



Volume 2 Number 1, January 2022

Vestibular Disorder Approach Base on International Classification of Vestibular Disorder

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Article info

Article History:

Received Nov 17, 2021

Revised Jan 3, 2022

Accepted Jan 10, 2022

Published Jan 31, 2022

Keywords:

Vestibular syndrome
Vestibular disorder
Classification of
vestibular disorder

ABSTRACT

Vestibular symptoms are symptoms that interfere with daily activities. Diagnosing these symptoms often relies on radiologic examinations that lead to a false negative. Proper clinical approach and study showed higher accuracy than radiologic examination on vestibular disease. These clinical approaches are based on time, triggers, and targeted analysis. The new vestibular symptoms will be classified into acute vestibular syndrome, episodic vestibular syndrome, and chronic vestibular syndrome. An acute vestibular syndrome is a vestibular symptom that lasts for days up to weeks. The episodic vestibular syndrome is vestibular symptoms that periodically appear. The chronic vestibular syndrome is a vestibular symptom that appears from months to years. Diagnosing vestibular symptoms must be precisely made. The proper termination is the best way to facilitate doctors in communicating with each other. Using this classification is a precise and easy way to detect vestibular etiology. This review is made for clinicians to determine and differentiate the etiology of the vestibular syndrome and gives information in uniforming nomenclature of vestibular symptoms.

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INTRODUCTION

Vestibular symptoms are symptoms that often make patients come to hospital. These symptoms often interfere with patient's activity of daily living. Approximately vestibular symptoms account for 4% of all cases in the emergency department. The most frequent vestibular symptoms are dizziness, vertigo, and unsteadiness. The prevalence of vertigo 48,3%, unsteadiness 39.1%, and dizziness 35.6%. These three symptoms are often felt in combination by the patient. Etiology of these symptoms must be differentiated from the peripheral or central causes.^{1,2}

Rapid and accurate diagnosis is essential in vestibular disorder. Reliance on radiological examination in distinguishing central and peripheral lesions can be more common to result in false-negative when compared to excellent and precise physical examination. The accurate physical examination has 99% of sensitivity while computed tomography scan only has around 7-16% in identifying acute stroke lesions. Even MRI with diffusion-weighted imaging misses 10-20% of strokes during the first 24-48 hours.^{3,4,5}

Another thing that often hinders the management of vestibular cases is the non-uniformity in nomenclature and description of syndromes, symptoms, and clinical disorders. The lack of vestibular symptom description is due to the many sub-specialties dealing with this disorder.^{4,5} The termination of dizziness and headache are often confusing for the patient to describe. However, healthcare providers must be able to differentiate these symptoms and to communicate with other healthcare providers to make the diagnosis and the treatment more precise.⁶

The clinician used to classify vestibular symptoms into four that are vertigo (spinning sensation), disequilibrium (feeling imbalance), light-headedness (sense of giddiness), and presyncope (sense of feeling faint). The clinician must differ between vertigo and non-rotational vestibular symptoms. Moreover, in the old vestibular approach, we differentiate the peripheral and central lesion from the additional symptoms of nausea, vomiting, and sweating associated with the peripheral lesion. Furthermore, the old approach suggests predicting the underlying disease based on the vestibular symptoms (vertigo is caused by the vestibular disorder, presyncope by cardiovascular, disequilibrium by neurologic disorder, nonspecific dizziness by psychiatric or metabolic cause).^{7,8}

Using this approach has limited value for guiding the clinician in distinguishing the central or peripheral causes of vestibular disorder. Recent evidence stated that using a quality symptoms approach is potentially dangerous. Because of this limitation, the international classification of the vestibular disorder suggests a

classification of vestibular disorder.⁷

Along with the above problems, we would like to review the classification of vertigo to harmonize the definition of vestibular symptoms among the clinician and introduce the classification of vestibular disorder. This review also helps the clinician in determining the central or peripheral lesion of the patient with vestibular symptoms more precise and accurate than the old approach.

REVIEW

Anatomy of Vestibular System

The vestibular system is composed of the central and peripheral systems. Central systems consist of vestibular nerve, vestibular ocular, vestibulospinal, and cerebellum. The vestibular nuclear complexes are located at the fourth ventricle. These complexes are divided into four primary nuclei that are medial superior, inferior, and lateral. Control of balance is regulated by vestibulospinal reflexes (VSR) mediated by structures at the pontomedullary and spinal cord. During head and body movement, gaze control is regulated by vestibulo ocular reflexes (VOR) that are regulated at the pontomesencephalic and cerebellar levels, which function to maintain the vision without blur even when the head is moving. The cortex and subcortex control perceptions of orientation, a movement towards self, and balance.^{7,9}

VOR begins from peripheral organ activation then passes to vestibular nuclei via the longitudinal fasciculus (MLF), which carries projections from the abducens nucleus to the contralateral oculomotor nucleus. The VOR's role is to keep the image in the middle of the visual field. This is achieved by converting physical head acceleration into biological signals directing eye movement inadequate and opposite direction of head movement.⁹

VSR is initiated from the vestibular system to maintain postural stability. The postural stability is kept balanced by receiving visual and proprioceptive input. This reflex is composed of the lateral and medial vestibulospinal tract. The medial vestibulospinal tract can maintain postural through controlling head and neck muscles. The lateral vestibulospinal tract helps to control the lower extremity when walking.⁹

Cerebellum through vestibulocerebellum (known as flocculonodular lobe) receives from vestibular nuclei and sends stimulus to vestibular nuclei for monitoring vestibular nuclei activity and work as an adaptive processor.⁹ The organization of the vestibular system requires the integration of both the right and left systems to maintain balance. This system is special because there is not only one gyrus that regulates balance on its own but also is regulated by multiple methods (visual, vestibular, somatosensory,

and auditory).³

Classification of Vestibular Symptoms

This classification of vestibular symptoms is divided into vertigo, dizziness, vestibulovisual, and postural symptoms. Vertigo is a sensation when the movement of oneself towards the environment without any actual movement (internal vertigo), or the sensation of environmental movement towards oneself without any actual movement (external vertigo or oscillopsia), sensation such as swaying, bouncing, or sliding are included here.⁷

Dizziness is the sensation of spatial disturbance in oneself without any false movements. Vestibulovisual symptom is a visual symptom felt by the patient and related to the vestibular system, such as visual distortion or blurred vision associated with vestibular disorders and not due to visual disturbances. Postural symptoms are disorders related to maintaining postural stability that occurs when in an upright position (sitting or standing).¹⁰

All vestibular symptoms are further classified into vestibular syndrome. Based on the International Classification of Vestibular Disorders (ICVD), these vestibular symptoms are divided into three syndromes, namely acute vestibular syndrome (AVS), episodic vestibular syndrome (EVS), and chronic vestibular syndrome (CVS).⁷

To differentiate all of these vestibular syndromes, the TiTrATE method (time, triggers, and targeted examination) can be used to point to a diagnosis. Time is an essential factor in determining vestibular symptom duration to narrow the differential diagnosis. In triggers, a doctor must find whether these symptoms emerge by triggering factors. The purpose of this method is to find the pathophysiology of the cause and will be divided into triggered AVS (t-AVS) or spontaneous AVS (s-AVS), triggered EVS (t-EVS), spontaneous (s -EVS). Targeted examinations are made to differ vertigo from benign or dangerous causal.^{3,5,10}

Acute Vestibular Syndromes

AVS is a condition when vestibular symptoms (vertigo, dizziness, vestibulovisual or postural symptoms) emerge acutely. The duration is usually from 24 hours up to several weeks, appears continuously, and suggests ongoing vestibular dysfunction. Vertigo and nystagmus may dominate this syndrome. These symptoms are usually precipitated by an acute central or peripheral lesion, resulting in an imbalance between right and left vestibular stimuli.^{5,11}

Generally, more than three million patients came to the emergency department with complaints of dizziness. In the United States, around 10% of all people belong to this syndrome. In acute vestibular syndrome, we must be concerned about the dangerous

cause of this syndrome, such as stroke. From all of the diagnoses already made in United States, only 0,7% of case were correctly identified as stroke in the first visit.¹¹

In AVS, all patients must be differentiated whether this disease is triggered or spontaneous. In triggered acute vestibular syndrome, the history of exposure is usually apparent, with the most common cause being blunt head trauma and drug intoxication.⁸

In s-AVS, the vestibular neuroimaging is often inaccurate enough to diagnose s-AVS. In this case, the HINTS test must be done. The HINTS tests are examinations that consist of head impulse test (to determine the presence of saccades indicating peripheral lesions), Nystagmus examination (bidirectional nystagmus indicates central lesion), and test of skew (to determine whether there is refixation of the eye that indicates a central lesion). In many studies, the HINTS examination is more sensitive and cheaper to detect central lesions when compared to radiological examination. The peripheral lesion in this syndrome is often caused by vestibular neuritis, whereas central lesion is caused by stroke.^{5,12}

Episodic Vestibular Syndromes

EVS is an intermittent vestibular symptom that lasts from seconds to hours with periods of remission between attacks (Meniere's, vestibular migraine, paroxysmal positional vertigo, and central paroxysmal positional vertigo).⁷

The most common disease in EVS is Benign paroxysmal positional vertigo (BPPV). It accounts for about 2,4% of lifetime prevalence and 10% of all of the dizziness cases in the emergency department. In S-EVS, Meniere is estimated to be 0,1% of the population. On the other hand, Vestibular migraine was accounted to be 1% in the general population. Vestibular paroxysms are considered a rare disease with uncertain prevalence and predicted to be <1:2000 person in population worldwide.^{5,13-15}

In s-EVS, several differential diagnoses that can be considered are stroke, vestibular migraine, and vestibular paroxysms. In t-EVS, the differential diagnosis is between positional paroxysmal vertigo (BPPV) or stroke.^{13,14} The diagnosis of disease in s-EVS is often made by taking patients' history because they often come when they are asymptomatic. The duration of the attack can help in establishing the diagnosis. Meniere's attack duration ranges from twenty minutes to twelve hours, accompanied by unilateral tinnitus, aural fullness, and reversible sensorineural hearing loss.⁵

Vestibular migraine is also categorized in this syndrome. Vestibular symptoms might appear from seconds to days with headaches that can happen before, together, or after the vestibular symptoms appear.⁵

While in vestibular paroxysms, the duration is last less than 60 second with at least five spontaneous episodic syndromes, and response to carbamazepine.¹⁵ In contrast to s-EVS, t-EVS emerge from a trigger that often occurs due to head or body position changes. It is essential to distinguish between aggravating and precipitating factors during the history taking. BPPV is a common disease of this type. A dix-hall pike examination is mandatory and can differentiate between a central lesion (atypical nystagmus) leading to central paroxysmal positional vertigo (CPPV) or peripheral (typical nystagmus) leading to BPPV.³

Chronic Vestibular Syndromes

CVS is a vestibular symptom that appears from months to years. This condition is suggestive of persistent vestibular dysfunction. It can be a disorder that refers to central nervous system dysfunction or cochlear disorders. This situation describes an ongoing process and does not get any better, although the possibility of an acute condition that experiences incomplete healing cannot be ruled out.⁷

There is no data on the prevalence of CVS generally. The most common diseases in this syndrome are persistent postural-perceptual dizziness (PPPD) and bilateral vestibulopathy. PPPD is estimated at 8-10% of all cases in neurotology centers, and vestibulopathy bilateral is 4-7% in various reports.^{16,17}

Other common diseases in CVS are neoplasms in the posterior fossa tumors, chronic bilateral vestibulopathy, and chronic psychological or behavioral manifestations of vestibular disorders.⁷ The new international classification differs from psychiatric dizziness and functional dizziness. PPPD used to be categorized as psychiatric dizziness, but now PPPD is organized into functional dizziness. The functional dizziness arises from the changes in organ system function. This disease diagnosis usually comes when the vestibular symptoms appear for more than three months and are present most days without any provocation but can be exacerbated. Symptoms wax and wane and significantly cause distress or functional impairment.¹⁶

Vestibulopathy bilateral is a condition with bilateral impairment of the peripheral vestibular. This disease is characterized by a chronic vestibular syndrome that worsens in darkness or uneven ground, with no symptoms while sitting. Vestibulo-ocular reflex examination will be either absent or reduced. These symptoms appear due to the disturbance in the peripheral vestibular and lead to a deficit in vestibulo-ocular reflex and vestibulospinal reflex.¹⁷

Management

Treatment of vestibular syndrome is based on etiology. Ruling out the dangerous causes of vertigo, such as stroke, is essential before giving symptomatic medication.¹⁸ After ruling out the dangerous cause,

vestibular symptoms in acute vestibular syndrome can be controlled with benzodiazepines, dimenhydrinate, or promethazine. Short-term corticosteroids can also be beneficial in vestibular neuritis. The use of symptomatic medication should be limited. Symptomatic medication usage for more than two days may result in central compensation impairment.^{11,18}

BPPV usually causes a non-dangerous type of t-EVS. Patients with BPPV usually take a benefit from physical maneuver that helps in the repositioning of canal otoliths. Anti-histamine is not helpful in BPPV and might cause side effects such as fall and drowsiness.¹⁸ In s-EVS, medications are based on the disease. Carbamazepine or oxcarbazepine is useful in vestibular paroxysms. Triptan and propranolol can help in aborting and preventing vestibular migraine consecutively. Betahistine and salt restriction can help in a patient with Meniere.^{6,8,15}

Cognitive-behavioral therapy alone or in combination with vestibular rehabilitation therapy significantly improved symptoms in CVS. The use of serotonergic antidepressants and vestibular habituation exercise has been investigated and shown to have a beneficial effect.¹⁶

CONCLUSION

Vestibular symptoms are symptoms that are often found in clinical practice. The diagnosis of these symptoms must be carried out as accurately and as quickly as possible so that patient management can be carried out immediately. The use of the right terms is one way that can make it easier for doctors to communicate with other medical personnel.

The international classification of vestibular disorders differentiates vestibular symptoms into vertigo, dizziness, vestibulovisual, and postural symptoms. The clinician must classify the patient's symptoms as vestibular syndrome. Using the TiTrATE approach is an easy way to determine whether the cause of the symptoms is dangerous or benign. As soon as the clinician identifies the cause of the vestibular symptoms, they can decide on the proper management for the patient. We see that using the ICVD classification is an easy and targeted classification in precisely detecting the etiology of vestibular cases.

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ATTACHMENT

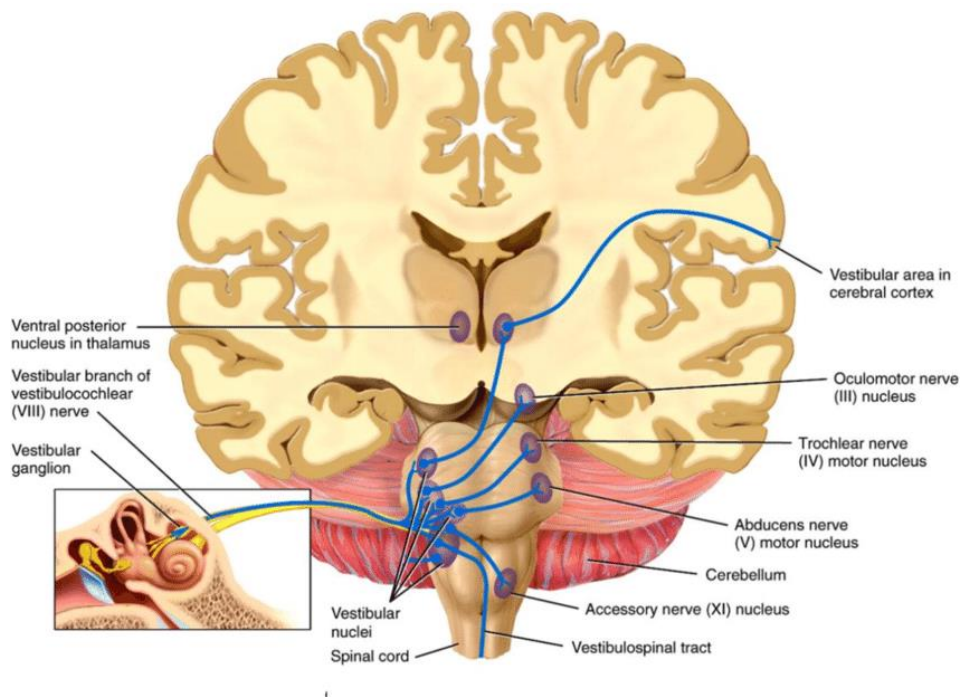


Figure 1. Vestibular system.¹⁹

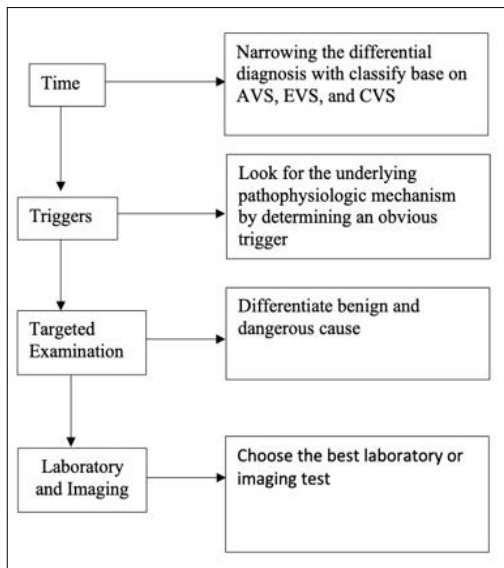


Figure 2. Time, Triggers, Targeted examination, and laboratory an imaging in vestibular symptoms.⁵

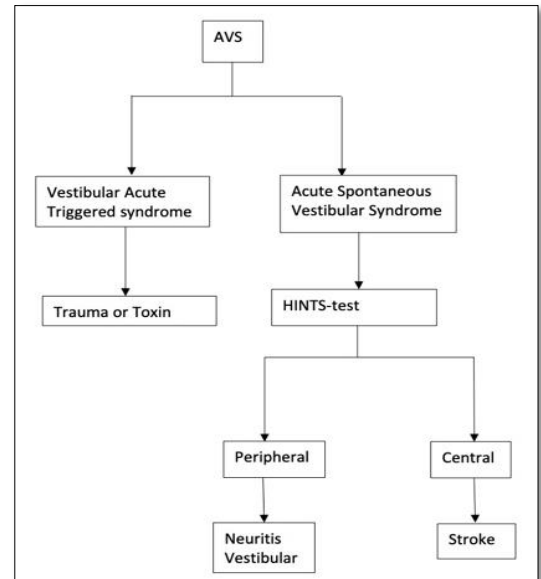


Figure 3. Acute vestibular Syndrome.

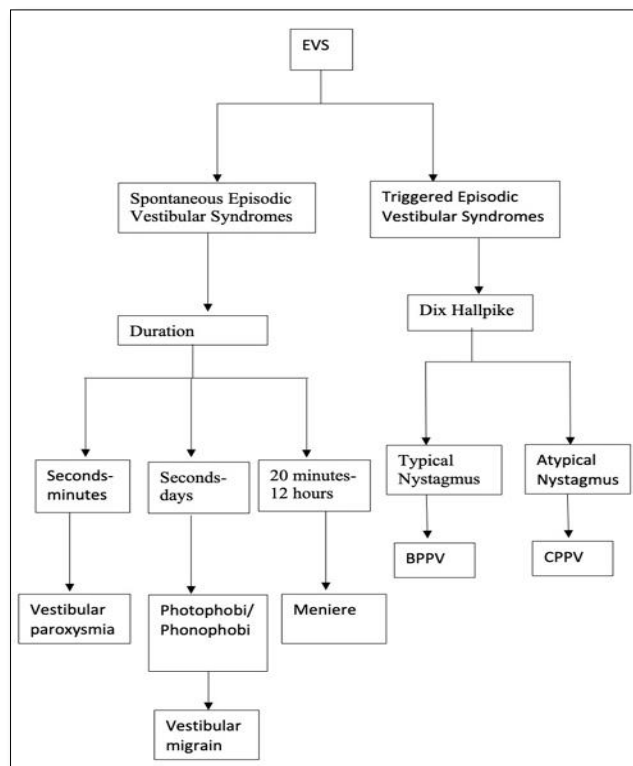


Figure 4. Episodic Vestibular Syndromes.