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Otolaryngology -- Head and Neck Surgery 2013 148: 810 originally published online 4 February 2013
DOI: 10.1177/0194599813476476

The online version of this article can be found at:
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OnlineFirst Version of Record - Feb 4, 2013

What is This?
Influence of Vestibular Disease on Psychological Distress: A Multicenter Study

Seok Min Hong, MD, PhD1,2*, Hyo-Jeong Lee, MD, PhD1*, Byungho Lee, MD, PhD3, Su-Kyoung Park, MD1, Sung Kwang Hong, MD1, Il-Seok Park, MD, PhD1,2, Yong Bok Kim, MD, PhD1,2, and Hyung-Jong Kim, MD, PhD1

Abstract
Objectives. Some patients with dizziness show high comorbidity with psychiatric disorders. However, the association of vestibular deficit with psychological symptoms remains controversial. Thus, we investigated psychological distress (depression and anxiety) in patients with vestibular disease and examined factors modifying the development of psychological distress in these patients, including age, sex, severity of dizziness symptoms, and type of vestibular disease.

Study Design. Prospective study.

Setting. Tertiary referral center.

Subjects and Methods. This study enrolled 407 patients with dizziness. Dizziness and the psychological symptoms of all patients were measured using the Korean versions of the Dizziness Handicap Inventory (DHI), the Beck Depression Inventory (BDI), and the Spielberger State-Trait Anxiety Inventory (STAI). We evaluated the influence of vestibular disease type, DHI score, and other factors such as sex and age on the psychological scales (BDI, STAI) through multiple regression analysis.

Results. Only DHI score and vestibular neuritis were related significantly to BDI scores in patients with vestibular disease, and only DHI scores were associated with STAI scores.

Conclusion. Dizziness Handicap Inventory scores and psychological distress were closely associated. Psychological distress might be a consequence of high DHI score rather than of a specific type of vestibular disease, although depressive symptoms were related to vestibular neuritis.

Keywords
dizziness, anxiety, depression

Received November 2, 2012; revised December 26, 2012; accepted January 9, 2013.
psychological distress in these patients, including age, sex, severity of dizziness symptoms, and type of vestibular disease.

**Methods**

This prospective study, designed for patients with dizziness, was approved by the Institutional Review Board of Hallym University. Patients with complaints of dizziness who presented at any of the 3 hospitals affiliated with Hallym University in Seoul, Kyunggi-do, and Kangwon-do, Korea (Chuncheon Sacred Heart Hospital, Kangnam Sacred Heart Hospital, and Hallym Sacred Heart Hospital), were included in the study. Informed consent was obtained from the patients, and we excluded patients with central vertigo, history of previous psychological disorder, or suspicion of psychogenic dizziness.

All participants underwent a detailed diagnostic procedure consisting of clinical, neurological, and otological examinations. Physical examination included positional and positioning maneuvers, caloric and audiological tests, a complete blood count, blood chemistry, and brain imaging. Patients with Ménière's disease or migrainous vertigo were enrolled in the study if the episode leading to the diagnosis had occurred within the past 3 months. Patients with vestibular neuritis and benign paroxysmal positional vertigo (BPPV) were enrolled within 7 days after disease onset. In total, 407 patients were enrolled in this study. On the basis of history and test results, 194 patients were diagnosed with BPPV, 75 with vestibular neuritis, 63 with Ménière's disease, 58 with migrainous vertigo, and 17 with presbystasis. Patients were included in the presbystasis group if no specific cause of the dizziness complaint was found, despite detailed examination of patient histories and text results.

Patients’ dizziness and psychological symptoms were also measured using the Korean versions of the Dizziness Handicap Inventory (DHI), the Beck Depression Inventory (BDI), and the Spielberger State-Trait Anxiety Inventory (STAI). The Korean version of these scales is a translation of the original English sentences into Korean for patients to understand the questions, and there is no difference between them.

The DHI is a self-administered scale of self-perceived handicapping effects imposed by vestibular disease. The BDI is a 21-item self-reported scale developed to measure depressive symptoms. Response categories range from 0 (not at all) to 3 (very much). Summation of the results gives a BDI score ranging from 0 to 63. A score ≥21 is considered to indicate clinically relevant depressive syndromes. The STAI scale comprises 4 levels of anxiety intensity ranging from 1 (not at all) to 4 (very much), and the results are summed to give a score between 20 and 80. A cutoff score of 40 is normally used to indicate clinically significant symptoms reflecting a state of anxiety.

We examined the sex ratio, age, sex, DHI, BDI, and STAI scores according to the type of vestibular disease. Also, to exclude biasing effects of sex and age on BDI and STAI scores, we evaluated the influence of vestibular disease, dizziness symptom scores, and other factors such as sex and age on the psychological scores using multiple regression analysis.

**Data Analysis**

Multiple regression analysis and factor analysis of BDI and STAI scores in patients with vestibular disease were performed with the SPSS software (version 11.5; SPSS, Inc, an IBM Company, Chicago, Illinois). P < .05 was deemed to indicate statistical significance.

**Results**

The average age of the patients was 49.3 years, and the male/female ratio was 107:300. Of the 407 patients, 194 patients with BPPV, 76 with vestibular neuritis, 63 with Ménière's disease, 58 with migrainous vertigo, and 16 with presbystasis were diagnosed (Table 1).

The sex ratio, age, DHI, BDI, and STAI scores according to vestibular disease are shown in Table 2. In particular, the value of mean showed the difference according to the type of vestibular disease (Table 2). Analysis of variance indicated that age and BDI differed significantly among disease groups (Table 3).

Therefore, a logistic regression was conducted with age, sex, DHI score, and the types of vestibular disease as modifying factors for the development of psychological distress. Multiple regression analyses adjusted for age, sex, DHI score, and types of vestibular disease determined that only DHI score and vestibular neuritis were related significantly to the BDI scores of patients with vestibular disease (P < .05; β = 1.040 and 2.774, respectively; Table 4), and only DHI scores were associated with STAI scores (P < .05; β = 1.033; Table 5).

**Discussion**

The relationships among dizziness, vertigo, and psychiatric disturbances were recognized previously. In panic disorder, dizziness is an important characteristic for diagnosis (DSM-IV). Conversely, dysfunction of the vestibular system can trigger the onset of a psychiatric illness in a previously mentally healthy person, especially in predisposed individuals.
Table 2. Data of Patients According to the Disease Groups

<table>
<thead>
<tr>
<th>M/F, No.</th>
<th>Age, y, Mean ± SD</th>
<th>DHI, Mean ± SD</th>
<th>BDI, Mean ± SD</th>
<th>STAI, Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPPV</td>
<td>47/147</td>
<td>49.2 ± 2.4</td>
<td>28.7 ± 21.7</td>
<td>7.6 ± 9.0</td>
</tr>
<tr>
<td>VN</td>
<td>20/55</td>
<td>48.1 ± 17.3</td>
<td>27.8 ± 21.6</td>
<td>9.0 ± 10.4</td>
</tr>
<tr>
<td>Ménière's disease</td>
<td>27/36</td>
<td>52.2 ± 16.1</td>
<td>32.9 ± 26.2</td>
<td>8.9 ± 9.1</td>
</tr>
<tr>
<td>Migrainous vertigo</td>
<td>7/51</td>
<td>40.4 ± 17.1</td>
<td>36.4 ± 21.8</td>
<td>9.1 ± 8.6</td>
</tr>
<tr>
<td>Presbystasis</td>
<td>5/12</td>
<td>71.2 ± 6.0</td>
<td>41.8 ± 30.2</td>
<td>9.6 ± 11.6</td>
</tr>
</tbody>
</table>

Abbreviations: BDI, Beck Depression Inventory; BPPV, benign paroxysmal positional vertigo; DHI, Dizziness Handicap Inventory; STAI, Spielberger State-Trait Anxiety Inventory; VN, vestibular neuritis.

Table 3. Analysis of Variance Result of Each Variable According to the Disease Group

<table>
<thead>
<tr>
<th>Levene Statistic</th>
<th>df1</th>
<th>df2</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>6.164</td>
<td>5</td>
<td>436</td>
</tr>
<tr>
<td>DHI</td>
<td>2.131</td>
<td>5</td>
<td>436</td>
</tr>
<tr>
<td>BDI</td>
<td>6.378</td>
<td>5</td>
<td>435</td>
</tr>
<tr>
<td>STAI</td>
<td>.301</td>
<td>5</td>
<td>436</td>
</tr>
</tbody>
</table>

Abbreviations: BDI, Beck Depression Inventory; DHI, Dizziness Handicap Inventory; STAI, Spielberger State-Trait Anxiety Inventory.

Table 4. Analysis of Variables Affecting the BDI

<table>
<thead>
<tr>
<th>B</th>
<th>SE</th>
<th>Wals</th>
<th>df</th>
<th>Significance</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>-0.956</td>
<td>.532</td>
<td>3.226</td>
<td>1</td>
<td>.072</td>
</tr>
<tr>
<td>Age</td>
<td>.002</td>
<td>.012</td>
<td>.027</td>
<td>1</td>
<td>.871</td>
</tr>
<tr>
<td>DHI</td>
<td>.039</td>
<td>.007</td>
<td>28.220</td>
<td>1</td>
<td>.000*</td>
</tr>
<tr>
<td>BPPV</td>
<td>5.963</td>
<td>4</td>
<td>.202</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VN</td>
<td>1.020</td>
<td>.486</td>
<td>4.411</td>
<td>1</td>
<td>.036*</td>
</tr>
<tr>
<td>Ménière's disease</td>
<td>.941</td>
<td>.511</td>
<td>3.388</td>
<td>1</td>
<td>.066</td>
</tr>
<tr>
<td>Migrainous vertigo</td>
<td>.450</td>
<td>.534</td>
<td>.712</td>
<td>1</td>
<td>.399</td>
</tr>
<tr>
<td>Presbystasis</td>
<td>.053</td>
<td>.919</td>
<td>.003</td>
<td>1</td>
<td>.954</td>
</tr>
<tr>
<td>(Constant)</td>
<td>-4.148</td>
<td>.731</td>
<td>32.156</td>
<td>1</td>
<td>.016</td>
</tr>
</tbody>
</table>

DHI score and VN were related significantly to the BDI scores of patients with vestibular disease. Abbreviations: BDI, Beck Depression Inventory; BPPV, benign paroxysmal positional vertigo; DHI, Dizziness Handicap Inventory; VN, vestibular neuritis.

*P < .05.

Table 5. Analysis of Variables Affecting the STAI

<table>
<thead>
<tr>
<th>B</th>
<th>SE</th>
<th>Wals</th>
<th>df</th>
<th>Significance</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>-0.204</td>
<td>.248</td>
<td>.680</td>
<td>1</td>
<td>.410</td>
</tr>
<tr>
<td>Age</td>
<td>-0.001</td>
<td>.008</td>
<td>.023</td>
<td>1</td>
<td>.879</td>
</tr>
<tr>
<td>DHI</td>
<td>.032</td>
<td>.006</td>
<td>33.136</td>
<td>1</td>
<td>.000*</td>
</tr>
<tr>
<td>BPPV</td>
<td>4.767</td>
<td>4</td>
<td>.312</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VN</td>
<td>-0.141</td>
<td>.287</td>
<td>.242</td>
<td>1</td>
<td>.623</td>
</tr>
<tr>
<td>Ménière's disease</td>
<td>.632</td>
<td>.337</td>
<td>3.509</td>
<td>1</td>
<td>.061</td>
</tr>
<tr>
<td>Migrainous vertigo</td>
<td>.178</td>
<td>.340</td>
<td>.274</td>
<td>1</td>
<td>.601</td>
</tr>
<tr>
<td>Presbystasis</td>
<td>.336</td>
<td>.619</td>
<td>.294</td>
<td>1</td>
<td>.588</td>
</tr>
<tr>
<td>(Constant)</td>
<td>-0.480</td>
<td>.440</td>
<td>1.195</td>
<td>1</td>
<td>.274</td>
</tr>
</tbody>
</table>

DHI scores were associated with STAI scores. Abbreviations: BPPV, benign paroxysmal positional vertigo; DHI, Dizziness Handicap Inventory; STAI, Spielberger State-Trait Anxiety Inventory; VN, vestibular neuritis.

*P < .05.
A previous report found no correlation between an acute or chronic vestibular dysfunction and pathology on psychometric testing, but subgroups of patients with Ménière’s disease and vestibular migraine were found to have high anxiety and depression scores. The authors suggested that the development of a psychosomatic pathology depends on the patient’s ability to control relapses of a disorder. Psychiatric morbidity in patients with vertigo has been mostly reported in association with chronic or recurrent vestibular disorders.  

In our study, we investigated whether only chronic or recurrent vestibular disease could cause psychological distress and sought to identify modifying factors of any psychological distress found in patients with vestibular disease. Our results differed from those of previous reports.

Multiple logistic regression analyses indicated that only the DHI score was associated with the development of psychological distress (anxiety and depression). The DHI has proven to be a useful instrument for documenting the consequences of vestibular and/or balance impairment at the level of disability and handicap. Although no consistent relationship between DHI score and vestibular function disturbance could be established, DHI scores were related to clinical findings such as the frequency of dizziness spells, the occurrence of spontaneous nystagmus, and the number of falls, that is, the severity of dizziness symptoms.

Therefore, we found that the most important factor influencing the development of psychological distress in patients with vestibular disease is the severity of vertigo symptoms, rather than the type of vestibular disease or other factors. The experience of dizziness or vertigo symptoms exerts considerable stress on patients, which may give rise to psychological distress regardless of the pathophysiological mechanism of a specific vestibular disease.

Vestibular neuritis was related to depression, described as a symptom cluster including anger, physical pain, and social discord. Vestibular neuritis is a neuro-otological disease characterized by a sudden onset of severe vertigo with nausea, vomiting, and directional swaying. Dizziness could persist for days or weeks and is accompanied by horizontal-rotatory spontaneous nystagmus and postural instability. The experience of severe vertigo and persistence of dizziness in patients with vestibular neuritis may be affected by emotional or psychological instability, and vestibular neuritis is thought to be associated with depression.

**Conclusion**

Dizziness Handicap Inventory scores and psychological distress were closely associated. Psychological distress might be a consequence of high DHI scores rather than the type of vestibular disease, although depressive symptoms were related to vestibular neuritis.

**Author Contributions**

Seok Min Hong, study design, writing; Hyo-Jeong Lee, data collection; Byungho Lee, study design, statistical analysis; Su-Kyoung Park, data collection; Sung Kwang Hong, data collection; Il-Seok Park, data collection; Yong Bok Kim, data collection; Hyung-Jong Kim, data collection.

**Disclosures**

**Competing interests:** None.

**Funding source:** Hallym University Medical Center Research Fund (01-2009-02).

**References**