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Correlation between the dizziness handicap inventory and balance performance during the acute phase of unilateral vestibulopathy

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ABSTRACT

Purpose: The dizziness handicap inventory (DHI) is widely used to evaluate self-perceived handicap due to dizziness, and is known to correlate with vestibular function tests in chronic dizziness. However, whether DHI reflects subjective symptoms during the acute phase has not been studied. This study aims to investigate the correlations of subjective and objective measurements to highlight parameters that reflect the severity of dizziness during the first week of acute unilateral vestibulopathy.

Materials and methods: Thirty-seven patients with acute unilateral vestibulopathy were examined. Patients' subjective perceptions of dizziness were measured using the DHI, Vertigo Visual Analog Scale (VVAS), Disability Scale (DS), and Activity-Specific Balance Scale (ABC). Additionally, the oculomotor tests, Romberg and sharpened Romberg tests, functional reach test, and dynamic visual acuity tests were performed. The correlation between the DHI and other tests was evaluated.

Results: DHI-total scores exhibited a moderately positive correlation with VVAS and DS, and a moderately negative correlation with ABC. However, DHI-total score did not correlate with results of the Romberg, sharpened Romberg, or functional reach tests. When compared among four groups divided according to DHI scores, VVAS and DS scores exhibited statistically significant differences, but no significant differences were detected for other test results.

Conclusion: Our findings revealed that the DHI correlated significantly with self-perceived symptoms measured by VVAS and DS, but not ABC. There was no significant correlation with other balance function tests during the first week of acute vestibulopathy. The results suggest that DHI, VVAS and DS may be more useful to measure the severity of acute dizziness symptoms.

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1. Introduction

The objective assessment of dizziness symptoms remains a challenge for both physicians and patients who are experiencing dizziness. Dizziness is a subjective symptom that is characterized by an individual's perceived sense of spinning motion, loss of balance, or feelings of lightheadedness. A patient who is experiencing dizziness often suffers from limitations in various common daily activities. Some measures such as the frequency and duration of dizziness attacks, the

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observation of nystagmus, and the number of falls are quantifiable and can be used to assess the severity of dizziness. However, these measurements may not necessarily correlate with the severity of self-perceived dizziness.

The Dizziness Handicap Inventory (DHI) was developed to evaluate self-perceived handicaps due to dizziness [1]. DHI is a global self-assessment tool that has been translated into many languages, including Korean [2]. DHI is used to identify specific functional, emotional, or physical problems imposed by vestibular impairment, and has proven to be a reliable tool for assessing the therapeutic effects of vestibular rehabilitation [1,3]. Previous studies have reported correlations between DHI scores and the results of dynamic posturography [4,5], electronystagmography [5], and dynamic gait index [4–7]. However, these studies were designed to include patients who experienced chronic dizziness symptoms arising from various etiologies such as benign paroxysmal postural vertigo, vestibular neuritis, bilateral vestibular loss, Meniere's disease, and chronic nonspecific dizziness. Since they have experienced subjective dizziness over prolonged periods, patients with chronic dizziness symptoms are likely to develop specific adaptations to their daily routine in order to evade aggravation of dizziness caused by certain head or body movements. The DHI scores reflect such dizziness-related handicap perceived by the patients. Conversely, acute unilateral vestibulopathy patients experience a sudden onset of severe dizziness, but the symptoms usually dissipate over time. Since the dizziness symptoms occur quite suddenly in patients with no prior history, coping with dizziness during the acute phase can be quite challenging. In the current study, we evaluated whether the subjective perception of dizziness reflected functional impairment during the acute phase of unilateral vestibulopathy. The study was designed to investigate the correlation of the self-perceived dizziness handicap, as measured by DHI, to various vestibular tests and other self-reported indications during the initial onset of symptoms in acute unilateral vestibulopathy patients.

2. Materials and methods

A prospective multicenter study was performed in five referral university hospitals (Incheon St Mary's Hospital, Uijeongbu St. Mary's Hospital, St. Paul's Hospital, and Bucheon St. Mary Hospital of the Catholic University of Korea and Yonsei University Gangnam Severance Hospital) from April 2013 to February 2014. Institutional review boards in each respective hospital approved the study. Patients who presented with acute onset of severe vertigo at the emergency department or ENT clinic and diagnosed with acute unilateral vestibulopathy were enrolled. Inclusion criteria of this study were sudden onset of acute vertigo lasting more than one day, no accompanying hearing difficulty, and no other neurologic symptoms or signs. Exclusion criteria were age <18 or >65, onset of acute vertigo more than seven days ago, central origin vertigo, a history of head trauma, accompanying otologic diseases (including, but not limited to otitis media and otosclerosis), a history of recurrent vertigo (including benign paroxysmal positional vertigo and Meniere's disease), accompanying musculoskeletal condition that limits physical examination or vestibular rehabilitation therapy, or lack of consent. Of the 51 patients who were eligible for the study, 14 patients were excluded, and 37 patients diagnosed with acute vestibulopathy were included into the statistical analysis. A complete and thorough history and physical examination were performed at the initial visit that was conducted within seven days of the sudden vertigo symptoms.

2.1. *Subjective measures of dizziness*

Several subjective evaluations of dizziness symptoms were performed at the initial visit. The patients' subjective perception of dizziness related handicaps in daily activities was measured using the Korean version of the Dizziness Handicap Inventory (DHI), which measures self-perceived handicaps resulting from the functional, emotional, and physical aspects of dizziness, using a 25 item questionnaire [1,2]. The DHI-total score ranges from 0 (no dizziness handicap) to 100 (maximum dizziness handicap). The DHI scores are subcategorized as functional (DHI-F, 36 points), emotional (DHI-E, 36 points), and physical (DHI-P, 28 points). Self-perceived dizziness handicaps were grouped according to DHI scores, and classified as minimal (0–14), mild (16–34), moderate (36–52), and severe (≥54).

During the initial visit, the patients indicated their feeling of dizziness on a Vertigo Visual Analog Scale (VVAS) ranging from 0 (no dizziness) to 10 (maximum dizziness). As well, the patient's perception of disability caused by dizziness was noted on the Disability Scale (DS) [6]. The DS is 6-point scale that ranges from 0 (no disability) to 5 (having a long-term disability). The Activity-specific Balance Scale (ABC) is a 16-item questionnaire that documents the patient's perceived confidence performing 16 specific daily activities on a scale of 0% (no confidence) to 100% (100% confident) [7].

2.2. *Vestibular function tests and balance examination*

Physical examinations included otomicroscopy, neurologic test and oculomotor tests (presence or absence of spontaneous nystagmus, gaze-evoked nystagmus, and head shaking-induced nystagmus). In addition, the canal paresis (%) and directional preponderance (%) of the bithermal caloric irrigation test was measured.

Static balance tests included Romberg and sharpened Romberg tests conducted with the eyes both opened and closed. During Romberg test, the patient is asked to stand on the floor, preferably with shoes off, feet together. Patient is asked his or her arms crossed on the chest. The amount of time in seconds able to maintain the position is timed, first tested with eyes open, and then eyes closed. During sharpened Romberg test, patient is asked to stand with one foot directly in front of the other foot, heal touching toe.

Dynamic balance was evaluated by performance of the functional reach test (FRT) [8] and the dynamic visual acuity (DVA) test [5]. During functional reach test, the patient is instructed to stand next to, but not touching a wall. Then the patient closes one's fist, stretches his or her arm along the wall being parallel to the floor. The examiner records the starting position at the 3rd metacarpal head on the yardstick and instructs the patient to reach as far as he or she can forward without taking a step. The location of the 3rd metacarpal at this step is again recorded and the difference between the starting and the end position is calculated. Three

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