Out-of-hospital Scaling to Recognize Central Vertigo

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Objective: To determine parameters that could assist emergency medical services (EMS) or triage personnel in identifying patients with central vertigo (cerebellar stroke).
Methods: The medical records at a university-based emergency department (ED) were retrospectively analyzed. The study patients comprised of 23 patients who were transported by EMS between April 2011 and March 2012 with a chief complaint of vertigo. We reviewed their medical records, including their symptoms, vital signs, review of systems, and past medical histories, to identify several parameters that could be used by paramedics to recognize central vertigo (cerebellar stroke).
Results: Of the 23 patients, 4 had central vertigo (2 had cerebellar infarction and 2 had cerebellar hemorrhage) and 19 had peripheral vertigo. High blood pressure and lack of horizontal component of nystagmus were found to be good predictors of central vertigo (cerebellar stroke) in these patients. Using a systolic blood pressure of more than 160 mmHg and lack of horizontal component of nystagmus as parameters, we can predict central vertigo (cerebellar stroke) with 100% sensitivity, 84% specificity, 57% positive predictive value and 100% negative predictive value (P = 0.0035).
Conclusion: Using limited sample data, high blood pressure and lack of horizontal component of nystagmus were identified as good out-of-hospital parameters that could be used by paramedics to recognize central vertigo (cerebellar stroke).

Key words: vertigo, stroke, out-of-hospital scaling, nystagmus, hypertension

INTRODUCTION

Paramedics play a critical role in timely treatment of potential stroke. They are trained to recognize stroke using validated, abbreviated out-of-hospital neurologic evaluation tools such as the Cincinnati Prehospital Stroke Scale (CPSS)[1] or the Los Angeles Prehospital Stroke Screen (LAPSS)[2, 3]. These tools are very useful to recognize cerebral stroke, but paramedics cannot recognize certain types of stroke.

Vertigo is the perception of movement in the absence of movement. It is typically subdivided into peripheral and central vertigo. Peripheral vertigo is caused by disorders affecting the vestibular apparatus and eighth cranial nerve, while central vertigo is caused by disorders affecting central structures, such as the brainstem and cerebellum.

Disorders causing peripheral vertigo tend to produce more distressing symptoms; however, these disorders are seldom life-threatening. On the other hand, disorders causing central vertigo may produce less distressing symptoms and have a slower onset than those causing peripheral vertigo, but these disorders are generally more severe, requiring urgent or semiurgent diagnostic imaging or consultation with a neurologist or neurosurgeon [4].

PATIENTS AND METHODS

Between April 2011 and March 2012, 67 patients were transported to our ED with a chief complaint of vertigo. Of these 67 patients, 4 were diagnosed with cerebellar stroke (2 had hemorrhage and 2 had infarction). The remaining 63 patients did not have central nervous lesions, as indicated by head magnetic resonance imaging.

Complete records of vital signs, review of systems, and past medical histories were available for 23 of the 67 patients.

A retrospective analysis was performed using the medical records of these 23 patients to identify parameters to aid paramedics in recognizing central vertigo (cerebellar stroke).

Statistical analysis was performed using a Mann-Whitney's *U* test with Microsoft Excel 2010 add-ins software.

RESULTS

Table 1 shows the result of diagnosis, vital signs, review of systems, and past medical histories of the 23 patients. These parameters were selected for paramedics to review these on the scene.

The vital signs for which data was available were systolic and diastolic blood pressures, respiratory ratio, heart rate, and body temperature. Of these, only blood pressure was correlated with diagnosis.

Not all paramedics in Japan can obtain a complete review of systems from their patients; this depends on individual skills of the paramedics. Standard paramedics can recognize tinnitus, hearing difficulty, and horizontal component of nystagmus and can apply the CPSS or LAPSS. However, they have difficulty in identifying fine rotational and/or vertical component

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Table 1 Type of vertigos, patient characters, vital signs, review of systems, and past medical histories of the 23 patients with vertigo.

No.	Age	Sex	Diagnosis	Vital signs	Review of systems				Past medical histories				
				SBP	Tinnitus	Horizontalc ompo-nent of nystugmus	Neurological abnormality	Arrhithmia	Hypertension	Diabetes mellites	Hyperlipidemia	Vertigo	Stroke
1	88	F	Cerebellar hemorrhage	208	No	No	No	Yes	Yes	No	Yes	No	Yes
2	73	M	Cerebellar hemorrhage	202	No	No	Yes	No	No	No	No	No	No
3	67	F	Cerebellar infarction	189	No	No	No	No	No	No	No	No	No
4	76	M	Cerebellar infarction	166	No	No	No	No	Yes	No	No	No	No
5	60	M	Peripheral vertigo	200	Yes	Yes	No	No	Yes	No	No	No	No
6	79	F	Peripheral vertigo	198	Yes	No	No	No	Yes	No	No	Yes	No
7	61	F	Peripheral vertigo	170	No	No	No	No	No	No	No	No	No
8	51	F	Peripheral vertigo	153	No	Yes	No	No	No	No	No	Yes	No
9	64	M	Peripheral vertigo	150	No	Yes	No	No	Yes	No	No	Yes	No
10	74	F	Peripheral vertigo	148	No	No	No	No	No	No	No	No	No
11	67	M	Peripheral vertigo	146	No	Yes	No	No	No	No	No	Yes	No
12	57	F	Peripheral vertigo	142	No	Yes	No	No	No	No	No	No	No
13	61	M	Peripheral vertigo	139	Yes	Yes	No	No	No	No	No	No	No
14	91	F	Peripheral vertigo	138	No	No	No	No	Yes	Yes	Yes	No	No
15	25	M	Peripheral vertigo	130	No	Yes	No	No	No	No	No	No	No
16	31	M	Peripheral vertigo	127	Yes	No	No	No	Yes	No	No	Yes	No
17	61	F	Peripheral vertigo	122	No	No	No	No	No	No	No	Yes	No
18	62	F	Peripheral vertigo	121	No	Yes	No	No	No	No	No	No	No
19	76	M	Peripheral vertigo	120	No	Yes	No	No	No	No	No	No	No
20	42	M	Peripheral vertigo	120	No	Yes	No	No	No	No	No	No	No
21	22	F	Peripheral vertigo	112	Yes	Yes	No	No	No	No	No	No	No
22	36	F	Peripheral vertigo	108	No	No	No	No	No	No	No	No	No
23	70	M	Peripheral vertigo	106	No	Yes	No	No	No	No	No	No	No

Table 2

	Central vertigo (N = 4)	Peripheral vertigo (N = 19)	P value
Patient characteristics			
Age	67 – 88 (mean = 76.0)	22 – 91 (mean = 57.4)	0.0423
Male	2 (50 %)	10 (52.6 %)	1.0000
Vital signs			
Systolic blood pressure (mmHg)	191.3 + / - 18.6	138.9 +/- 27.5	* 0.0083
SBP > 160 mmHg	4	3	* 0.0094
SBP > 170 mmHg	3	3	0.0680
Review of system			
Lack of tinnitus	4	14	0.3946
Lack of horizontal component of nystagmus	4	7	* 0.0180
Neurological abnormality	1	0	0.4410
Arrhythmia	1	0	0.4100
Past medical history			
Hypertension	2	5	0.4960
Diabetes mellitus	0	1	0.8648
Hyperlipidemia	1	1	0.5513
Vertigo	0	6	0.3304
Stroke	1	0	0.4410

of nystagmus or detailed neurological abnormalities. Therefore, here, we concentrated on horizontal component of nystagmus and neurological abnormalities including facial droops, arm drift, or abnormal speech.

Almost all patients with vertigo are alert and can answer questions about their past medical history. A recent study showed that history of hypertension, current smoking habit, waist-to-hip ratio, diet risk score, lack of regular physical activity, diabetes mellitus, alcohol intake, psychosocial stress and depression, cardiac causes and ratio of apolipoproteins B and A1 are significant risk factors for all types of stroke[5]. Paramedics usually obtain past medical histories from their patient, but they seldom question about smoking or alcohol intake. Therefore, we considered past medical histories and not history of smoking or alcohol consumption.

Table 2 shows the sensitivity, specificity, positive predictive value, negative predictive value, and P value for each parameter. Systolic blood pressure more than 160 mmHg (100% sensitivity, 84% specificity, 57% positive predictive value, 100% negative predictive value, P = 0.0094) and lack of horizontal component of nystagmus (100% sensitivity, 63% specificity, 36% positive predictive value, 100% negative predictive value, P = 0.0180) were identified as candidate parameters to predict central vertigo (cerebellar stroke). Using these 2 parameters in combination, central vertigo (cerebellar stroke) can be predicted with 100% sensitivity, 84% specificity, 57% positive predictive value, and 100% negative predictive value (P = 0.0035). Although the sample size in this study was very small, high blood pressure and lack of horizontal component of nystagmus can be good out-of-hospital parameters for recognition of central vertigo (cerebellar stroke) by paramedics.

DISCUSSION

Several papers on the diagnosis of central vertigo have been published recently.

Chen *et al.* reported the reliability of a clinical bedside examination in 24 patients with vertigo. They were able to diagnose stroke with 100% sensitivity and 90% specificity if one of the following signs was observed: normal horizontal head impulse test, skew deviation of the eyes, abnormal vertical smooth pursuit eye movement, or central type nystagmus (purely vertical, purely rotational, or with directional change)[6].

Kattah *et al.* proposed a three-step bedside oculomotor examination in which a normal horizontal head impulse test, direction-changing nystagmus in eccentric gaze, or skew deviation indicated stroke[7].

The examinations discussed by these authors are usually performed by expert physicians and are difficult for paramedics. It is not practical to train all paramedics to perform these examinations. In addition, patients with vertigo are usually in too severe a condition to undergo complete physical examination. High blood pressure and lack of horizontal component of nystagmus seem to be good parameters for paramedics to quickly recognize central vertigo (cerebellar stroke) and can be considered for designing a validated, abbreviated out-of hospital neurologic evaluation tool.

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