

Etiological diagnoses of vertebrobasilar insufficiency with dizziness in 773 patients over a 10-year period in Suzhou, China

Xiaowei Hu¹, Qi Fang², Xia Yuan³, Zhengchun Zhang⁴, Wanli Dong⁵

ABSTRACT

Objective: Dizziness and vertigo were common but nonspecific symptoms of vertebrobasilar insufficiency (VBI), while out-of-date VBI has been falsely considered the major cause of dizziness symptoms by many clinicians in China. The objective of this study was to re-evaluate etiological diagnosis of VBI with dizziness symptoms among the hospitalized patients during the past 10 years.

Methodology: Retrospectively searched patients with the diagnosis of VBI in the in-patient database of the First Affiliated Hospital of Soochow University, China from January 1997 to December 2007. The original medical information were examined by the neurological specialists or combined with other specialists (such as otological specialists and cardiac specialists). The terms of dizziness symptoms and the diagnoses of related diseases were strictly distinguished.

Results: Seven hundred and seventy three patients were entered in the study. Five hundred and forty five patients (70.50%) were from Department of Neurology. After re-assessment, 462 (59.77%) cases had vertigo as chief complaint. Sixty seven (8.67%) met diagnostic criteria of vertebrobasilar TIA. Forty one patients (5.30%) were attributed to benign paroxysmal positional vertigo. There were 35 cases of Meniere's disease, 26 cases of heart diseases, 26 cases caused by abnormal blood pressure, 25 cases of psychological disorders, 21 cases of infectious diseases, 20 cases of syncope, 17 cases of sudden deafness, 11 cases of vestibular neuronitis, 7 cases of other ear diseases, 6 cases of migrainous vertigo and 5 cases of vertebrobasilar infarction. Thirty four were diagnosed as other diseases (6 cases of cervical osteoarthritis, 5 cases of brain trauma, 5 cases of encephalitis, 4 cases of intracranial hypotension syndrome, 4 cases of climacteric syndrome, 3 cases of old cerebral infarction, 2 cases of anemia, 2 cases of electrolyte disturbances, one case of multiple sclerosis, one case of hypoglycemia and one case of acute alcoholism). Four hundred and thirty two (55.89%) in total incredibly remained undiagnosed because of incomplete clinical information.

Conclusions: Serious exaggeration of VBI, confusion of dizziness symptoms and other related diseases lead to the abuse of VBI. VBI is not supposed to be used again. It's necessary to renew knowledge on VBI and dizziness symptoms, offer correct diagnosis and treatment to patients. The limitations addressed here are the retrospective design and more than 55% cases without definitive diagnosis.

KEY WORDS: Dizziness, Etiological diagnosis, Vertebrobasilar insufficiency, Vertigo.

Pak J Med Sci October - December 2012 Vol. 28 No. 5 860-864

How to cite this article:

Hu X, Fang Q, Yuan X, Zhang Z, Dong W. Etiological diagnoses of vertebrobasilar insufficiency with dizziness in 773 patients over a 10-year period in Suzhou, China. Pak J Med Sci 2012;28(5):860-864

Correspondence:
Dr. Wanli Dong,
E-mail: dwlsz@163.com

- * Received for Publication: February 20, 2012
- * 1st Revision Received: July 20, 2012
- * 2nd Revision Received: August 7, 2012
- * Final Revision Accepted: August 8, 2012

INTRODUCTION

Millikan and Siekert from Mayo Clinic firstly introduced the term of vertebrobasilar insufficiency (VBI) in 1955.¹ Clinicians from both sides of the Atlantic Ocean described about symptoms and signs

of VBI, and made the term popular.^{2,3} VBI could be used to account for transient ischemia attack (TIA) and the fluctuating nature of vertebrobasilar artery ischemia. However, so-called VBI is problematic term, lacking pathophysiological information. Today Magnetic Resonance Angiography (MRA) and transcranial Doppler sonography (TCD) could noninvasively evaluate the posterior circulation and Magnetic Resonance Image (MRI) could show infarction in the distribution of vertebrobasilar system.⁴ So Caplan has therefore recommended not using this term since 2000.⁵

VBI was added in classification of cerebrovascular diseases in 1995 in China and then has been extensively accepted.⁶ Vertigo and dizziness were common but nonspecific symptoms of VBI, while VBI has been falsely considered the major cause of vertigo and dizziness by many clinicians. Patients with vertigo and dizziness are incorrectly diagnosed as VBI.⁷

Up to now, no large-sample studies have been conducted on the misdiagnosis of VBI and dizziness symptoms in China. It is necessary to clarify the definitions of dizziness symptoms, and etiological diagnoses of VBI with the above-mentioned symptoms. Our study aimed to re-evaluate the hospitalized patients with the diagnosis of VBI over 10 years at the 1st Affiliated Hospital of Soochow University in China, summed up the reasons of misdiagnosis and provided the real world information of correct classification and diagnoses for those diseases with dizziness symptoms.

METHODOLOGY

The present study retrospectively searched patients with the diagnosis of VBI in the in-patient database of the 1st Affiliated Hospital of Soochow University from January 1997 to December 2007. In China, the diagnostic criteria of VBI generally included: (1) They were middle or old aged; (2) With dizziness symptoms; (3) With common risk factors of cerebral vascular diseases (such as hypertension, diabetes mellitus, hyperglycemia, heart diseases and smoking); (4) With cervical vertebral hyperostosis or degeneration; (5) Abnormal TCD test.⁸ Three hundred and sixty seven patients (47.47%) were successfully follow-up visited for more detailed information by phone. The original medical information were examined by the neurological specialists (Dong WL, Zhang ZC, Yuan X, Fang Q and Hu XW) or combined with other specialists (such as otological specialists and cardiac specialists at the same hospital). Patients' information in-

cluded ID number, name, gender, age, hospitalized duration, hospitalized departments, diagnosis, present history, symptoms, physical signs, previous history, and neurological or other investigations.

The concepts were correctly clarified. Dizziness usually refers to vague symptoms of light-headedness, a lack of orientation, or frank vertigo, but without motor hallucination. Vertigo is a subtype of dizziness and indicates disorder of the peripheral vestibular or central vestibulocerebellar system, characterized by an illusion or hallucination of movement. Vertigo of peripheral causes is often triggered by sudden movements and positional changes and is usually associated with aural symptoms, while central causes can induce episodes of vertigo with neurologic deficits as well.^{9,10} Light-headedness is commonly one symptom of presyncope related to circulatory, systemic diseases. Syncope refers to a brief lapse in consciousness caused by transient cerebral hypoxia because of many different factors.

Due to clinical records, the main complaints (vertigo, dizziness or light-headedness) were firstly clarified. Then peripheral vertigo and central vertigo were distinguished. The etiological diagnoses of VBI were based on the patient's complete medical history, a careful neurological examination, neurological investigations and other auxiliary investigations. Strict diagnostic criteria of related diseases were referred. References from No.11 to No.17 offer diagnostic criteria of common diseases with dizziness symptoms, which are vertebrobasilar TIA,¹¹ vertebrobasilar artery infarction,¹¹ Benign paroxysmal positional vertigo,¹² Meniere's disease,¹³ sudden deafness,¹⁴ vestibular neuronitis,¹⁵ Migrainous vertigo,¹⁶ anxiety and depression.¹⁷ Numeration data was expressed by percentage and frequency.

RESULTS

In total, 773 patients (414 male, 359 female, mean age 64 years) were entered in the study. Six hundred and fourteen (79.43%) were hospitalized in 2000 and before, and only 159 (20.57%) were after 2000. Days of hospitalization ranged from 1 to 74 days (mean $\pm$ SD, 12.25 $\pm$ 8.92). Duration of episodes lasted from half hour to several decades (mean $\pm$ SD, 4.53 $\pm$ 14.92 days).

Five hundred and forty five patients (70.50%) were from Department of Neurology. There were 57 (7.37%) from Department of Cardiology, 48 (6.21%) from Department of internal medicine for officials and 42 (5.43%) from Department of Geriatrics (Table-I).

Table-I: Section distributions.

Department	Cases	Percentage
Neurology	545	70.50%
Cardiology	57	7.37%
Internal medicine for officials	48	6.21%
Geriatrics	42	5.43%
VIP	21	2.72%
Digestive diseases	17	2.20%
Chinese Medicine	14	1.81%
Emergency room	10	1.29%
Endocrinology	9	1.16%
Respiratory disease	2	0.26%
Neurosurgery	2	0.26%
Tumor	2	0.26%
Nephrology	1	0.13%
Rheumatic disease	1	0.13%
Otorhinolaryngology	1	0.13%
Infectious disease	1	0.13%
Total	773	100%

Among 773 patients, 140 (18.11%) had vertigo as chief complaint. But based on the above-mentioned and accurate concepts, vertigo, dizziness and light-headedness symptoms were re-analyzed. The result indicated 462 (59.77%) cases had vertigo, 118 (15.26%) had dizziness, and 24 (3.11%) had light-headedness. One hundred and sixty nine cases (21.86%) had vertigo, dizziness or light-headedness, but these symptoms were not distinguished because they were not well described. Of 462 patients with vertigo, 318 (68.84%) were peripheral vertigo, 113 (24.46%) were central vertigo, and in 31 (6.70%) patients vertigo could not be categorized.

Only 72 (9.31%) patients had vertigo or dizziness accompanied with symptoms of Horner's syndrome, limb ataxia, laryngeal and pharyngeal paralysis, dysphagia, dysarthria, visual disturbance, diplopia, gaze palsies, nystagmus, internuclear ophthalmoplegia, ataxia, drop attacks, face and extremity weakness, numbness, or reduced consciousness etc. One hundred and seventy one cases (22.12%) were tested by cranial CT, MRI (or plus MRA), cervical vertebra X-ray, cervical vertebra MRI, brain-stem auditory evoked potential (BAEP), TCD and carotid artery ultrasound.

VBI was the first diagnosis in 647 patients (83.70%), was not the first diagnosis in 126 ones (16.30%). After being correctly diagnosed, only 8.67% in them met diagnostic criteria of vertebrobasilar TIA (VBI may be vertebrobasilar TIA). Five were diagnosed

Table-II: Etiological diagnoses of VBI.

Diagnosis	cases	percentage
Vertebrobasilar TIA	67	8.67%
BPPV	41	5.30%
Meniere's disease	35	4.50%
Heart diseases	26	3.40%
Abnormal blood pressure	26	3.40%
Psychological disorders	25	3.20%
Infectious diseases	21	2.70%
Syncope	20	2.60%
Sudden deafness	17	2.20%
Vestibular neuronitis	11	1.40%
Other ear diseases	7	0.91%
Migrainous vertigo	6	0.78%
Cervical osteoarthritis	6	0.78%
Vertebrobasilar infarction	5	0.64%
Brain trauma	5	0.64%
Encephalitis	5	0.64%
Intracranial hypotension syndrome	4	0.52%
Climacteric syndrome	4	0.52%
Old cerebral infarction	3	0.39%
Anemia	2	0.26%
Electrolyte disturbances	2	0.26%
Multiple sclerosis	1	0.13%
Hypoglycemia	1	0.13%
Acute alcoholism	1	0.13%
Undiagnosed	432	55.89%
Total	773	100%

as vertebrobasilar artery infarction. Forty one patients were attributed to benign paroxysmal positional vertigo. And there were 26 related to heart diseases, 26 related to high or low blood pressure. Others were definitively diagnosed as other different diseases. Four hundred and thirty two in total incredibly remained undiagnosed because of insufficient clinical information (Table-II).

DISCUSSION

Although VBI might be a common disease in elderly patients, the diagnostic criteria have not yet been strictly defined because of the variety and non-specificity of its signs and symptoms.¹⁸

In China, the diagnosis of VBI has not been standardized as well.⁶⁻⁸ To date, few published articles have focused on the etiological diagnoses of possible VBI. This study aimed to summarize the diagnosis of VBI at the First Affiliated Hospital of Soochow University. The comprehensive hospital is located in Soochow City, a very representative city of China. Patients were mainly 60-79 years old. The majority of patients were treated at the Department of Neurology. The real information about VBI and dizziness symptoms was reflected in China from this study.

Based on diagnostic criteria, the etiological diagnoses of 44.11% among 773 patients were definite. The proportion of correct diagnoses in our retrospective study is significantly lower than in other two prospective studies.^{18,19} It may be concluded that generalized VBI was thought to be vertebrobasilar artery TIA and infarction; vestibular and inner ear lesions (including benign paroxysmal positional vertigo, Meniere's disease, etc); Mental disorders associated with dizziness or vertigo (anxiety and depression) and other systemic diseases. The results indicated most vertigo or dizziness are attributable to the above diseases, as Furman et al described that the most common causes of vertigo are benign paroxysmal positional vertigo, Meniere's disease, migraine.²⁰ Among 341 patients with certain diagnoses in our study, 111 patients (diagnosed as peripheral vestibular diseases) occupied 32.55%. It indicated vertigo is mainly caused by peripheral vestibular diseases.

The causes of misdiagnosis on VBI were carefully analyzed, which were attributed to both doctors and patients. The confusion of dizziness symptoms may be the primary. Dizziness is an umbrella term; it is nonspecific, which may be caused by any system disease, especially medical, neurologic and otology causes should be distinguished.²⁰ Dizziness may refer to vertigo, light-headedness, presyncope, anxiety, or just not feeling well.²¹ Vertigo is a subtype of dizziness and more specific refers to vestibular system diseases, characterized by an illusion of movement. In our study most patients complained dizziness; however they had vertigo as their chief complaint in fact. The assessment of dizziness and vertigo is one of the most difficult tasks for clinicians as well; our study showed some physicians seemed to confuse dizziness symptoms.

Secondary, the diagnosis of VBI is still a challenging problem, and it even remains unclear whether VBI is the same as vertebrobasilar TIA, so VBI is subject to be over diagnosed and generalized. VBI might be a common cause of spontaneous attacks of vertigo in older patients.^{10,18} The real world experience from our study indicated VBI has been mistakenly thought to be the most common cause of dizziness or vertigo. Brain blood-supply insufficiency (VBI included) has been popular in Chinese people.^{7,8} VBI given by busy clinicians seems to please patients, for sometimes patients with dizziness or vertigo may tell the diagnosis of VBI before correct diagnoses are made. The term carotid insufficiency was abandoned already in the 1970s, Caplan suggested VBI should not be utilized again.⁵ Neuro-

logical specialists' consensus also recommended stopping using VBI three years ago in China.²² As a result, we are glad to see less patients (21.57% after 2000) who were diagnosed as VBI.

Incomplete information also played a role in the undiagnosed of 432 (55.89%) patients with suspected VBI. Some patients have difficulty describing dizziness and vertigo, and anti-vertiginous and antiemetic drugs can suppress symptoms when a specific cause cannot be found, so often physicians may not attempt to differentiate among these types of a patient's dizziness.²³ Because no standardized definitions for symptom terminology were used by some physicians, caution must be taken when interpreting differences among dizzy terms. Physician must manage to collect symptom onset, duration, aggravating or alleviating factors, and associated auditory symptoms or focal brain symptoms. In general, >90% of patients with dizziness can be diagnosed by history alone. So the importance of taking a thorough history cannot be overemphasized.²⁴ Cranial MRI+MRA, TCD and DSA are very important to investigate vertebrobasilar diseases. In our study, however, only a minority of patients took related tests. In many cases correct diagnoses could not be obtained without necessary neurological investigations. Moreover, despite careful evaluation a significant number of patients cannot easily be diagnosed. From the experience in a Multidisciplinary "Dizzy" Clinic of Canada, even 108 (13.3%) of 812 patients had a diagnosis unknown.¹⁶ So misdiagnosis and unknown diagnosis in our study may be unavoidable. All the above factors attributed to that high proportion of unknown diagnosis in our study.

Limitations of the study: As a retrospective observational study, misclassification and mistaken diagnosis may exist. This patient population, only 773 cases at one hospital, may not fully be representative to all populations in China.

CONCLUSION

In conclusion, the confusion of dizziness symptoms, VBI and other related diseases lead to the abuse of VBI. Both patients and doctors should be responsible for the serious exaggeration of VBI. Neurological specialists have the duty to help patients and physicians to differentiate these terms. Our new set up Dizzy Clinic (from 2007) and extensive use of auxiliary diagnostic procedures could definitely benefit to correctly diagnose dizziness symptoms and related diseases.

ACKNOWLEDGEMENT

All authors declare no financial or conflicting interest regarding any data or device mentioned in the text, such as stock ownership, consulting relationships, speaking engagements, research grants. The authors want to thank the technical staff of medical record library, Jianpin Song from Department of Cardiology, Guanghua Lan from Department of Psychiatry, Gensheng Xiao from Department of Otorhinolaryngology, at the First Affiliated Hospital of Soochow University, Suzhou, China, for assistance.

REFERENCES

1. Millikan CH, Siekert RG. Studies in cerebrovascular disease, I: the syndrome of intermittent insufficiency of the basilar arterial system. *Proc Staff Meet Mayo Clin.* 1955;30:61-68.
2. Fang HC, Palmer JJ. Vascular phenomena involving brainstem structures: a clinical and pathological correlation study. *Neurology.* 1956;6:402-419.
3. Williams D, Wilson TG. The diagnosis of the major and minor syndromes of basilar insufficiency. *Brain.* 1962;85:741-774.
4. Eaton DA, Roland PS. Dizziness in the older adult, part 2: Treatments for causes of the four most common symptoms. *Geriatrics.* 2003;58:46-52.
5. Caplan L. Posterior Circulation Ischemia: Then, Now, and Tomorrow The Thomas Willis Lecture-2000. *Stroke.* 2000;31:2011-2023.
6. Chinese neurology society, Chinese neurosurgery society. Classification of cerebrovascular diseases (1995). *J Chinese Neurol.* 1996;29:376-378.
7. Li CY. Do not diagnose vertebrobasilar insufficiency. *Chinese Stroke Neurol Dis.* 2008;15:127-128.
8. Dong WL. Correct recognition and diagnosis of diseases with dizziness symptoms. *Chin Cerebrovasc Dis.* 2008;6:46-48.
9. Baloh RW. Differentiating between peripheral and central causes of vertigo. *Otolaryngol Head Neck Surg.* 1998;119:56-60.
10. Baloh RW. Vertigo. *Lancet.* 1998;352:1841-1846.
11. American Heart Association/American Stroke Association Council on Stroke; Council on Cardiovascular Radiology and Intervention; American Academy of Neurology. Guidelines for prevention of stroke in patients with ischemic stroke or transient ischemic attack: a statement for healthcare professionals from the American Heart Association/American Stroke Association Council on Stroke: co-sponsored by the Council on Cardiovascular Radiology and Intervention: the American Academy of Neurology affirms the value of this guideline. *Stroke.* 2006;37:577-617.
12. Dix MR, Hallpike SC. The pathology, symptomatology and diagnosis of certain common disorders of the vestibular system. *Proc R Soc Med.* 1952;45:341-354.
13. Weber PC, Adkins WY JR. The differential diagnosis of Meniere's disease. *Otolaryngol Clin North Am.* 1997;30:977-986.
14. Friedland D, Shemirani N. Practice guidelines for sudden sensorineural hearing loss. *Otolaryngol Head Neck Surg.* 2008;139:58.
15. Baloh RW. Vestibular Neuritis. *N Engl J Med.* 2003;33:1027-1032.
16. Headache Classification Subcommittee of the International Headaches. The International Classification of Headache Disorders: 2nd edition. *Cephalalgia.* 2004;24(Suppl 1):9-160.
17. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders DSM-IV. APA, Washington. 1994.
18. Acara M, Degirmencia B, Yucela A. Comparison of vertebral artery velocity and flow volume measurements for diagnosis of vertebrobasilar insufficiency using color duplex sonography. *Eur J Radiol.* 2005;54:221-224.
19. Bath, AP, Walsh RM, Ranalli P. Experience from a multidisciplinary "dizzy" clinic. *Am J Otol.* 2000;21:92-97.
20. Furman JM, Cass SP. Benign Paroxysmal Positional Vertigo. *New Engl J Med.* 1999;341:1590-1596.
21. Kerber KA, Brown DL, Lisabeth LD. Stroke among patients with dizziness, vertigo, and imbalance in the emergency department: a population-based study. *Stroke.* 2006;37:2484-2487.
22. Li YS, Chen HB, Chen KN. Chinese neurological specialists' consensus on posterior circulation ischemia. *Chin J Intern Med.* 2006;45:787-789.
23. Kwong EC, Pimlott NJ. Assessment of dizziness among older patients at a family practice clinic: a chart audit study. *BMC Fam Pract.* 2005;6:2.
24. Rutka J. Dizziness and vertigo: what's being missed? *Can J CME.* 1984;6:75-84.

Authors Contributions:

Xiaowei Hu-Research project: Conception; Statistical Analysis: Design, Execution, Review and Critique; Writing the first draft.
 Qi Fang, Xia Yuan, Zhengchun Zhang-Research project: Execution; Statistical Analysis: Execution; Critical Review of Manuscript.
 Wanli Dong-Research project: Conception and Organization; Statistical Analysis: Review of Manuscript.

Authors:

1. Xiaowei Hu, MD,
 2. Qi Fang, MD,
 3. Xia Yuan, MD,
 4. Zhengchun Zhang, MD,
 5. Wanli Dong, MD,
- 1-5: Department of Neurology,
 The First Affiliated Hospital of Soochow University,
 Suzhou, China.

Correspondence:

Dr. Wanli Dong,
 Department of Neurology,
 The First Affiliated Hospital of Soochow University
 No 188, Shi Zi Street, Suzhou, 215006, Jiangsu Province,
 People's Republic of China.
 E-mail: dwlsz@163.com