How Commonly Is Stroke Found in Patients with Isolated Vertigo or Dizziness Attack?

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Background: The sudden development of vertigo or dizziness without focal neurological symptoms is generally attributable to vestibular diseases such as benign paroxysmal positional vertigo. Isolated vertigo or dizziness attack needs more attention than vestibular diseases. This retrospective study was performed to elucidate the frequency of strokes in patients with isolated vertigo or dizziness attack. *Subjects and methods:* We enrolled 221 patients (men, 119; women, 102; mean age, 68.4 ± 10.3 years) who were admitted to our hospital over the last 10 years because of sudden isolated vertigo or dizziness attack without other neurological symptoms except for nystagmus, deafness, or tinnitus. We investigated the clinical features, final diagnosis, neuroimaging findings, and short- or long-term outcome of these patients. *Results:* One hundred eighteen patients had vertigo whereas the other 103 had dizziness. Brain computed tomography or magnetic resonance imaging revealed recent stroke lesions in 25 patients (11.3%) (ischemic, 21; hemorrhagic, 4).The lesions were generally small and localized in the cerebellum (n = 21), pons (n = 1), medulla oblongata (n = 1), or corona radiata (n = 1). Of the 25 patients, 19 (76%) had dizzy-type spells; none had neurological dysfunction at the time of discharge. In the remaining 196 patients, no stroke was detected on computed tomography or magnetic resonance imaging. *Conclusions:* Stroke was found in 11% of patients with isolated vertigo or dizziness attack. The posterior inferior cerebellar artery area was the most frequently implicated for isolated vertigo or dizziness. **Key Words:** Isolated vertigo—isolated dizziness—stroke—posterior inferior cerebellar artery.

Introduction

Acute vertigo and dizziness are common presenting symptoms in patients visiting the emergency department (ED). Although the most common cause is peripheral vestibular syndrome, which is generally benign,[1,2] it is important to distinguish patients with central ischemic insults from those with benign peripheral vestibular syndrome because misdiagnosis may lead to serious morbidity or mortality. Savitz et al have described that mortality in cases of misdiagnosed cerebellar infarctions was 40% and half of the survivors retained disabling deficits.[3] Case reports and small case series have shown that vertigo or dizziness can also be the principal or only complaint in stroke patients.[4-8] Acute cerebrovascular causes were diagnosed in only 3.2% of all patients presenting to ED with vertigo or dizziness and in only .7% of those presenting with isolated dizziness.[9] It is not easy to distinguish central vertigo from peripheral vertigo in patients who present without accompanying focal neurological deficits. Therefore, clarifying their clinical features is important. The

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objective of this study was to characterize the clinical presentation, proportion, evaluation of vascular area, diagnosis, and disposition of acute stroke patients with isolated vertigo or dizziness (IVD).

Materials and Methods

Patient Selection and Definition

We conducted a retrospective medical record review of consecutive patients who had not needed neurosurgical treatment, presenting with dizziness, vertigo, or imbalance to the National Cerebral and Cardiovascular Center, Suita, Osaka, Japan. ED is staffed 24 hours a day by stroke neurologists and is equipped with emergency computed tomography (CT) and magnetic resonance imaging (MRI). A retrospective study was undertaken in 221 patients admitted to our institute over the last 10 years for IVD attack, which was defined as sudden onset vertigo or dizziness without other neurological symptoms except for nystagmus, deafness, or tinnitus. The term "vertigo" is defined as an illusion of movement (rotational or linear) or a change in orientation from the vertical. The term "dizziness" is used when a sensation of imbalance is present without the illusion of movement. All patients underwent intense neurological examination on admission, and assessment tools such as the National Institutes of Health Stroke Scale were utilized. Retrospective investigation included the following: clinical features, nature of IVD, and the presence or absence of acute stroke lesions on CT or MRI. IVD patients were classified into a stroke group, with focal cerebrovascular lesions, and a nonstroke group, without such lesions on CT and/or MRI images. The local ethics committee approved the research protocol.

CT and MRI Methods

For CT scans, an Aquilion 16 (Toshiba Medical Systems, Ohtawara, Japan) was used, with a slice thickness of 8 mm, Scan speed 1.5 sec/rot, tube voltage 120 kV, tube current 180-230 mA, and field of view (FOV) 240 mm. As for MRI, diffusion-weighted imaging (DWI), fluid-attenuated inversion recovery (FLAIR) imaging, and time-of-flight magnetic resonance angiography (MRA) were routinely performed at 1.5 T (Magnetom Sonata or Magnetom Vision; Siemens Medical Solutions, Erlangen, Germany). DWI images were displayed using the following parameters: repetition time, 3000 ms (4000 ms); echo time, 72 ms (100 ms); matrix, 128 × 128; FOV, 23 cm; section thickness, 4 mm; intersection gap, 2 mm; and *b* values, 0 and 1000 s/mm^2. FLAIR images were as follows: repetition time, 9000 ms; echo time, 119 ms (105 ms); inversion time, 2500 ms (2400 ms); matrix, 182 × 256; FOV, 23 cm; flip angle, 150° (180°); section thickness, 5 mm (4 mm); and intersection gap, 1 mm (2 mm). Time-of-flight MRA was obtained using the following parameters: repetition time, 37 ms (35 ms); echo time, 7.15 ms (7.6 ms); flip angle, 25° (20°); FOV, 200 mm; matrix, 230 × 512 (224 × 512); and slice thickness, .6 mm. For each slice, a sequence including an image without diffusion gradients plus DWI was performed on participants within a day after onset of symptoms. The presence of acute cerebral infarction was assessed on DWI and the presence of acute intracranial hemorrhage was assessed on CT. Stroke volume was estimated by the ABC/2 method.[10] The CT or MRI slice with the largest area of cerebral infarction or intracranial hemorrhage was identified. The largest diameter (A) of the stroke lesion on this slice was measured. Next, the largest diameter 90° to A on the same slice was measured (B). Finally, the approximate number of 10-mm slices on which the stroke lesion was seen was calculated (C). C was calculated through a comparison of each CT or MRI slice with stroke lesion to the slice with the largest lesion on that scan.

Data Analysis

Continuous variables were expressed as the mean ± standard deviation for age and stroke volume. Categorical data were summarized as percentages. Differences between groups were analyzed using the Student's *t*-test and Mann–Whitney *U*-test for continuous values, and Pearson's chi-square test and Fisher's exact test for categorical variables as appropriate.

All statistical analyses were conducted using JMP 10 statistical software (SAS Institute, Inc., Cary, NC). All *P* values used in these tests were two tailed, with $P < .05$ considered statistically significant.

Results

Of the 221 patients with IVD admitted to our hospital over the last 10 years, 118 showed vertigo and the other 103 showed dizziness as the sole presenting complaint. The demographics and clinical characteristics of the patients are shown in Table 1. Brain CT or MRI revealed recent stroke lesions in 25 patients (11.3%) (ischemic, 21; hemorrhagic, 4). Patients with dizziness had a greater number of strokes than those with vertigo (19 [18%] versus 6 [5%], $P = .002$). Furthermore, patients with vertigo had larger stroke volumes than those with dizziness (12.9 ± 12.4 cm^3 [n = 6] versus 3.1 ± 5.0 cm^3 [n = 19], $P = .01$). The cerebrovascular lesions were generally small and localized in the cerebellum (n = 22), pons (n = 1), medulla oblongata (n = 1), or corona radiata (n = 1) (Table 2). We show the greatest dimension of cerebral infarction or cerebral hemorrhage in Table 2. Among the 25 patients, 19 (76%) had dizzy-type spells. Stroke etiology is shown in Table 3. Of these strokes, 21 had ischemic etiology (atherothrombotic, 9; cardioembolic, 7; dissection, 3; and aortogenic embolism, 2). The stroke volume of the cardioembolic ischemic stroke was larger than that of other ischemic strokes, and the stroke volume of the ischemic stroke was larger than that of the intracranial hemorrhage.