al., 1993; Yardley et al., 1994). Using caloric testing six weeks after the vestibular episode, we were also unable to find any differences between patients who went on to develop a psychiatric disorder and those who did not. However, up to 15% of healthy control subjects may exhibit unilateral hypofunction during caloric testing (Yardley et al., 1995), which can interfere with the identification of differences between subgroups of patients with and without panic disorder by this vestibular test. Lastly, to keep the drop-out rate as low as possible and thus ensure the representativeness of our data, we decided to limit the number of vestibular tests in our study.

Our findings show that vestibular systems returned to an age-adjusted, normal functional state within one year in nearly all of our patients. In fact, only two patients exhibited gross vestibular dysfunction one year after the onset of vestibular neuritis, and only one of them went on to develop a panic disorder. Contrary to Furman and Jacob (2001) and Perna et al. (2001), we found no correlation between the development of panic or somatoform disorders and persistent functional vestibular impairment.

Interestingly, our results also contrast with those of Yardley et al. (1994), who found that patients with panic disorder relied on visual and proprioceptive information for postural control. Posturography tests results correlated with agoraphobic avoidance. However, the difference can hardly be explained by methodological disparities, because we used the same study techniques, enrolled a comparable number of subjects, and also compared our posturography data with controls from the standardization procedure. One possible explanation could be the presence of pronounced avoidance behavior as observed in the patients in Yardley's study (1994). It is reasonable to assume that phobic behavior occurs when sensory and optical stimuli are removed, much in the sense of space phobia as described by Marks (1981). The experience of separated vestibular, proprioceptive, and visual stimuli by means of sway-referencing is similar to situations in which predisposed patients experience agoraphobia (e.g. when moving in an elevator). Thus, it would not be surprising if the patients with panic disorder (and no vestibular pathology) were abnormal on posturographic testing. The low number of significant pathological findings in our study may be due to the fact that only two of our patients were suffering from agoraphobia. In the study by Jacob et al. (1996), for example, vestibular dysfunction was most pronounced in patients with a panic disorder accompanied by moderate or severe agoraphobia: 32% of these patients had pathological posturography scores. Therefore, we suggest that future studies should focus on the comorbidity of agoraphobia and vestibular dysfunction. The observation that patients with panic disorder do not exhibit vestibular dysfunction might explain why patients with panic disorders, but without agoraphobia, have been shown to have a better prognosis with regard to natural disease course (Carpiniello et al., 2002), as such patients are not subject to strong space discomfort, which can lead to anxiety and phobic avoidance behavior.

Because panic and somatoform disorders generally show a high prevalence in young adults, a limitation of our study can be seen in the mean age of our sample, which at the end of the investigation was 53 years. The mean age of patients in the studies by Jacob et al. (1997) was 35, which corresponds more closely to the peak prevalence of panic disorders (i.e. 36 years of age). This reduces the generalizability of our findings.

Undoubtedly, vestibular neuritis represents a risk factor for the subsequent development of panic or somatoform disorders. However, in view of our findings, it seems unlikely that subclinical vestibular dysfunction plays a decisive role in their etiology. In contrast, panic-related cognitions seem to

play an important role in the development of panic and somatoform disorders in vestibular patients. Patients who experience vertigo as particularly alarming appear to focus more intensely than others on their aversive symptoms (Godemann et al., 2006).

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