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Significant Posturography Findings in Patients with Psychogenic Dizziness

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1. Introduction

Posturography is useful for investigating global balance performance (Kushiro & Goto, 2011). We found that anxiety affects postural perturbation in the anteroposterior axis, possibly indicating that anxiety affects the interactions between visual inputs and vestibular as well as somatosensory inputs in the maintenance of postural balance in patients complaining of dizziness (Goto et al. 2011a).

Dizziness is a common somatic complaint that can be caused by several factors including peripheral or central vestibular dysfunction. Anxiety and depression are closely related to somatic complaints, including dizziness. Patients suffering from vestibular disorders are prone to anxiety (Eagger et al., 1992), which is known to affect postural stability. Patients can present with dizziness even in the absence of any signs of organic or functional dysfunction; such patients are usually diagnosed with psychogenic dizziness. The aim of our study was to identify abnormal findings in patients with psychogenic dizziness.

Healthy subjects with high anxiety are reported to have larger sway in the anteroposterior axis (Wada et al., 2001). This characteristic disappears when the eyes are closed (Ohno et al. 2004). It is believed that anxiety affects the postural sway of the anteroposterior axis and the interactions of visual inputs with vestibular and somatosensory inputs are influenced by anxiety in healthy subjects (Wada et al. 2001). Maki and McIlroy (1996) reported that healthy subjects with elevated levels of state anxiety undergoing cognitive tasks such as mental arithmetic tend to lean forward. This observation shows that elevated levels of state anxiety cause the center of gravity to shift forward. We previously reported a clear relationship between anxiety and anteroposterior perturbations (Goto et al. 2011a).

There are several types of patients with vestibular disorders due to organic and psychogenic factors and combinations thereof. There may be some specific pattern of posturography depending on the levels of anxiety and vestibular deficits. It would be useful to know if there is a relationship between anxiety and postural sway in patients complaining of dizziness. Therefore, the relationship between the levels of anxiety and postural sway in patients complaining of dizziness was evaluated. In addition, the effect of visual input was investigated. Posturography is a useful tool for investigating the effects of various conditions (Kushiro & Goto, 2011), and we used it to evaluate postural sway. Anxiety levels were assessed by the hospital anxiety and depression scale (HADS).

2. Methods

The subjects were patients who visited Hino Municipal Hospital complaining of dizziness from January 2007 to May 2007. The average age was 51.9 ± 18.8 years (mean \pm standard deviation). Before each examination, the purpose and procedure were explained and informed consent was obtained from each subject. The ethics committee of Hino Municipal Hospital approved the examinations. Examinations were carried out in accordance with the Declaration of Helsinki.

2.1 Diagnosis and psychological evaluation

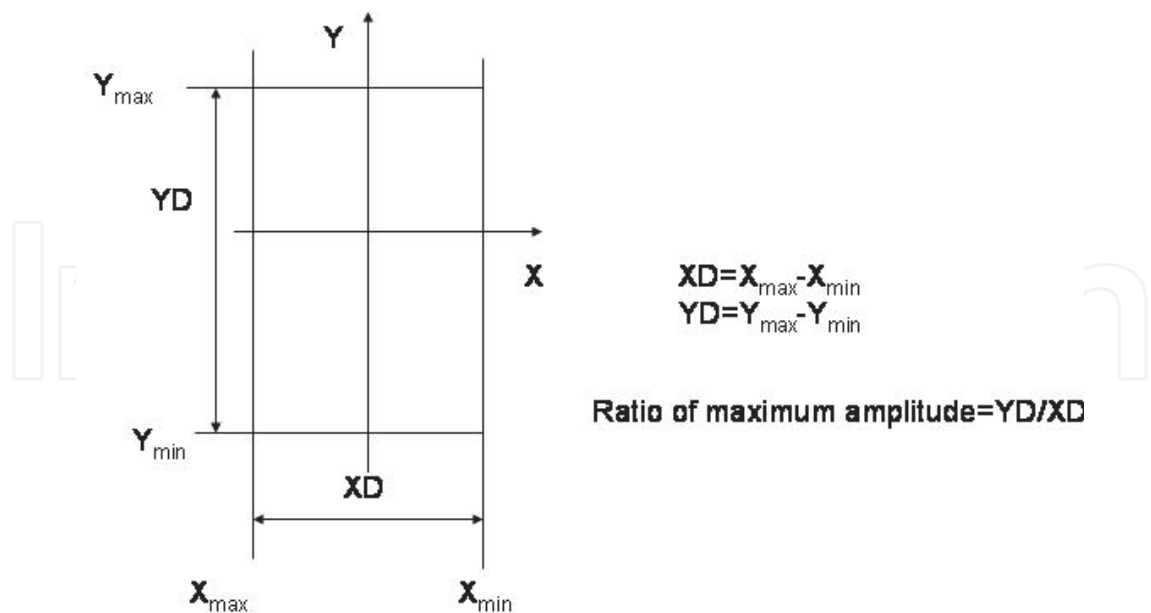
To obtain a diagnosis, all patients underwent otoneurological examinations. These examinations included pure-tone audiometry, nystagmus evaluation with an infrared CCD camera, and posturography. Some patients required bithermal caloric tests, vestibular evoked myogenic potentials, auditory brain stem response, and head imaging (i.e., CT and MRI) to obtain a clinical diagnosis. In addition, the dizziness handicap inventory (DHI) and HADS (Hosaka et al. 1999) were used to evaluate the severity of dizziness and anxiety plus depression, respectively. If no apparent organic or functional abnormalities were identified from a variety of examinations, the patients were diagnosed with psychogenic dizziness. The rest of the patients were further divided according to their anxiety level depending on the HADS score. A HADS score greater than 6 indicates that the patients had a certain level of anxiety (Hosaka et al. 1999); these patients were defined as having psychogenic + organic dizziness; if the score was less than 5, the patients were defined as having organic dizziness.

2.2 Postural sway analysis

Postural sway was measured by continuously detecting the body's center of gravity by using a force platform equipped with a data processor (Gravicorder G-6100; Anima, Tokyo, Japan). Patients were asked to stand on the platform with their feet parallel, gazing at a visual target: a black circle 17 cm in diameter on a white background fixed at a 1-m distance at eye level. Body sway was measured for 1 min with eyes open and then closed. This arrangement of the visual target produced a visual angle of 10° . The total length and area of body sway were recorded. The left-right maximum amplitude (XD) and anteroposterior maximum amplitude (YD) were also measured. From these values, the ratio of the maximum amplitude of the anteroposterior (YD) and left-right axes (XD) was calculated as YD/XD (Fig. 1). The Romberg ratio of YD/XD was calculated as the YD/XD with the eyes closed divided by that with the eyes open.

3. Results

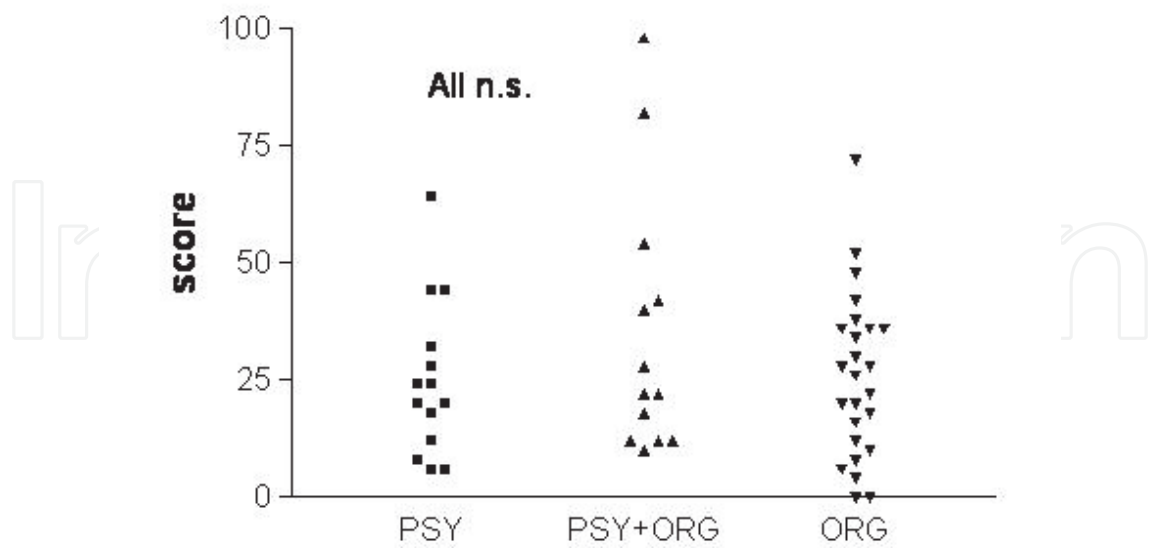
There were 16, 25, and 13 subjects in the psychogenic, organic, and psychogenic + organic groups, respectively. The distribution of total DHI scores is shown in Fig. 2. The relationship between the ratio of maximum amplitude (YD/XD) in the eyes-open and eyes-closed conditions is shown in Fig. 3. However, there appears to be no relationship between these values. YD/XD ratios in the eyes-open and eyes-closed conditions are shown in Fig. 4. There was a statically significant difference in the YD/XD values between patients with psychogenic and organic dizziness in the eyes-open condition. However, this difference was



The perturbation of antero-posterior direction is defined as Y and left-right direction is as X, respectively.

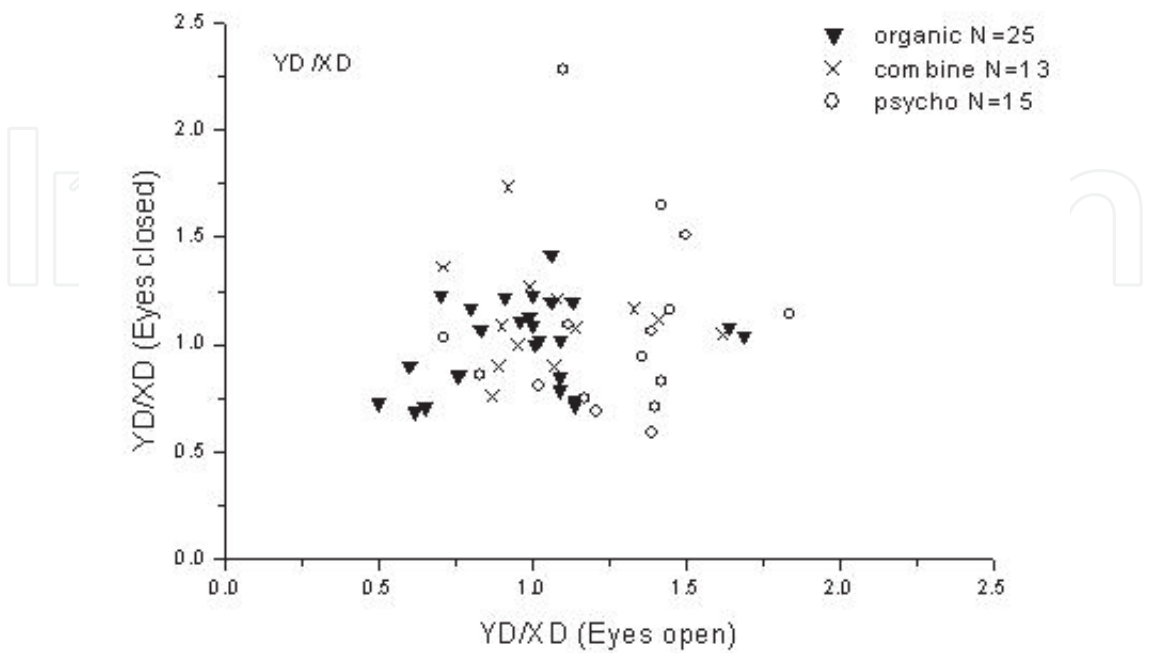
Fig. 1. The definition of the ratio of maximum amplitude (YD/XD)

not apparent in the eyes-closed condition. The Romberg ratio of YD/XD in the psychogenic group was significantly smaller than that in the organic and psychogenic + organic groups (Fig. 5). This means that the patients with psychogenic dizziness became more stable in anteroposterior direction with their eyes closed.



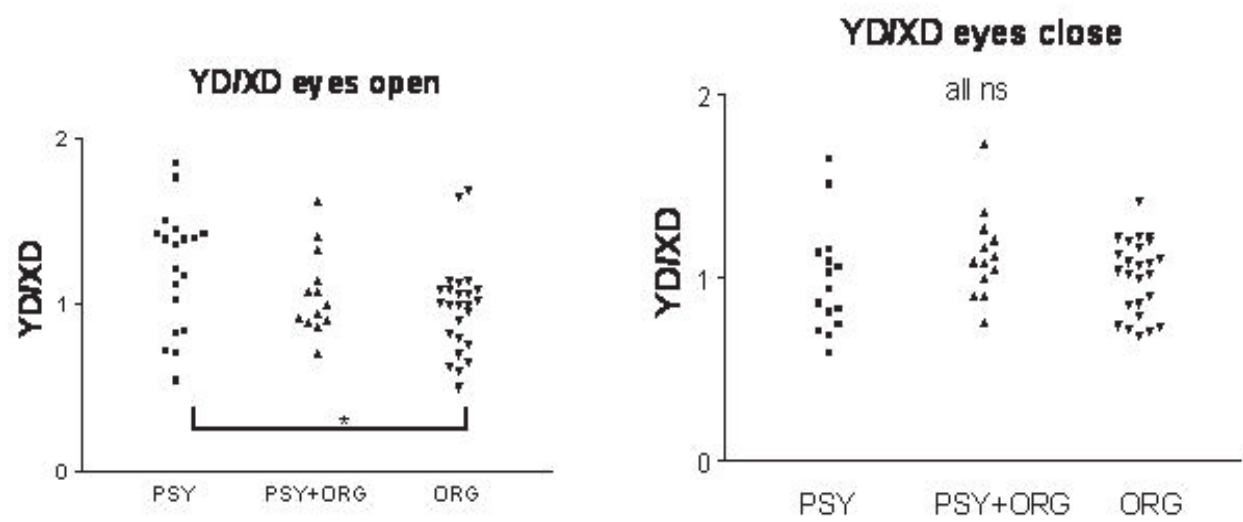
The distribution of total DHI scores is shown. There are no statistical deference in each groups. XD and YD are calculated as in figure.

Fig. 2. Dizziness handicap inventory (DHI)



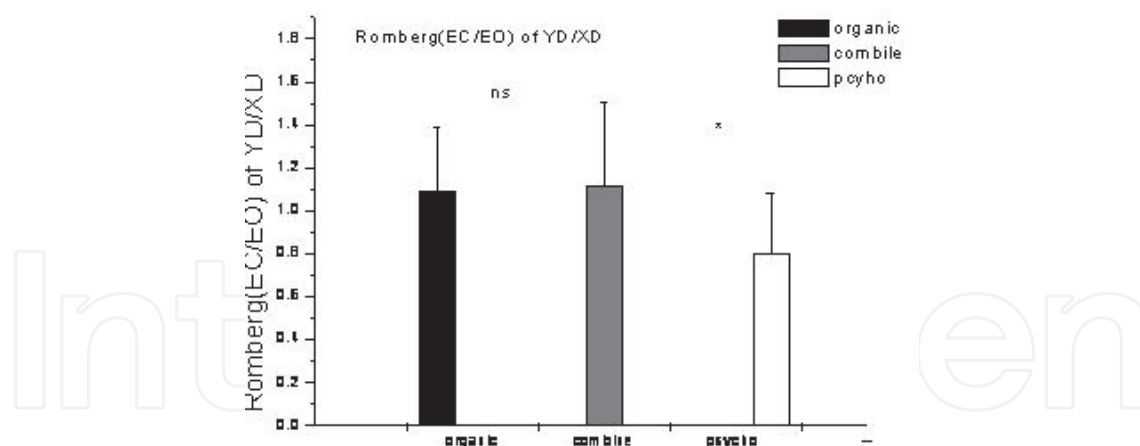
The relationship between the ratio of maximum amplitude (YD/XD) in the eyes-open and eyes-closed conditions is shown. There is no relationship between these values in both conditions.

Fig. 3. The relationship between YD/XD with eyes open and closed



There is a statically significant difference in the YD/XD values between patients with psychogenic and organic dizziness with their eyes open. However, this difference disappears when the eyes are closed.

Fig. 4. YD/XD with eyes open and closed



The Romberg ratio of YD/XD in psychogenic subjects was significantly smaller than that in organic or psychogenic + organic patients.

Fig. 5. The Romberg ratio (eyes closed/eyes open) of YD/XD in patients with organic, organic + psychogenic, and psychogenic dizziness

4. Discussion

We tried to identify specific posturography findings in a variety of patients complaining of dizziness. As shown in Fig. 4, our results indicate that the YD/XD value is greater in patients with psychogenic dizziness than in those with organic, and organic + psychogenic dizziness. The organic disorder itself has a significant effect on posturography results. It is believed that the effect of the organic disorder is so significant that the effect of anxiety on postural perturbation cannot be determined.

In addition, as shown in Fig. 4, the Romberg ratio was smaller in patients with psychogenic dizziness. This might be a clinical indicator of anxiety in patients with dizziness lacking organic and functional dysfunction.

Since anxiety is closely related to vertigo and dizziness, it is important to evaluate anxiety in patients reporting dizziness. This, however, is usually not easy. To obtain an accurate diagnosis, it is important to examine patients from both physical and psychiatric perspectives. Doctors in otolaryngology departments are familiar with routine physical examinations such as posturography and audiometry. However, they are not accustomed to evaluating the psychological status of patients. The only way to measure psychogenic status, including anxiety and depression, is to use self-rating questionnaires. For example, anxiety can be evaluated by the state-trait anxiety inventory (STAI), depression by the self-rating depression scale (SDS), and both anxiety and depression by the HADS, of which the latter was used in this study. Although these questionnaires are subjective measurements, it is not common to use them for evaluation. Consequently, a method for objectively evaluating anxiety would be indispensable. In both healthy subjects and patients experiencing dizziness, anxiety affects posturography in the anteroposterior direction.

If patients do not have any functional or organic abnormalities, it is a diagnostic dilemma as to why they have psychological dizziness. The diagnosis of psychological dizziness is quite important, because if the patients have it, treatment should be specially arranged. Selective serotonin reuptake inhibitors (SSRIs) and anxiolytics, including benzodiazepines, are used to treat these patients. In some cases, psychotherapy such as autogenic training can be successfully used to control anxiety (Goto et al. 2011b).

In a previous study, we found that anxiety affects the postural perturbation in the anteroposterior axis and that this trend disappears when the eyes are closed. Power spectrum analysis clearly demonstrates that the effect of visual input on vestibular and somatosensory inputs is affected by anxiety.

In the present study, we found that the Romberg ratio of YD/XD is significantly smaller in patients with psychogenic dizziness. The Romberg ratio of YD/XD might be a potential clinical indicator of anxiety in patients with dizziness who lack organic and functional dysfunction.

5. Conclusions

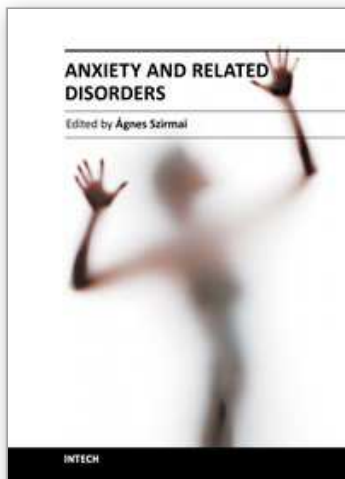
Our results indicate that anxiety affects postural perturbations in the anteroposterior axis and that the Romberg ratio of YD/XD might be a potential clinical indicator of anxiety in patients with dizziness and without organic or functional dysfunction. This research sheds new light on the mechanisms of dizziness and initiates the development of novel, promising diagnostic strategies.

6. Acknowledgments

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7. References

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Anxiety disorders are one of the most common psychiatric disorders worldwide and many aspects of anxiety can be observed. Anxious patients often consult primary care physicians for their treatment, but in most cases they do not accept the diagnosis of anxiety disorder. Anxiety is a symptom that could be seen in many organic disorders and can accompany almost any psychiatric disorder. Anxiety disorders are frequent and are associated with significant distress and dysfunction. Stigmatization is an important factor in insufficient diagnosis. The problems of anxiety cover all fields of life. This book intends to describe the epidemiological aspects and the main co-morbidities and consecutive diseases of the anxiety disorders.

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